

Gather and Edited By

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Math MCQ'S Book

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Problems on Trains

Formulas

km/hr to m/s conversion:

$$a \text{ km/hr} = \left(a \times \frac{5}{18} \right) \text{ m/s.}$$

m/s to km/hr conversion:

$$a \text{ m/s} = \left(a \times \frac{18}{5} \right) \text{ km/hr.}$$

Formulas for finding Speed, Time and Distance

Time taken by a train of length l metres to pass a pole or standing man or a signal post is equal to the time taken by the train to cover l metres.

Time taken by a train of length l metres to pass a stationary object of length b metres is the time taken by the train to cover $(l + b)$ metres.

Suppose two trains or two objects bodies are moving in the same direction at u m/s and v m/s, where $u > v$, then their relative speed is $= (u - v)$ m/s.

Suppose two trains or two objects bodies are moving in opposite directions at u m/s and v m/s, then their relative speed is $= (u + v)$ m/s.

If two trains of length a metres and b metres are moving in opposite directions at u m/s and v m/s, then:

$$\text{The time taken by the trains to cross each other} = \frac{(a + b)}{(u + v)} \text{ sec.}$$

If two trains of length a metres and b metres are moving in the same direction at u m/s and v m/s, then:

$$\text{The time taken by the faster train to cross the slower train} = \frac{(a + b)}{(u - v)} \text{ sec.}$$

If two trains (or bodies) start at the same time from points A and B towards each other and after crossing they take a and b sec in reaching B and A respectively, then:

$$(\text{A's speed}) : (\text{B's speed}) = (b : a)$$

1 A train running at the speed of 60 km/hr crosses a pole in 9 seconds. What is the length of the train?

A. 120 metres

B. 180 metres

C. 324 metres

D. 150 metres

Answer & Explanation

Answer: Option D

Explanation:

$$\text{Speed} = \left(60 \times \frac{5}{18}\right) \text{m/sec} = \left(\frac{50}{3}\right) \text{m/sec.}$$

$$\text{Length of the train} = (\text{Speed} \times \text{Time}) = \left(\frac{50}{3} \times 9\right) \text{m} = 150 \text{ m.}$$

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A train 125 m long passes a man, running at 5 km/hr in the same direction in which the train is going, in 10 seconds. The speed of the train is:

A. 45 km/hr

B. 50 km/hr

C. 54 km/hr

D. 55 km/hr

Answer & Explanation

Answer: Option B

Explanation:

$$\text{Speed of the train relative to man} = \left(\frac{125}{10}\right) \text{m/sec}$$

$$\left(\frac{25}{2}\right) \text{m/sec.}$$

$$\left(\frac{25}{2} \times \frac{18}{5}\right) \text{km/hr}$$

45 km/hr.

Let the speed of the train be x km/hr. Then, relative speed = $(x - 5)$ km/hr.

$$\therefore x - 5 = 45 \Rightarrow x = 50 \text{ km/hr.}$$

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The length of the bridge, which a train 130 metres long and travelling at 45 km/hr can cross in 30 seconds, is:

A. 200 m

B. 225 m

C. 245 m

D. 250 m

Answer & Explanation

Answer: Option **C**

Explanation:

$$\text{Speed} = \left(45 \times \frac{5}{18} \right) \text{ m/sec} = \left(\frac{25}{2} \right) \text{ m/sec.}$$

Time = 30 sec.

Let the length of bridge be x metres.

$$\text{Then, } \frac{130 + x}{30} = \frac{25}{2}$$

$$\Rightarrow 2(130 + x) = 750$$

$$\Rightarrow x = 245 \text{ m.}$$

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Two trains running in opposite directions cross a man standing on the platform in 27 seconds and 17 seconds respectively and they cross each other in 23 seconds. The ratio of their speeds is:

A. 1 : 3

B. 3 : 2

C. 3 : 4

D. None of these

Answer & Explanation

Answer: Option **B**

Explanation:

Let the speeds of the two trains be x m/sec and y m/sec respectively.

Then, length of the first train = $27x$ metres,

and length of the second train = $17y$ metres.

$$\therefore \frac{27x + 17y}{x + y} = 23$$

$$\Rightarrow 27x + 17y = 23x + 23y$$

$$\Rightarrow 4x = 6y$$

$$\Rightarrow \frac{x}{y} = \frac{3}{2}.$$

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A train passes a station platform in 36 seconds and a man standing on the platform in 20 seconds. If the speed of the train is 54 km/hr, what is the length of the platform?

A. 120 m

B. 240 m

C. 300 m

D. None of these

Answer & Explanation

Answer: Option **B**

Explanation:

$$\text{Speed} = \left(54 \times \frac{5}{18} \right) \text{ m/sec} = 15 \text{ m/sec.}$$

Length of the train = $(15 \times 20)\text{m} = 300 \text{ m.}$

Let the length of the platform be x metres.

$$\text{Then, } \frac{x + 300}{36} = 15$$

$$\Rightarrow x + 300 = 540$$

$$\Rightarrow x = 240 \text{ m.}$$

A train 240 m long passes a pole in 24 seconds. How long will it take to pass a platform 650 m long?

A. 65 sec

B. 89 sec

C. 100 sec

D. 150 sec

Answer & Explanation

Answer: Option B

Explanation:

$$\text{Speed} = \left(\frac{240}{24} \right) \text{m/sec} = 10 \text{ m/sec.}$$

$$\therefore \text{Required time} = \left(\frac{240 + 650}{10} \right) \text{sec} = 89 \text{ sec.}$$

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Two trains of equal length are running on parallel lines in the same direction at 46 km/hr and 36 km/hr. The faster train passes the slower train in 36 seconds. The length of each train is:

A. 50 m

B. 72 m

C. 80 m

D. 82 m

Answer & Explanation

Answer: Option A

Explanation:

Let the length of each train be x metres.

Then, distance covered = $2x$ metres.

Relative speed = $(46 - 36)$ km/hr

$$\left(10 \times \frac{5}{18} \right) \text{m/sec}$$
$$\left(\frac{25}{9} \right) \text{m/sec}$$

$$\therefore \frac{2x}{36} = \frac{25}{9}$$

$$\Rightarrow 2x = 100$$

$$\Rightarrow x = 50.$$

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A train 360 m long is running at a speed of 45 km/hr. In what time will it pass a bridge 140 m

$$\left(\frac{500}{9}\right) \text{ m/sec.}$$

Let the length of the other train be x metres.

$$\text{Then, } \frac{x + 270}{9} = \frac{500}{9}$$

$$\Rightarrow x + 270 = 500$$

$$\Rightarrow x = 230.$$

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A goods train runs at the speed of 72 kmph and crosses a 250 m long platform in 26 seconds. What is the length of the goods train?

A. 230 m

B. 240 m

C. 260 m

D. 270 m

Answer & Explanation

Answer: Option **D**

Explanation:

$$\text{Speed} = \left(72 \times \frac{5}{18}\right) \text{ m/sec} = 20 \text{ m/sec.}$$

Time = 26 sec.

Let the length of the train be x metres.

$$\text{Then, } \frac{x + 250}{26} = 20$$

$$\Rightarrow x + 250 = 520$$

$$\Rightarrow x = 270.$$

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Two trains, each 100 m long, moving in opposite directions, cross each other in 8 seconds. If one is moving twice as fast the other, then the speed of the faster train is:

A. 30 km/hr

B. 45 km/hr

C. 60 km/hr

D. 75 km/hr

Answer & Explanation

Answer: Option C

Explanation:

Let the speed of the slower train be x m/sec.

Then, speed of the faster train = $2x$ m/sec.

Relative speed = $(x + 2x)$ m/sec = $3x$ m/sec.

$$\therefore \frac{(100 + 100)}{8} = 3x$$

$$\Rightarrow 24x = 200$$

$$\Rightarrow x = \frac{25}{3}$$

So, speed of the faster train = $\frac{50}{3}$ m/sec

$$\left(\frac{50}{3} \times \frac{18}{5} \right) \text{ km/hr}$$

60 km/hr.

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Two trains 140 m and 160 m long run at the speed of 60 km/hr and 40 km/hr respectively in opposite directions on parallel tracks. The time (in seconds) which they take to cross each other, is:

A. 9

B. 9.6

C. 10

D. 10.8

Answer & Explanation

Answer: Option D

Explanation:

$$\text{Relative speed} = (60 + 40) \text{ km/hr} = \left(\frac{100 \times 5}{18} \right) \text{ m/sec} = \left(\frac{250}{9} \right) \text{ m/sec.}$$

Distance covered in crossing each other = $(140 + 160) \text{ m} = 300 \text{ m}$.

$$\text{Required time} = \left(\frac{300 \times 9}{250} \right) \text{sec} = \frac{54}{5} \text{ sec} = 10.8 \text{ sec}.$$

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A train 110 metres long is running with a speed of 60 kmph. In what time will it pass a man who is running at 6 kmph in the direction opposite to that in which the train is going?

A. 5 sec

B. 6 sec

C. 7 sec

D. 10 sec

Answer & Explanation

Answer: Option **B**

Explanation:

Speed of train relative to man = $(60 + 6) \text{ km/hr} = 66 \text{ km/hr}$.

$$\left(66 \times \frac{5}{18} \right) \text{ m/sec}$$
$$\left(\frac{55}{3} \right) \text{ m/sec}.$$

$$\therefore \text{Time taken to pass the man} = \left(\frac{110 \times 3}{55} \right) \text{ sec} = 6 \text{ sec}.$$

16.

A train travelling at a speed of 75 mph enters a tunnel $3\frac{1}{2}$ miles long. The train is $\frac{1}{4}$ mile long. How long does it take for the train to pass through the tunnel from the moment the front enters to the moment the rear emerges?

A. 2.5 min B. 3 min

C. 3.2 min D. 3.5 min

Answer & Explanation

Answer: Option B

Explanation:

Total distance covered

$$= \left(\frac{7}{2} + 1 \right) \text{ miles}$$

$$= \frac{9}{2} \text{ miles.}$$

$$= 4.5 \text{ miles.}$$

4

Therefore Time taken

$$= \left(\frac{15}{4 \times 75} \right) \text{ hrs}$$

$$= \frac{1}{20} \text{ hrs}$$

$$= \frac{1}{20} \times 60 \text{ min.}$$

$$= 3 \text{ min.}$$

$$= 3 \text{ min.}$$

$$= 3 \text{ min.}$$

$$= 3 \text{ min.}$$

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17.

A train 800 metres long is running at a speed of 78 km/hr. If it crosses a tunnel in 1 minute, then the length of the tunnel (in meters) is:

A. 130 B. 360

C. 500 D. 540

Answer & Explanation

Answer: Option C

Explanation:

$$\text{Speed} = \left(\frac{78 \times 5}{18 \times 3} \right) \text{ m/sec} = 65 \text{ m/sec.}$$

Time = 1 minute = 60 seconds.

Let the length of the tunnel be x metres.

$$\text{Then, } \left(\frac{800 + x}{60 \times 3} \right) = 65$$

$$\Rightarrow 3(800 + x) = 3900$$

$$\Rightarrow x = 500.$$

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18.

A 300 metre long train crosses a platform in 39 seconds while it crosses a signal pole in 18 seconds. What is the length of the platform?

- A. 320 m B. 350 m
C. 650 m D. Data inadequate

Answer & Explanation

Answer: Option B

Explanation:

$$\text{Speed} = \left(\frac{300}{39} \right) \text{ m/sec} = 50 \text{ m/sec.}$$

18 3

Let the length of the platform be x metres.

Then, $(x + 300) \times 3 = 50$

39 3

$$\Rightarrow 3(x + 300) = 1950$$

$$\Rightarrow x = 350 \text{ m.}$$

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19.

A train speeds past a pole in 15 seconds and a platform 100 m long in 25 seconds. Its length is:

- A. 50 m B. 150 m
C. 200 m D. Data inadequate

Answer & Explanation

Answer: Option B

Explanation:

Let the length of the train be x metres and its speed by y m/sec.

Then, $\frac{x}{y} = 15 \Rightarrow y = \frac{x}{15}$

$y = \frac{x}{15}$

Therefore $\frac{x + 100}{y} = 25$

$$25 \quad 15$$

$$\Rightarrow 15(x + 100) = 25x$$

$$\Rightarrow 15x + 1500 = 25x$$

$$\Rightarrow 1500 = 10x$$

$$\Rightarrow x = 150 \text{ m.}$$

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20.

A train moves past a telegraph post and a bridge 264 m long in 8 seconds and 20 seconds respectively. What is the speed of the train?

69.5 km/hr

70 km/hr

79 km/hr

79.2 km/hr

Answer & Explanation

Answer: Option D

Explanation:

Let the length of the train be x metres and its speed by y m/sec.

$$\text{Then, } \frac{x}{y} = 8 \Rightarrow x = 8y$$

y

$$\text{Now, } \frac{x + 264}{y} = 20$$

Answer & Explanation

Answer: Option **B**

Explanation:

Relative speed = = (45 + 30) km/hr

$$= \left(75 \times \frac{5}{18} \right) \text{ m/sec}$$

$$= \left(\frac{125}{6} \right) \text{ m/sec.}$$

We have to find the time taken by the slower train to pass the DRIVER of the faster train and not the complete train.

So, distance covered = Length of the slower train.

Therefore, Distance covered = 500 m.

$$\therefore \text{Required time} = \left(500 \times \frac{6}{125} \right) = 24 \text{ sec.}$$

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Two trains are running in opposite directions with the same speed. If the length of each train is 120 metres and they cross each other in 12 seconds, then the speed of each train (in km/hr) is:

A. 10

B. 18

C. 36

D. 72

Answer & Explanation

Answer: Option **C**

Explanation:

Let the speed of each train be x m/sec.

Then, relative speed of the two trains = $2x$ m/sec.

$$\text{So, } 2x = \frac{(120 + 120)}{12}$$

$$\Rightarrow 2x = 20$$

Explanation:

$$2 \text{ kmph} = \left(2 \times \frac{5}{18} \right) \text{ m/sec} = \frac{5}{9} \text{ m/sec.}$$
$$4 \text{ kmph} = \left(4 \times \frac{5}{18} \right) \text{ m/sec} = \frac{10}{9} \text{ m/sec.}$$

Let the length of the train be x metres and its speed by y m/sec.

$$\text{Then, } \left(\frac{x}{y - \frac{5}{9}} \right) = 9 \text{ and } \left(\frac{x}{y - \frac{10}{9}} \right) = 10.$$

$$\therefore 9y - 5 = x \text{ and } 10(9y - 10) = 9x$$

$$\Rightarrow 9y - x = 5 \text{ and } 90y - 9x = 100.$$

On solving, we get: $x = 50$.

\therefore Length of the train is 50 m.

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A train overtakes two persons walking along a railway track. The first one walks at 4.5 km/hr. The other one walks at 5.4 km/hr. The train needs 8.4 and 8.5 seconds respectively to overtake them. What is the speed of the train if both the persons are walking in the same direction as the train?

A. 66 km/hr

B. 72 km/hr

C. 78 km/hr

D. 81 km/hr

Answer & Explanation

Answer: Option **D**

Explanation:

$$4.5 \text{ km/hr} = \left(4.5 \times \frac{5}{18} \right) \text{ m/sec} = \frac{5}{4} \text{ m/sec} = 1.25 \text{ m/sec, and}$$
$$5.4 \text{ km/hr} = \left(5.4 \times \frac{5}{18} \right) \text{ m/sec} = \frac{3}{2} \text{ m/sec} = 1.5 \text{ m/sec.}$$

Let the speed of the train be x m/sec.

$$\text{Then, } (x - 1.25) \times 8.4 = (x - 1.5) \times 8.5$$

$$\Rightarrow 8.4x - 10.5 = 8.5x - 12.75$$

$$\Rightarrow 0.1x = 2.25$$

$$\Rightarrow x = 22.5$$

$$\therefore \text{Speed of the train} = \left(22.5 \times \frac{18}{5} \right) \text{ km/hr} = 81 \text{ km/hr.}$$

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A train travelling at 48 kmph completely crosses another train having half its length and travelling in opposite direction at 42 kmph, in 12 seconds. It also passes a railway platform in 45 seconds. The length of the platform is

A. 400 m

B. 450 m

C. 560 m

D. 600 m

Answer & Explanation

Answer: Option **A**

Explanation:

Let the length of the first train be x metres.

Then, the length of the second train is $\left(\frac{x}{2} \right)$ metres.

$$\text{Relative speed} = (48 + 42) \text{ kmph} = \left(90 \times \frac{5}{18} \right) \text{ m/sec} = 25 \text{ m/sec.}$$

$$\therefore \frac{[x + (x/2)]}{25} = 12 \text{ or } \frac{3x}{2} = 300 \text{ or } x = 200.$$

\therefore Length of first train = 200 m.

Let the length of platform be y metres.

$$\text{Speed of the first train} = \left(48 \times \frac{5}{18} \right) \text{ m/sec} = \frac{40}{3} \text{ m/sec.}$$

$$\therefore (200 + y) \times \frac{40}{3} = 45$$

$$\Rightarrow 600 + 3y = 1800$$

$$\Rightarrow y = 400 \text{ m.}$$

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Two stations A and B are 110 km apart on a straight line. One train starts from A at 7 a.m. and travels towards B at 20 kmph. Another train starts from B at 8 a.m. and travels towards A at a speed of 25 kmph. At what time will they meet?

A. 9 a.m.

B. 10 a.m.

C. 10.30 a.m.

D. 11 a.m.

Answer & Explanation

Answer: Option B

Explanation:

Suppose they meet x hours after 7 a.m.

Distance covered by A in x hours = $20x$ km.

Distance covered by B in $(x - 1)$ hours = $25(x - 1)$ km.

$$\therefore 20x + 25(x - 1) = 110$$

$$\Rightarrow 45x = 135$$

$$\Rightarrow x = 3.$$

So, they meet at 10 a.m.

Time and Work

Formulas

Work from Days:

If A can do a piece of work in n days, then A's 1 day's work = $\frac{1}{n}$.

Days from Work:

If A's 1 day's work = $\frac{1}{n}$, then A can finish the work in n days.

Ratio:

If A is thrice as good a workman as B, then:

Ratio of work done by A and B = 3 : 1.

Ratio of times taken by A and B to finish a work = 1 : 3.

A can do a work in 15 days and B in 20 days. If they work on it together for 4 days, then the fraction of the work that is left is :

A. $\frac{1}{4}$

B. $\frac{1}{10}$

C. $\frac{7}{15}$

D. $\frac{8}{15}$

Answer & Explanation

Answer: Option D

Explanation:

A's 1 day's work = $\frac{1}{15}$;

B's 1 day's work = $\frac{1}{20}$;

(A + B)'s 1 day's work = $\left(\frac{1}{15} + \frac{1}{20} \right) = \frac{7}{60}$.

(A + B)'s 4 day's work = $\left(\frac{7}{60} \times 4 \right) = \frac{7}{15}$.

Therefore, Remaining work = $\left(1 - \frac{7}{15} \right) = \frac{8}{15}$.

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A can lay railway track between two given stations in 16 days and B can do the same job in 12 days. With help of C, they did the job in 4 days only. Then, C alone can do the job in:

A. $\frac{1}{95}$ days

B. $\frac{2}{95}$ days

C. $\frac{3}{95}$ days

D. 10

Answer & Explanation

Answer: Option C

Explanation:

(A + B + C)'s 1 day's work = $\frac{1}{4}$,

A's 1 day's work = $\frac{1}{16}$,

$$\text{B's 1 day's work} = \frac{1}{12}.$$

$$\therefore \text{C's 1 day's work} = \frac{1}{4} - \left(\frac{1}{16} + \frac{1}{12} \right) = \left(\frac{1}{4} - \frac{7}{48} \right) = \frac{5}{48}.$$

So, C alone can do the work in $\frac{48}{5} = 9\frac{3}{5}$ days.

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A, B and C can do a piece of work in 20, 30 and 60 days respectively. In how many days can A do the work if he is assisted by B and C on every third day?

A. 12 days

B. 15 days

C. 16 days

D. 18 days

Answer & Explanation

Answer: Option **B**

Explanation:

$$\text{A's 2 day's work} = \left(\frac{1}{20} \times 2 \right) = \frac{1}{10}.$$

$$(\text{A} + \text{B} + \text{C})\text{'s 1 day's work} = \left(\frac{1}{20} + \frac{1}{30} + \frac{1}{60} \right) = \frac{6}{60} = \frac{1}{10}.$$

$$\text{Work done in 3 days} = \left(\frac{1}{10} + \frac{1}{10} \right) = \frac{1}{5}.$$

Now, $\frac{1}{5}$ work is done in 3 days.

\therefore Whole work will be done in $(3 \times 5) = 15$ days.

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A is thrice as good as workman as B and therefore is able to finish a job in 60 days less than B. Working together, they can do it in:

A. 20 days

B. $22\frac{1}{2}$ days

C. 25 days

D. 30 days

Answer & Explanation

Answer: Option **B**

Explanation:

Ratio of times taken by A and B = 1 : 3.

The time difference is (3 - 1) 2 days while B take 3 days and A takes 1 day.

If difference of time is 2 days, B takes 3 days.

If difference of time is 60 days, B takes $\left(\frac{3}{2} \times 60\right) = 90$ days.

So, A takes 30 days to do the work.

$$\text{A's 1 day's work} = \frac{1}{30}$$

$$\text{B's 1 day's work} = \frac{1}{90}$$

$$\text{(A + B)'s 1 day's work} = \left(\frac{1}{30} + \frac{1}{90}\right) = \frac{4}{90} = \frac{2}{45}$$

$$\therefore \text{A and B together can do the work in } \frac{45}{2} = 22\frac{1}{2} \text{ days.}$$

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A alone can do a piece of work in 6 days and B alone in 8 days. A and B undertook to do it for Rs. 3200. With the help of C, they completed the work in 3 days. How much is to be paid to C?

A. Rs. 375

B. Rs. 400

C. Rs. 600

D. Rs. 800

Answer & Explanation

Answer: Option **B**

Explanation:

$$\text{C's 1 day's work} = \frac{1}{3} - \left(\frac{1}{6} + \frac{1}{8}\right) = \frac{1}{3} - \frac{7}{24} = \frac{1}{24}$$

$$\text{A's wages : B's wages : C's wages} = \frac{1}{6} : \frac{1}{8} : \frac{1}{24} = 4 : 3 : 1.$$

$$\therefore \text{C's share (for 3 days)} = \text{Rs. } \left(3 \times \frac{1}{24} \times 3200\right) = \text{Rs. 400.}$$

If 6 men and 8 boys can do a piece of work in 10 days while 26 men and 48 boys can do the same in 2 days, the time taken by 15 men and 20 boys in doing the same type of work will be:

A. 4 days

B. 5 days

C. 6 days

D. 7 days

Answer & Explanation

Answer: Option **A**

Explanation:

Let 1 man's 1 day's work = x and 1 boy's 1 day's work = y .

$$\text{Then, } 6x + 8y = \frac{1}{10} \text{ and } 26x + 48y = \frac{1}{2} .$$

Solving these two equations, we get : $x = \frac{1}{100}$ and $y = \frac{1}{200}$.

$$(15 \text{ men} + 20 \text{ boy})\text{'s 1 day's work} = \left(\frac{15}{100} + \frac{20}{200} \right) = \frac{1}{4} .$$

∴ 15 men and 20 boys can do the work in 4 days.

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A can do a piece of work in 4 hours; B and C together can do it in 3 hours, while A and C together can do it in 2 hours. How long will B alone take to do it?

A. 8 hours

B. 10 hours

C. 12 hours

D. 24 hours

Answer & Explanation

Answer: Option **C**

Explanation:

$$\text{A's 1 hour's work} = \frac{1}{4} ;$$

$$\text{(B + C)'s 1 hour's work} = \frac{1}{3} ;$$

$$\text{(A + C)'s 1 hour's work} = \frac{1}{2} .$$

$$\text{(A + B + C)'s 1 hour's work} = \left(\frac{1}{4} + \frac{1}{3} \right) = \frac{7}{12} .$$

$$\text{B's 1 hour's work} = \left(\frac{7}{12} - \frac{1}{2} \right) = \frac{1}{12} .$$

∴ B alone will take 12 hours to do the work.

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A can do a certain work in the same time in which B and C together can do it. If A and B together could do it in 10 days and C alone in 50 days, then B alone could do it in:

A. 15 days

B. 20 days

C. 25 days

D. 30 days

Answer & Explanation

Answer: Option C

Explanation:

$$(A + B)\text{'s 1 day's work} = \frac{1}{10}$$

$$C\text{'s 1 day's work} = \frac{1}{50}$$

$$(A + B + C)\text{'s 1 day's work} = \left(\frac{1}{10} + \frac{1}{50} \right) = \frac{6}{50} = \frac{3}{25} \dots (i)$$

$$A\text{'s 1 day's work} = (B + C)\text{'s 1 day's work} \dots (ii)$$

$$\text{From (i) and (ii), we get: } 2 \times (A\text{'s 1 day's work}) = \frac{3}{25}$$

$$\Rightarrow A\text{'s 1 day's work} = \frac{3}{50}$$

$$\therefore B\text{'s 1 day's work} \left(\frac{1}{10} - \frac{3}{50} \right) = \frac{2}{50} = \frac{1}{25}$$

So, B alone could do the work in 25 days.

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A does 80% of a work in 20 days. He then calls in B and they together finish the remaining work in 3 days. How long B alone would take to do the whole work?

A. 23 days

B. 37 days

C. $37\frac{1}{2}$

D. 40 days

Answer & Explanation

Answer: Option C

Explanation:

Whole work is done by A in $\left(20 \times \frac{5}{4} \right) = 25$ days.

Now, $\left(1 - \frac{4}{5} \right)$ i.e., $\frac{1}{5}$ work is done by A and B in 3 days.

Whole work will be done by A and B in $(3 \times 5) = 15$ days.

$$A's\ 1\ day's\ work = \frac{1}{25},\ (A + B)'s\ 1\ day's\ work = \frac{1}{15}$$

$$\therefore B's\ 1\ day's\ work = \left(\frac{1}{15} - \frac{1}{25} \right) = \frac{4}{150} = \frac{2}{75}$$

So, B alone would do the work in $\frac{75}{2} = 37\frac{1}{2}$ days.

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A machine P can print one lakh books in 8 hours, machine Q can print the same number of books in 10 hours while machine R can print them in 12 hours. All the machines are started at 9 A.M. while machine P is closed at 11 A.M. and the remaining two machines complete work. Approximately at what time will the work (to print one lakh books) be finished ?

- | | |
|----------------------|---------------------|
| A. 11:30 A.M. | B. 12 noon |
| C. 12:30 P.M. | D. 1:00 P.M. |

Answer & Explanation

Answer: Option **D**

Explanation:

$$(P + Q + R)'s\ 1\ hour's\ work = \left(\frac{1}{8} + \frac{1}{10} + \frac{1}{12} \right) = \frac{37}{120}$$

$$Work\ done\ by\ P,\ Q\ and\ R\ in\ 2\ hours = \left(\frac{37}{120} \times 2 \right) = \frac{37}{60}$$

$$Remaining\ work = \left(1 - \frac{37}{60} \right) = \frac{23}{60}$$

$$(Q + R)'s\ 1\ hour's\ work = \left(\frac{1}{10} + \frac{1}{12} \right) = \frac{11}{60}$$

Now, $\frac{11}{60}$ work is done by Q and R in 1 hour.

$$So,\ \frac{23}{60}\ work\ will\ be\ done\ by\ Q\ and\ R\ in\ \left(\frac{60}{11} \times \frac{23}{60} \right) = \frac{23}{11}\ hours \approx 2\ hours.$$

So, the work will be finished approximately 2 hours after 11 A.M., i.e., around 1 P.M.
A can finish a work in 18 days and B can do the same work in 15 days. B worked for 10 days and left the job. In how many days, A alone can finish the remaining work?

- | | |
|-------------|--------------------------|
| A. 5 | B. $5\frac{1}{2}$ |
| C. 6 | D. 8 |

Answer & Explanation

Answer: Option C

Explanation:

$$\text{B's 10 day's work} = \left(\frac{1}{15} \times 10 \right) = \frac{2}{3} .$$

$$\text{Remaining work} = \left(1 - \frac{2}{3} \right) = \frac{1}{3} .$$

Now, $\frac{1}{18}$ work is done by A in 1 day.

$$\therefore \frac{1}{3} \text{ work is done by A in } \left(18 \times \frac{1}{3} \right) = 6 \text{ days.}$$

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4 men and 6 women can complete a work in 8 days, while 3 men and 7 women can complete it in 10 days. In how many days will 10 women complete it?

A. 35

B. 40

C. 45

D. 50

Answer & Explanation

Answer: Option B

Explanation:

Let 1 man's 1 day's work = x and 1 woman's 1 day's work = y .

$$\text{Then, } 4x + 6y = \frac{1}{8} \text{ and } 3x + 7y = \frac{1}{10} .$$

$$\text{Solving the two equations, we get: } x = \frac{11}{400} , y = \frac{1}{400}$$

$$\therefore \text{1 woman's 1 day's work} = \frac{1}{400} .$$

$$\Rightarrow \text{10 women's 1 day's work} = \left(\frac{1}{400} \times 10 \right) = \frac{1}{40} .$$

Hence, 10 women will complete the work in 40 days.

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A and B can together finish a work 30 days. They worked together for 20 days and then B left. After another 20 days, A finished the remaining work. In how many days A alone can finish the work?

A. 40

B. 50

C. 54

D. 60

Answer & Explanation

Answer: Option D

Explanation:

$$(A + B)\text{'s 20 day's work} = \left(\frac{1}{30} \times 20 \right) = \frac{2}{3}.$$

$$\text{Remaining work} = \left(1 - \frac{2}{3} \right) = \frac{1}{3}.$$

Now, $\frac{1}{3}$ work is done by A in 20 days.

Therefore, the whole work will be done by A in $(20 \times 3) = 60$ days.

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P can complete a work in 12 days working 8 hours a day. Q can complete the same work in 8 days working 10 hours a day. If both P and Q work together, working 8 hours a day, in how many days can they complete the work?

A. $\frac{5}{11}$

B. $\frac{6}{11}$

C. $\frac{5}{611}$

D. $\frac{6}{611}$

Answer & Explanation

Answer: Option A

Explanation:

P can complete the work in (12×8) hrs. = 96 hrs.

Q can complete the work in (8×10) hrs. = 80 hrs.

∴ P's 1 hour's work = $\frac{1}{96}$ and Q's 1 hour's work = $\frac{1}{80}$.

$$(P + Q)\text{'s 1 hour's work} = \left(\frac{1}{96} + \frac{1}{80} \right) = \frac{11}{480}.$$

So, both P and Q will finish the work in $\left(\frac{480}{11} \right)$ hrs.

$$\square \text{ Number of days of 8 hours each} = \left(\frac{480}{11} \times \frac{1}{8} \right) = \frac{60}{11} \text{ days} = 5\frac{5}{11} \text{ days.}$$

Explanation:

Number of pages typed by Ravi in 1 hour = $\frac{32}{6} = \frac{16}{3}$.

Number of pages typed by Kumar in 1 hour = $\frac{40}{5} = 8$.

Number of pages typed by both in 1 hour = $\left(\frac{16}{3} + 8\right) = \frac{40}{3}$.

\therefore Time taken by both to type 110 pages = $\left(110 \times \frac{3}{40}\right)$ hours
= $8\frac{1}{4}$ hours (or) 8 hours 15 minutes.

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A, B and C can complete a piece of work in 24, 6 and 12 days respectively. Working together, they will complete the same work in:

A. $\frac{1}{24}$ day

B. $\frac{7}{24}$ day

C. $\frac{3}{37}$ days

D. 4 days

Answer & Explanation

Answer: Option C

Explanation:

Formula: If A can do a piece of work in n days, then A's 1 day's work = $\frac{1}{n}$.

(A + B + C)'s 1 day's work = $\left(\frac{1}{24} + \frac{1}{6} + \frac{1}{12}\right) = \frac{7}{24}$.

Formula: If A's 1 day's work = $\frac{1}{n}$, then A can finish the work in n days.

So, all the three together will complete the job in $\left(\frac{24}{7}\right)$ days = $3\frac{3}{7}$ days.

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Sakshi can do a piece of work in 20 days. Tanya is 25% more efficient than Sakshi. The number of days taken by Tanya to do the same piece of work is:

A. 15

B. 16

C. 18

D. 25

Answer & Explanation

Answer: Option B

Explanation:

Ratio of times taken by Sakshi and Tanya = $125 : 100 = 5 : 4$.

Suppose Tanya takes x days to do the work.

$$5 : 4 :: 20 : x \Rightarrow x = \left(\frac{4 \times 20}{5} \right)$$

$\Rightarrow x = 16$ days.

Hence, Tanya takes 16 days to complete the work

A takes twice as much time as B or thrice as much time as C to finish a piece of work. Working together, they can finish the work in 2 days. B can do the work alone in:

- | | |
|------------------|-------------------|
| A. 4 days | B. 6 days |
| C. 8 days | D. 12 days |

Answer & Explanation

Answer: Option **B**

Explanation:

Suppose A, B and C take x , $\frac{x}{2}$ and $\frac{x}{3}$ days respectively to finish the work.

$$\text{Then, } \left(\frac{1}{x} + \frac{2}{x} + \frac{3}{x} \right) = \frac{1}{2}$$

$$\Rightarrow \frac{6}{x} = \frac{1}{2}$$

$\Rightarrow x = 12$.

So, B takes $(12/2) = 6$ days to finish the work.

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A and B can complete a work in 15 days and 10 days respectively. They started doing the work together but after 2 days B had to leave and A alone completed the remaining work. The whole work was completed in :

- | | |
|-------------------|-------------------|
| A. 8 days | B. 10 days |
| C. 12 days | D. 15 days |

Answer & Explanation

Answer: Option C

Explanation:

$$(A + B)\text{'s 1 day's work} = \left(\frac{1}{15} + \frac{1}{10} \right) = \frac{1}{6}.$$

$$\text{Work done by A and B in 2 days} = \left(\frac{1}{6} \times 2 \right) = \frac{1}{3}.$$

$$\text{Remaining work} = \left(1 - \frac{1}{3} \right) = \frac{2}{3}.$$

Now, $\frac{1}{15}$ work is done by A in 1 day.

$$\therefore \frac{2}{3} \text{ work will be done by a in } \left(15 \times \frac{2}{3} \right) = 10 \text{ days.}$$

Hence, the total time taken = (10 + 2) = 12 days.

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A and B can do a piece of work in 30 days, while B and C can do the same work in 24 days and C and A in 20 days. They all work together for 10 days when B and C leave. How many days more will A take to finish the work?

A. 18 days

B. 24 days

C. 30 days

D. 36 days

Answer & Explanation

Answer: Option A

Explanation:

$$2(A + B + C)\text{'s 1 day's work} = \left(\frac{1}{30} + \frac{1}{24} + \frac{1}{20} \right) = \frac{15}{120} = \frac{1}{8}.$$

$$\text{Therefore, } (A + B + C)\text{'s 1 day's work} = \frac{1}{2 \times 8} = \frac{1}{16}.$$

$$\text{Work done by A, B, C in 10 days} = \frac{10}{16} = \frac{5}{8}.$$

$$\text{Remaining work} = \left(1 - \frac{5}{8} \right) = \frac{3}{8}.$$

$$\text{A's 1 day's work} = \left(\frac{1}{16} - \frac{1}{24} \right) = \frac{1}{48}.$$

Now, $\frac{1}{48}$ work is done by A in 1 day.

$$\text{So, } \frac{3}{8} \text{ work will be done by A in } \left(48 \times \frac{3}{8} \right) = 18 \text{ days.}$$

(16 x 15) men can complete the work in 1 day.

$$\therefore 1 \text{ man's 1 day's work} = \frac{1}{240}$$

So, required ratio = 240 : 320

$$1_3 : 1_4$$

4 : 3 (cross multiplied)

A and B can do a work in 8 days, B and C can do the same work in 12 days. A, B and C together can finish it in 6 days. A and C together will do it in :

A. 4 days

B. 6 days

C. 8 days

D. 12 days

Answer & Explanation

Answer: Option C

Explanation:

$$(A + B + C)'s \text{ 1 day's work} = \frac{1}{6} ;$$

$$(A + B)'s \text{ 1 day's work} = \frac{1}{8} ;$$

$$(B + C)'s \text{ 1 day's work} = \frac{1}{12} .$$

$$\therefore (A + C)'s \text{ 1 day's work} = \left(2 \times \frac{1}{6} \right) - \left(\frac{1}{8} + \frac{1}{12} \right)$$

$$\left(\frac{2}{3} - \frac{5}{24} \right)$$

$$24^3$$

$$\frac{1}{8} .$$

So, A and C together will do the work in 8 days.

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A can finish a work in 24 days, B in 9 days and C in 12 days. B and C start the work but are forced to leave after 3 days. The remaining work was done by A in:

A. 5 days

B. 6 days

C. 10 days

D. $\frac{1}{102}$ days

Answer & Explanation

Answer: Option C

Explanation:

$$(B + C)\text{'s 1 day's work} = \left(\frac{1}{9} + \frac{1}{12} \right) = \frac{7}{36} .$$

$$\text{Work done by B and C in 3 days} = \left(\frac{7}{36} \times 3 \right) = \frac{7}{12} .$$

$$\text{Remaining work} = \left(1 - \frac{7}{12} \right) = \frac{5}{12} .$$

Now, $\frac{1}{24}$ work is done by A in 1 day.

$$\text{So, } \frac{5}{12} \text{ work is done by A in } \left(24 \times \frac{5}{12} \right) = 10 \text{ days.}$$

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X can do a piece of work in 40 days. He works at it for 8 days and then Y finished it in 16 days. How long will they together take to complete the work?

A. $13\frac{1}{3}$ days

B. 15 days

C. 20 days

D. 26 days

Answer & Explanation

Answer: Option A

Explanation:

$$\text{Work done by X in 8 days} = \left(\frac{1}{40} \times 8 \right) = \frac{1}{5} .$$

$$\text{Remaining work} = \left(1 - \frac{1}{5} \right) = \frac{4}{5} .$$

Now, $\frac{4}{5}$ work is done by Y in 16 days.

$$\text{Whole work will be done by Y in } \left(16 \times \frac{5}{4} \right) = 20 \text{ days.}$$

∴ X's 1 day's work = $\frac{1}{40}$, Y's 1 day's work = $\frac{1}{16}$.

$$(X + Y)\text{'s 1 day's work} = \left(\frac{1}{40} + \frac{1}{20} \right) = \frac{3}{40}$$

Hence, X and Y will together complete the work in $\left(\frac{40}{3} \right) = 13\frac{1}{3}$ days.

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29. A and B can do a job together in 7 days. A is $1\frac{3}{4}$ times as efficient as B. The same job can be done by A alone in :

A. $9\frac{1}{3}$ days

B. 11 days

C. $12\frac{1}{4}$ days

D. $16\frac{1}{3}$ days

Answer & Explanation

Answer: Option **B**

Explanation:

$$(\text{A's 1 day's work}) : (\text{B's 1 day's work}) = \frac{7}{4} : 1 = 7 : 4.$$

Let A's and B's 1 day's work be $7x$ and $4x$ respectively.

$$\text{Then, } 7x + 4x = \frac{1}{7} \Rightarrow 11x = \frac{1}{7} \Rightarrow x = \frac{1}{77}$$

$$\therefore \text{A's 1 day's work} = \left(\frac{1}{77} \times 7 \right) = \frac{1}{11}$$

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A and B together can do a piece of work in 30 days. A having worked for 16 days, B finishes the remaining work alone in 44 days. In how many days shall B finish the whole work alone?

A. 30 days

B. 40 days

C. 60 days

D. 70 days

Answer & Explanation

Answer: Option **C**

Explanation:

Let A's 1 day's work = x and B's 1 day's work = y .

$$\text{Then, } x + y = \frac{1}{30} \text{ and } 16x + 44y = \frac{1}{30}$$

Solving these two equations, we get: $x = 60^1$ and $y = -60^1$

∴ B's 1 day's work = 60^1 .

Hence, B alone shall finish the whole work in 60 days.

Profit and Loss

Formulas

IMPORTANT FACTS

Cost Price:

The price, at which an article is purchased, is called its **cost price**, abbreviated as **C.P.**

Selling Price:

The price, at which an article is sold, is called its **selling prices**, abbreviated as **S.P.**

Profit or Gain:

If S.P. is greater than C.P., the seller is said to have a **profit** or **gain**.

Loss:

If S.P. is less than C.P., the seller is said to have incurred a **loss**.

IMPORTANT FORMULAE

$$\text{Gain} = (\text{S.P.}) - (\text{C.P.})$$

$$\text{Loss} = (\text{C.P.}) - (\text{S.P.})$$

Loss or gain is always reckoned on C.P.

Gain Percentage: (Gain %)

$$\text{Gain \%} = \left(\frac{\text{Gain} \times 100}{\text{C.P.}} \right)$$

5. Loss Percentage: (Loss %)

$$\text{Loss \%} = \left(\frac{\text{Loss} \times 100}{\text{C.P.}} \right)$$

6. Selling Price: (S.P.)

$$SP = \left[\frac{(100 + \text{Gain \%})}{100} \times \text{C.P.} \right]$$

7. Selling Price: (S.P.)

$$SP = \left[\frac{(100 - \text{Loss \%})}{100} \times \text{C.P.} \right]$$

8. Cost Price: (C.P.)

$$\text{C.P.} = \left[\frac{100}{(100 + \text{Gain \%})} \times \text{S.P.} \right]$$

9. Cost Price: (C.P.)

$$\text{C.P.} = \left[\frac{100}{(100 - \text{Loss \%})} \times \text{S.P.} \right]$$

If an article is sold at a gain of say 35%, then S.P. = 135% of C.P.

If an article is sold at a loss of say, 35% then S.P. = 65% of C.P.

When a person sells two similar items, one at a gain of say $x\%$, and the other at a loss of $x\%$, then the seller always incurs a loss given by:

$$\text{Loss \%} = \left(\frac{\text{Common Loss and Gain \%}}{10} \right)^2 = \left(\frac{x}{10} \right)^2.$$

13. If a trader professes to sell his goods at cost price, but uses false weights, then

$$\text{Gain \%} = \left[\frac{\text{Error}}{(\text{True Value}) - (\text{Error})} \times 100 \right] \%$$

Alfred buys an old scooter for Rs. 4700 and spends Rs. 800 on its repairs. If he sells the scooter for Rs. 5800, his gain percent is:

A. $\frac{4}{47} \%$

B. $\frac{5}{511} \%$

C. 10%

D. 12%

Answer & Explanation

Answer: Option **B**

Explanation:

Cost Price (C.P.) = Rs. (4700 + 800) = Rs. 5500.

Selling Price (S.P.) = Rs. 5800.

Gain = (S.P.) - (C.P.) = Rs.(5800 - 5500) = Rs. 300.

$$\text{Gain \%} = \left(\frac{300}{5500} \times 100 \right) \% = 5\overline{45} \%$$

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The cost price of 20 articles is the same as the selling price of x articles. If the profit is 25%, then the value of x is:

A. 15

B. 16

C. 18

D. 25

Answer & Explanation

Answer: Option **B**

Explanation:

Let C.P. of each article be Re. 1 C.P. of x articles = Rs. x.

S.P. of x articles = Rs. 20.

Profit = Rs. (20 - x).

$$\therefore \left(\frac{20 - x}{25x} \times 100 = \right)$$

$$\Rightarrow 2000 - 100x = 25x$$

$$125x = 2000$$

$$\Rightarrow x = 16.$$

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If selling price is doubled, the profit triples. Find the profit percent.

A.

—

663

B. 100

—

C. 1053

D. 120

Answer & Explanation

Answer: Option C

Explanation:

C.P. of 6 toffees = Re. 1

S.P. of 6 toffees = 120% of Re. 1 = Rs. $6\frac{5}{5}$

For Rs. $6\frac{5}{5}$, toffees sold = 6.

For Re. 1, toffees sold = $\left(6 \times \frac{5}{6}\right) = 5$.

The percentage profit earned by selling an article for Rs. 1920 is equal to the percentage loss incurred by selling the same article for Rs. 1280. At what price should the article be sold to make 25% profit?

Rs. 2000

Rs. 2200

Rs. 2400

Data inadequate

Answer & Explanation

Answer: Option A

Explanation:

Let C.P. be Rs. x .

$$\text{Then, } \frac{1920 - x}{x} \times 100 = \frac{x - 1280}{x} \times 100$$

$$\Rightarrow 1920 - x = x - 1280$$

$$\Rightarrow 2x = 3200$$

$$\Rightarrow x = 1600$$

$$\therefore \text{ Required S.P.} = 125\% \text{ of Rs. } 1600 = \text{Rs. } \left(\frac{125}{100} \times 1600\right) = \text{Rs } 2000.$$

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A shopkeeper expects a gain of 22.5% on his cost price. If in a week, his sale was of Rs. 392, what was his profit?

A. Rs. 18.20

B. Rs. 70

C. Rs. 72

D. Rs. 88.25

Answer & Explanation

Answer: Option C

Explanation:

$$\text{C.P.} = \text{Rs.} \left(\frac{100}{122.5} \times 392 \right) = \text{Rs.} \left(\frac{1000}{1225} \times 392 \right) = \text{Rs.} 320$$

$$\therefore \text{Profit} = \text{Rs.} (392 - 320) = \text{Rs.} 72.$$

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A man buys a cycle for Rs. 1400 and sells it at a loss of 15%. What is the selling price of the cycle?

A. Rs. 1090

B. Rs. 1160

C. Rs. 1190

D. Rs. 1202

Answer & Explanation

Answer: Option C

Explanation:

$$\text{S.P.} = 85\% \text{ of Rs. } 1400 = \text{Rs.} \left(\frac{85}{100} \times 1400 \right) = \text{Rs.} 1190$$

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Sam purchased 20 dozens of toys at the rate of Rs. 375 per dozen. He sold each one of them at the rate of Rs. 33. What was his percentage profit?

A. 3.5

B. 4.5

C. 5.6

D. 6.5

Answer & Explanation

Answer: Option C

Explanation:

$$\text{Cost Price of 1 toy} = \text{Rs.} \left(\frac{375}{12} \right) = \text{Rs.} 31.25$$

$$\text{Selling Price of 1 toy} = \text{Rs.} 33$$

17

17

2

C. $6\bar{3}\%$ gain

D. None of these

Answer & Explanation

Answer: Option B

Explanation:

$$\text{C.P. of 1}^{\text{st}} \text{ transistor} = \text{Rs. } \left(\frac{100}{120} \times 840 \right) = \text{Rs. } 700.$$

$$\text{C.P. of 2}^{\text{nd}} \text{ transistor} = \text{Rs. } \left(\frac{100}{96} \times 960 \right) = \text{Rs. } 1000$$

So, total C.P. = Rs. (700 + 1000) = Rs. 1700.

Total S.P. = Rs. (840 + 960) = Rs. 1800.

$$\therefore \text{Gain \%} = \left(\frac{100}{1700} \times 100 \right) \% = 5\bar{17}\%$$

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A trader mixes 26 kg of rice at Rs. 20 per kg with 30 kg of rice of other variety at Rs. 36 per kg and sells the mixture at Rs. 30 per kg. His profit percent is:

A. No profit, no loss

B. 5%

C. 8%

D. 10%

None of these

Answer & Explanation

Answer: Option B

Explanation:

C.P. of 56 kg rice = Rs. (26 × 20 + 30 × 36) = Rs. (520 + 1080) = Rs. 1600.

S.P. of 56 kg rice = Rs. (56 × 30) = Rs. 1680.

$$\therefore \text{Gain} = \left(\frac{80}{1600} \times 100 \right) \% = 5\%.$$

Problems on Ages

Formulas

Important Formulas on "Problems on Ages" :

If the current age is x , then n times the age is nx .

If the current age is x , then age n years later/hence = $x + n$.

If the current age is x , then age n years ago = $x - n$.

The ages in a ratio $a : b$ will be ax and bx .

If the current age is x , then $\frac{1}{n}$ of the age is $\frac{x}{n}$.

Father is aged three times more than his son Ronit. After 8 years, he would be two and a half times of Ronit's age. After further 8 years, how many times would he be of Ronit's age?

A. 2 times

B. $2\frac{1}{2}$ times

C. $2\frac{3}{4}$ times

D. 3 times

Answer & Explanation

Answer: Option A

Explanation:

Let Ronit's present age be x years. Then, father's present age = $(x + 3x)$ years = $4x$ years.

$$\therefore (4x + 8) = 2\frac{1}{2}(x + 8)$$

$$\Rightarrow 8x + 16 = 5x + 40$$

$$\Rightarrow 3x = 24$$

$$\Rightarrow x = 8.$$

$$\text{Hence, required ratio} = \frac{(4x + 16)}{(x + 16)} = \frac{48}{24} = 2.$$

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The sum of ages of 5 children born at the intervals of 3 years each is 50 years. What is the age of the youngest child?

A. 4 years

B. 8 years

C. 10 years

D. None of these

Answer & Explanation

Answer: Option A

Explanation:

Let the ages of children be x , $(x + 3)$, $(x + 6)$, $(x + 9)$ and $(x + 12)$ years.

Then, $x + (x + 3) + (x + 6) + (x + 9) + (x + 12) = 50$

$$\Rightarrow 5x = 20$$

$$\Rightarrow x = 4.$$

∴ Age of the youngest child = $x = 4$ years.

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A father said to his son, "I was as old as you are at the present at the time of your birth". If the father's age is 38 years now, the son's age five years back was:

A. 14 years

B. 19 years

C. 33 years

D. 38 years

Answer & Explanation

Answer: Option A

Explanation:

Let the son's present age be x years. Then, $(38 - x) = x$

$$\Rightarrow 2x = 38.$$

$$\Rightarrow x = 19.$$

∴ Son's age 5 years back $(19 - 5) = 14$ years.

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A is two years older than B who is twice as old as C. If the total of the ages of A, B and C be 27, the how old is B?

A. 7

B. 8

C. 9

D. 10

11

Answer & Explanation

Answer: Option **D**

Explanation:

Let C's age be x years. Then, B's age = $2x$ years. A's age = $(2x + 2)$ years.

$$\therefore (2x + 2) + 2x + x = 27$$

$$\Rightarrow 5x = 25$$

$$\Rightarrow x = 5.$$

Hence, B's age = $2x = 10$ years.

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Present ages of Sameer and Anand are in the ratio of 5 : 4 respectively. Three years hence, the ratio of their ages will become 11 : 9 respectively. What is Anand's present age in years?

A. 24

B. 27

C. 40

D. Cannot be determined

None of these

Answer & Explanation

Answer: Option **A**

Explanation:

Let the present ages of Sameer and Anand be $5x$ years and $4x$ years respectively.

$$\text{Then, } \frac{5x + 3}{4x + 3} = \frac{11}{9}$$

$$\Rightarrow 9(5x + 3) = 11(4x + 3)$$

$$\Rightarrow 45x + 27 = 44x + 33$$

$$\Rightarrow 45x - 44x = 33 - 27$$

$$\Rightarrow x = 6.$$

∴ Anand's present age = $4x = 24$ years.

A man is 24 years older than his son. In two years, his age will be twice the age of his son. The present age of his son is:

A. 14 years

B. 18 years

C. 20 years

D. 22 years

Answer & Explanation

Answer: Option D

Explanation:

Let the son's present age be x years. Then, man's present age = $(x + 24)$ years.

$$\therefore (x + 24) + 2 = 2(x + 2)$$

$$\Rightarrow x + 26 = 2x + 4$$

$$\Rightarrow x = 22.$$

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Six years ago, the ratio of the ages of Kunal and Sagar was 6 : 5. Four years hence, the ratio of their ages will be 11 : 10. What is Sagar's age at present?

A. 16 years

B. 18 years

C. 20 years

D. Cannot be determined

None of these

Answer & Explanation

Answer: Option A

Explanation:

Let the ages of Kunal and Sagar 6 years ago be $6x$ and $5x$ years respectively.

$$\text{Then, } \frac{(6x + 6) + 4}{(5x + 6) + 4} = \frac{11}{10}$$

$$\Rightarrow 10(6x + 10) = 11(5x + 10)$$

$$\Rightarrow 5x = 10$$

$$\Rightarrow x = 2.$$

∴ Sagar's present age = $(5x + 6) = 16$ years.

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The sum of the present ages of a father and his son is 60 years. Six years ago, father's age was five times the age of the son. After 6 years, son's age will be:

A. 12 years

B. 14 years

C. 18 years

D. 20 years

Answer & Explanation

Answer: Option **D**

Explanation:

Let the present ages of son and father be x and $(60 - x)$ years respectively.

Then, $(60 - x) - 6 = 5(x - 6)$

$$\Rightarrow 54 - x = 5x - 30$$

$$\Rightarrow 6x = 84$$

$$\Rightarrow x = 14.$$

∴ Son's age after 6 years = $(x + 6) = 20$ years..

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At present, the ratio between the ages of Arun and Deepak is 4 : 3. After 6 years, Arun's age will be 26 years. What is the age of Deepak at present ?

A. 12 years

B. 15 years

C. 19 and half

D. 21 years

Answer & Explanation

Answer: Option **B**

Explanation:

Let the present ages of Arun and Deepak be $4x$ years and $3x$ years respectively. Then,

$$4x + 6 = 26 \Leftrightarrow 4x = 20$$

$$x = 5.$$

∴ Deepak's age = $3x = 15$ years.

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Sachin is younger than Rahul by 7 years. If their ages are in the respective ratio of 7 : 9, how old is Sachin?

A. 16 years

B. 18 years

C. 28 years

D. 24.5 years

None of these

Answer & Explanation

Answer: Option **D**

Explanation:

Let Rahul's age be x years.

Then, Sachin's age = $(x - 7)$ years.

$$\therefore \frac{x - 7}{x} = \frac{7}{9}$$

$$\Rightarrow 9x - 63 = 7x$$

$$\Rightarrow 2x = 63$$

$$\Rightarrow x = 31.5$$

Hence, Sachin's age = $(x - 7) = 24.5$ years.

The present ages of three persons in proportions 4 : 7 : 9. Eight years ago, the sum of their ages was 56. Find their present ages (in years).

A. 8, 20, 28

B. 16, 28, 36

C. 20, 35, 45

D. None of these

Answer & Explanation

Answer: Option **B**

Explanation:

Let their present ages be $4x$, $7x$ and $9x$ years respectively.

$$\text{Then, } (4x - 8) + (7x - 8) + (9x - 8) = 56$$

$$\Rightarrow 20x = 80$$

$$\Rightarrow x = 4.$$

∴ Their present ages are $4x = 16$ years, $7x = 28$ years and $9x = 36$ years respectively.

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Ayesha's father was 38 years of age when she was born while her mother was 36 years old when her brother four years younger to her was born. What is the difference between the ages of her parents?

A. 2 years

B. 4 years

C. 6 years

D. 8 years

Answer & Explanation

Answer: Option **C**

Explanation:

Mother's age when Ayesha's brother was born = 36 years.

Father's age when Ayesha's brother was born = $(38 + 4)$ years = 42 years.

∴ Required difference = $(42 - 36)$ years = 6 years.

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A person's present age is two-fifth of the age of his mother. After 8 years, he will be one-half of the age of his mother. How old is the mother at present?

A. 32 years

B. 36 years

C. 40 years

D. 48 years

Answer & Explanation

Answer: Option C

Explanation:

Let the mother's present age be x years.

Then, the person's present age = $\left(\frac{2}{5x}\right)$ years.

$$\therefore \left(\frac{2}{5x + 8}\right) = \frac{1}{2(x + 8)}$$

$$\Rightarrow 2(2x + 40) = 5(x + 8)$$

$$\Rightarrow x = 40.$$

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Q is as much younger than R as he is older than T. If the sum of the ages of R and T is 50 years, what is definitely the difference between R and Q's age?

A. 1 year

B. 2 years

C. 25 years

D. Data inadequate

None of these

Answer & Explanation

Answer: Option D

Explanation:

Given that:

The difference of age b/w R and Q = The difference of age b/w Q and T.

Sum of age of R and T is 50 i.e. $(R + T) = 50$.

Question: $R - Q = ?$.

Explanation:

$$R - Q = Q - T$$

$$(R + T) = 2Q$$

Now given that, $(R + T) = 50$

So, $50 = 2Q$ and therefore $Q = 25$.

Question is $(R - Q) = ?$

Here we know the value(age) of Q (25), but we don't know the age of R .

Therefore, $(R-Q)$ cannot be determined.

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The age of father 10 years ago was thrice the age of his son. Ten years hence, father's age will be twice that of his son. The ratio of their present ages is:

A. 5 : 2

B. 7 : 3

C. 9 : 2

D. 13 : 4

Answer & Explanation

Answer: Option **B**

Explanation:

Let the ages of father and son 10 years ago be $3x$ and x years respectively.

Then, $(3x + 10) + 10 = 2[(x + 10) + 10]$

$\Rightarrow 3x + 20 = 2x + 40$

$\Rightarrow x = 20$.

\therefore Required ratio = $(3x + 10) : (x + 10) = 70 : 30 = 7 : 3$.

Average

Formulas

Average:

$$\text{Average} = \left(\frac{\text{Sum of observations}}{\text{Number of observations}} \right)$$

Average Speed:

Suppose a man covers a certain distance at x kmph and an equal distance at y kmph.

A. 3500

B. 4000

C. 4050

D. 5000

Answer & Explanation

Answer: Option B

Explanation:

Let P, Q and R represent their respective monthly incomes. Then, we have:

$$P + Q = (5050 \times 2) = 10100 \dots (i)$$

$$Q + R = (6250 \times 2) = 12500 \dots (ii)$$

$$P + R = (5200 \times 2) = 10400 \dots (iii)$$

$$\text{Adding (i), (ii) and (iii), we get: } 2(P + Q + R) = 33000 \text{ or } P + Q + R = 16500 \dots (iv)$$

Subtracting (ii) from (iv), we get $P = 4000$.

∴ P's monthly income = Rs. 4000.

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The average age of husband, wife and their child 3 years ago was 27 years and that of wife and the child 5 years ago was 20 years. The present age of the husband is:

A. 35 years

B. 40 years

C. 50 years

D. None of these

Answer & Explanation

Answer: Option B

Explanation:

Sum of the present ages of husband, wife and child = $(27 \times 3 + 3 \times 3)$ years = 90 years.

Sum of the present ages of wife and child = $(20 \times 2 + 5 \times 2)$ years = 50 years.

∴ Husband's present age = $(90 - 50)$ years = 40 years.

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A car owner buys petrol at Rs.7.50, Rs. 8 and Rs. 8.50 per litre for three successive years. What

According to Arun, $65 < X < 72$

According to Arun's brother, $60 < X < 70$.

According to Arun's mother, $X \leq 68$

The values satisfying all the above conditions are 66, 67 and 68.

$$\therefore \text{Required average} = \left(\frac{66 + 67 + 68}{3} \right) = \left(\frac{201}{3} \right) = 67 \text{ kg.}$$

The average weight of A, B and C is 45 kg. If the average weight of A and B be 40 kg and that of B and C be 43 kg, then the weight of B is:

A. 17 kg

B. 20 kg

C. 26 kg

D. 31 kg

Answer & Explanation

Answer: Option **D**

Explanation:

Let A, B, C represent their respective weights. Then, we have:

$$A + B + C = (45 \times 3) = 135 \dots (i)$$

$$A + B = (40 \times 2) = 80 \dots (ii)$$

$$B + C = (43 \times 2) = 86 \dots (iii)$$

$$\text{Adding (ii) and (iii), we get: } A + 2B + C = 166 \dots (iv)$$

Subtracting (i) from (iv), we get : $B = 31$.

$$\therefore \text{B's weight} = 31 \text{ kg.}$$

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The average weight of 16 boys in a class is 50.25 kg and that of the remaining 8 boys is 45.15 kg. Find the average weights of all the boys in the class.

A. 47.55 kg

B. 48 kg

C. 48.55 kg

D. 49.25 kg

Answer & Explanation

C. 55

D. None of these

Answer & Explanation

Answer: Option B

Explanation:

$$\begin{aligned}\text{Required average} &= \left(\frac{55 \times 50 + 60 \times 55 + 45 \times 60}{55 + 60 + 45} \right) \\ &= \left(\frac{2750 + 3300 + 2700}{160} \right) \\ &= \frac{8750}{160} \\ &= 54.68\end{aligned}$$

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A pupil's marks were wrongly entered as 83 instead of 63. Due to that the average marks for the class got increased by half ($\frac{1}{2}$). The number of pupils in the class is:

10

B. 20

40

D. 73

Answer & Explanation

Answer: Option C

Explanation:

Let there be x pupils in the class.

$$\begin{aligned}\text{Total increase in marks} &= \left(x \times \frac{1}{2} \right) = \frac{x}{2} \\ \therefore \frac{x}{2} &= (83 - 63) \Rightarrow \frac{x}{2} = 20 \Rightarrow x = 40.\end{aligned}$$

Permutation and Combination

Formulas

Factorial Notation:

Let n be a positive integer. Then, factorial n , denoted $n!$ is defined as:

$$n! = n(n - 1)(n - 2) \dots 3.2.1.$$

Examples:

We define $0! = 1$.

$$4! = (4 \times 3 \times 2 \times 1) = 24.$$

$$5! = (5 \times 4 \times 3 \times 2 \times 1) = 120.$$

Permutations:

The different arrangements of a given number of things by taking some or all at a time, are called permutations.

Examples:

All permutations (or arrangements) made with the letters a, b, c by taking two at a time are (ab, ba, ac, ca, bc, cb).

All permutations made with the letters a, b, c taking all at a time are:

($abc, acb, bac, bca, cab, cba$)

Number of Permutations:

Number of all permutations of n things, taken r at a time, is given by:

$${}^n P_r = n(n - 1)(n - 2) \dots (n - r + 1) = \frac{n!}{(n - r)!}$$

Examples:

i. ${}^6 P_2 = (6 \times 5) = 30$.

ii. ${}^7 P_3 = (7 \times 6 \times 5) = 210$.

Cor. number of all permutations of n things, taken all at a time = $n!$.

An Important Result:

If there are n subjects of which p_1 are alike of one kind; p_2 are alike of another kind; p_3 are alike of third kind and so on and p_r are alike of r^{th} kind, such that $(p_1 + p_2 + \dots p_r) = n$.

$$\text{Then, number of permutations of these } n \text{ objects is } = \frac{n!}{(p_1!).(p_2)! \dots (p_r!)}$$

Combinations:

Each of the different groups or selections which can be formed by taking some or all of a number of objects is called a **combination**.

Examples:

Suppose we want to select two out of three boys A, B, C. Then, possible selections are AB, BC and CA.

Note: AB and BA represent the same selection.

All the combinations formed by a, b, c taking **ab, bc, ca** .

The only combination that can be formed of three letters a, b, c taken all at a time is **abc** .

Various groups of 2 out of four persons A, B, C, D are:

AB, AC, AD, BC, BD, CD.

Note that ab ba are two different permutations but they represent the same combination.

Number of Combinations:

The number of all combinations of n things, taken r at a time is:

$${}^n C_r = \frac{n!}{(r!)(n-r)!} = \frac{n(n-1)(n-2) \dots \text{to } r \text{ factors}}{r!}$$

Note:

. ${}^n C_n = 1$ and ${}^n C_0 = 1$.

i. ${}^n C_r = {}^n C_{(n-r)}$

Examples:

i. ${}^{11} C_4 = \frac{(11 \times 10 \times 9 \times 8)}{(4 \times 3 \times 2 \times 1)} = 330$.

ii. ${}^{16} C_{13} = {}^{16} C_{(16-13)} = {}^{16} C_3 = \frac{16 \times 15 \times 14}{3!} = \frac{16 \times 15 \times 14}{3 \times 2 \times 1} = 560$.

From a group of 7 men and 6 women, five persons are to be selected to form a committee so that at least 3 men are there on the committee. In how many ways can it be done?

A. 564

B. 645

C. 735

D. 756

None of these

Answer & Explanation

Answer: Option **D**

The vowels (EAI) can be arranged among themselves in $3! = 6$ ways.

∴ Required number of ways = $(120 \times 6) = 720$.

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In how many different ways can the letters of the word 'CORPORATION' be arranged so that the vowels always come together?

A. 810

B. 1440

C. 2880

D. 50400

5760

Answer & Explanation

Answer: Option **D**

Explanation:

In the word 'CORPORATION', we treat the vowels OOAIO as one letter.

Thus, we have CRPRTN (OOAIO).

This has 7 (6 + 1) letters of which R occurs 2 times and the rest are different.

Number of ways arranging these letters = $\frac{7!}{2!} = 2520$.

Now, 5 vowels in which O occurs 3 times and the rest are different, can be arranged

in $\frac{5!}{3!} = 20$ ways.

∴ Required number of ways = $(2520 \times 20) = 50400$.

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Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

A. 210

B. 1050

C. 25200

D. 21400

None of these

Answer & Explanation

Answer: Option C

Explanation:

Number of ways of selecting (3 consonants out of 7) and (2 vowels out of 4)

$$= ({}^7C_3 \times {}^4C_2)$$

$$= \left(\frac{7 \times 6 \times 5}{3 \times 2 \times 1} \times \frac{4 \times 3}{2 \times 1} \right)$$

$$= 210.$$

Number of groups, each having 3 consonants and 2 vowels = 210.

Each group contains 5 letters.

Number of ways of arranging 5 letters among themselves = 5!

$$5 \times 4 \times 3 \times 2 \times 1$$

$$120.$$

∴ Required number of ways = (210 × 120) = 25200.

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In how many ways can the letters of the word 'LEADER' be arranged?

A.

3

None of

Answer &

Explanation Answer:

Explanati

The word 'LEADER' contains 6 letters, namely 1L, 2E, 1A, 1D

$$\text{Required number of} = 360.$$

$$(1!)(2!)(1!)(1!)(1!)$$

6. In a group of 6 boys and 4 girls, four children are to be selected. In how many different ways can they be selected such that at least one boy should be there?

A.

1

2

D.

None of

Answer &

Explanation Answer:

Explanati

We may have (1 boy and 3 girls) or (2 boys and 2 girls) or (3 boys and 1 girl) or

$$\text{Required} = (C_1 \times C_3) + (C_2 \times C_2) + (C_3 \times C_1) +$$

of

$$= ({}^6C_1 \times {}^4C_3) + ({}^6C_2 \times {}^4C_2) + ({}^6C_3 \times {}^4C_1) +$$

$$= (6 \times 4) + \left(\frac{6 \times 5}{2 \times 1} \times \frac{4 \times 3}{2 \times 1} \right) + \left(\frac{6 \times 5 \times 4}{3 \times 2 \times 1} \times 4 \right) + \left(\frac{6 \times 5}{2 \times 1} \right)$$

1
4
4

Answer: Option C

Explanation:

$$\text{Required number of ways} = {}^8C_5 \times {}^{10}C_6$$

$$= ({}^8C_3 \times {}^{10}C_4)$$

$$= \left(\frac{8 \times 7 \times 6}{3 \times 2 \times 1} \times \frac{10 \times 9 \times 8 \times 7}{4 \times 3 \times 2 \times 1} \right)$$

$$= 11760.$$

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A box contains 2 white balls, 3 black balls and 4 red balls. In how many ways can 3 balls be drawn from the box, if at least one black ball is to be included in the draw?

A. 32

B. 48

C. 64

D. 96

None of these

Answer & Explanation

Answer: Option C

Explanation:

We may have (1 black and 2 non-black) or (2 black and 1 non-black) or (3 black).

$$\therefore \text{Required number of ways} = ({}^3C_1 \times {}^6C_2) + ({}^3C_2 \times {}^6C_1) + ({}^3C_3)$$

$$= \left(3 \times \frac{6 \times 5}{2 \times 1} \right) + \left(\frac{3 \times 2}{2 \times 1} \times 6 \right) + 1$$

$$= (45 + 18 + 1)$$

Answer: Option C

Explanation:

In the word 'MATHEMATICS', we treat the vowels AEAI as one letter.

Thus, we have MTHMTCS (AEAI).

Now, we have to arrange 8 letters, out of which M occurs twice, T occurs twice and the rest are different.

$$\therefore \text{Number of ways of arranging these letters} = \frac{8!}{(2!)(2!)} = 10080.$$

Now, AEAI has 4 letters in which A occurs 2 times and the rest are different.

$$\text{Number of ways of arranging these letters} = \frac{4!}{2!} = 12.$$

$$\therefore \text{Required number of words} = (10080 \times 12) = 120960.$$

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In how many different ways can the letters of the word 'OPTICAL' be arranged so that the vowels always come together?

A. 120

B. 720

C. 4320

D. 2160

None of these

Answer & Explanation

Answer: Option B

Explanation:

The word 'OPTICAL' contains 7 different letters.

When the vowels OIA are always together, they can be supposed to form one letter.

Then, we have to arrange the letters PTCL (OIA).

Now, 5 letters can be arranged in $5! = 120$ ways.

The vowels (OIA) can be arranged among themselves in $3! = 6$ ways.

∴ Required number of ways = $(120 \times 6) = 720$.

Problems on H.C.F and L.C.M

Formulas

Factors and Multiples:

If number a divided another number b exactly, we say that a is a **factor** of

b . In this case, b is called a **multiple** of a .

Highest Common Factor (H.C.F.) or Greatest Common Measure (G.C.M.) or Greatest Common Divisor (G.C.D.):

The H.C.F. of two or more than two numbers is the greatest number that divides each of them exactly.

There are two methods of finding the H.C.F. of a given set of numbers:

Factorization Method: Express the each one of the given numbers as the product of prime factors. The product of least powers of common prime factors gives H.C.F.

Division Method: Suppose we have to find the H.C.F. of two given numbers, divide the larger by the smaller one. Now, divide the divisor by the remainder. Repeat the process of dividing the preceding number by the remainder last obtained till zero is obtained as remainder. The last divisor is required H.C.F.

Finding the H.C.F. of more than two numbers: Suppose we have to find the H.C.F. of three numbers, then, H.C.F. of [(H.C.F. of any two) and (the third number)] gives the H.C.F. of three given number.

Similarly, the H.C.F. of more than three numbers may be obtained.

Least Common Multiple (L.C.M.):

The least number which is exactly divisible by each one of the given numbers is called their L.C.M.

There are two methods of finding the L.C.M. of a given set of numbers:

Factorization Method: Resolve each one of the given numbers into a product of prime factors. Then, L.C.M. is the product of highest powers of all the factors.

Division Method (short-cut): Arrange the given numbers in a row in any order. Divide by a number which divided exactly at least two of the given numbers and carry forward the numbers which are not divisible. Repeat the above process till no two of the numbers are divisible by the same number except 1. The product of the divisors and the undivided numbers is the required L.C.M. of the given numbers.

Product of two numbers = Product of their H.C.F. and L.C.M.

Co-primes: Two numbers are said to be co-primes if their H.C.F. is 1.

H.C.F. and L.C.M. of Fractions:

$$1. \text{ H.C.F.} = \frac{\text{H.C.F. of Numerators}}{\text{L.C.M. of Denominators}}$$
$$2. \text{ L.C.M.} = \frac{\text{L.C.M. of Numerators}}{\text{H.C.F. of Denominators}}$$

8. H.C.F. and L.C.M. of Decimal Fractions:

In a given numbers, make the same number of decimal places by annexing zeros in some numbers, if necessary. Considering these numbers without decimal point, find H.C.F. or L.C.M. as the case may be. Now, in the result, mark off as many decimal places as are there in each of the given numbers.

9. Comparison of Fractions:

Find the L.C.M. of the denominators of the given fractions. Convert each of the fractions into an equivalent fraction with L.C.M as the denominator, by multiplying both the numerator and denominator by the same number. The resultant fraction with the greatest numerator is the greatest.

1. Find the greatest number that will divide 43, 91 and 183 so as to leave the same remainder in each case.

A. 4

B. 7

C. 9

D. 13

Answer & Explanation

Answer: Option A

Explanation:

Required number = H.C.F. of $(91 - 43)$, $(183 - 91)$ and $(183 - 43)$

= H.C.F. of 48, 92 and 140 = 4.

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The H.C.F. of two numbers is 23 and the other two factors of their L.C.M. are 13 and 14. The larger of the two numbers is:

- A.** 276 **B.** 299
C. 322 **D.** 345

Answer & Explanation

Answer: Option **C**

Explanation:

Clearly, the numbers are (23 x 13) and (23 x 14).

∴ Larger number = (23 x 14) = 322.

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Six bells commence tolling together and toll at intervals of 2, 4, 6, 8, 10 and 12 seconds respectively. In 30 minutes, how many times do they toll together ?

- A.** 4 **B.** 10
C. 15 **D.** 16

Answer & Explanation

Answer: Option **D**

Explanation:

L.C.M. of 2, 4, 6, 8, 10, 12 is 120.

So, the bells will toll together after every 120 seconds(2 minutes).

In 30 minutes, they will toll together $\frac{30}{2} + 1 = 16$ times.

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Let N be the greatest number that will divide 1305, 4665 and 6905, leaving the same remainder

in each case. Then sum of the digits in N is:

- | | | | |
|-----------|---|-----------|---|
| A. | 4 | B. | 5 |
| C. | 6 | D. | 8 |

Answer & Explanation

Answer: Option **A**

Explanation:

$N = \text{H.C.F. of } (4665 - 1305), (6905 - 4665) \text{ and } (6905 - 1305)$

H.C.F. of 3360, 2240 and 5600 = 1120.

Sum of digits in $N = (1 + 1 + 2 + 0) = 4$

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The greatest number of four digits which is divisible by 15, 25, 40 and 75 is:

- | | | | |
|-----------|------|-----------|------|
| A. | 9000 | B. | 9400 |
| C. | 9600 | D. | 9800 |

Answer & Explanation

Answer: Option **C**

Explanation:

Greatest number of 4-digits is 9999.

L.C.M. of 15, 25, 40 and 75 is 600.

On dividing 9999 by 600, the remainder is 399.

∴ Required number $(9999 - 399) = 9600$.

The product of two numbers is 4107. If the H.C.F. of these numbers is 37, then the greater number is:

- | | | | |
|-----------|-----|-----------|-----|
| A. | 101 | B. | 107 |
| C. | 111 | D. | 185 |

Answer & Explanation

Answer: Option C

Explanation:

Let the numbers be $37a$ and $37b$.

Then, $37a \times 37b = 4107$

$\Rightarrow ab = 3$.

Now, co-primes with product 3 are (1, 3).

So, the required numbers are $(37 \times 1, 37 \times 3)$ i.e., (37, 111).

∴ Greater number = 111.

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Three number are in the ratio of 3 : 4 : 5 and their L.C.M. is 2400. Their H.C.F. is:

A. 40

B. 80

C. 120

D. 200

Answer & Explanation

Answer: Option A

Explanation:

Let the numbers be $3x$, $4x$ and $5x$.

Then, their L.C.M. = $60x$.

So, $60x = 2400$ or $x = 40$.

∴ The numbers are (3×40) , (4×40) and (5×40) .

Hence, required H.C.F. = 40.

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The G.C.D. of 1.08, 0.36 and 0.9 is:

A. 0.03

B. 0.9

C. 0.18

D. 0.108

Answer & Explanation

Answer: Option C

Explanation:

Given numbers are 1.08, 0.36 and 0.90. H.C.F. of 108, 36 and 90 is 18,

∴ H.C.F. of given numbers = 0.18.

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The product of two numbers is 2028 and their H.C.F. is 13. The number of such pairs is:

A. 1

B. 2

C. 3

D. 4

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The least multiple of 7, which leaves a remainder of 4, when divided by 6, 9, 15 and 18 is:

A. 74

B. 94

C. 184

D. 364

Answer & Explanation

Answer: Option D

Explanation:

L.C.M. of 6, 9, 15 and 18 is 90.

Let required number be $90k + 4$, which is multiple of 7.

Least value of k for which $(90k + 4)$ is divisible by 7 is $k = 4$.

∴ Required number = $(90 \times 4) + 4 = 364$

The H.C.F. of two numbers is 11 and their L.C.M. is 7700. If one of the numbers is 275, then the other is:

A. 279

B. 283

C. 308

D. 318

Answer & Explanation

Answer: Option C

Explanation:

$$\text{Other number} = \left(\frac{11 \times 7700}{275} \right) = 308.$$

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What will be the least number which when doubled will be exactly divisible by 12, 18, 21 and 30 ?

A. 196

B. 630

C. 1260

D. 2520

Answer & Explanation

Answer: Option B

Explanation:

$$\begin{aligned} \text{L.C.M. of } 12, 18, 21, 30 \\ &= 2 \times 3 \times 2 \times 3 \times 7 \times 5 = 1260. \\ \text{Required number} &= (1260 \div 2) \\ &= 630. \end{aligned}$$

$$\begin{array}{r} 2 \mid 12 - 18 - 21 - 30 \\ \hline 3 \mid 6 - 9 - 21 - 15 \\ \hline \mid 2 - 3 - 7 - 5 \end{array}$$

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The ratio of two numbers is 3 : 4 and their H.C.F. is 4. Their L.C.M. is:

A. 12

B. 16

C. 24

D. 48

Answer & Explanation

Answer: Option D

C. 235

D. 305

Answer & Explanation

Answer: Option B

Explanation:

Required number = H.C.F. of (1657 - 6) and (2037 - 5)

= H.C.F. of 1651 and 2032 = 127.

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Which of the following has the most number of divisors?

A. 99

B. 101

C. 176

D. 182

Answer & Explanation

Answer: Option C

Explanation:

$$99 = 1 \times 3 \times 3 \times 11$$

$$101 = 1 \times 101$$

$$176 = 1 \times 2 \times 2 \times 2 \times 2 \times 11$$

$$182 = 1 \times 2 \times 7 \times 13$$

So, divisors of 99 are 1, 3, 9, 11, 33, 99

Divisors of 101 are 1 and 101

Divisors of 176 are 1, 2, 4, 8, 11, 16, 22, 44, 88 and 176

Divisors of 182 are 1, 2, 7, 13, 14, 26, 91 and 182.

Hence, 176 has the most number of divisors.

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The L.C.M. of two numbers is 48. The numbers are in the ratio 2 : 3. Then sum of the number is:

A. 28

B. 32

C. 40

D. 64

Answer & Explanation

Answer: Option C

Explanation:

Let the numbers be $2x$ and $3x$.

Then, their L.C.M. = $6x$.

So, $6x = 48$ or $x = 8$.

∴ The numbers are 16 and 24.

Hence, required sum = $(16 + 24) = 40$.

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29. The H.C.F. of $\frac{9}{10}$, $\frac{12}{25}$, $\frac{18}{35}$ and $\frac{21}{40}$ is:

A. $\frac{3}{5}$

B. $\frac{252}{5}$

C. $\frac{3}{1400}$

D. $\frac{63}{700}$

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If the sum of two numbers is 55 and the H.C.F. and L.C.M. of these numbers are 5 and 120 respectively, then the sum of the reciprocals of the numbers is equal to:

A. $\frac{55}{601}$

B. $\frac{601}{55}$

$$\frac{11}{120}$$

$$\frac{120}{11}$$

Answer & Explanation

Answer: Option C

Explanation:

Let the numbers be a and b .

Then, $a + b = 55$ and $ab = 5 \times 120 = 600$.

$$\therefore \text{The required sum} = \frac{1}{a} + \frac{1}{b} = \frac{a + b}{ab} = \frac{55}{600} = \frac{11}{120}$$

Square Root and Cube Root

Formulas

1. Square Root:

If $x^2 = y$, we say that the square root of y is x and we write $y = x$.

Thus, $4 = 2$, $9 = 3$, $196 = 14$.

2. Cube Root:

The cube root of a given number x is the number whose cube is x .

We, denote the cube root of x by x .

Thus, $8 = 2 \times 2 \times 2 = 2$, $343 = 7 \times 7 \times 7 = 7$ etc.

Note:

1. $xy = x \times y$

2. $\frac{x}{y} = \frac{x}{y} = \frac{x}{y} \times \frac{y}{y} = \frac{xy}{y}$.

The cube root of .000216 is:

A. .6

B. .06

C. 77

D. 87

Answer & Explanation

Answer: Option B

Explanation:

$$\begin{aligned} (.000216)^{1/3} &= \left(\frac{\quad}{10^6} \right)^{1/3} \\ &= \left(\frac{6 \times 6 \times 6}{10^2 \times 10^2 \times 10^2} \right)^{1/3} \\ &= \frac{6}{10^2} \\ &= \frac{6}{100} \\ &= 0.06 \end{aligned}$$

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2. What should come in place of both x in the equation $\frac{x}{128} = \frac{162}{x}$.

A. 12

B. 14

C. 144

D. 196

Answer & Explanation

Answer: Option A

Explanation:

$$\text{Let } \frac{162}{128x} = \frac{162}{128x}$$

$$\text{Then } x^2 = 128 \times 162$$

$$64 \times 2 \times 18 \times 9$$

$$8^2 \times 6^2 \times 3^2$$

$$8 \times 6 \times 3$$

$$144.$$

$$\therefore x = 144 = 12.$$

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The least perfect square, which is divisible by each of 21, 36 and 66 is:

A. 213444

B. 214344

C. 214434

D. 231444

Answer & Explanation

Answer: Option **A**

Explanation:

L.C.M. of 21, 36, 66 = 2772.

Now, $2772 = 2 \times 2 \times 3 \times 3 \times 7 \times 11$

To make it a perfect square, it must be multiplied by 7×11 .

So, required number = $2^2 \times 3^2 \times 7^2 \times 11^2 = 213444$

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1.5625 = ?

A. 1.05

B. 1.25

$$45 + 65$$

$$105 = (10 \times 2.235) = 22.35$$

If $a = 0.1039$, then the value of $4a^2 - 4a + 1 + 3a$ is:

A. 0.1039

B. 0.2078

C. 1.1039

D. 2.1039

Answer & Explanation

Answer: Option C

Explanation:

$$4a^2 - 4a + 1 + 3a = (1)^2 + (2a)^2 - 2 \times 1 \times 2a + 3a$$

$$(1 - 2a)^2 + 3a$$

$$(1 - 2a) + 3a$$

$$(1 + a)$$

$$(1 + 0.1039)$$

$$1.1039$$

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7. If $x = \frac{3 + 1}{3 - 1}$ and $y = \frac{3 - 1}{3 + 1}$, then the value of $(x^2 + y^2)$ is:

A. 10

B. 13

C. 14

D. 15

Answer & Explanation

Answer: Option C

Explanation:

$$x = \frac{(3 + 1)}{(3 - 1)} \times \frac{(3 + 1)}{(3 + 1)} = \frac{(3 + 1)^2}{(3 - 1)} = \frac{3 + 1 + 23}{2} = 2 + 3.$$

$$y = \frac{(3-1)}{(3+1)} \times \frac{(3-1)}{(3-1)} = \frac{(3-1)^2}{(3-1)} = \frac{3+1-23}{2} = 2-3.$$

$$\therefore x^2 + y^2 = (2+3)^2 + (2-3)^2$$

$$2(4+3)$$

$$14$$

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A group of students decided to collect as many paise from each member of group as is the number of members. If the total collection amounts to Rs. 59.29, the number of the member is the group is:

A. 57

B. 67

C. 77

D. 87

[Answer & Explanation](#)

Answer: Option C

Explanation:

Money collected = (59.29 x 100) paise = 5929 paise.

\therefore Number of members = $\sqrt{5929} = 77$.

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The square root of $(7+35)(7-35)$ is

A. 5

B. 2

C. 4

D. 35

[Answer & Explanation](#)

Answer: Option B

Explanation:

$$(7 + 35)(7 - 35) = (7)^2 - (35)^2 = 49 - 1225 = -1176 = -4 \times 294 = -4 \times 2 \times 147 = -8 \times 147 = -8 \times 3 \times 49 = -24 \times 49 = -1176$$

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10. If $5 = 2.236$, then the value of $\frac{5}{2} - \frac{10}{5} + 125$ is equal to:

A. 5.59

B. 7.826

C. 8.944

D. 10.062

Answer & Explanation

Answer: Option **B**

Explanation:

$$\frac{5}{2} - \frac{10}{5} + 125 = \frac{(5)^2 - 20 + 25 \times 55}{25}$$

$$= \frac{5 - 20 + 50}{25}$$

$$= \frac{5}{5}$$

$$= \frac{355}{10}$$

$$= \frac{7 \times 2.236}{2}$$

$$= 7 \times 1.118$$

$$= 7.826$$

11. $\left(\frac{625}{1125} - \frac{14}{196} \right) \times \frac{11}{11}$ is equal to:

A. 5

B. 6

C. 8

D. 11

Answer & Explanation

Answer: Option **A**

Explanation:

$$\text{Given Expression} = \frac{25}{11} \times \frac{14}{5} \times \frac{11}{14} = 5.$$

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$$0.0169 \times ? = 1.3$$

A. 10

B. 100

C. 1000

D. None of these

Answer & Explanation

Answer: Option **B**

Explanation:

$$\text{Let } 0.0169 \times x = 1.3.$$

$$\text{Then, } 0.0169x = (1.3)^2 = 1.69$$

$$\Rightarrow x = \frac{1.69}{0.0169} = 100$$

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$\left(3 - \frac{2}{3} \right)$ simplifies to:

A. 3
—

B. 4
—

4

3

4

3

None of these

Answer & Explanation

Answer: Option C

Explanation:

$$\left(3 - \frac{1}{3}\right)^2 = (3)^2 + \left(\frac{1}{3}\right)^2 - 2 \times 3 \times \frac{1}{3}$$

$$= 3 + \frac{1}{3} - 2$$

$$= 1 + \frac{1}{3}$$

$$= \frac{4}{3}$$

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How many two-digit numbers satisfy this property.: The last digit (unit's digit) of the square of the two-digit number is 8 ?

A. 1

B. 2

C. 3

D. None of these

Answer & Explanation

Answer: Option D

Explanation:

A number ending in 8 can never be a perfect square.

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The square root of 64009 is:

A. 253

B. 347

C. 363

D. 803

Answer & Explanation

Answer: Option **A**

Explanation:

$$\begin{array}{r} 2 \mid 64009 \quad (\quad 253 \\ \quad \mid 4 \\ \quad \mid \text{-----} \\ 45 \mid 240 \\ \quad \mid 225 \\ \quad \mid \text{-----} \\ 503 \mid \quad 1509 \\ \quad \mid \quad 1509 \\ \quad \mid \text{-----} \\ \quad \mid \quad \quad \quad \times \\ \quad \mid \text{-----} \end{array}$$

$$\therefore 64009 = 253$$

Chain Rule

Formulas

Direct Proportion:

Two quantities are said to be directly proportional, if on the increase (or decrease) of the one, the other increases (or decreases) to the same extent.

Eg. Cost is directly proportional to the number of articles. (More Articles, More Cost)

Indirect Proportion:

Two quantities are said to be indirectly proportional, if on the increase of the one, the other decreases to the same extent and vice-versa.

Eg. The time taken by a car in covering a certain distance is inversely proportional to the speed of the car. (More speed, Less is the time taken to cover a distance.)

Note: In solving problems by chain rule, we compare every item with the term to be found out.

3 pumps, working 8 hours a day, can empty a tank in 2 days. How many hours a day must 4 pumps work to empty the tank in 1 day?

A. 9

B. 10

C. 11

D. 12

Answer & Explanation

Answer: Option D

Explanation:

Let the required number of working hours per day be x .

More pumps, Less working hours per day (Indirect Proportion)

Less days, More working hours per day (Indirect Proportion)

Pumps 4 : 3
Days 1 : 2 } 8 : x

$$\therefore 4 \times 1 \times x = 3 \times 2 \times 8$$

$$\Rightarrow x = \frac{(3 \times 2 \times 8)}{(4)}$$

$$\Rightarrow x = 12.$$

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If the cost of x metres of wire is d rupees, then what is the cost of y metres of wire at the same rate?

A. Rs. $\left(\frac{xy}{d}\right)$

B. Rs. (xd)

C. Rs. (yd)

D. Rs. $\left(\frac{yd}{x}\right)$

Answer & Explanation

Answer: Option **D**

Explanation:

Cost of x metres = Rs. d .

Cost of 1 metre = Rs. $\left(\frac{d}{x}\right)$

Cost of y metres = Rs. $\left(\frac{d}{x} \cdot y\right) = \text{Rs. } \left(\frac{yd}{x}\right)$.

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Running at the same constant rate, 6 identical machines can produce a total of 270 bottles per minute. At this rate, how many bottles could 10 such machines produce in 4 minutes?

A. 648

B. 1800

C. 2700

D. 10800

Answer & Explanation

Answer: Option **B**

Explanation:

Let the required number of bottles be x .

More machines, More bottles (Direct Proportion)

More minutes, More bottles (Direct Proportion)

Machines	6 : 10	}	270 : x
Time (in minutes)	1 : 4		

$$\therefore 6 \times 1 \times x = 10 \times 4 \times 270$$

$$\Rightarrow x = \underline{\underline{(10 \times 4 \times 270)}}$$

(6)

$$\Rightarrow x = 1800.$$

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A fort had provision of food for 150 men for 45 days. After 10 days, 25 men left the fort. The number of days for which the remaining food will last, is:

$$\begin{array}{r} 1 \\ 29 \\ \hline 5 \end{array}$$

$$\begin{array}{r} 1 \\ 37 \\ \hline 4 \end{array} -$$

42

54

Answer & Explanation

Answer: Option C

Explanation:

After 10 days : 150 men had food for 35 days.

Suppose 125 men had food for x days.

Now, *Less men, More days (Indirect Proportion)*

$$\therefore 125 : 150 :: 35 : x \Leftrightarrow 125 \times x = 150 \times 35$$

$$\Rightarrow x = \frac{150 \times 35}{125}$$

$$\Rightarrow x = 42.$$

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39 persons can repair a road in 12 days, working 5 hours a day. In how many days will 30 persons, working 6 hours a day, complete the work?

A. 10

B. 13

C. 14

D. 15

Answer & Explanation

Answer: Option **B**

Explanation:

Let the required number of days be x .

Less persons, More days (Indirect Proportion)

More working hours per day, Less days (Indirect Proportion)

Persons	30 : 39	}	12 : x
Working hours/day	6 : 5		

$$\therefore 30 \times 6 \times x = 39 \times 5 \times 12$$

$$\Rightarrow x = \frac{(39 \times 5 \times 12)}{(30 \times 6)}$$

$$\Rightarrow x = 13$$

6. A man completes $\frac{5}{8}$ of a job in 10 days. At this rate, how many more days will it takes him to finish the job?

A. 5

B. 6

C. 7

D. $7\frac{1}{2}$

Answer & Explanation

Answer: Option **B**

Explanation:

$$\text{Work done} = \frac{5}{8}$$

$$\text{Balance work} = \left(1 - \frac{5}{8}\right) = \frac{3}{8}$$

Let the required number of days be x .

$$\text{Then, } \frac{5}{8} : \frac{3}{8} = :: 10 : x \quad \Leftrightarrow \quad \frac{5}{8} \times x = \frac{3}{8} \times 10$$

$$\Rightarrow x = \left(\frac{3}{8} \times 10 \times \frac{8}{5}\right)$$

$$\Rightarrow x = 6.$$

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If a quarter kg of potato costs 60 paise, how many paise will 200 gm cost?

A. 48 paise

B. 54 paise

C. 56 paise

D. 72 paise

Answer & Explanation

Answer: Option **A**

Explanation:

Let the required weight be x kg.

Less weight, Less cost (Direct Proportion)

$$\therefore 250 : 200 :: 60 : x \quad \Leftrightarrow \quad 250 \times x = (200 \times 60)$$

$$\Rightarrow x = \frac{(200 \times 60)}{250}$$

$$\Rightarrow x = 48.$$

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In a dairy farm, 40 cows eat 40 bags of husk in 40 days. In how many days one cow will eat one bag of husk?

A. 1

B. $\frac{1}{40}$

C. 40

D. 80

Answer & Explanation

Answer: Option C

Explanation:

Let the required number of days be x .

Less cows, More days (Indirect Proportion)

Less bags, Less days (Direct Proportion)

Cows	1 : 40	}	40 : x
Bags	40 : 1		

$$\therefore 1 \times 40 \times x = 40 \times 1 \times 40$$

$$\Rightarrow x = 40.$$

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A wheel that has 6 cogs is meshed with a larger wheel of 14 cogs. When the smaller wheel has made 21 revolutions, then the number of revolutions made by the larger wheel is:

A. 4

B. 9

C. 12

D. 49

Answer & Explanation

Answer: Option B

Explanation:

Let the required number of revolutions made by larger wheel be x .

Then, *More cogs, Less revolutions (Indirect Proportion)*

$$\therefore 14 : 6 :: 21 : x \Leftrightarrow 14 \times x = 6 \times 21$$

$$\Rightarrow x = \frac{6 \times 21}{14}$$

$$\Rightarrow x = 9.$$

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If 7 spiders make 7 webs in 7 days, then 1 spider will make 1 web in how many days? 7

A. 1

B. $\frac{1}{2}$

C. 7

D. 49

Answer & Explanation

Answer: Option C

Explanation:

Let the required number days be x .

Less spiders, More days (Indirect Proportion)

Less webs, Less days (Direct Proportion)

$$\begin{array}{l} \text{Spiders } 1 : 7 \\ \text{Webs } 7 : 1 \end{array} \left. \vphantom{\begin{array}{l} \text{Spiders } 1 : 7 \\ \text{Webs } 7 : 1 \end{array}} \right\} 7 : x$$

$$\therefore 1 \times 7 \times x = 7 \times 1 \times 7$$

$$\Rightarrow x = 7.$$

A flagstaff 17.5 m high casts a shadow of length 40.25 m. The height of the building, which casts

Answer: Option **D**

Explanation:

Let the required number of days be x .

Less men, More days (Indirect Proportion)

$$\therefore 27 : 36 :: 18 : x \Leftrightarrow 27 \times x = 36 \times 18$$

$$\Rightarrow x = \frac{36 \times 18}{27}$$

$$\Rightarrow x = 24.$$

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4 mat-weavers can weave 4 mats in 4 days. At the same rate, how many mats would be woven by 8 mat-weavers in 8 days?

A. 4

B. 8

C. 12

D. 16

Answer & Explanation

Answer: Option **D**

Explanation:

Let the required number of bottles be x .

More weavers, More mats (Direct Proportion)

More days, More mats (Direct Proportion)

$$\begin{array}{l} \text{Wavers } 4 : 8 \\ \text{Days } 4 : 8 \end{array} \left. \vphantom{\begin{array}{l} \text{Wavers } 4 : 8 \\ \text{Days } 4 : 8 \end{array}} \right\} 4 : x$$

$$\therefore 4 \times 4 \times x = 8 \times 8 \times 4$$

$$\Rightarrow x = \frac{(8 \times 8 \times 4)}{(4 \times 4)}$$

$$\Rightarrow x = 16.$$

Alligation or Mixture

Formulas

Alligation:

It is the rule that enables us to find the ratio in which two or more ingredients at the given price must be mixed to produce a mixture of desired price.

Mean Price:

The cost of a unit quantity of the mixture is called the mean price.

Rule of Alligation:

If two ingredients are mixed, then

$$\left(\frac{\text{Quantity of cheaper}}{\text{Quantity of dearer}} \right) = \left(\frac{\text{C.P. of dearer} - \text{Mean Price}}{\text{Mean price} - \text{C.P. of cheaper}} \right)$$

We present as under:

C.P. of a unit quantity
of cheaper C.P. of a unit quantity
of dearer

(c)	Mean Price	(d)
(d - m)	(m)	(m - c)

$$\therefore (\text{Cheaper quantity}) : (\text{Dearer quantity}) = (d - m) : (m - c).$$

Suppose a container contains x of liquid from which y units are taken out and replaced by water.

$$\text{After } n \text{ operations, the quantity of pure liquid} = \left[x \left(1 - \frac{y}{x} \right)^n \right] \text{ units.}$$

A vessel is filled with liquid, 3 parts of which are water and 5 parts syrup. How much of the mixture must be drawn off and replaced with water so that the mixture may be half water and half syrup?

- | | | | |
|-----------|---------------|-----------|---------------|
| | 1 | | 1 |
| A. | $\frac{1}{3}$ | B. | $\frac{1}{4}$ |
| | 1 | | 1 |
| C. | $\frac{1}{5}$ | D. | $\frac{1}{7}$ |

Answer & Explanation

Answer: Option C

Explanation:

Suppose the vessel initially contains 8 litres of liquid.

Let x litres of this liquid be replaced with water.

$$\text{Quantity of water in new mixture} = \left(3 - \frac{3x}{8} + x \right) \text{ litres}$$

$$\text{Quantity of syrup in new mixture} = \left(5 - \frac{5x}{8} \right) \text{ litres}$$

$$\therefore \left(3 - \frac{3x}{8} + x \right) = \left(5 - \frac{5x}{8} \right)$$

$$\Rightarrow 5x + 24 = 40 - 5x$$

$$\Rightarrow 10x = 16$$

$$\Rightarrow x = \frac{8}{5}$$

$$\text{So, part of the mixture replaced} = \left(\frac{8}{5} \times \frac{1}{8} \right) = \frac{1}{5}$$

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C. 21

D. 25

Answer & Explanation

Answer: Option C

Explanation:

Suppose the can initially contains $7x$ and $5x$ of mixtures A and B respectively.

$$\text{Quantity of A in mixture left} = \left(7x - \frac{7}{12} \times 9 \right) \text{ litres} = \left(7x - \frac{21}{4} \right) \text{ litres.}$$

$$\text{Quantity of B in mixture left} = \left(5x - \frac{5}{12} \times 9 \right) \text{ litres} = \left(5x - \frac{15}{4} \right) \text{ litres.}$$

$$\begin{aligned} \therefore \frac{\left(7x - \frac{21}{4} \right)}{\left(5x - \frac{15}{4} \right) + 9} &= \frac{7}{9} \\ \Rightarrow \frac{28x - 21}{20x + 21} &= \frac{7}{9} \end{aligned}$$

$$\Rightarrow 252x - 189 = 140x + 147$$

$$\Rightarrow 112x = 336$$

$$\Rightarrow x = 3.$$

So, the can contained 21 litres of A.

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A milk vendor has 2 cans of milk. The first contains 25% water and the rest milk. The second contains 50% water. How much milk should he mix from each of the containers so as to get 12 litres of milk such that the ratio of water to milk is 3 : 5?

A. 4 litres, 8 litres

B. 6 litres, 6 litres

C. 5 litres, 7 litres

D. 7 litres, 5 litres

Answer & Explanation

Answer: Option B

Explanation:

Let the cost of 1 litre milk be Re. 1

Milk in 1 litre mix. in 1st can = $\frac{3}{4}$ litre, C.P. of 1 litre mix. in 1st can Re. $\frac{3}{4}$

Milk in 1 litre mix. in 2nd can = $\frac{1}{2}$ litre, C.P. of 1 litre mix. in 2nd can Re. $\frac{1}{2}$

Milk in 1 litre of final mix. = $\frac{5}{8}$ litre, Mean price = Re. $\frac{5}{8}$

By the rule of alligation, we have:

C.P. of 1 litre mixture in 1st can C.P. of 1 litre mixture in 2nd can

3		1
$\frac{3}{4}$	Mean Price	$\frac{1}{2}$
	5	
1	$\frac{5}{8}$	1
$\frac{1}{8}$		$\frac{1}{8}$

∴ Ratio of two mixtures = $\frac{1}{8} : \frac{1}{8} = 1 : 1$.

So, quantity of mixture taken from each can = $\left(\frac{1}{2} \times 12 \right) = 6$ litres.

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In what ratio must a grocer mix two varieties of pulses costing Rs. 15 and Rs. 20 per kg respectively so as to get a mixture worth Rs. 16.50 kg?

A. 3 : 7

B. 5 : 7

C. 7 : 3

D. 7 : 5

Answer & Explanation

Answer: Option C

Explanation:

By the rule of alligation:

Cost of 1 kg pulses of 1 st kind	Cost of 1 kg pulses of 2 nd kind
Rs. 15	Rs. 20
3.50	1.50
Mean Price Rs. 16.50	

∴ Required rate = $3.50 : 1.50 = 7 : 3$.

A dishonest milkman professes to sell his milk at cost price but he mixes it with water and thereby gains 25%. The percentage of water in the mixture is:

A. 4%

B. $\frac{1}{64}$ %

C. 20%

D. 25%

Answer & Explanation

Answer: Option C

Explanation:

Let C.P. of 1 litre milk be Re. 1

Then, S.P. of 1 litre of mixture = Re. 1, Gain = 25%.

$$\text{C.P. of 1 litre mixture} = \text{Re.} \left(\frac{100}{125} \times 1 \right) = \frac{4}{5}$$

By the rule of alligation, we have:

C.P. of 1 litre of milk C.P. of 1 litre of water

Re. 1 4 <hr style="width: 100%; border: 0; border-top: 1px solid black; margin: 5px 0;"/> 5	Mean Price 4 Re. $\frac{4}{5}$ 5	0 1 <hr style="width: 100%; border: 0; border-top: 1px solid black; margin: 5px 0;"/> 5
--	---	--

∴ Ratio of milk to water = $\frac{4}{5} : \frac{1}{5} = 4 : 1$.

Hence, percentage of water in the mixture = $\left(\frac{1}{5} \times 100 \right) \% = 20\%$.

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How many kilogram of sugar costing Rs. 9 per kg must be mixed with 27 kg of sugar costing Rs. 7 per kg so that there may be a gain of 10% by selling the mixture at Rs. 9.24 per kg?

- | | |
|---|---|
| <p>A. 36 kg</p> <p>C. 54 kg</p> | <p>B. 42 kg</p> <p>D. 63 kg</p> |
|---|---|

Answer & Explanation

Answer: Option **D**

Explanation:

S.P. of 1 kg of mixture = Rs. 9.24, Gain 10%.

∴ C.P. of 1 kg of mixture = Rs. $\left(\frac{100}{x 9.24} = \text{Rs.} \right) 8.40$

By the rule of alligation, we have:

C.P. of 1 kg sugar of 1st kind Cost of 1 kg sugar of 2nd kind

Rs. 9 1.40	Mean Price Rs. 8.40	Rs. 7 0.60
-------------------	------------------------	-------------------

∴ Ratio of quantities of 1st and 2nd kind = $14 : 6 = 7 : 3$.

Let x kg of sugar of 1st be mixed with 27 kg of 2nd kind.

Then, $7 : 3 = x : 27$

$$\Rightarrow x = \left(\frac{7 \times 27}{3} \right) = 63 \text{ kg.}$$

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A container contains 40 litres of milk. From this container 4 litres of milk was taken out and replaced by water. This process was repeated further two times. How much milk is now contained by the container?

- | | |
|------------------------|------------------------|
| A. 26.34 litres | B. 27.36 litres |
| C. 28 litres | D. 29.16 litres |

Answer & Explanation

Answer: Option **D**

Explanation:

$$\text{Amount of milk left after 3 operations} = \left[40 \left(1 - \frac{4}{40} \right)^3 \right] \text{ litres}$$

$$= \left(40 \times \frac{9}{10} \times \frac{9}{10} \times \frac{9}{10} \right) = 29.16 \text{ litres.}$$

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A jar full of whisky contains 40% alcohol. A part of this whisky is replaced by another containing 19% alcohol and now the percentage of alcohol was found to be 26%. The quantity of whisky replaced is:

- | | |
|-------------------------|-------------------------|
| A. $\frac{1}{3}$ | B. $\frac{2}{3}$ |
| C. $\frac{2}{5}$ | D. $\frac{3}{5}$ |

Answer & Explanation

Answer: Option **B**

Explanation:

By the rule of alligation, we have:

Strength of first jar	Strength of 2 nd jar	
40%	Mean Strength	19%
7	26%	14

So, ratio of 1st and 2nd quantities = 7 : 14 = 1 : 2

$$\therefore \text{Required quantity replaced} = \frac{2}{3}$$

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10. In what ratio must water be mixed with milk to gain $16\frac{2}{3}\%$ on selling the mixture at cost price?

A. 1 : 6

B. 6 : 1

C. 2 : 3

D. 4 : 3

Answer & Explanation

Answer: Option **A**

Explanation:

Let C.P. of 1 litre milk be Re. 1.

S.P. of 1 litre of mixture = Re.1, Gain = $\frac{50}{3}\%$.

$$\therefore \text{C.P. of 1 litre of mixture} = \left(100 \times \frac{3}{350} \times 1 \right) = \frac{6}{7}$$

By the rule of alligation, we have:

C.P. of 1 litre of water C.P. of 1 litre of milk

0	Mean Price	Re. 1
1	6	6
$\frac{1}{7}$	Re. $\frac{6}{7}$	$\frac{6}{7}$

$$\therefore \text{Ratio of water and milk} = \frac{1}{7} : \frac{6}{7} = 1 : 6.$$

Find the ratio in which rice at Rs. 7.20 a kg be mixed with rice at Rs. 5.70 a kg to produce a mixture worth Rs. 6.30 a kg.

A. 1 : 3

B. 2 : 3

C. 3 : 4

D. 4 : 5

Answer & Explanation

Answer: Option **B**

Explanation:

By the rule of alligation:

Cost of 1 kg of 1st kind Cost of 1 kg of 2nd kind

720 p	Mean Price	570 p
60	630 p	90

$$\therefore \text{Required ratio} = 60 : 90 = 2 : 3.$$

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In what ratio must a grocer mix two varieties of tea worth Rs. 60 a kg and Rs. 65 a kg so that by selling the mixture at Rs. 68.20 a kg he may gain 10%?

A. 3 : 2

B. 3 : 4

C. 3 : 5

D. 4 : 5

Answer & Explanation

Answer: Option **A**

Explanation:

S.P. of 1 kg of the mixture = Rs. 68.20, Gain = 10%.

$$\text{C.P. of 1 kg of the mixture} = \text{Rs.} \left(\frac{100}{110} \times 68.20 \right) = \text{Rs.} 62.$$

By the rule of alligation, we have:

Cost of 1 kg tea of 1st kind. Cost of 1 kg tea of 2nd kind.

Rs. 60	Mean Price	Rs. 65
	Rs. 62	
3		2

∴ Required ratio = 3 : 2.

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The cost of Type 1 rice is Rs. 15 per kg and Type 2 rice is Rs. 20 per kg. If both Type 1 and Type 2 are mixed in the ratio of 2 : 3, then the price per kg of the mixed variety of rice is:

- | | |
|------------------|---------------------|
| A. Rs. 18 | B. Rs. 18.50 |
| C. Rs. 19 | D. Rs. 19.50 |

Answer & Explanation

Answer: Option **A**

Explanation:

Let the price of the mixed variety be Rs. x per kg.

By rule of alligation, we have:

Cost of 1 kg of Type 1 rice Cost of 1 kg of Type 2 rice

Rs. 15	Mean Price	Rs. 20
--------	------------	--------

(20 - x)

Rs. x

(x - 15)

$$\therefore \frac{(20 - x)}{(x - 15)} = \frac{2}{3}$$

$$\Rightarrow 60 - 3x = 2x - 30$$

$$\Rightarrow 5x = 90$$

$$\Rightarrow x = 18.$$

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8 litres are drawn from a cask full of wine and is then filled with water. This operation is performed three more times. The ratio of the quantity of wine now left in cask to that of water is 16 : 65. How much wine did the cask hold originally?

A. 18 litres

B. 24 litres

C. 32 litres

D. 42 litres

Answer & Explanation

Answer: Option **B**

Explanation:

Let the quantity of the wine in the cask originally be x litres.

Then, quantity of wine left in cask after 4 operations = $\left[x \left(1 - \frac{8}{x} \right)^4 \right]$ litres.

$$\therefore \left(\frac{x(1 - (8/x))^4}{x} \right) = \frac{16}{81}$$

$$\Rightarrow \left(1 - \frac{8}{x} \right)^4 = \left(\frac{2}{3} \right)^4$$

$$\Rightarrow \left(\frac{x - 8}{x} \right)^4 = \frac{16}{81}$$

$$\Rightarrow 3x - 24 = 2x$$

$$\Rightarrow x = 24.$$

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A merchant has 1000 kg of sugar, part of which he sells at 8% profit and the rest at 18% profit. He gains 14% on the whole. The quantity sold at 18% profit is:

A. 400 kg

B. 560 kg

C. 600 kg

D. 640 kg

Answer & Explanation

Answer: Option **C**

Explanation:

By the rule of alligation, we have:

Profit on 1st part Profit on 2nd part

8%

Mean Profit

18%

4

14%

6

Ration of 1st and 2nd parts = 4 : 6 = 2 : 3

\therefore Quantity of 2nd kind = $\left(\frac{3}{2} \times 1000 \right)_{\text{kg}} = 600 \text{ kg.}$

Stocks and Shares

Formulas

Stock Capital:

The total amount of money needed to run the company is called the **stock capital**.

Shares or Stock:

The whole capital is divided into small units, called **shares** or **stock**.

For each investment, the company issues a 'share-certificate', showing the value of each share and the number of shares held by a person.

The person who subscribes in shares or stock is called a **share holder** or **stock holder**.

Dividend:

The annual profit distributed among share holders is called **dividend**.

Dividend is paid annually as per share or as a percentage.

Face Value:

The value of a share or stock printed on the share-certificate is called its **Face Value** or **Nominal Value** or **Par Value**.

Market Value:

The stock of different companies are sold and bought in the open market through brokers at stock-exchanges. A share or stock is said to be:

At premium or **Above par**, if its market value is more than its face value.

At par, if its market value is the same as its face value.

At discount or **Below par**, if its market value is less than its face value.

Thus, if a Rs. 100 stock is quoted at premium of 16, then market value of the stock = Rs.(100 + 16) = Rs. 116.

Likewise, if a Rs. 100 stock is quoted at a discount of 7, then market value of the stock = Rs. (100 -7) = 93.

Brokerage:

The broker's charge is called **brokerage**.

When stock is purchased, brokerage is added to the cost price.

When stock is sold, brokerage is subtracted from the selling price.

Remember:

The face value of a share always remains the same.

The market value of a share changes from time to time.

Dividend is always paid on the face value of a share.

Number of shares held by a person

$$= \frac{\text{Total Investment}}{\text{Investment in 1 share}} = \frac{\text{Total Income}}{\text{Income from 1 share}} = \frac{\text{Total Face Value}}{\text{Face of 1 share}}$$

Thus, by a Rs. 100, 9% stock at 120, we mean that:

Face Value of stock = Rs. 100.

Market Value (M.V) of stock = Rs. 120.

Annual dividend on 1 share = 9% of face value = 9% of Rs. 100 = Rs. 9.

An investment of Rs. 120 gives an annual income of Rs. 9.

v. Rate of interest p.a = Annual income from an investment of Rs. 100

$$= \left(\frac{9}{120} \times 100 \right) \% = 7\frac{1}{2}\%.$$

In order to obtain an income of Rs. 650 from 10% stock at Rs. 96, one must make an investment of:

A. Rs. 3100

B. Rs. 6240

C. Rs. 6500

D. Rs. 9600

Answer & Explanation

Answer: Option B

Explanation:

To obtain Rs. 10, investment = Rs. 96.

To obtain Rs. 650, investment = Rs. $\left(\frac{96}{10} \times 650 \right) = \text{Rs. } 6240.$

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2.

A man bought 20 shares of Rs. 50 at 5 discount, the rate of dividend being $13\frac{1}{2}\%$ The rate of interest obtained is:

A. $12\frac{1}{2}\%$

B. $13\frac{1}{2}\%$

C. 15%

D. $16\frac{2}{3}\%$

Answer & Explanation

Answer: Option C

Explanation:

Investment = Rs. $[20 \times (50 - 5)] = \text{Rs. } 900.$

Face value = Rs. $(50 \times 20) = \text{Rs. } 1000.$

$$\text{Dividend} = \text{Rs. } \left(\frac{27}{2} \times \frac{1000}{100} \right) = \text{Rs. } 135.$$

$$\text{Interest obtained} = \left(\frac{135}{900} \times 100 \right) \% = 15\%$$

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3. Which is better investment: 11% stock at 143 or $9\frac{3}{4}\%$ stock at 117?

11% stock at 143

$9\frac{3}{4}\%$ stock at 117

Both are equally good

Cannot be compared, as the total amount of investment is not given.

Answer & Explanation

Answer: Option B

Explanation:

Let investment in each case be Rs. $(143 \times 117).$

$$\text{Income in 1}^{\text{st}} \text{ case} = \text{Rs. } \left(\frac{11}{143} \times 143 \times 117 \right) = \text{Rs. } 1287.$$

$$\text{Income in 2}^{\text{nd}} \text{ case} = \text{Rs. } \left(\frac{39}{4 \times 117} \times 143 \times 117 \right) = \text{Rs. } 1394.25$$

Clearly, $9\frac{3}{4}\%$ stock at 117 is better.

Explanation:

Let the investment in 9% stock be Rs. x .

Then, investment in 10% stock = Rs. $(9800 - x)$.

$$\frac{x}{75} = \frac{(9800 - x)}{80}$$

$$\Rightarrow \frac{3x}{25} = \frac{9800 - x}{8}$$

$$\Rightarrow 24x = 9800 \times 25 - 25x$$

$$\Rightarrow 49x = 9800 \times 25$$

$$\Rightarrow x = 5000.$$

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A man invests some money partly in 9% stock at 96 and partly in 12% stock at 120. To obtain equal dividends from both, he must invest the money in the ratio:

A. 3 : 4

B. 3 : 5

C. 4 : 5

D. 16 : 15

Answer & Explanation

Answer: Option **D**

Explanation:

For an income of Re. 1 in 9% stock at 96, investment = Rs. $\left(\frac{96}{9}\right) = \text{Rs. } \frac{32}{3}$

For an income Re. 1 in 12% stock at 120, investment = Rs. $\left(\frac{120}{12}\right) = \text{Rs. } 10.$

∴ Ratio of investments = $\frac{32}{3} : 10 = 32 : 30 = 16 : 15.$

A. Rs. 83.33

B. Rs. 110

C. Rs. 112

D. Rs. 120

Answer & Explanation

Answer: Option D

Explanation:

To earn Rs. 10, money invested = Rs. 100.

$$\begin{aligned} \text{To earn Rs. 12, money invested} &= \frac{100}{10} \times 12 \\ &= \text{Rs. } 120. \end{aligned}$$

$$\left(\frac{100}{10} \times 12 \right)$$

∴ Market value of Rs. 100 stock = Rs. 120.

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The market value of a 10.5% stock, in which an income of Rs. 756 is derived by investing Rs. 9000, brokerage being $\frac{1}{4}\%$, is:

A. Rs. 108.25

B. Rs. 112.20

C. Rs. 124.75

D. Rs. 125.25

Answer & Explanation

Answer: Option C

Explanation:

For an income of Rs. 756, investment = Rs. 9000.

$$\text{For an income of Rs. } \frac{21}{2}, \text{ investment} = \text{Rs. } \left(\frac{9000}{756} \times \frac{21}{2} \right) = \text{Rs. } 125.$$

∴ For a Rs. 100 stock, investment = Rs. 125.

$$\text{Market value of Rs. 100 stock} = \text{Rs. } \left(125 - \frac{1}{4} \right) = \text{Rs. } 124.75$$

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14. The cost price of a Rs. 100 stock at 4 discount, when brokerage is $\frac{1}{4}\%$ is:

A. Rs. 95.75

B. Rs. 96

C. Rs. 96.25

D. Rs. 104.25

Answer & Explanation

Answer: Option **C**

Explanation:

$$\text{C.P.} = \text{Rs.} \left(100 - 4 + \frac{1}{4} \right) = \text{Rs.} 96.25$$

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Sakshi invests a part of Rs. 12,000 in 12% stock at Rs. 120 and the remainder in 15% stock at Rs. 125. If his total dividend per annum is Rs. 1360, how much does he invest in 12% stock at Rs. 120?

A. Rs. 4000

B. Rs. 4500

C. Rs. 5500

D. Rs. 6000

Answer & Explanation

Answer: Option **A**

Explanation:

Let investment in 12% stock be Rs. x .

Then, investment in 15% stock = Rs. $(12000 - x)$.

$$\therefore \frac{12}{120} \times x + \frac{15}{125} \times (12000 - x) = 1360.$$

$$\Rightarrow x + 3(12000 - x) = 1360.$$

— —

10 25

$$\Rightarrow 5x + 72000 - 6x = 1360 \times 50$$

$$\Rightarrow x = 4000.$$

Banker's Discount

Formulas

IMPORTANT CONCEPTS

Banker's Discount:

Suppose a merchant A buys goods worth, say Rs. 10,000 from another merchant B at a credit of say 5 months. Then, B prepares a bill, called the bill of exchange. A signs this bill and allows B to withdraw the amount from his bank account after exactly 5 months.

The date exactly after 5 months is called **nominally due date**. Three days (known as grace days) are added to it get a date, known as **legally due date**.

Suppose B wants to have the money before the legally due date. Then he can have the money from the banker or a broker, who deducts S.I. on the face value (i.e., Rs. 10,000 in this case) for the period from the date on which the bill was discounted (i.e., paid by the banker) and the legally due date. This amount is known as **Banker's Discount (B.D.)**.

Thus, B.D. is the S.I. on the face value for the period from the date on which the bill was discounted and the legally due date.

Banker's Gain (B.G.) = (B.D.) - (T.D.) for the unexpired time.

Note: When the date of the bill is not given, grace days are not to be added.

IMPORTANT FORMULAE

B.D. = S.I. on bill for unexpired time.

$$B.G. = (B.D.) - (T.D.) = S.I. \text{ on } T.D. = \frac{(T.D.)^2}{P.W.}$$

T.D. P.W. \times B.G.

$$4. \quad \begin{aligned} B.D. &= \left[\frac{\text{Amount} \times \text{Rate} \times \text{Time}}{100} \right] \\ T.D. &= \left[\frac{\text{Amount} \times \text{Rate} \times \text{Time}}{100} \right] \end{aligned}$$

$$6. \text{ Amount} = \frac{100 + (\text{Rate} \times \text{Time})}{\left[\frac{\text{B.D.} \times \text{T.D.}}{\text{B.D.} - \text{T.D.}} \right]}$$

$$7. \text{ T.D.} = \left[\frac{\text{B.G.} \times 100}{\text{Rate} \times \text{Time}} \right]$$

The banker's discount on a bill due 4 months hence at 15% is Rs. 420. The true discount is:

A. Rs. 400

B. Rs. 360

C. Rs. 480

D. Rs. 320

Answer & Explanation

Answer: Option **A**

Explanation:

$$\text{T.D.} = \frac{\text{B.D.} \times 100}{100 + (\text{R} \times \text{T})}$$

$$= \text{Rs.} \left[\frac{420 \times 100}{100 + \left(15 \times \frac{1}{3} \right)} \right]$$

$$= \text{Rs.} \left(\frac{420 \times 100}{105} \right)$$

$$= \text{Rs.} 400.$$

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The banker's discount on Rs. 1600 at 15% per annum is the same as true discount on Rs. 1680 for the same time and at the same rate. The time is:

A. 3 months

B. 4 months

C. 6 months

D. 8 months

Answer & Explanation

Answer: Option **B**

Explanation:

S.I. on Rs. 1600 = T.D. on Rs. 1680.

∴ Rs. 1600 is the P.W. of Rs. 1680, i.e., Rs. 80 is on Rs. 1600 at 15%.

$$\therefore \text{Time} = \left(\frac{100 \times 80}{1600 \times 15} \right) \text{year} = \frac{1}{3} \text{year} = 4 \text{ months.}$$

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The banker's gain of a certain sum due 2 years hence at 10% per annum is Rs. 24. The present worth is:

A. Rs. 480

B. Rs. 520

C. Rs. 600

D. Rs. 960

Answer & Explanation

Answer: Option **C**

Explanation:

$$\text{T.D.} = \left(\frac{\text{B.G.} \times 100}{\text{Rate} \times \text{Time}} \right) = \text{Rs.} \left(\frac{24 \times 100}{10 \times 2} \right) = \text{Rs.} 120.$$

$$\therefore \text{P.W.} = \frac{100 \times \text{T.D.}}{\text{Rate} \times \text{Time}} = \text{Rs.} \left(\frac{100 \times 120}{10 \times 2} \right) = \text{Rs.} 600.$$

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4.

The banker's discount on a sum of money for $1\frac{1}{2}$ years is Rs. 558 and the true discount on the same sum for 2 years is Rs. 600. The rate percent is:

A. 10%

B. 13%

C. 12%

D. 15%

Answer & Explanation

Answer: Option C

Explanation:

$$\text{B.D. for } \frac{3}{2} \text{ years} = \text{Rs. } 558.$$

$$\text{B.D. for 2 years} = \text{Rs. } \left(558 \times \frac{2}{3} \right)$$

$$= \text{Rs. } 744$$

$$\text{T.D. for 2 years} = \text{Rs. } 600.$$

$$\therefore \text{Sum} = \frac{\text{B.D.} \times \text{T.D.}}{\text{B.D.} - \text{T.D.}} = \text{Rs. } \left(\frac{744 \times 600}{144} \right) = \text{Rs. } 3100.$$

Thus, Rs. 744 is S.I. on Rs. 3100 for 2 years.

$$\therefore \text{Rate} = \left(\frac{100 \times 744}{3100 \times 2} \right) \% = 12\%$$

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The banker's gain on a sum due 3 years hence at 12% per annum is Rs. 270. The banker's discount is:

A. Rs. 960

B. Rs. 840

C. Rs. 1020

D. Rs. 760

Answer & Explanation

Answer: Option C

Explanation:

$$\text{T.D.} = \left(\frac{\text{B.G.} \times 100}{R} \right) = \text{Rs. } \left(\frac{270 \times 100}{12} \right) = \text{Rs. } 750.$$

R x T

12 x 3

$$\therefore \text{B.D.} = \text{Rs.}(750 + 270) = \text{Rs. } 1020.$$

The banker's discount of a certain sum of money is Rs. 72 and the true discount on the same sum for the same time is Rs. 60. The sum due is:

A. Rs. 360

B. Rs. 432

C. Rs. 540

D. Rs. 1080

Answer & Explanation

Answer: Option **A**

Explanation:

$$\text{Sum} = \frac{\text{B.D.} \times \text{T.D.}}{\text{B.D.} - \text{T.D.}} = \text{Rs.} \left(\frac{72 \times 60}{72 - 60} \right) = \text{Rs.} \left(\frac{72 \times 60}{12} \right) = \text{Rs. } 360.$$

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The certain worth of a certain sum due sometime hence is Rs. 1600 and the true discount is Rs. 160. The banker's gain is:

A. Rs. 20

B. Rs. 24

C. Rs. 16

D. Rs. 12

Answer & Explanation

Answer: Option **C**

Explanation:

$$\text{B.G.} = \frac{(\text{T.D.})^2}{\text{P.W.}} = \text{Rs.} \left(\frac{160 \times 160}{1600} \right) = \text{Rs. } 16.$$

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The present worth of a certain bill due sometime hence is Rs. 800 and the true discount is Rs. 36. The banker's discount is:

A. Rs. 37

B. Rs. 37.62

C. Rs. 34.38

D. Rs. 38.98

Answer & Explanation

Answer: Option B

Explanation:

$$\text{B.G.} = \frac{(\text{T.D.})^2}{\text{P.W.}} = \text{Rs.} \left(\frac{36 \times 36}{800} \right) = \text{Rs.} 1.62$$

$$\therefore \text{B.D.} = (\text{T.D.} + \text{B.G.}) = \text{Rs.} (36 + 1.62) = \text{Rs.} 37.62$$

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The banker's gain on a bill due 1 year hence at 12% per annum is Rs. 6. The true discount is:

A. Rs. 72

B. Rs. 36

C. Rs. 54

D. Rs. 50

Answer & Explanation

Answer: Option D

Explanation:

$$\text{T.D.} = \frac{\text{B.G.} \times 100}{R \times T} = \text{Rs.} \left(\frac{6 \times 100}{12 \times 1} \right) = \text{Rs.} 50.$$

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10.

The banker's gain on a certain sum due $1\frac{1}{2}$ years hence is $\frac{3}{25}$ of the banker's

discount. The rate percent is:

A. $\frac{5}{5}\%$

B. $\frac{9}{11}\%$

C. $\frac{1}{8}\%$

D. $\frac{1}{6}\%$

Answer & Explanation

Answer: Option B

Explanation:

Let, B.D = Re. 1.

Then, B.G. = Re. $\frac{3}{25}$.

\therefore T.D. = (B.D. - B.G.) = Re. $\left(1 - \frac{3}{25}\right)$ = Re. $\frac{22}{25}$

Sum = $\left(\frac{1 \times (22/25)}{1 - (22/25)}\right)$ = $\frac{Rs.}{3}$

S.I. on Rs. $\frac{22}{3}$ for $1\frac{1}{2}$ years is Re. 1.

\therefore Rate = $\left(\frac{100 \times 1}{\frac{22}{3} \times 1\frac{1}{2}}\right)$ % = 100 = 91%

The present worth of a sum due sometime hence is Rs. 576 and the banker's gain is Rs. 16. The true discount is:

A. Rs. 36

B. Rs. 72

C. Rs. 48

D. Rs. 96

Answer & Explanation

Answer: Option D

Explanation:

T.D. = P.W. x B.G. = 576 x 16 = 96.

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$$\therefore \text{Sum} = \text{Rs.} \left(\frac{1.10 \times 1}{1.10 - 1} \right) = \text{Rs.} \left(\frac{110}{10} \right) = \text{Rs.} 11.$$

\therefore S.I. on Rs. 11 for 2 years is Rs. 1.10

$$\therefore \text{Rate} = \left(\frac{100 \times 1.10}{11 \times 2} \right) \% = 5\%.$$

Gather and Edited By

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Math Book Part 2

Best Of Luck

***You Can Not Help Every one But Every
One Can Help Someone***

'FPSC Custom Inspectors BS16 & Preventive Officer BS16 Preparation group

Time and Distance

Formulas

Speed, Time and Distance:

$$\text{Speed} = \left(\frac{\text{Distance}}{\text{Time}} \right), \text{Time} = \left(\frac{\text{Distance}}{\text{Speed}} \right), \text{Distance} = (\text{Speed} \times \text{Time}).$$

km/hr to m/sec conversion:

$$x \text{ km/hr} = \left(x \times \frac{5}{18} \right) \text{ m/sec.}$$

m/sec to km/hr conversion:

$$x \text{ m/sec} = \left(x \times \frac{18}{5} \right) \text{ km/hr.}$$

If the ratio of the speeds of A and B is $a : b$, then the ratio of the

the times taken by them to cover the same distance is $\frac{1}{a} : \frac{1}{b}$ or $b : a$.

Suppose a man covers a certain distance at x km/hr and an equal distance at y km/hr. Then,

the average speed during the whole journey is $\left(\frac{2xy}{x+y} \right)$ km/hr.

A person crosses a 600 m long street in 5 minutes. What is his speed in km per hour?

A. 3.6

B. 7.2

C. 8.4

D. 10

Answer & Explanation

Answer: Option B

Explanation:

$$\text{Speed} = \left(\frac{600}{5 \times 60} \right) \text{m/sec.}$$

$$= 2 \text{ m/sec.}$$

Converting m/sec to km/hr (see [important formulas](#) section)

$$= \left(2 \times \frac{18}{5} \right) \text{km/hr}$$

$$= 7.2 \text{ km/hr.}$$

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An aeroplane covers a certain distance at a speed of 240 kmph in 5 hours. To cover the same distance in $1\frac{2}{3}$ hours, it must travel at a speed of:

A. 300 kmph

B. 360 kmph

C. 600 kmph

D. 720 kmph

Answer & Explanation

Answer: Option D

Explanation:

$$\text{Distance} = (240 \times 5) = 1200 \text{ km.}$$

$$\text{Speed} = \text{Distance/Time}$$

$$\text{Speed} = 1200 / \left(5\frac{2}{3} \right) \text{ km/hr.} \quad [\text{We can write } 1\frac{2}{3} \text{ hours as } 5\frac{2}{3} \text{ hours}]$$

$$\therefore \text{Required speed} = \left(1200 \times \frac{3}{5} \right) \text{ km/hr} = 720 \text{ km/hr.}$$

$$\Rightarrow (2x + 3)(x - 1) = 0$$

$$\Rightarrow x = 1 \text{ hr.} \quad [\text{neglecting the -ve value of } x]$$

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A man complete a journey in 10 hours. He travels first half of the journey at the rate of 21 km/hr and second half at the rate of 24 km/hr. Find the total journey in km.

A. 220 km

B. 224 km

C. 230 km

D. 234 km

Answer & Explanation

Answer: Option **B**

Explanation:

$$\frac{(1/2)x}{21} + \frac{(1/2)x}{24} = 10$$

$$\Rightarrow 21^X + 24^X = 20$$

$$\Rightarrow 15x = 168 \times 20$$

$$\Rightarrow x = \left(\frac{168 \times 20}{15} \right) = 224 \text{ km.}$$

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The ratio between the speeds of two trains is 7 : 8. If the second train runs 400 km in 4 hours, then the speed of the first train is:

A. 70 km/hr

B. 75 km/hr

C. 84 km/hr

D. 87.5 km/hr

Answer & Explanation

Answer: Option **D**

Explanation:

Let the speed of two trains be $7x$ and $8x$ km/hr.

$$\text{Then, } 8x = \left(\frac{400}{4} \right) = 100$$

$$\Rightarrow x = \frac{100}{8} = 12.5$$

In covering a distance of 30 km, Abhay takes 2 hours more than Sameer. If Abhay doubles his speed, then he would take 1 hour less than Sameer. Abhay's speed is:

- A. 5 kmph
- B. 6 kmph
- C. 6.25 kmph
- D. 7.5 kmph

Answer & Explanation

Answer: Option **A**

Explanation:

Let Abhay's speed be x km/hr.

$$\text{Then, } \frac{30}{x} - \frac{30}{2x} = 3$$

$$\Rightarrow 6x = 30$$

$$\Rightarrow x = 5 \text{ km/hr.}$$

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Robert is travelling on his cycle and has calculated to reach point A at 2 P.M. if he travels at 10 kmph, he will reach there at 12 noon if he travels at 15 kmph. At what speed must he travel to reach A at 1 P.M.?

- A. 8 kmph
- B. 11 kmph
- C. 12 kmph
- D. 14 kmph

Answer & Explanation

Answer: Option **C**

Explanation:

Let the distance travelled be x km.

$$\text{Then, } \frac{x}{10} - \frac{x}{15} = 2$$

$$\Rightarrow 3x - 2x = 60$$

$$\Rightarrow x = 60 \text{ km.}$$

$$\text{Time taken to travel 60 km at 10 km/hr} = \left(\frac{60}{10}\right) \text{ hrs} = 6 \text{ hrs.}$$

So, Robert started 6 hours before 2 P.M. *i.e.*, at 8 A.M.

$$\therefore \text{Required speed} = \left(\frac{60}{5}\right) \text{ kmph.} = 12 \text{ kmph.}$$

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It takes eight hours for a 600 km journey, if 120 km is done by train and the rest by car. It takes 20 minutes more, if 200 km is done by train and the rest by car. The ratio of the speed of the train to that of the cars is:

A. 2 : 3

B. 3 : 2

C. 3 : 4

D. 4 : 3

Answer & Explanation

Answer: Option C

Explanation:

Let the speed of the train be x km/hr and that of the car be y km/hr.

$$\begin{aligned} \text{Then, } \frac{120}{x} + \frac{480}{y} &= 8 & \Rightarrow \frac{1}{x} + \frac{4}{y} &= \frac{1}{15} \dots(i) \\ \text{And, } \frac{200}{x} + \frac{400}{y} &= \frac{25}{3} & \Rightarrow \frac{1}{x} + \frac{2}{y} &= \frac{1}{24} \dots(ii) \end{aligned}$$

Solving (i) and (ii), we get: $x = 60$ and $y = 80$.

$$\therefore \text{Ratio of speeds} = 60 : 80 = 3 : 4.$$

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A farmer travelled a distance of 61 km in 9 hours. He travelled partly on foot @ 4 km/hr and partly on bicycle @ 9 km/hr. The distance travelled on foot is:

A. 14 km

B. 15 km

C. 16 km

D. 17 km

Answer & Explanation

Answer: Option C

Explanation:

Let the distance travelled on foot be x km.

Then, distance travelled on bicycle = $(61 - x)$ km.

$$\text{So, } \frac{x}{4} + \frac{(61 - x)}{9} = 9$$

$$\Rightarrow 9x + 4(61 - x) = 9 \times 36$$

$$\Rightarrow 5x = 80$$

$$\Rightarrow x = 16 \text{ km.}$$

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A man covered a certain distance at some speed. Had he moved 3 kmph faster, he would have taken 40 minutes less. If he had moved 2 kmph slower, he would have taken 40 minutes more. The distance (in km) is:

A. 35

B. $36\frac{2}{3}$

C. $37\frac{1}{2}$

D. 40

Answer & Explanation

Answer: Option **D**

Explanation:

Let distance = x km and usual rate = y kmph.

$$\text{Then, } \frac{x}{y} - \frac{x}{y + 3} = \frac{40}{60} \Rightarrow 2y(y + 3) = 9x \dots(i)$$

$$\text{And, } \frac{x}{y - 2} - \frac{x}{y} = \frac{40}{60} \Rightarrow y(y - 2) = 3x \dots(ii)$$

On dividing (i) by (ii), we get: $x = 40$

Simple Interest

Formulas

Principal:

C. 10.5%

D. None of these

Answer & Explanation

Answer: Option B

Explanation:

Let the sum be Rs. 100. Then,

$$\text{S.I. for first 6 months} = \text{Rs.} \left(\frac{100 \times 10 \times 1}{100 \times 2} \right) = \text{Rs. } 5$$

$$\text{S.I. for last 6 months} = \text{Rs.} \left(\frac{105 \times 10 \times 1}{100 \times 2} \right) = \text{Rs. } 5.25$$

So, amount at the end of 1 year = Rs. (100 + 5 + 5.25) = Rs. 110.25

$$\therefore \text{Effective rate} = (110.25 - 100) = 10.25\%$$

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A lent Rs. 5000 to B for 2 years and Rs. 3000 to C for 4 years on simple interest at the same rate of interest and received Rs. 2200 in all from both of them as interest. The rate of interest per annum is:

A. 5%

B. 7%

C. $\frac{1}{78}\%$

D. 10%

Answer & Explanation

Answer: Option D

Explanation:

Let the rate be R% p.a.

$$\text{Then,} \left(\frac{5000 \times R \times 2}{100} \right) + \left(\frac{3000 \times R \times 4}{100} \right) = 2200.$$

$$\Rightarrow 100R + 120R = 2200$$

$$\Rightarrow R = \left(\frac{2200}{220} \right) = 10.$$

$$\therefore \text{Rate} = 10\%.$$

$$\therefore \text{Gain in 1 year} = \text{Rs. } \left(\frac{225}{2} \right) = \text{Rs. } 112.50$$

Partnership

Formulas

Partnership:

When two or more than two persons run a business jointly, they are called **partners** and the deal is known as **partnership**.

Ratio of Divisions of Gains:

When investments of all the partners are for the same time, the gain or loss is distributed among the partners in the ratio of their investments.

Suppose A and B invest Rs. x and Rs. y respectively for a year in a business, then at the end of the year:

$$(\text{A's share of profit}) : (\text{B's share of profit}) = x : y.$$

When investments are for different time periods, then equivalent capitals are calculated for a unit of time by taking (capital \times number of units of time). Now gain or loss is divided in the ratio of these capitals.

Suppose A invests Rs. x for p months and B invests Rs. y for q months then,

$$(\text{A's share of profit}) : (\text{B's share of profit}) = xp : yq.$$

Working and Sleeping Partners:

A partner who manages the the business is known as a **working partner** and the one who simply invests the money is a **sleeping partner**.

A and B invest in a business in the ratio 3 : 2. If 5% of the total profit goes to charity and A's share is Rs. 855, the total profit is:

A. Rs. 1425

B. Rs. 1500

C. Rs. 1537.50

D. Rs. 1576

Answer & Explanation

Answer: Option **B**

Explanation:

Let the total profit be Rs. 100.

$$\text{After paying to charity, A's share} = \text{Rs.} \left(95 \times \frac{3}{5} \right) = \text{Rs. } 57.$$

If A's share is Rs. 57, total profit = Rs. 100.

$$\text{If A's share Rs. 855, total profit} = \left(\frac{100}{57} \times 855 \right) = 1500.$$

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A, B and C jointly thought of engaging themselves in a business venture. It was agreed that A would invest Rs. 6500 for 6 months, B, Rs. 8400 for 5 months and C, Rs. 10,000 for 3 months. A wants to be the working member for which, he was to receive 5% of the profits. The profit earned was Rs. 7400. Calculate the share of B in the profit.

A. Rs. 1900

B. Rs. 2660

C. Rs. 2800

D. Rs. 2840

Answer & Explanation

Answer: Option **B**

Explanation:

For managing, A received = 5% of Rs. 7400 = Rs. 370.

Balance = Rs. (7400 - 370) = Rs. 7030.

Ratio of their investments = (6500 × 6) : (8400 × 5) : (10000 × 3)

39000 : 42000 : 30000

13 : 14 : 10

$$\therefore \text{B's share} = \text{Rs.} \left(7030 \times \frac{14}{37} \right) = \text{Rs. } 2660.$$

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3. A, B and C enter into a partnership in the ratio $\frac{7}{2} : \frac{4}{3} : \frac{6}{5}$. After 4 months, A increases his share 50%. If the total profit at the end of one year be Rs. 21,600, then B's share in the profit is:

A. Rs. 2100

B. Rs. 2400

C. Rs. 3600

D. Rs. 4000

Answer & Explanation

Answer: Option D

Explanation:

$$\text{Ratio of initial investments} = \left(\frac{7}{2} : \frac{4}{3} : \frac{6}{5} \right) = 105 : 40 : 36.$$

Let the initial investments be $105x$, $40x$ and $36x$.

$$\begin{aligned} \therefore A : B : C &= \left(105x \times 4 + \frac{150}{100} \times 105x \times 8 \right) : (40x \times 12) : (36x \times 12) \\ &= 1680x : 480x : 432x = 35 : 10 : 9. \end{aligned}$$

$$\text{Hence, B's share} = \text{Rs.} \left(21600 \times \frac{10}{54} \right) = \text{Rs.} 4000.$$

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A, B, C subscribe Rs. 50,000 for a business. A subscribes Rs. 4000 more than B and B Rs. 5000 more than C. Out of a total profit of Rs. 35,000, A receives:

A. Rs. 8400

B. Rs. 11,900

C. Rs. 13,600

D. Rs. 14,700

Answer & Explanation

Answer: Option D

Explanation:

Let C = x .

Then, B = $x + 5000$ and A = $x + 5000 + 4000 = x + 9000$.

$$\text{So, } x + x + 5000 + x + 9000 = 50000$$

$$\Rightarrow 3x = 36000$$

$$\Rightarrow x = 12000$$

$$A : B : C = 21000 : 17000 : 12000 = 21 : 17 : 12.$$

$$\therefore \text{A's share} = \text{Rs.} \left(35000 \times \frac{21}{50} \right) = \text{Rs.} 14,700.$$

Three partners shared the profit in a business in the ratio 5 : 7 : 8. They had partnered for 14 months, 8 months and 7 months respectively. What was the ratio of their investments?

- A. 5 : 7 : 8
 B. 20 : 49 : 64
 C. 38 : 28 : 21
 D. None of these

Answer & Explanation

Answer: Option B

Explanation:

Let their investments be Rs. x for 14 months, Rs. y for 8 months and Rs. z for 7 months respectively.

Then, $14x : 8y : 7z = 5 : 7 : 8$.

$$\text{Now, } \frac{14x}{8y} = \frac{5}{7} \Leftrightarrow 98x = 40y \Leftrightarrow y = \frac{49}{20}x$$

$$\text{And, } \frac{14x}{7z} = \frac{5}{8} \Leftrightarrow 112x = 35z \Leftrightarrow z = \frac{112}{35}x = \frac{16}{5}x.$$

$$\therefore x : y : z = x : \frac{49}{20}x : \frac{16}{5}x = 20 : 49 : 64.$$

A starts business with Rs. 3500 and after 5 months, B joins with A as his partner. After a year, the profit is divided in the ratio 2 : 3. What is B's contribution in the capital?

- A. Rs. 7500
 B. Rs. 8000
 C. Rs. 8500
 D. Rs. 9000

Answer & Explanation

Answer: Option D

Explanation:

Let B's capital be Rs. x .

$$\text{Then, } \left(\frac{3500 \times 12}{7x} \quad \frac{2}{3} \right)$$

$$\Rightarrow 14x = 126000$$

much period does B join, if the profits at the end of the year are divided in the ratio of 3 : 1?

- A. 4 months
- B. 5 months
- C. 6 months
- D. 8 months

Answer & Explanation

Answer: Option **D**

Explanation:

Suppose B joined for x months. Then,

$$\text{Then, } \left(\frac{85000 \times 12}{42500 \times x} = \frac{3}{1} \right)$$
$$\Rightarrow x = \left(\frac{85000 \times 12}{42500 \times 3} \right) = 8.$$

So, B joined for 8 months.

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Aman started a business investing Rs. 70,000. Rakhi joined him after six months with an amount of Rs. 1,05,000 and Sagar joined them with Rs. 1.4 lakhs after another six months. The amount of profit earned should be distributed in what ratio among Aman, Rakhi and Sagar respectively, 3 years after Aman started the business?

- A. 7 : 6 : 10
- B. 12 : 15 : 16
- C. 42 : 45 : 56
- D. Cannot be determined

Answer & Explanation

Answer: Option **B**

Explanation:

Aman : Rakhi : Sagar = $(70,000 \times 36) : (1,05,000 \times 30) : (1,40,000 \times 24) = 12 : 15 : 16.$

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Arun, Kamal and Vinay invested Rs. 8000, Rs. 4000 and Rs. 8000 respectively in a business. Arun left after six months. If after eight months, there was a gain of Rs. 4005, then what will be the share of Kamal?

- A. Rs. 890
- B. Rs. 1335

C. Rs. 1602

D. Rs. 1780

Answer & Explanation

Answer: Option A

Explanation:

Arun : Kamal : Vinay = $(8,000 \times 6) : (4,000 \times 8) : (8,000 \times 8)$

48 : 32 : 64

3 : 2 : 4.

\therefore Kamal's share = Rs. $\left(4005 \times \frac{2}{9}\right)$ = Rs. 890.

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Simran started a software business by investing Rs. 50,000. After six months, Nanda joined her with a capital of Rs. 80,000. After 3 years, they earned a profit of Rs. 24,500. What was Simran's share in the profit?

A. Rs. 9,423

B. Rs. 10,250

C. Rs. 12,500

D. Rs. 10,500

Answer & Explanation

Answer: Option D

Explanation:

Simran : Nanda = $(50000 \times 36) : (80000 \times 30) = 3 : 4$.

\therefore Simran's share = Rs. $\left(24500 \times \frac{3}{7}\right)$ = Rs. 10,500.

Calendar

Formulas

Odd Days:

We are supposed to find the day of the week on a given date.

For this, we use the concept of 'odd days'.

In a given period, the number of days more than the complete weeks are called **odd days**.

Leap Year:

- (i). Every year divisible by 4 is a leap year, if it is not a century.
- (ii). Every 4th century is a leap year and no other century is a leap year. Note: **A leap year has 366 days.**

Examples:

Each of the years 1948, 2004, 1676 etc. is a leap year.
Each of the years 400, 800, 1200, 1600, 2000 etc. is a leap year.
None of the years 2001, 2002, 2003, 2005, 1800, 2100 is a leap year.

Ordinary Year:

The year which is not a leap year is called an **ordinary years**. An ordinary year has 365 days.

Counting of Odd Days:

1 ordinary year = 365 days = (52 weeks + 1 day.)

1 leap year = 366 days = (52 weeks + 2 days)

∴ 1 leap year has 2 odd days.

100 years = 76 ordinary years + 24 leap years

(76 x 1 + 24 x 2) odd days = 124 odd days.

(17 weeks + days) ≡ 5 odd days.

∴ Number of odd days in 100 years = 5.

Number of odd days in 200 years = (5 x 2) ≡ 3 odd days.

Number of odd days in 300 years = (5 x 3) ≡ 1 odd day.

Number of odd days in 400 years = (5 x 4 + 1) ≡ 0 odd day.

Similarly, each one of 800 years, 1200 years, 1600 years, 2000 years etc. has 0 odd days.

Day of the Week Related to Odd Days:

Answer: Option **A**

Explanation:

15th August, 2010 = (2009 years + Period 1.1.2010 to 15.8.2010)

Odd days in 1600 years = 0

Odd days in 400 years = 0

9 years = (2 leap years + 7 ordinary years) = (2 × 2 + 7 × 1) = 11 odd days ≡ 4 odd days.

Jan. Feb. March April May June July Aug.
(31 + 28 + 31 + 30 + 31 + 30 + 31 + 15) = 227 days

∴ 227 days = (32 weeks + 3 days) ≡ 3 odd days.

Total number of odd days = (0 + 0 + 4 + 3) = 7 ≡ 0 odd days.

Given day is Sunday.

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Today is Monday. After 61 days, it will be:

- | | |
|---------------------|--------------------|
| A. Wednesday | B. Saturday |
| C. Tuesday | D. Thursday |

Answer & Explanation

Answer: Option **B**

Explanation:

Each day of the week is repeated after 7 days.

So, after 63 days, it will be Monday.

∴ After 61 days, it will be Saturday.

If 6th March, 2005 is Monday, what was the day of the week on 6th March, 2004?

- | | |
|-------------------|---------------------|
| A. Sunday | B. Saturday |
| C. Tuesday | D. Wednesday |

Answer & Explanation

Answer: Option **A**

Explanation:

The year 2004 is a leap year. So, it has 2 odd days.

But, Feb 2004 not included because we are calculating from March 2004 to March 2005. So it has 1 odd day only.

∴ The day on 6th March, 2005 will be 1 day beyond the day on 6th March, 2004.

Given that, 6th March, 2005 is Monday.

∴ 6th March, 2004 is Sunday (1 day before to 6th March, 2005).

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On what dates of April, 2001 did Wednesday fall?

A. 1st, 8th, 15th, 22nd, 29th

B. 2nd, 9th, 16th, 23rd, 30th

C. 3rd, 10th, 17th, 24th

D. 4th, 11th, 18th, 25th

Answer & Explanation

Answer: Option **D**

Explanation:

We shall find the day on 1st April, 2001.

1st April, 2001 = (2000 years + Period from 1.1.2001 to 1.4.2001)

Odd days in 1600 years = 0

Odd days in 400 years = 0

Jan. Feb. March April

(31 + 28 + 31 + 1) = 91 days ≡ 0 odd days.

Total number of odd days = (0 + 0 + 0) = 0

On 1st April, 2001 it was Sunday.

In April, 2001 Wednesday falls on 4th, 11th, 18th and 25th.

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Answer: Option **A**

Explanation:

The century divisible by 400 is a leap year.

∴ The year 700 is not a leap year.

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On 8th Dec, 2007 Saturday falls. What day of the week was it on 8th Dec, 2006?

A. Sunday **B.** Thursday **C.** Tuesday **D.** Friday

Answer & Explanation

Answer: Option **D**

Explanation:

The year 2006 is an ordinary year. So, it has 1 odd day.

So, the day on 8th Dec, 2007 will be 1 day beyond the day on 8th Dec, 2006.

But, 8th Dec, 2007 is Saturday.

∴ 8th Dec, 2006 is Friday.

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January 1, 2008 is Tuesday. What day of the week lies on Jan 1, 2009?

A. Monday **B.** Wednesday **C.** Thursday **D.** Sunday

Answer & Explanation

Answer: Option **C**

Explanation:

The year 2008 is a leap year. So, it has 2 odd days.

The area of the triangle formed by joining the mid-points of the sides of a given triangle is one-fourth of the area of the given triangle.

Results on Quadrilaterals:

The diagonals of a parallelogram bisect each other.
 Each diagonal of a parallelogram divides it into triangles of the same area.
 The diagonals of a rectangle are equal and bisect each other.
 The diagonals of a square are equal and bisect each other at right angles.
 The diagonals of a rhombus are unequal and bisect each other at right angles.
 A parallelogram and a rectangle on the same base and between the same parallels are equal in area.
 Of all the parallelogram of given sides, the parallelogram which is a rectangle has the greatest area.

IMPORTANT FORMULAE

1. Area of a rectangle = (Length x Breadth).

$$\therefore \text{Length} = \left(\frac{\text{Area}}{\text{Breadth}} \right) \text{ and Breadth} = \left(\frac{\text{Area}}{\text{Length}} \right).$$

2. Perimeter of a rectangle = 2(Length + Breadth).

$$\text{Area of a square} = (\text{side})^2 = \frac{1}{2}(\text{diagonal})^2.$$

IV. Area of 4 walls of a room = 2 (Length + Breadth) x Height.

1. Area of a triangle = $\frac{1}{2}$ x Base x Height.

$$\text{Area of a triangle} = s(s-a)(s-b)(s-c)$$

where a, b, c are the sides of the triangle and $s = \frac{1}{2}(a + b + c)$.

$$\text{Area of an equilateral triangle} = \frac{\sqrt{3}}{4} \times (\text{side})^2.$$

$$\text{Radius of incircle of an equilateral triangle of side } a = \frac{a\sqrt{3}}{6}.$$

$$\text{Radius of circumcircle of an equilateral triangle of side } a = \frac{a\sqrt{3}}{3}.$$

6. Radius of incircle of a triangle of area Δ and semi-perimeter $s = \frac{\Delta}{s}$

VI. 1. Area of parallelogram = (Base x Height).

$$\text{Area of a rhombus} = \frac{1}{2} \times (\text{Product of diagonals}).$$

$$\text{Area of a trapezium} = \frac{1}{2} \times (\text{sum of parallel sides}) \times \text{distance between them}.$$

VII. 1. Area of a circle = πR^2 , where R is the radius.

Circumference of a circle = $2\pi R$.

3. Length of an arc = $\frac{\pi R \theta}{360}$, where θ is the central angle.

4. Area of a sector = $\frac{1}{2}(\text{arc} \times R) = \frac{\pi R^2 \theta}{360}$.

VIII. 1. Circumference of a semi-circle = πR .

2. Area of semi-circle = $\frac{\pi R^2}{2}$.

The ratio between the length and the breadth of a rectangular park is 3 : 2. If a man cycling along the boundary of the park at the speed of 12 km/hr completes one round in 8 minutes, then the area of the park (in sq. m) is:

A. 15360

B. 153600

C. 30720

D. 307200

Answer & Explanation

Answer: Option B

Explanation:

Perimeter = Distance covered in 8 min. = $\left(\frac{12000}{60} \times 8\right)$ m = 1600 m.

Let length = $3x$ metres and breadth = $2x$ metres.

Then, $2(3x + 2x) = 1600$ or $x = 160$.

∴ Length = 480 m and Breadth = 320 m.

∴ Area = $(480 \times 320) \text{ m}^2 = 153600 \text{ m}^2$.

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An error 2% in excess is made while measuring the side of a square. The percentage of error in the calculated area of the square is:

A. 2%

B. 2.02%

C. 4%

D. 4.04%

Answer & Explanation

Answer: Option D

Explanation:

100 cm is read as 102 cm.

$$\therefore A_1 = (100 \times 100) \text{ cm}^2 \text{ and } A_2 (102 \times 102) \text{ cm}^2.$$

$$(A_2 - A_1) = [(102)^2 - (100)^2]$$

$$(102 + 100) \times (102 - 100)$$

$$404 \text{ cm}^2.$$

$$\therefore \text{Percentage error} = \left(\frac{404}{100 \times 100} \right) \% = 4.04\%$$

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The ratio between the perimeter and the breadth of a rectangle is 5 : 1. If the area of the rectangle is 216 sq. cm, what is the length of the rectangle?

A. 16 cm

B. 18 cm

C. 24 cm

D. Data inadequate

None of these

Answer & Explanation

Answer: Option **B**

Explanation:

$$\frac{2(l + b)}{b} = \frac{5}{1}$$

$$\Rightarrow 2l + 2b = 5b$$

$$\Rightarrow 3b = 2l$$

$$b = \frac{2}{3}l$$

Then, Area = 216 cm²

$$\Rightarrow l \times b = 216$$

$$\Rightarrow l \times \frac{2}{3}l = 216$$

$$\Rightarrow l^2 = 324$$

$$\Rightarrow l = 18 \text{ cm.}$$

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— The percentage increase in the area of a rectangle, if each of its sides is increased by 20% is: —

A. 40%

B. 42%

C. 44%

D. 46%

Answer & Explanation

Answer: Option C

Explanation:

Let original length = x metres and original breadth = y metres.

Original area = $(xy) \text{ m}^2$.

$$\text{New length} = \left(\frac{120}{100x} \right) \text{ m} = \left(\frac{6}{5x} \right) \text{ m.}$$

$$\text{New breadth} = \left(\frac{120}{100y} \right) \text{ m} = \left(\frac{6}{5y} \right) \text{ m.}$$

$$\text{New Area} = \left(\frac{6}{5} x \times \frac{6}{5} y \right) \text{ m}^2 = \left(\frac{36}{25} xy \right) \text{ m}^2.$$

The difference between the original area = xy and new-area $\frac{36}{25} xy$ is

$$(36/25)xy - xy$$

$$xy(36/25 - 1)$$

$$xy(11/25) \text{ or } (11/25)xy$$

$$\therefore \text{Increase \%} = \left(\frac{11}{25} xy \times \frac{1}{xy} \times 100 \right) \% = 44\%.$$

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A rectangular park 60 m long and 40 m wide has two concrete crossroads running in the middle of the park and rest of the park has been used as a lawn. If the area of the lawn is 2109 sq. m, then what is the width of the road?

A. 2.91 m

B. 3 m

C. 5.82 m

D. None of these

Answer & Explanation

Answer: Option B

Explanation:

Area of the park = $(60 \times 40) \text{ m}^2 = 2400 \text{ m}^2$.

Area of the lawn = 2109 m^2 .

∴ Area of the crossroads = $(2400 - 2109) \text{ m}^2 = 291 \text{ m}^2$.

Let the width of the road be x metres. Then,

$$60x + 40x - x^2 = 291$$

$$\Rightarrow x^2 - 100x + 291 = 0$$

$$\Rightarrow (x - 97)(x - 3) = 0$$

$$\Rightarrow x = 3.$$

6. The diagonal of the floor of a rectangular closet is $7\frac{1}{2}$ feet. The shorter side of the closet is $4\frac{1}{2}$ feet. What is the area of the closet in square feet?

A. $\frac{1}{54}$

B. $\frac{1}{132}$

C. 27

D. 37

Answer & Explanation

Answer: Option C

Explanation:

$$\text{Other side} = \left(\frac{15}{2}\right)^2 - \left(\frac{9}{2}\right)^2 \text{ ft}$$

$$= \frac{225}{4} - \frac{81}{4} \quad \text{ft}$$

$$= \frac{144}{4} \quad \text{ft}$$

$$= 6 \text{ ft.}$$

∴ Area of closet = (6×4.5) sq. ft = 27 sq. ft.

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A towel, when bleached, was found to have lost 20% of its length and 10% of its breadth. The percentage of decrease in area is:

A. 10%

B. 10.08%

C. 20%

D. 28%

Answer & Explanation

Answer: Option **D**

Explanation:

Let original length = x and original breadth = y .

$$\begin{aligned}\text{Decrease in area} &= xy - \left(\frac{80}{100}x \times \frac{90}{100}y \right) \\ &= \left(xy - \frac{18}{25}xy \right) \\ &= \frac{7}{25}xy.\end{aligned}$$

$$\therefore \text{Decrease \%} = \left(\frac{7}{25}xy \times \frac{1}{xy} \right) \times 100 = 28\%.$$

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A man walked diagonally across a square lot. Approximately, what was the percent saved by not walking along the edges?

A. 20

B. 24

C. 30

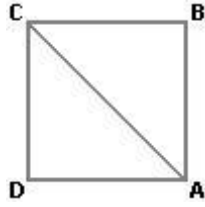
D. 33

Answer & Explanation

Answer: Option **C**

Explanation:

Let the side of the square(ABCD) be x metres.



Then, $AB + BC = 2x$ metres.

$$AC = 2x = (1.41x) \text{ m.}$$

Saving on $2x$ metres = $(0.59x)$ m.

$$\text{Saving \%} = \left(\frac{0.59x}{2x} \times 100 \right) \% = 30\% \text{ (approx.)}$$

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The diagonal of a rectangle is 41 cm and its area is 20 sq. cm. The perimeter of the rectangle must be:

- | | |
|-----------------|-----------------|
| A. 9 cm | B. 18 cm |
| C. 20 cm | D. 41 cm |

Answer & Explanation

Answer: Option **B**

Explanation:

$$l^2 + b^2 = 41.$$

$$\text{Also, } lb = 20.$$

$$(l + b)^2 = (l^2 + b^2) + 2lb = 41 + 40 = 81$$

$$\Rightarrow (l + b) = 9.$$

$$\therefore \text{Perimeter} = 2(l + b) = 18 \text{ cm.}$$

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What is the least number of squares tiles required to pave the floor of a room 15 m 17 cm long and 9 m 2 cm broad?

- | | |
|---------------|---------------|
| A. 814 | B. 820 |
| C. 840 | D. 844 |

Answer & Explanation

Answer: Option **A**

Explanation:

Length of largest tile = H.C.F. of 1517 cm and 902 cm = 41 cm.

Area of each tile = $(41 \times 41) \text{ cm}^2$.

$$\therefore \text{Required number of tiles} = \left(\frac{1517 \times 902}{41 \times 41} \right) = 814.$$

The difference between the length and breadth of a rectangle is 23 m. If its perimeter is 206 m, then its area is:

A. 1520 m^2

B. 2420 m^2

C. 2480 m^2

D. 2520 m^2

Answer & Explanation

Answer: Option **D**

Explanation:

We have: $(l - b) = 23$ and $2(l + b) = 206$ or $(l + b) = 103$.

Solving the two equations, we get: $l = 63$ and $b = 40$.

$$\therefore \text{Area} = (l \times b) = (63 \times 40) \text{ m}^2 = 2520 \text{ m}^2.$$

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The length of a rectangle is halved, while its breadth is tripled. What is the percentage change in area?

A. 25% increase

B. 50% increase

C. 50% decrease

D. 75% decrease

Answer & Explanation

Answer: Option **B**

Explanation:

Let original length = x and original breadth = y .

Original area = xy .

$$\text{New length} = 2x.$$

$$\text{New breadth} = 3y.$$

$$\text{New area} = \left(\frac{x}{2} \times 3y\right) = \frac{3}{2}xy.$$

$$\therefore \text{Increase \%} = \left(\frac{1}{2}xy \times \frac{1}{xy} \times 100\right) \% = 50\%.$$

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The length of a rectangular plot is 20 metres more than its breadth. If the cost of fencing the plot @ 26.50 per metre is Rs. 5300, what is the length of the plot in metres?

A. 40

B. 50

C. 120

D. Data inadequate

None of these

Answer & Explanation

Answer: Option E

Explanation:

Let breadth = x metres.

Then, length = $(x + 20)$ metres.

$$\text{Perimeter} = \left(\frac{5300}{26.50}\right) \text{ m} = 200 \text{ m.}$$

$$\therefore 2[(x + 20) + x] = 200$$

$$\Rightarrow 2x + 20 = 100$$

$$\Rightarrow 2x = 80$$

$$\Rightarrow x = 40.$$

Hence, length = $x + 20 = 60$ m.

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A rectangular field is to be fenced on three sides leaving a side of 20 feet uncovered. If the area of the field is 680 sq. feet, how many feet of fencing will be required?

A. 34

B. 40

C. 68

D. 88

Answer & Explanation

Answer: Option D

Explanation:

We have: $l = 20$ ft and $lb = 680$ sq. ft.

So, $b = 34$ ft.

∴ Length of fencing = $(l + 2b) = (20 + 68)$ ft = 88 ft.

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A tank is 25 m long, 12 m wide and 6 m deep. The cost of plastering its walls and bottom at 75 paise per sq. m, is:

A. Rs. 456

B. Rs. 458

C. Rs. 558

D. Rs. 568

Answer & Explanation

Answer: Option C

Explanation:

Area to be plastered = $[2(l + b) \times h] + (l \times b)$

$$\{[2(25 + 12) \times 6] + (25 \times 12)\} \text{ m}^2$$

$$(444 + 300) \text{ m}^2$$

$$744 \text{ m}^2.$$

∴ Cost of plastering = Rs. $\left(744 \times \frac{75}{10}\right) = \text{Rs. } 558.$

Numbers

Formulas

Some Basic Formulae:

$$(a + b)(a - b) = (a^2 - b^2)$$

Answer: Option **D**

Explanation:

Let $2^{32} = x$. Then, $(2^{32} + 1) = (x + 1)$.

Let $(x + 1)$ be completely divisible by the natural number N . Then,

$(2^{96} + 1) = [(2^{32})^3 + 1] = (x^3 + 1) = (x + 1)(x^2 - x + 1)$, which is completely divisible by N , since $(x + 1)$ is divisible by N .

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4. _____

What least number must be added to 1056, so that the sum is completely divisible by 23 ?

A. 2

B. 3

C. 18

D. 21

None of these

Answer & Explanation

Answer: Option **A**

Explanation:

```
1056 (45
  92
  ---
 136
 115
  ---
  21
  ---
```

Required number = $(23 - 21)$
= 2.

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5. _____

5. $1397 \times 1397 = ?$

A. 1951609

B. 1981709

C. 18362619

D. 2031719

None of these

Answer & Explanation

Answer: Option **A**

Explanation:

$$\begin{aligned}1397 \times 1397 &= (1397)^2 \\ &= (1400 - 3)^2 \\ &= (1400)^2 + (3)^2 - (2 \times 1400 \times 3) \\ &= 1960000 + 9 - 8400 \\ &= 1960009 - 8400 \\ &= 1951609.\end{aligned}$$

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6.

How many of the following numbers are divisible by 132 ?
264, 396, 462, 792, 968, 2178, 5184, 6336

A. 4

B. 5

C. 6

D. 7

Answer & Explanation

Answer: Option **A**

Explanation:

$$132 = 4 \times 3 \times 11$$

So, if the number divisible by all the three number 4, 3 and 11, then the number is divisible by 132 also.

→ 11,3,4 (/)

→ 11,3,4 (/)

→ 11,3 (X)

→ 11,3,4 (/)

→ 11,4 (X)

2178 → 11,3 (X)

5184 \rightarrow 3,4 (X)

6336 \rightarrow 11,3,4 (/)

Therefore the following numbers are divisible by 132 : 264, 396, 792 and 6336.

Required number of number = 4.

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7. _____
(935421 x 625) = ?

- A.** 575648125 **B.** 584638125
C. 584649125 **D.** 585628125

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8. _____
The largest 4 digit number exactly divisible by 88 is:

- A.** 9944 **B.** 9768
C. 9988 **D.** 8888

None of these

Answer & Explanation

Answer: Option **A**

Explanation:

Largest 4-digit number = 9999

```
9999 (113
 88
----
119
 88
----
 319
 264
----
   55
---
```

Required number = (9999 - 55)
= 9944.

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9. _____

Which of the following is a prime number ?

A. 33

B. 81

C. 93

D. 97

Answer & Explanation

Answer: Option **D**

Explanation:

Clearly, 97 is a prime number.

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10.

What is the unit digit in $\{(6374)^{1793} \times (625)^{317} \times (341^{491})\}$?

A. 0

B. 2

C. 3

D. 5

Answer & Explanation

Answer: Option **A**

Explanation:

Unit digit in $(6374)^{1793} = \text{Unit digit in } (4)^{1793}$

Unit digit in $[(4^2)^{896} \times 4]$

Unit digit in $(6 \times 4) = 4$

Unit digit in $(625)^{317} = \text{Unit digit in } (5)^{317} = 5$

Unit digit in $(341)^{491} = \text{Unit digit in } (1)^{491} = 1$

Required digit = Unit digit in $(4 \times 5 \times 1) = 0$.

A. 273258

B. 273268

C. 273348

D. 273358

Answer & Explanation

Answer: Option **A**

Explanation:

$$5358 \times 51 = 5358 \times (50 + 1)$$

$$5358 \times 50 + 5358 \times 1$$

$$267900 + 5358$$

$$273258.$$

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The sum of first five prime numbers is:

A. 11

B. 18

C. 26

D. 28

Answer & Explanation

Answer: Option **D**

Explanation:

$$\text{Required sum} = (2 + 3 + 5 + 7 + 11) = 28.$$

Note: 1 is not a prime number.

Definition: A prime number (or a prime) is a natural number that has exactly two distinct natural number divisors: 1 and itself.

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The difference of two numbers is 1365. On dividing the larger number by the smaller, we get 6 as quotient and the 15 as remainder. What is the smaller number ?

A. 240

B. 270

C. 295

D. 360

Answer & Explanation

Answer: Option **B**

Explanation:

Let the smaller number be x . Then larger number = $(x + 1365)$.

$$\therefore x + 1365 = 6x + 15$$

$$\Rightarrow 5x = 1350$$

$$\Rightarrow x = 270$$

\therefore Smaller number = 270.

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$$(12)^3 \times 6^4 \div 432 = ?$$

A. 5184

B. 5060

C. 5148

D. 5084

None of these

Answer & Explanation

Answer: Option **A**

Explanation:

$$\text{Given Exp.} = \frac{(12)^3 \times 6^4}{432} = \frac{(12)^3 \times 6^4}{12 \times 6^2} = (12)^2 \times 6^2 = (72)^2 = 5184$$

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$$72519 \times 9999 = ?$$

A. 725117481

B. 674217481

C. 685126481

D. 696217481

None of these

Answer & Explanation

Answer: Option **A**

Explanation:

$$72519 \times 9999 = 72519 \times (10000 - 1)$$

$$72519 \times 10000 - 72519 \times 1$$

$$725190000 - 72519$$

A. 235641

B. 245642

C. 315624

D. 415624

Answer & Explanation

Answer: Option D

Explanation:

$(4 + 5 + 2) - (1 + 6 + 3) = 1$, not divisible by 11.

$(2 + 6 + 4) - (4 + 5 + 2) = 1$, not divisible by 11.

$(4 + 6 + 1) - (2 + 5 + 3) = 1$, not divisible by 11.

$(4 + 6 + 1) - (2 + 5 + 4) = 0$, So, 415624 is divisible by 11.

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(?) - 19657 - 33994 = 9999

A. 63650

B. 53760

C. 59640

D. 61560

None of these

Answer & Explanation

Answer: Option A

Explanation:

```
19657
33994
-----
53651
-----
```

Let $x - 53651 = 9999$
Then, $x = 9999 + 53651 = 63650$

[View Answer Workspace Report Discuss in Forum](#)

The sum of first 45 natural numbers is:

A. 1035

B. 1280

C. 2070

D. 2140

Answer & Explanation

Answer: Option **A**

Explanation:

Let $S_n = (1 + 2 + 3 + \dots + 45)$. This is an A.P. in which $a = 1$, $d = 1$, $n = 45$.

$$S_n = \frac{n}{2} [2a + (n - 1)d] = \frac{45}{2} [2 \times 1 + (45 - 1) \times 1] = \left(\frac{45}{2} \times 46 \right) = (45 \times 23)$$

$$45 \times (20 + 3)$$

$$45 \times 20 + 45 \times 3$$

$$900 + 135$$

$$1035.$$

Shortcut Method:

$$S_n = \frac{n(n + 1)}{2} = \frac{45(45 + 1)}{2} = 1035.$$

Which of the following number is divisible by 24 ?

A. 35718

B. 63810

C. 537804

D. 3125736

Answer & Explanation

Answer: Option **D**

Explanation:

$24 = 3 \times 8$, where 3 and 8 co-prime.

Clearly, 35718 is not divisible by 8, as 718 is not divisible by 8.

Similarly, 63810 is not divisible by 8 and 537804 is not divisible by 8.

Consider option (D),

Sum of digits = $(3 + 1 + 2 + 5 + 7 + 3 + 6) = 27$, which is divisible by 3.

Also, 736 is divisible by 8.

∴ 3125736 is divisible by (3×8) , i.e., 24.

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$$\frac{753 \times 753 + 247 \times 247 - 753 \times 247}{753 \times 753 \times 753 + 247 \times 247 \times 247} = ?$$

A. $\frac{1}{1000}$

B. $\frac{1}{506}$

C. $\frac{253}{500}$

D. None of these

Answer & Explanation

Answer: Option A

Explanation:

$$\text{Given Exp.} = \frac{(a^2 + b^2 - ab)}{(a^3 + b^3)} = \frac{1}{(a + b)} = \frac{1}{(753 + 247)} = \frac{1}{1000}$$

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$$(?) + 3699 + 1985 - 2047 = 31111$$

A. 34748

B. 27474

C. 30154

D. 27574

None of these

Answer & Explanation

Answer: Option B

Explanation:

$$x + 3699 + 1985 - 2047 = 31111$$

$$\Rightarrow x + 3699 + 1985 = 31111 + 2047$$

$$\Rightarrow x + 5684 = 33158$$

$$\Rightarrow x = 33158 - 5684 = 27474.$$

[View Answer](#) [Workspace Report](#) [Discuss in Forum](#)

If the number $481 * 673$ is completely divisible by 9, then the smallest whole number in place of * will be:

A. 2

B. 5

C. 6

D. 7

None of these

Answer & Explanation

Answer: Option D

Explanation:

Sum of digits = $(4 + 8 + 1 + x + 6 + 7 + 3) = (29 + x)$, which must be divisible by 9.

$$\therefore x = 7.$$

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The difference between the local value and the face value of 7 in the numeral 32675149 is

A. 75142

B. 64851

C. 5149

D. 69993

None of these

Answer & Explanation

Answer: Option D

Explanation:

(Local value of 7) - (Face value of 7) = $(70000 - 7) = 69993$

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The difference between a positive proper fraction and its reciprocal is $\frac{9}{20}$. The fraction is:

A. $\frac{3}{5}$

B. $\frac{3}{10}$

C. $\frac{4}{5}$

D. $\frac{4}{3}$

Answer & Explanation

Answer: Option C

Explanation:

Let the required fraction be x . Then $\frac{1}{x} - x = \frac{9}{20}$

$$\therefore \frac{1-x^2}{x} = \frac{9}{20}$$

$$\Rightarrow 20 - 20x^2 = 9x$$

$$\Rightarrow 20x^2 + 9x - 20 = 0$$

$$\Rightarrow 20x^2 + 25x - 16x - 20 = 0$$

$$\Rightarrow 5x(4x + 5) - 4(4x + 5) = 0$$

$$\Rightarrow (4x + 5)(5x - 4) = 0$$

$$x = \frac{4}{5}$$

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On dividing a number by 56, we get 29 as remainder. On dividing the same number by 8, what will be the remainder ?

A. 4

B. 5

C. 6

D. 7

Answer & Explanation

Answer: Option **B**

Explanation:

No answer description available for this question. [Let us discuss.](#)

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If n is a natural number, then $(6n^2 + 6n)$ is always divisible by:

A. 6 only

B. 6 and 12 both

C. 12 only

D. by 18 only

Answer & Explanation

Answer: Option **B**

Explanation:

$(6n^2 + 6n) = 6n(n + 1)$, which is always divisible by 6 and 12 both, since $n(n + 1)$ is always even.

Answer & Explanation

Answer: Option **D**

Explanation:

Let the number be x and on dividing x by 5, we get k as quotient and 3 as remainder.

$$\therefore x = 5k + 3$$

$$\Rightarrow x^2 = (5k + 3)^2$$

$$(25k^2 + 30k + 9)$$

$$5(5k^2 + 6k + 1) + 4$$

\therefore On dividing x^2 by 5, we get 4 as remainder.

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How many 3-digit numbers are completely divisible 6 ?

A. 149

B. 150

C. 151

D. 166

Answer & Explanation

Answer: Option **B**

Explanation:

3-digit number divisible by 6 are: 102, 108, 114, ... ,

996 This is an A.P. in which $a = 102$, $d = 6$ and $l = 996$

Let the number of terms be n . Then $t_n = 996$.

$$\therefore a + (n - 1)d = 996$$

$$\Rightarrow 102 + (n - 1) \times 6 = 996$$

$$\Rightarrow 6 \times (n - 1) = 894$$

$$\Rightarrow (n - 1) = 149$$

$$\Rightarrow n = 150$$

Answer: Option B

Explanation:

Marking (/) those which are divisible by 3 but not by 9 and the others by (X), by taking the sum of digits, we get:

2133 \rightarrow 9 (X)

2343 \rightarrow 12 (/)

3474 \rightarrow 18 (X)

4131 \rightarrow 9 (X)

5286 \rightarrow 21 (/)

5340 \rightarrow 12 (/)

6336 \rightarrow 18 (X)

7347 \rightarrow 21 (/)

8115 \rightarrow 15 (/)

9276 \rightarrow 24 (/)

Required number of numbers = 6.

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$$\frac{(963 + 476)^2 + (963 - 476)^2}{? (963 \times 963 + 476 \times 476)} =$$

A. 1449

B. 497

C. 2

D. 4

None of these

Answer & Explanation

Answer: Option C

Explanation:

Given Exp. = $\frac{(a + b)^2 + (a - b)^2}{a^2 + b^2} = \frac{2(a^2 + b^2)}{a^2 + b^2} = 2$

Also, 13 b7 is divisible by 11 $\Rightarrow (7 + 3) - (b + 1) = (9 - b)$

$$\Rightarrow (9 - b) = 0$$

$$\Rightarrow b = 9$$

$$\therefore (b = 9 \text{ and } a = 1) \Rightarrow (a + b) = 10.$$

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$$8597 - ? = 7429 - 4358$$

A. 5426

B. 5706

C. 5526

D. 5476

None of these

Answer & Explanation

Answer: Option C

Explanation:

7429	Let $8597 - x = 3071$
-4358	Then, $x = 8597 - 3071$
-----	$= 5526$
3071	

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The smallest prime number is:

A. 1

B. 2

C. 3

D. 4

Answer & Explanation

Answer: Option B

Explanation:

The smallest prime number is 2.

[View Answer](#) [Workspace Report](#) [Discuss in Forum](#)

$$(12345679 \times 72) = ?$$

A. 88888888

B. 888888888

C. 898989898

D. 999999998

Answer & Explanation

Answer: Option B

Explanation:

$$12345679 \times 72 = 12345679 \times (70 + 2)$$

$$12345679 \times 70 + 12345679 \times 2$$

$$864197530 + 24691358$$

$$888888888$$

On dividing a number by 357, we get 39 as remainder. On dividing the same number 17, what will be the remainder ?

A. 0

B. 3

C. 5

D. 11

Answer & Explanation

Answer: Option C

Explanation:

Let x be the number and y be the quotient. Then,

$$x = 357 \times y + 39$$

$$(17 \times 21 \times y) + (17 \times 2) + 5$$

$$17 \times (21y + 2) + 5$$

∴ Required remainder = 5.

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If the product $4864 \times 9 \times P \times 2$ is divisible by 12, then the value of P is:

A. 2

B. 5

C. 6

D. 8

None of these

Answer & Explanation

Answer: Option E

Explanation:

Clearly, 4864 is divisible by 4.

So, 9P2 must be divisible by 3. So, $(9 + P + 2)$ must be divisible by 3.

∴ $P = 1$.

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Which one of the following is the common factor of $(47^{43} + 43^{43})$ and $(47^{47} + 43^{47})$?

A. $(47 - 43)$

B. $(47 + 43)$

C. $(47^{43} + 43^{43})$

D. None of these

Answer & Explanation

Answer: Option B

Explanation:

When n is odd, $(x^n + a^n)$ is always divisible by $(x + a)$.

∴ Each one of $(47^{43} + 43^{43})$ and $(47^{47} + 43^{47})$ is divisible by $(47 + 43)$.

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$-84 \times 29 + 365 = ?$

A. 2436

B. 2801

C. -2801

D. -2071

None of these

Answer & Explanation

Answer: Option D

Explanation:

$$\text{Given Exp.} = -84 \times (30 - 1) + 365$$

$$-(84 \times 30) + 84 + 365$$

$$-2520 + 449$$

$$-2071$$

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A number when divided by 296 leaves 75 as remainder. When the same number is divided by 37, the remainder will be:

A. 1

B. 2

C. 8

D. 11

Answer & Explanation

Answer: Option **A**

Explanation:

$$\text{Let } x = 296q + 75$$

$$(37 \times 8q + 37 \times 2) + 1$$

$$37(8q + 2) + 1$$

Thus, when the number is divided by 37, the remainder is 1.

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In dividing a number by 585, a student employed the method of short division. He divided the number successively by 5, 9 and 13 (factors 585) and got the remainders 4, 8, 12 respectively. If he had divided the number by 585, the remainder would have been

A. 24

B. 144

C. 292

D. 584

Answer & Explanation

Answer: Option **D**

Explanation:

$$5 \mid x$$

$$z = 13 \times 1 + 12 = 25$$

C. $\frac{1}{4}$

D. $\frac{3}{5}$

None of these

Answer & Explanation

Answer: Option B

Explanation:

$$4500 \times x = 3375x \Rightarrow \frac{3375_{75}}{4500_{100}} = \frac{3}{4}$$

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—What smallest number should be added to 4456 so that the sum is completely divisible by 6?—

A. 4

B. 3

C. 2

D. 1

None of these

Answer & Explanation

Answer: Option C

Explanation:

$$\begin{array}{r} 4456 \quad (742) \\ 42 \\ \text{---} \\ 25 \\ 24 \\ \text{---} \\ 16 \\ 12 \\ \text{---} \\ 4 \end{array}$$

Therefore, Required number = (6 - 4) = 2.

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What least number must be subtracted from 13601, so that the remainder is divisible by 87 ?

A. 23

B. 31

C. 29

D. 37

A. 3

B. 2

C. 1

D. 5

None of these

Answer & Explanation

Answer: Option A

Explanation:

Given number = $97215x6$

$(6 + 5 + 2 + 9) - (x + 1 + 7) = (14 - x)$, which must be divisible by 11.

$\therefore x = 3$

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$(11^2 + 12^2 + 13^2 + \dots + 20^2) = ?$

A. 385

B. 2485

C. 2870

D. 3255

Answer & Explanation

Answer: Option B

Explanation:

$(11^2 + 12^2 + 13^2 + \dots + 20^2) = (1^2 + 2^2 + 3^2 + \dots + 20^2) - (1^2 + 2^2 + 3^2 + \dots + 10^2)$

$$= \left(\frac{20 \times 21 \times 41}{6} - \frac{10 \times 11 \times 21}{6} \right) \left[\text{Ref: } (1^2 + 2^2 + 3^2 + \dots + n^2) = \frac{1}{6} n(n+1)(2n+1) \right]$$

$(2870 - 385)$

2485.

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If the number $5 * 2$ is divisible by 6, then $* = ?$

A. 2

B. 3

C. 6

D. 7

Answer & Explanation

Answer: Option A

Explanation:

$6 = 3 \times 2$. Clearly, $5 * 2$ is divisible by 2. Replace * by x .

Then, $(5 + x + 2)$ must be divisible by 3. So, $x = 2$.

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Which of the following numbers will completely divide $(49^{15} - 1)$?

A. 8

B. 14

C. 46

D. 50

Answer & Explanation

Answer: Option A

Explanation:

$(x^n - 1)$ will be divisibly by $(x + 1)$ only when n is even.

$(49^{15} - 1) = \{(7^2)^{15} - 1\} = (7^{30} - 1)$, which is divisible by $(7 + 1)$, *i.e.*, 8.

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56. $9 + \frac{3}{4} + 7 + \frac{2}{17} - \left(9 + \frac{1}{15}\right) = ?$

A. $7 + \frac{719}{1020}$

B. $9 + \frac{817}{1020}$

C. $9 + \frac{719}{1020}$

D. $7 + \frac{817}{1020}$

None of these

Answer & Explanation

Answer: Option D

Explanation:

$$\begin{aligned}\text{Given sum} &= 9 + \frac{3}{4} + 7 + \frac{2}{17} - \left(9 + \frac{1}{15}\right) \\ &= (9 + 7 - 9) + \left(\frac{3}{4} + \frac{2}{17} - \frac{1}{15}\right) \\ &= 7 + \frac{765 + 120 - 68}{1020} \\ &= 7 + \frac{817}{1020}\end{aligned}$$

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57. $\left(1 - \frac{1}{n}\right) + \left(1 - \frac{2}{n}\right) + \left(1 - \frac{3}{n}\right) + \dots$ up to n terms = ?

A. $\frac{1}{2n}$

B. $\frac{1}{2}(n - 1)$

C. $\frac{1}{2n(n - 1)}$

D. None of these

Answer & Explanation

Answer: Option **B**

Explanation:

$$\begin{aligned}\text{Given sum} &= (1 + 1 + 1 + \dots \text{ to } n \text{ terms}) - \left(\frac{1}{n} + \frac{2}{n} + \frac{3}{n} + \dots \text{ to } n \text{ terms}\right) \\ &= n - \frac{n}{2} \left(\frac{1}{n} + 1\right) \quad [\text{Ref: } n\text{th terms} = (n/n) = 1] \\ &= \frac{n - \frac{n + n}{2}}{1} \\ &= \frac{1}{2}(n - 1)\end{aligned}$$

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On dividing 2272 as well as 875 by 3-digit number N , we get the same remainder. The sum of the digits of N is:

A. 10

B. 11

C. 12

D. 13

Answer & Explanation

Answer: Option A

Explanation:

Clearly, $(2272 - 875) = 1397$, is exactly divisible by N.

Now, $1397 = 11 \times 127$

∴ The required 3-digit number is 127, the sum of whose digits is 10.

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A boy multiplied 987 by a certain number and obtained 559981 as his answer. If in the answer both 9 are wrong and the other digits are correct, then the correct answer would be:

A. 553681

B. 555181

C. 555681

D. 556581

Answer & Explanation

Answer: Option C

Explanation:

$987 = 3 \times 7 \times 47$

So, the required number must be divisible by each one of 3, 7, 47

553681 \rightarrow (Sum of digits = 28, not divisible by 3)

555181 \rightarrow (Sum of digits = 25, not divisible by 3)

555681 is divisible by 3, 7, 47.

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How many prime numbers are less than 50 ?

A. 16

B. 15

C. 14

D. 18

Answer & Explanation

Answer: Option **B**

Explanation:

Prime numbers less than 50 are:

2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47

Their number is 15

When a number is divided by 13, the remainder is 11. When the same number is divided by 17, then remainder is 9. What is the number ?

A. 339

B. 349

C. 369

D. Data inadequate

Answer & Explanation

Answer: Option **B**

Explanation:

$$x = 13p + 11 \text{ and } x = 17q + 9$$

$$\therefore 13p + 11 = 17q + 9$$

$$\Rightarrow 17q - 13p = 2$$

$$\Rightarrow q = \frac{2 + 13p}{17}$$

The least value of p for which $q = \frac{2 + 13p}{17}$ is a whole number is $p =$

$$\therefore x = (13 \times 26 + 11)$$

$$(338 + 11)$$

$$349$$

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(51 + 52 + 53 + ... + 100) = ?

A. 2525

B. 2975

C. 3225

D. 3775

Answer & Explanation

Answer: Option **D**

Explanation:

$$S_n = (1 + 2 + 3 + \dots + 50 + 51 + 52 + \dots + 100) - (1 + 2 + 3 + \dots + 50)$$

$$= \frac{100}{2} \times (1 + 100) - \frac{50}{2} \times (1 + 50)$$

$$(50 \times 101) - (25 \times 51)$$

$$(5050 - 1275)$$

$$3775.$$

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$$(800 \div 64) \times (1296 \div 36) = ?$$

A. 420

B. 460

C. 500

D. 540

None of these

Answer & Explanation

Answer: Option **E**

Explanation:

$$\text{Given Exp.} = \frac{800}{64} \times \frac{1296}{36} = 450$$

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$$\text{Which natural number is nearest to 8485, which is completely divisible by 75 ?}$$

A. 8475

B. 8500

C. 8550

D. 8525

None of these

Answer & Explanation

Answer: Option **A**

Explanation:

On dividing, we get

$$\begin{array}{r} 8485 \text{ (113)} \\ 75 \\ \text{---} \\ 98 \\ 75 \\ \text{----} \\ 235 \\ 225 \\ \text{---} \\ 10 \\ \text{---} \end{array}$$

$$\begin{aligned} \text{Required number} &= (8485 - 10) // \text{ Because } 10 < (75 - 10) \\ &= 8475. \end{aligned}$$

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If the number 42573 * is exactly divisible by 72, then the minimum value of * is:

- A. 4
 - B. 5
 - C. 6
 - D. 7
- 8

Answer & Explanation

Answer: Option C

Explanation:

$72 = 9 \times 8$, where 9 and 8 are co-prime.

The minimum value of x for which 73x for which 73x is divisible by 8 is, $x = 6$.

Sum of digits in 425736 = $(4 + 2 + 5 + 7 + 3 + 6) = 27$, which is divisible by 9.

∴ Required value of * is 6.

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Which of the following numbers is divisible by each one of 3, 7, 9 and 11 ?

- A. 639
- B. 2079
- C. 3791
- D. 37911

None of these

Answer & Explanation

Answer: Option **B**

Explanation:

639 is not divisible by 7

2079 is divisible by each of 3, 7, 9, 11.

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Which natural number is nearest to 9217, which is completely divisible by 88 ?

A. 9152

B. 9240

C. 9064

D. 9184

None of these

Answer & Explanation

Answer: Option **B**

Explanation:

On dividing we get,

$$\begin{array}{r} 9217 \quad (104 \\ 88 \\ \text{----} \\ 417 \\ 352 \\ \text{----} \\ 65 \\ \text{----} \end{array}$$

Therefore, Required number = $9217 + (88 - 65)$ // Because $(88 - 65) < 65$.
 $9217 + 23$
 $9240.$

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(4300731) - ? = 2535618

A. 1865113

B. 1775123

C. 1765113

D. 1675123

None of these

Answer & Explanation

Answer: Option C

Explanation:

Let $4300731 - x = 2535618$

Then $x = 4300731 - 2535618 = 1765113$

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n is a whole number which when divided by 4 gives 3 as remainder. What will be the remainder when $2n$ is divided by 4 ?

A. 3

B. 2

C. 1

D. 0

Answer & Explanation

Answer: Option B

Explanation:

Let $n = 4q + 3$. Then $2n = 8q + 6 = 4(2q + 1) + 2$.

Thus, when $2n$ is divided by 4, the remainder is 2.

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$$\frac{(489 + 375)^2 - (489 - 375)^2}{? (489 \times 375)} =$$

A. 144

B. 864

C. 2

D. 4

None of these

Answer & Explanation

Answer: Option D

Explanation:

Given Exp. $= (a + b)^2 - (a - b)^2 = 4ab = 4$

$397 \times 397 + 104 \times 104 + 2 \times 397 \times 104 = ?$

- A. 250001
- B. 251001
- C. 260101
- D. 261001

Answer & Explanation

Answer: Option B

Explanation:

Given Exp. $= (397)^2 + (104)^2 + 2 \times 397 \times 104$

$(397 + 104)^2$

$(501)^2 = (500 + 1)^2$

$(500^2) + (1)^2 + (2 \times 500 \times 1)$

$250000 + 1 + 1000$

251001

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$(35423 + 7164 + 41720) - (317 \times 89) = ?$

- A. 28213
 - B. 84307
 - C. 50694
 - D. 56094
- None of these

Answer & Explanation

Answer: Option D

Explanation:

$$\begin{array}{r}
 35423 \\
 + 7164 \\
 + 41720 \\
 \hline
 84307 \\
 - 28213 \\
 \hline
 56094 \\
 \hline
 \end{array}$$

$$\begin{aligned}
 317 \times 89 &= 317 \times (90 - 1) \\
 &= (317 \times 90 - 317) \\
 &= (28530 - 317) \\
 &= 28213
 \end{aligned}$$

Answer: Option **D**

Explanation:

$$(3^{25} + 3^{26} + 3^{27} + 3^{28}) = 3^{25} \times (1 + 3 + 3^2 + 3^3) = 3^{25} \times 40$$

$$3^{24} \times 3 \times 4 \times 10$$

$$(3^{24} \times 4 \times 30), \text{ which is divisible by } 30.$$

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A number when divide by 6 leaves a remainder 3. When the square of the number is divided by 6, the remainder is:

A. 0

B. 1

C. 2

D. 3

Answer & Explanation

Answer: Option **D**

Explanation:

$$\text{Let } x = 6q + 3.$$

$$\text{Then, } x^2 = (6q + 3)^2$$

$$36q^2 + 36q + 9$$

$$6(6q^2 + 6q + 1) + 3$$

Thus, when x^2 is divided by 6, then remainder = 3.

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The sum of the two numbers is 12 and their product is 35. What is the sum of the reciprocals of these numbers ?

A. $\frac{12}{35}$

B. $\frac{1}{35}$

C. $\frac{35}{8}$

D. $\frac{7}{32}$

Answer & Explanation

Answer: Option **A**

Explanation:

Let the numbers be a and b . Then, $a + b = 12$ and $ab = 35$.

$$\therefore \frac{a+b}{ab} = \frac{12}{35} \Rightarrow \left(\frac{1}{b} + \frac{1}{a} \right) = \frac{12}{35}$$

$$\therefore \text{Sum of reciprocals of given numbers} = \frac{12}{35}$$

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What will be remainder when 17^{200} is divided by 18 ?

A. 17

B. 16

C. 1

D. 2

Answer & Explanation

Answer: Option **C**

Explanation:

When n is even, $(x^n - a^n)$ is completely divisible by $(x + a)$

$(17^{200} - 1^{200})$ is completely divisible by $(17 + 1)$, i.e., 18.

$\Rightarrow (17^{200} - 1)$ is completely divisible by 18.

\Rightarrow On dividing 17^{200} by 18, we get 1 as remainder.

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If $1400 \times x = 1050$. Then, $x = ?$

A. $\frac{1}{4}$

B. $\frac{3}{5}$

C. $\frac{2}{3}$

D. $\frac{3}{4}$

None of these

Answer & Explanation

Answer: Option **D**

Explanation:

$$1400 \times x = 1050 \Rightarrow x = \frac{1050}{1400} = \frac{3}{4}$$

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$$(1^2 + 2^2 + 3^2 + \dots + 10^2) = ?$$

A. 330

B. 345

C. 365

D. 385

Answer & Explanation

Answer: Option **D**

Explanation:

We know that $(1^2 + 2^2 + 3^2 + \dots + n^2) = \frac{1}{6} n(n+1)(2n+1)$

Putting $n = 10$, required sum = $\left(\frac{1}{6} \times 10 \times 11 \times 21\right) = 385$

The difference of the squares of two consecutive even integers is divisible by which of the following integers ?

A. 3

B. 4

C. 6

D. 7

Answer & Explanation

Answer: Option **B**

Explanation:

Let the two consecutive even integers be $2n$ and $(2n + 2)$. Then,

$$(2n + 2)^2 = (2n + 2 + 2n)(2n + 2 - 2n)$$

$$2(4n + 2)$$

$$4(2n + 1), \text{ which is divisible by 4.}$$

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Which one of the following is a prime number ?

A. 119

B. 187

C. 247

D. 551

None of these

Answer & Explanation

Answer: Option E

Explanation:

$551 > 22$

All prime numbers less than 24 are : 2, 3, 5, 7, 11, 13, 17, 19, 23.

119 is divisible by 7; 187 is divisible by 11; 247 is divisible by 13 and 551 is divisible by 19.

So, none of the given numbers is prime.

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The sum all even natural numbers between 1 and 31 is:

A. 16

B. 128

C. 240

D. 512

Answer & Explanation

Answer: Option C

Explanation:

Required sum = $(2 + 4 + 6 + \dots + 30)$

This is an A.P. in which $a = 2$, $d = (4 - 2) = 2$ and $l = 30$.

Let the number of terms be n . Then,

$$t_n = 30 \Rightarrow a + (n - 1)d = 30$$

$$\Rightarrow 2 + (n - 1) \times 2 = 30$$

$$\Rightarrow n - 1 = 14$$

$$\Rightarrow n = 15$$

$$\therefore S_n = \frac{n}{2} (a + l) = \frac{15}{2} \times (2 + 30) = 240.$$

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The difference between the place value and the face value of 6 in the numeral 856973 is

- A. 973
- B. 6973
- C. 5994
- D. None of these

Answer & Explanation

Answer: Option C

Explanation:

(Place value of 6) - (Face value of 6) = (6000 - 6) = 5994

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If a and b are odd numbers, then which of the following is even ?

- A. $a + b$
- B. $a + b + 1$
- C. ab
- D. $ab + 2$

None of these

Answer & Explanation

Answer: Option A

Explanation:

The sum of two odd number is even. So, $a + b$ is even.

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Which one of the following numbers is completely divisible by 99?

- A. 3572404
- B. 135792
- C. 913464
- D. 114345

None of these

Answer & Explanation

Answer: Option D

Explanation:

$99 = 11 \times 9$, where 11 and 9 are co-prime.

By hit and trial, we find that 114345 is divisible by 11 as well as 9. So, it is divisible by 99.

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The sum of how many terms of the series $6 + 12 + 18 + 24 + \dots$ is 1800 ?

A. 16

B. 24

C. 20

D. 18

22

Answer & Explanation

Answer: Option **B**

Explanation:

This is an A.P. in which $a = 6$, $d = 6$ and $S_n = 1800$

$$\text{Then, } \sum_n [2a + (n - 1)d] = 1800$$

$$\sum [2 \times 6 + (n - 1) \times 6] = 1800$$

$$\Rightarrow 3n(n + 1) = 1800$$

$$\Rightarrow n(n + 1) = 600$$

$$\Rightarrow n^2 + n - 600 = 0$$

$$\Rightarrow n^2 + 25n - 24n - 600 = 0$$

$$\Rightarrow n(n + 25) - 24(n + 25) = 0$$

$$\Rightarrow (n + 25)(n - 24) = 0$$

$$\Rightarrow n = 24$$

Number of terms = 24.

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(51 + 52 + 53 + ... + 100) = ?

A. 2525

B. 2975

C. 3225

D. 3775

Answer & Explanation

Answer: Option **D**

Explanation:

This is an A.P. in which $a = 51$, $l = 100$ and $n = 50$.

$$n = 50$$

$$\therefore \text{Sum} = \frac{n}{2}(a + l) = \frac{50}{2} \times (51 + 100) = (25 \times 151) = 3775.$$

1904 x 1904 = ?

A. 3654316

B. 3632646

C. 3625216

D. 3623436

None of these

Answer & Explanation

Answer: Option **C**

Explanation:

$$1904 \times 1904 = (1904)^2$$

$$(1900 + 4)^2$$

$$(1900)^2 + (4)^2 + (2 \times 1900 \times 4)$$

$$3610000 + 16 + 15200.$$

$$3625216.$$

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What is the unit digit in $(7^{95} - 3^{58})$?

A. 0

B. 4

C. 6

D. 7

Answer & Explanation

A. 111111

B. 110011

C. 100011

D. 110101

None of these

Answer & Explanation

Answer: Option C

Explanation:

The smallest 6-digit number 100000.

$$\begin{array}{r} 100000 \text{ (900} \\ 999 \\ \text{-----} \\ 100 \\ \text{---} \end{array}$$

$$\begin{aligned} \text{Required number} &= 100000 + (111 - 100) \\ &= 100011. \end{aligned}$$

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The largest 5 digit number exactly divisible by 91 is:

A. 99921

B. 99918

C. 99981

D. 99971

None of these

Answer & Explanation

Answer: Option B

Explanation:

Largest 5-digit number = 99999

$$\begin{array}{r} 99999 \text{ (1098} \\ 91 \\ \text{---} \\ 899 \\ 819 \\ \text{-----} \\ 809 \\ 728 \\ \text{---} \\ 81 \\ \text{---} \end{array}$$

$$\begin{aligned} \text{Required number} &= (99999 - 81) \\ &= 99918. \end{aligned}$$

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$$768 \times 768 \times 768 + 232 \times 232 \times 232 =$$

$$? \quad 768 \times 768 - 768 \times 232 + 232 \times 232$$

- | | |
|----------------|---------------|
| A. 1000 | B. 536 |
| C. 500 | D. 268 |

None of these

Answer & Explanation

Answer: Option **A**

Explanation:

$$(a^3 + b^3)$$

$$\text{Given Exp.} = \overbrace{(a^3 - ab^2 + b^3)} = (a + b) = (768 + 232) = 1000$$

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The smallest 5 digit number exactly divisible by 41 is:

- | | |
|-----------------|-----------------|
| A. 1004 | B. 10004 |
| C. 10045 | D. 10025 |

None of these

Answer & Explanation

Answer: Option **B**

Explanation:

The smallest 5-digit number = 10000.

$$\begin{array}{r} 10000 \quad (243) \\ 82 \\ \hline 180 \\ 164 \\ \hline 160 \\ 123 \\ \hline 37 \end{array}$$

Explanation:

By hit and trial, we put $x = 5$ and $y = 1$ so that $(3x + 7y) = (3 \times 5 + 7 \times 1) = 22$, which is divisible by 11.

$$\therefore (4x + 6y) = (4 \times 5 + 6 \times 1) = 26, \text{ which is not divisible by 11;}$$

$$(x + y + 4) = (5 + 1 + 4) = 10, \text{ which is not divisible by 11;}$$

$$(9x + 4y) = (9 \times 5 + 4 \times 1) = 49, \text{ which is not divisible by 11;}$$

$$(4x - 9y) = (4 \times 5 - 9 \times 1) = 11, \text{ which is divisible by 11.}$$

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$$9548 + 7314 = 8362 + (?)$$

A. 8230

B. 8410

C. 8500

D. 8600

None of these

Answer & Explanation

Answer: Option C

Explanation:

$$\begin{array}{r} 9548 \\ + 7314 \\ \hline 16862 \\ \hline \end{array} \qquad \begin{array}{r} 16862 = 8362 + x \\ x = 16862 - 8362 \\ = 8500 \end{array}$$

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In a division sum, the remainder is 0. As student mistook the divisor by 12 instead of 21 and obtained 35 as quotient. What is the correct quotient ?

A. 0

B. 12

C. 13

D. 20

Answer & Explanation

Answer: Option D

Explanation:

$$\text{Number} = (12 \times 35)$$

$$\text{Correct Quotient} = 420 \div 21 = 20$$

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$$2 + 2^2 + 2^3 + \dots + 2^9 = ?$$

A. 2044

B. 1022

C. 1056

D. None of these

Answer & Explanation

Answer: Option **B**

Explanation:

$$2_2$$

This is a G.P. in which $a = 2$, $r = 2$ and $n = 9$.

$$\therefore S_n = \frac{a(r^n - 1)}{(r - 1)} = \frac{2 \times (2^9 - 1)}{(2 - 1)} = 2 \times (512 - 1) = 2 \times 511 = 1022.$$

The sum of even numbers between 1 and 31 is:

A. 6

B. 28

C. 240

D. 512

Answer & Explanation

Answer: Option **C**

Explanation:

Let $S_n = (2 + 4 + 6 + \dots + 30)$. This is an A.P. in which $a = 2$, $d = 2$ and $l = 30$

Let the number of terms be n . Then,

$$a + (n - 1)d = 30$$

$$\Rightarrow 2 + (n - 1) \times 2 = 30$$

$$\Rightarrow n = 15.$$

$$\therefore S_n = \frac{n}{2} (a + l) = \frac{15}{2} \times (2 + 30) = (15 \times 16) = 240.$$

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If the number $91876 * 2$ is completely divisible by 8, then the smallest whole number in place of

* will be:

A. 1

B. 2

C. 3

D. 4

None of these

Answer & Explanation

Answer: Option C

Explanation:

Then number $6x2$ must be divisible by 8.

$\therefore x = 3$, as 632 is divisible 8.

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2056 x 987 = ?

A. 1936372

B. 2029272

C. 1896172

D. 1926172

None of these

Answer & Explanation

Answer: Option B

Explanation:

$$2056 \times 987 = 2056 \times (1000 - 13)$$

$$2056 \times 1000 - 2056 \times 13$$

$$2056000 - 26728$$

$$2029272.$$

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On multiplying a number by 7, the product is a number each of whose digits is 3. The smallest such number is:

A. 47619

B. 47719

C. 48619

D. 47649

Answer & Explanation

Answer: Option **A**

Explanation:

By hit and trial, we find that

$$47619 \times 7 = 333333.$$

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If 60% of $\frac{3}{5}$ of a number is 36, then the number is:

A. 80

B. 100

C. 75

D. 90

Answer & Explanation

Answer: Option **B**

Explanation:

Let the number be x . Then

$$60\% \text{ of } \frac{3}{5} \text{ of } x = 36$$

$$\Rightarrow \frac{60}{100} \times \frac{3}{5} \times x = 36$$

$$\Rightarrow x = \left(36 \times \frac{25}{9} \right) = 100$$

\therefore Required number = 100

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If x and y are the two digits of the number $653xy$ such that this number is divisible by 80, then $x + y = ?$

A. 2 or 6

B. 4

C. 4 or 8

D. 8

None of these

Answer & Explanation

Answer: Option **A**

Explanation:

$$80 = 2 \times 5 \times 8$$

Since $653xy$ is divisible by 2 and 5 both, so $y = 0$.

Now, $653x$ is divisible by 8, so $13x$ should be divisible by 8.

This happens when $x = 6$.

$$\therefore x + y = (6 + 0) = 6.$$

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The difference of the squares of two consecutive odd integers is divisible by which of the following integers ?

A. 3

B. 6

C. 7

D. 8

Answer & Explanation

Answer: Option **D**

Explanation:

Let the two consecutive odd integers be $(2n + 1)$ and $(2n + 3)$. Then,

$$(2n + 3)^2 - (2n + 1)^2 = (2n + 3 + 2n + 1)(2n + 3 - 2n - 1)$$

$$(4n + 4) \times 2$$

$$8(n + 1), \text{ which is divisible by 8.}$$

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What is the unit digit in $(4137)^{754}$?

A. 1

B. 3

C. 7

D. 9

Answer & Explanation

Answer: Option **D**

Explanation:

Unit digit in $(4137)^{754} = \text{Unit digit in } \{[(4137)^4]^{188} \times (4137)^2\}$

= Unit digit in $\{ 292915317923361 \times 17114769 \}$

= $(1 \times 9) = 9$

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587 x 999 = ?

A. 586413

B. 587523

C. 614823

D. 615173

Answer & Explanation

Answer: Option **A**

Explanation:

$587 \times 999 = 587 \times (1000 - 1)$

$587 \times 1000 - 587 \times 1$

$587000 - 587$

586413.

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A number was divided successively in order by 4, 5 and 6. The remainders were respectively 2, 3 and 4. The number is:

A. 214

B. 476

C. 954

D. 1908

Answer & Explanation

Answer: Option **A**

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$$(2^2 + 4^2 + 6^2 + \dots + 20^2) = ?$$

A. 770

B. 1155

C. 1540

D. 385 x 385

Answer & Explanation

Answer: Option C

Explanation:

$$(2^2 + 4^2 + 6^2 + \dots + 20^2) = (1 \times 2)^2 + (2 \times 2)^2 + (2 \times 3)^2 + \dots + (2 \times 10)^2$$

$$(2^2 \times 1^2) + (2^2 \times 2^2) + (2^2 \times 3^2) + \dots + (2^2 \times 10^2)$$

$$2^2 \times [1^2 + 2^2 + 3^2 + \dots + 10^2]$$

$$= 4 \times \left(\frac{1}{6} \times 10 \times 11 \times 21 \right)$$

$$\left[\text{Ref: } (1^2 + 2^2 + 3^2 + \dots + n^2) = \frac{1}{6} n(n+1)(2n+1) \right]$$

$$(4 \times 5 \times 77)$$

$$= 1540.$$

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$$\frac{854 \times 854 \times 854 - 276 \times 276 \times 276}{854 \times 854 + 854 \times 276 + 276 \times 276} = ?$$

A. 1130

B. 578

C. 565

D. 1156

None of these

Answer & Explanation

Answer: Option B

Explanation:

$$\text{Given Exp. } = \frac{(a^3 - b^3)}{(a^2 + ab + b^2)} = (a - b) = (854 - 276) = 578$$

C. 111

D. 84

None of these

Answer & Explanation

Answer: Option A

Explanation:

Given Exp. = $666 \times \frac{1}{6} \times \frac{1}{3} = 37$

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The sum of all two digit numbers divisible by 5 is:

A. 1035

B. 1245

C. 1230

D. 945

None of these

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The difference between the place values of two sevens in the numeral 69758472 is

A. 0

B. 6993

C. 699930

D. None of these

Answer & Explanation

Answer: Option C

Explanation:

Required difference = $(700000 - 70) = 699930$

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On dividing a number by 68, we get 269 as quotient and 0 as remainder. On dividing the same number by 67, what will the remainder ?

A. 0

B. 1

C. 2

D. 3

Answer & Explanation

C.

1375 D.
1200

None of these

Answer & Explanation

Answer: Option **D**

Explanation:

$$\begin{array}{r} 3251 \\ 587 \\ 369 \\ \hline 4207 \end{array}$$

Let $4207 - x = 3007$
Then, $x = 4207 - 3007 = 1200$

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7589 - ? = 3434

A. 4242

B. 4155

C. 1123

D. 11023

None of these

Answer & Explanation

Answer: Option **B**

Explanation:

Let $7589 - x = 3434$

Then, $x = 7589 - 3434 = 4155$

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$217 \times 217 + 183 \times 183 = ?$

A. 79698

B. 80578

C. 80698

D. 81268

Answer & Explanation

Answer: Option **B**

A. 3

B. 10

C. 11

D. 13

Answer & Explanation

Answer: Option B

Explanation:

$$(4^{61} + 4^{62} + 4^{63} + 4^{64}) = 4^{61} \times (1 + 4 + 4^2 + 4^3) = 4^{61} \times 85$$

$$4^{60} \times (4 \times 85)$$

$(4^{60} \times 340)$, which is divisible by 10.

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$$106 \times 106 - 94 \times 94 = ?$$

A. 2400

B. 2000

C. 1904

D. 1906

None of these

Answer & Explanation

Answer: Option A

Explanation:

$$106 \times 106 - 94 \times 94 = (106)^2 - (94)^2$$

$$(106 + 94)(106 - 94) \quad [\text{Ref: } (a^2 - b^2) = (a + b)(a - b)]$$

$$(200 \times 12)$$

$$2400.$$

A number when divided successively by 4 and 5 leaves remainders 1 and 4 respectively. When it is successively divided by 5 and 4, then the respective remainders will be

A. 1, 2

B. 2, 3

C. 3, 2

D. 4, 1

Answer & Explanation

None of these

Answer & Explanation

Answer: Option **D**

Explanation:

$$\text{Given Exp.} = 8988 \times \frac{1}{8} \times \frac{1}{4} = \frac{2247}{8} = 280.875$$

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$$287 \times 287 + 269 \times 269 - 2 \times 287 \times 269 = ?$$

A. 534

B. 446

C. 354

D. 324

None of these

Answer & Explanation

Answer: Option **D**

Explanation:

$$\text{Given Exp.} = a^2 + b^2 - 2ab, \text{ where } a = 287 \text{ and } b = 269$$

$$(a - b)^2 = (287 - 269)^2$$

$$(18^2)$$

$$324$$

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$$3 + 33 + 333 + 3.33 = ?$$

A. 362.3

B. 372.33

C. 702.33

D. 702

None of these

Answer & Explanation

Answer: Option **B**

$$\{(476 + 424)^2 - 4 \times 476 \times 424\} = ?$$

A. 2906

B. 3116

C. 2704

D. 2904

None of these

Answer & Explanation

Answer: Option C

Explanation:

Given Exp. = $[(a + b)^2 - 4ab]$, where $a = 476$ and $b = 424$

$$[(476 + 424)^2 - 4 \times 476 \times 424]$$

$$[(900)^2 - 807296]$$

$$810000 - 807296$$

$$2704.$$

Decimal Fraction

Formulas

Decimal Fractions:

Fractions in which denominators are powers of 10 are known as **decimal fractions**.

$$\begin{array}{l} \text{Thus, } \frac{1}{10} = 1 \text{ tenth} = .1; \quad \frac{1}{100} = 1 \text{ hundredth} = .01; \\ \frac{99}{100} = 99 \text{ hundredths} = .99; \quad \frac{7}{1000} = 7 \text{ thousandths} = .007, \text{ etc.;} \end{array}$$

Conversion of a Decimal into Vulgar Fraction:

Put 1 in the denominator under the decimal point and annex with it as many zeros as is the number of digits after the decimal point. Now, remove the decimal point and reduce the fraction to its lowest terms.

$$\text{Thus, } 0.25 = \frac{25}{100} = \frac{1}{4}; \quad 2.008 = \frac{2008}{1000} = \frac{251}{125}.$$

Annexing Zeros and Removing Decimal Signs:

Annexing zeros to the extreme right of a decimal fraction does not change its value. Thus, $0.8 = 0.80 = 0.800$, etc.

If numerator and denominator of a fraction contain the same number of decimal places, then we remove the decimal sign.

$$\text{Thus, } \frac{1.299^{84}}{2.99^{84}} = \frac{184}{299} = 13^8.$$

Operations on Decimal Fractions:

Addition and Subtraction of Decimal Fractions: The given numbers are so placed under each other that the decimal points lie in one column. The numbers so arranged can now be added or subtracted in the usual way.

Multiplication of a Decimal Fraction By a Power of 10: Shift the decimal point to the right by as many places as is the power of 10.

$$\text{Thus, } 5.9632 \times 100 = 596.32; \quad 0.073 \times 10000 = 730.$$

Multiplication of Decimal Fractions: Multiply the given numbers considering them without decimal point. Now, in the product, the decimal point is marked off to obtain as many places of decimal as is the sum of the number of decimal places in the given numbers.

Suppose we have to find the product $(.2 \times 0.02 \times .002)$.

$$\text{Now, } 2 \times 2 \times 2 = 8. \text{ Sum of decimal places} = (1 + 2 + 3) = 6.$$

$$\therefore .2 \times .02 \times .002 = .000008$$

Dividing a Decimal Fraction By a Counting Number: Divide the given number without considering the decimal point, by the given counting number. Now, in the quotient, put the decimal point to give as many places of decimal as there are in the dividend.

Suppose we have to find the quotient $(0.0204 \div 17)$. Now, $204 \div 17 = 12$.

Dividend contains 4 places of decimal. So, $0.0204 \div 17 = 0.0012$

Dividing a Decimal Fraction By a Decimal Fraction: Multiply both the dividend and the divisor by a suitable power of 10 to make divisor a whole number.

Now, proceed as above.

$$\text{Thus, } \frac{0.00066}{0.11} = \frac{0.00066 \times 100}{0.11 \times 100} = \frac{0.066}{11} = .006$$

Comparison of Fractions:

Suppose some fractions are to be arranged in ascending or descending order of magnitude, then convert each one of the given fractions in the decimal form, and arrange them accordingly.

Let us to arrange the fractions $\frac{3}{5}$, $\frac{6}{7}$ and $\frac{7}{9}$ in descending order.

Now, $\frac{3}{5} = 0.6$, $\frac{6}{7} = 0.857$, $\frac{7}{9} = 0.777\dots$

Since, $0.857 > 0.777\dots > 0.6$. So, $\frac{6}{7} > \frac{7}{9} > \frac{3}{5}$.

Recurring Decimal:

If in a decimal fraction, a figure or a set of figures is repeated continuously, then such a number is called a **recurring decimal**.

In a recurring decimal, if a single figure is repeated, then it is expressed by putting a dot on it. If a set of figures is repeated, it is expressed by putting a bar on the set.

Thus, $\overset{\cdot}{1}3 = 0.333\dots = 0.3$; $\overline{22}7 = 3.142857142857\dots = 3.142857$.

Pure Recurring Decimal: A decimal fraction, in which all the figures after the decimal point are repeated, is called a pure recurring decimal.

Converting a Pure Recurring Decimal into Vulgar Fraction: Write the repeated figures only once in the numerator and take as many nines in the denominator as is the number of repeating figures.

Thus, $0.\overline{5} = \frac{5}{9}$; $0.5\overline{3} = \frac{53}{99}$; $0.06\overline{7} = \frac{67}{999}$, etc.

Mixed Recurring Decimal: A decimal fraction in which some figures do not repeat and some of them are repeated, is called a mixed recurring decimal.

Eg. $0.1733333\dots = 0.173$.

Converting a Mixed Recurring Decimal Into Vulgar Fraction: In the numerator, take the difference between the number formed by all the digits after decimal point (taking repeated digits only once) and that formed by the digits which are not repeated. In the denominator, take the number formed by as many nines as there are repeating digits followed by as many zeros as is the number of non-repeating digits.

Thus, $0.16 = \frac{16 - 1}{90} = \frac{15}{90} = \frac{1}{6}$; $0.227\overline{3} = \frac{2273 - 22}{9900} = \frac{2251}{9900}$.

Some Basic Formulae:

$$(a + b)(a - b) = (a^2 - b^2)$$

$$(a + b)^2 = (a^2 + b^2 + 2ab)$$

- iii. $(a - b)^2 = (a^2 + b^2 - 2ab)$
- iv. $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$
- v. $(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$
- vi. $(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$
- vii. $(a^3 + b^3 + c^3 - 3abc) = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac)$
- viii. When $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$.

1. Evaluate : $\frac{(2.39)^2 - (1.61)^2}{2.39 - 1.61}$

- A. 2
- B. 4
- C. 6
- D. 8

Answer & Explanation

Answer: Option B

Explanation:

Given Expression = $\frac{a^2 - b^2}{a - b} = \frac{(a + b)(a - b)}{(a - b)} = (a + b) = (2.39 + 1.61) = 4$.

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8. _____
What decimal of an hour is a second ?

- A. .0025
- B. .0256
- C. .00027
- D. .000126

Answer & Explanation

Answer: Option C

Explanation:

Required decimal = $\frac{1}{60 \times 60} = \frac{1}{3600} = .00027$

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3. 9. _____
The value of $\frac{(0.96)^3 - (0.1)^3}{(0.96)^2 + 0.096 + (0.1)}$ is:

- A. 0.86
- B. 0.95
- C. 0.97
- D. 1.06

Answer & Explanation

Answer: Option A

Explanation:

$$\begin{aligned} \text{Given expression} &= \frac{(0.96)^3 - (0.1)^3}{(0.96)^2 + (0.96 \times 0.1) + (0.1)^2} \\ &= \left(\frac{a^3 - b^3}{a^2 + ab + b^2} \right) \\ &= (a - b) \\ &= (0.96 - 0.1) \\ &= 0.86 \end{aligned}$$

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10.

The value of $\frac{0.1 \times 0.1 \times 0.1 + 0.02 \times 0.02 \times 0.02}{0.2 \times 0.2 \times 0.2 + 0.04 \times 0.04 \times 0.04}$ is:

A. 0.0125

B. 0.125

C. 0.25

D. 0.5

Answer & Explanation

Answer: Option B

Explanation:

$$\text{Given expression} = \frac{(0.1)^3 + (0.02)^3}{2^3 [(0.1) + (0.02)]} = \frac{1}{8} = 0.125$$

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11.

If $2994 \div 14.5 = 172$, then $29.94 \div 1.45 = ?$

A. 0.172

B. 1.72

C. 17.2

D. 172

Answer & Explanation

Answer: Option C

Explanation:

Answer: Option C

Explanation:

Given expression = $(11.98)^2 + (0.02)^2 + 11.98 \times x$.

For the given expression to be a perfect square, we must have

$$11.98 \times x = 2 \times 11.98 \times 0.02 \text{ or } x = 0.04$$

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$(0.1667)(0.8333)(0.3333)$ is approximately
equal to: $(0.2222)(0.6667)(0.1250)$

A. 2

B. 2.40

C. 2.43

D. 2.50

Answer & Explanation

Answer: Option D

Explanation:

Given expression = $(0. \frac{3333}{2222}) \times \frac{(0.1667)(0.8333)}{(0.6667)(0.1250)}$

$$\frac{3333}{2222} \times \frac{6}{612125} \times \frac{5}{3 \times 1000}$$

$$= \left(\frac{3}{2} \times \frac{1}{6} \times \frac{5}{6} \times \frac{3}{2} \times 8 \right)$$

$$= 5$$

$$= 2.50$$

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$3889 + 12.952 - ? = 3854.002$

A. 47.095

B. 47.752

C. 47.932

D. 47.95

Answer & Explanation

Answer: Option **D**

Explanation:

Let $3889 + 12.952 - x = 3854.002$.

Then $x = (3889 + 12.952) - 3854.002$

$$3901.952 - 3854.002$$

$$47.95.$$

0.04×0.0162 is equal to:

$$6.48 \times 10^{-3}$$

$$6.48 \times 10^{-4}$$

$$6.48 \times 10^{-5}$$

$$6.48 \times 10^{-6}$$

Answer & Explanation

Answer: Option **B**

Explanation:

$4 \times 162 = 648$. Sum of decimal places = 6. So,

$$0.04 \times 0.0162 = 0.000648 = 6.48 \times 10^{-4}$$

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$4.2 \times 4.2 - 1.9 \times 1.9$ is equal

to: 2.3×6.1

A. 0.5

B. 1.0

C. 20

D. 22

Answer & Explanation

Answer: Option **B**

Explanation:

$$\text{Given Expression} = \frac{(a^2 - b^2)}{(a + b)(a - b)} = \frac{(a^2 - b^2)}{(a^2 - b^2)} = 1.$$

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13. If $\frac{144}{0.144} = \frac{14.4}{x}$, then the value of x is:

A. 0.0144

B. 1.44

C. 14.4

D. 144

Answer & Explanation

Answer: Option A

Explanation:

$$\begin{aligned}\frac{144}{0.144} &= \frac{14.4}{x} \\ \Rightarrow \frac{144 \times 1000}{144} &= \frac{14.4}{x} \\ \Rightarrow x &= \frac{14.4}{1000} = 0.0144\end{aligned}$$

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The price of commodity X increases by 40 paise every year, while the price of commodity Y increases by 15 paise every year. If in 2001, the price of commodity X was Rs. 4.20 and that of Y was Rs. 6.30, in which year commodity X will cost 40 paise more than the commodity Y?

A. 2010

B. 2011

C. 2012

D. 2013

Answer & Explanation

Answer: Option B

Explanation:

Suppose commodity X will cost 40 paise more than Y after z years.

$$\text{Then, } (4.20 + 0.40z) - (6.30 + 0.15z) = 0.40$$

$$\Rightarrow 0.25z = 0.40 + 2.10$$

$$\Rightarrow z = \frac{2.50}{0.25} = \frac{250}{25} = 10.$$

∴ X will cost 40 paise more than Y 10 years after 2001 *i.e.*, 2011.

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Which of the following are in descending order of their value ?

A. $\frac{1}{3}, \frac{2}{5}, \frac{3}{7}, \frac{4}{5}, \frac{5}{6}, \frac{6}{7}$

B. $\frac{1}{3}, \frac{2}{5}, \frac{3}{5}, \frac{4}{7}, \frac{5}{6}, \frac{6}{7}$

C. $\frac{1}{3}, \frac{2}{5}, \frac{3}{5}, \frac{4}{6}, \frac{5}{7}, \frac{6}{7}$

D. $\frac{6}{7}, \frac{5}{6}, \frac{4}{5}, \frac{3}{7}, \frac{2}{5}, \frac{1}{3}$

Answer & Explanation

Answer: Option D

Explanation:

Which of the following fractions is greater than

$\frac{3}{4}$ and less than $\frac{5}{6}$?

A. $\frac{1}{2}$

B. $\frac{2}{3}$

C. $\frac{4}{5}$

D. $\frac{9}{10}$

Answer & Explanation

Answer: Option C

Explanation:

$$\frac{3}{4} = 0.75, \frac{5}{6} = 0.833, \frac{1}{2} = 0.5, \frac{2}{3} = 0.66, \frac{4}{5} = 0.8, \frac{9}{10} = 0.9.$$

Clearly, 0.8 lies between 0.75 and 0.833.

$\therefore \frac{4}{5}$ lies between $\frac{3}{4}$ and $\frac{5}{6}$.

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The rational number for recurring decimal 0.125125.... is:

A. $\frac{63}{487}$

B. $\frac{119}{993}$

C. $\frac{125}{999}$

D. None of these

Answer & Explanation

Answer: Option C

Explanation:

 $0.002 \times 0.5 = ?$

- A.** 0.0001 **B.** 0.001
C. 0.01 **D.** 0.1

Answer & Explanation

Answer: Option **B**

Explanation:

$2 \times 5 = 10.$

Sum of decimal places = 4

$$\begin{array}{l} \cdot \cdot \cdot 0.002 \times 0.5 = 0.001 \\ 34.95 + 240.016 + 23.98 = ? \end{array}$$

- A.** 298.0946 **B.** 298.111
C. 298.946 **D.** 299.09

Answer & Explanation

Answer: Option **C**

Explanation:

$$\begin{array}{r} 34.95 \\ 240.016 \\ 23.98 \\ \hline 298.946 \\ \hline \end{array}$$

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Which of the following is equal to 3.14×10^6 ?

- A.** 314 **B.** 3140
C. 3140000 **D.** None of these

Answer & Explanation

Answer: Option **C**

Explanation:

$$3.14 \times 10^6 = 3.14 \times 1000000 = 3140000.$$

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The least among the following is:

A. 0.2

B. $1 \div 0.2$

C. 0.2

D. $(0.2)^2$

Answer & Explanation

Answer: Option **D**

Explanation:

$$1 \div 0.2 = \frac{1}{0.2} = \frac{10}{2} = 5;$$

$$0.2 = 0.222\dots;$$

$$(0.2)^2 = 0.04.$$

$$0.04 < 0.2 < 0.22\dots < 5.$$

Since 0.04 is the least, so $(0.2)^2$ is the least.

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$$\frac{5 \times 1.6 - 2 \times 1.4}{1.3} = ?$$

A. 0.4

B. 1.2

C. 1.4

D. 4

Answer & Explanation

Answer: Option **D**

Explanation:

$$\text{Given Expression} = \frac{8 - 2.8}{1.3} = \frac{5.2}{1.3} = \frac{52}{13} = 4.$$

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How many digits will be there to the right of the decimal point in the product of 95.75 and .02554?

A. 5

B. 6

C. 7

D. None of these

Answer & Explanation

Answer: Option B

Explanation:

Sum of decimal places = 7.

Since the last digit to the extreme right will be zero (since $5 \times 4 = 20$), so there will be 6 significant digits to the right of the decimal point
The correct expression of 6.46 in the fractional form is:

A. $\frac{646}{99}$

B. $\frac{64640}{1000}$

C. $\frac{640}{100}$

D. $\frac{640}{99}$

Answer & Explanation

Answer: Option D

Explanation:

$$6.46 = 6 + 0.46 = 6 + \frac{46}{99} = \frac{594 + 46}{99} = \frac{640}{99}$$

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27. The fraction $101 \frac{27}{100000}$ in decimal form is:

A. .01027

B. .10127

C. 101.00027

D. 101.000027

Answer & Explanation

Answer: Option C

Explanation:

$$101 \frac{27}{100000} = 101 + \frac{27}{100000} = 101 + .00027 = 101.00027$$

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28. 0.0203 × 2.92 = ?

$$1 + \overset{99}{28}99$$

1.28

Surds and Indices

Formulas

Laws of Indices:

$$a^m \times a^n = a^{m+n}$$

ii.

$$\frac{a^m}{a^n} = a^{m-n}$$

$$(a^m)^n = a^{mn}$$

$$(ab)^n = a^n b^n$$

v.

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

vi. $a^0 = 1$

2. Surds:

Let a be rational number and n be a positive integer such that $a^{(1/n)} = a$

Then, a is called a surd of order n .

3. Laws of Surds:

i. $a = a^{(1/n)}$

ii. $ab = a \times b$

iii.

$$\sqrt[n]{\frac{a}{b}} = \frac{a}{b}$$

iv. $\frac{(a)^n}{\sqrt[m]{\sqrt[n]{a}}} = a$

v. $\sqrt[m]{\sqrt[n]{a}} = \sqrt[mn]{a}$

vi. $(a)^m = a^m$

1. $(17)^{3.5} \times (17)^? = 17^8$

A. 2.29

B. 2.75

C. 4.25

D. 4.5

Answer & Explanation

Answer: Option **D**

Explanation:

$$\text{Let } (17)^{3.5} \times (17)^x = 17^8.$$

$$\text{Then, } (17)^{3.5 + x} = 17^8.$$

$$\therefore 3.5 + x = 8$$

$$\Rightarrow x = (8 - 3.5)$$

$$\Rightarrow x = 4.5$$

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4. _____

2. If $\left(\frac{a}{b}\right)^{x-1} = \left(\frac{b}{a}\right)^{x-3}$, then the value of x is:

A. $\frac{1}{2}$

1

2

D. $\frac{7}{2}$

Answer & Explanation

Answer: Option **C**

Explanation:

$$\begin{aligned} \text{Given } \left(\frac{a}{b}\right)^{x-1} &= \left(\frac{b}{a}\right)^{x-3} \\ \Rightarrow \left(\frac{a}{b}\right)^{x-1} &= \left(\frac{a}{b}\right)^{-(x-3)} = \left(\frac{a}{b}\right)^{(3-x)} \end{aligned}$$

$$\Rightarrow x - 1 = 3 - x$$

$$\Rightarrow 2x = 4$$

$$\Rightarrow x = 2.$$

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5. _____

Answer: Option C

Explanation:

$$3^x - y = 27 = 3^3 \Leftrightarrow x - y = 3 \dots(i)$$

$$3^x + y = 243 = 3^5 \Leftrightarrow x + y = 5 \dots(ii)$$

On solving (i) and (ii), we get $x = 4$.

$$(256)^{0.16} \times (256)^{0.09} = ?$$

A. 4

B. 16

C. 64

D. 256.25

Answer & Explanation

Answer: Option A

Explanation:

$$(256)^{0.16} \times (256)^{0.09} = (256)^{(0.16 + 0.09)}$$

$$(256)^{0.25}$$

$$(256)^{(25/100)}$$

$$(256)^{(1/4)}$$

$$(4)^{(1/4)}$$

$$4^{4(1/4)}$$

$$4^1$$

$$4$$

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The value of $[(10)^{150} \div (10)^{146}]$

A. 1000

B. 10000

C. 100000

D. 10^6

Answer & Explanation

Answer: Option B

Explanation:

$$(10)_{150} \div (10)_{146} = \frac{10_{150}}{10_{146}}$$

$$10_{150 - 146}$$

$$10^4$$

$$10000.$$

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$$8. \frac{1}{1+x} \frac{1}{(b-a)+x} \frac{1}{(c-a)+x} + \frac{1}{1+x} \frac{1}{(a-b)+x} \frac{1}{(c-b)+x} + \frac{1}{1+x} \frac{1}{(b-c)+x} \frac{1}{(a-c)+x} = ?$$

A. 0

B. 1

C. X^{a-b-c}

D. None of these

Answer & Explanation

Answer: Option B

Explanation:

$$\begin{aligned} \text{Given Exp.} &= \frac{1}{\left(1 + \frac{x^b}{x^a} + \frac{x^c}{x^a}\right)} + \frac{1}{\left(1 + \frac{x^a}{x^b} + \frac{x^c}{x^b}\right)} + \frac{1}{\left(\frac{x^b}{x^c} + \frac{x^a}{x^c} + \frac{1}{x^c}\right)} \\ &= \frac{x^a}{(x^a + x^b + x^c)} + \frac{x^b}{(x^a + x^b + x^c)} + \frac{x^c}{(x^a + x^b + x^c)} \\ &= \frac{(x^a + x^b + x^c)}{(x^a + x^b + x^c)} \\ &= 1. \end{aligned}$$

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$$(25)^{7.5} \times (5)^{2.5} \div (125)^{1.5} = 5^?$$

A. 8.5

B. 13

C. 16

D. 17.5

None of these

Answer & Explanation

Answer: Option B

Explanation:

$$\text{Let } (25)^{7.5} \times (5)^{2.5} \div (125)^{1.5} = 5^x.$$

$$\text{Then, } \frac{(5^2)^{7.5} \times (5)^{2.5}}{(5^3)^{1.5}} = 5^x$$

$$\Rightarrow \frac{5^{(2 \times 7.5)} \times 5^{2.5}}{5^{(3 \times 1.5)}} = 5^x$$

$$\Rightarrow \frac{5^{15} \times 5^{2.5}}{5^{4.5}} = 5^x$$

$$\Rightarrow 5^x = 5^{(15 + 2.5 - 4.5)}$$

$$\Rightarrow 5^x = 5^{13}$$

$$\therefore x = 13.$$

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$$(0.04)^{-1.5} = ?$$

A. 25

B. 125

C. 250

D. 625

Answer & Explanation

Answer: Option B

Explanation:

$$(0.04)^{-1.5} = \left(\frac{4}{100}\right)^{-1.5}$$
$$\left(\frac{1}{25}\right)^{-(3/2)}$$

$$(25)^{(3/2)}$$

$$(5^2)^{(3/2)}$$

$$(5)^{2 \times (3/2)}$$

$$= 5^3$$

$$11. \frac{(243)^{n/5} \times 3^{2n+1}}{9^n \times 3^{n-1}} = ?$$

A. 1

B. 2

C. 9

D. 3^n

Answer & Explanation

Answer: Option C

Explanation:

$$\begin{aligned} \text{Given Expression} &= \frac{(243)^{(n/5)} \times 3^{2n+1}}{9^n \times 3^{n-1}} \\ &= \frac{(3^5)^{(n/5)} \times 3^{2n+1}}{3^{2n} \times 3^{n-1}} \\ &= \frac{3^{5 \times (n/5)} \times 3^{2n+1}}{3^{2n} \times 3^{n-1}} \\ &= \frac{3^{2n+1}}{3^{2n} \times 3^{n-1}} \\ &= \frac{3^{(n+2n+1)}}{3^{(2n+n-1)}} \\ &= \frac{3^{3n+1}}{3^{3n-1}} = 3^{(3n+1-3n+1)} = 3^2 = 9. \end{aligned}$$

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$$12. \frac{1}{1+a^{(n-m)}} + \frac{1}{1+a^{(m-n)}} = ?$$

A. 0

B. $\frac{1}{2}$

C. 1

D. a^{m+n}

Answer & Explanation

Answer: Option B

Explanation:

Given Exp. $= x^{(b-c)(b+c-a)} \cdot x^{(c-a)(c+a-b)} \cdot x^{(a-b)(a+b-c)}$

$$= X^{(b-c)(b+c) - a(b-c)} \cdot X^{(c-a)(c+a) - b(c-a)}$$
$$\cdot X^{(a-b)(a+b) - c(a-b)}$$

$$X^{(b^2 - c^2 + c^2 - a^2 + a^2 - b^2)} \cdot X^{-a(b-c) - b(c-a) - c(a-b)}$$

$$(x^0 \times x^0)$$

$$(1 \times 1) = 1.$$

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15.

If $x = 3 + 22$, then the value of $\left(x - \frac{1}{x}\right)$ is:

A. 1

B. 2

C. 22

D. 33

Answer & Explanation

Answer: Option B

Explanation:

$$\left(x - \frac{1}{x}\right)^2 = x + \frac{1}{x} - 2$$
$$= (3 + 22) + \frac{1}{(3 + 22)} - 2$$
$$= (3 + 22) + \frac{1}{(3 + 22)} \times \frac{(3 - 22)}{(3 - 22)} - 2$$

$$(3 + 22) + (3 - 22) - 2$$

4.

$$\therefore \left(x - \frac{1}{x}\right) = 2.$$

Pipes and Cistern

Formulas

Inlet:

A pipe connected with a tank or a cistern or a reservoir, that fills it, is known as an inlet.

Outlet:

A pipe connected with a tank or cistern or reservoir, emptying it, is known as an outlet.

If a pipe can fill a tank in x hours, then:

$$\text{part filled in 1 hour} = \frac{1}{x}.$$

If a pipe can empty a tank in y hours, then:

$$\text{part emptied in 1 hour} = \frac{1}{y}.$$

If a pipe can fill a tank in x hours and another pipe can empty the full tank in y hours (where $y > x$), then on opening both the pipes, then

$$\text{the net part filled in 1 hour} = \left(\frac{1}{x} - \frac{1}{y} \right).$$

If a pipe can fill a tank in x hours and another pipe can empty the full tank in y hours (where $x > y$), then on opening both the pipes, then

$$\text{the net part emptied in 1 hour} = \left(\frac{1}{y} - \frac{1}{x} \right).$$

Three pipes A, B and C can fill a tank from empty to full in 30 minutes, 20 minutes, and 10 minutes respectively. When the tank is empty, all the three pipes are opened. A, B and C discharge chemical solutions P, Q and R respectively. What is the proportion of the solution R in the liquid in the tank after 3 minutes?

A. $\frac{5}{11}$

B. $\frac{6}{11}$

C. $\frac{7}{11}$

D. $\frac{8}{11}$

Answer & Explanation

Answer: Option B

Explanation:

$$\text{Part filled by (A + B + C) in 3 minutes} = 3 \left(\frac{1}{30} + \frac{1}{20} + \frac{1}{10} \right) = \left(3 \times \frac{11}{60} \right) = \frac{11}{20}.$$

$$\text{Part filled by C in 3 minutes} = \frac{3}{10}.$$

$$\therefore \text{Required ratio} = \left(\frac{3}{10} \times \frac{20}{11} \right) = \frac{6}{11}.$$

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Pipes A and B can fill a tank in 5 and 6 hours respectively. Pipe C can empty it in 12 hours. If all the three pipes are opened together, then the tank will be filled in:

A. $\frac{13}{117}$ hours

B. $\frac{8}{211}$ hours

C. $\frac{9}{317}$ hours

D. $\frac{1}{42}$ hours

Answer & Explanation

Answer: Option C

Explanation:

$$\text{Net part filled in 1 hour} = \left(\frac{1}{5} + \frac{1}{6} - \frac{1}{12} \right) = \frac{17}{60}.$$

\therefore The tank will be full in $\frac{60}{17}$ hours i.e., $3\frac{9}{17}$ hours.

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3.

A pump can fill a tank with water in 2 hours. Because of a leak, it took $2\frac{1}{3}$ hours to fill the tank. The leak can drain all the water of the tank in:

A. $4\frac{1}{3}$ hours

B. 7 hours

C. 8 hours

D. 14 hours

Answer & Explanation

Answer: Option D

Explanation:

$$\text{Work done by the leak in 1 hour} = \left(\frac{1}{2} - \frac{3}{7} \right) = \frac{1}{14}.$$

$$\Rightarrow x^2 - 2x - 24 = 0$$

$$\Rightarrow (x - 6)(x + 4) = 0$$

$$\Rightarrow x = 6. \quad [\text{neglecting the negative value of } x]$$

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Two pipes A and B can fill a tank in 20 and 30 minutes respectively. If both the pipes are used together, then how long will it take to fill the tank?

A. 12 min

B. 15 min

C. 25 min

D. 50 min

Answer & Explanation

Answer: Option **A**

Explanation:

$$\text{Part filled by A in 1 min} = \frac{1}{20}.$$

$$\text{Part filled by B in 1 min} = \frac{1}{30}.$$

$$\text{Part filled by (A + B) in 1 min} = \left(\frac{1}{20} + \frac{1}{30} \right) = \frac{1}{12}.$$

∴ Both pipes can fill the tank in 12 minutes.

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Two pipes A and B can fill a tank in 15 minutes and 20 minutes respectively. Both the pipes are opened together but after 4 minutes, pipe A is turned off. What is the total time required to fill the tank?

A. 10 min. 20 sec.

B. 11 min. 45 sec.

C. 12 min. 30 sec.

D. 14 min. 40 sec.

Answer & Explanation

Answer: Option **D**

Explanation:

$$\text{Part filled in 4 minutes} = 4 \left(\frac{1}{15} + \frac{1}{20} \right) = \frac{7}{5}.$$

$$\text{Remaining part} = \left(1 - \frac{7}{15}\right) = \frac{8}{15}$$

$$\text{Part filled by B in 1 minute} = \frac{1}{20}$$

$$\therefore \frac{1}{20} : \frac{8}{15} :: 1 : x$$

$$x = \left(\frac{8}{15} \times 1 \times 20\right) = 10\frac{2}{3} \text{ min} = 10 \text{ min. } 40 \text{ sec.}$$

∴ The tank will be full in (4 min. + 10 min. + 40 sec.) = 14 min. 40 sec.

One pipe can fill a tank three times as fast as another pipe. If together the two pipes can fill the tank in 36 minutes, then the slower pipe alone will be able to fill the tank in:

A. 81 min.

B. 108 min.

C. 144 min.

D. 192 min.

Answer & Explanation

Answer: Option C

Explanation:

Let the slower pipe alone fill the tank in x minutes.

Then, faster pipe will fill it in $\frac{x}{3}$ minutes.

$$\therefore \frac{1}{x} + \frac{3}{x} = \frac{1}{36}$$

$$\Rightarrow \frac{4}{x} = \frac{1}{36}$$

$$\Rightarrow x = 144 \text{ min.}$$

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A large tanker can be filled by two pipes A and B in 60 minutes and 40 minutes respectively. How many minutes will it take to fill the tanker from empty state if B is used for half the time and A and B fill it together for the other half?

A. 15 min

B. 20 min

C. 27.5 min

D. 30 min

Answer & Explanation

Answer: Option D

A. 6 hours

B. $\frac{2}{63}$ hours

C. 7 hours

D. $\frac{1}{72}$ hours

Answer & Explanation

Answer: Option C

Explanation:

$$(A + B)\text{'s 1 hour's work} = \left(\frac{1}{12} + \frac{1}{15} \right) = \frac{9}{60} = \frac{3}{20} .$$

$$(A + C)\text{'s hour's work} = \left(\frac{1}{12} + \frac{1}{20} \right) = \frac{8}{60} = \frac{2}{15} .$$

$$\text{Part filled in 2 hrs} = \left(\frac{3}{20} + \frac{2}{15} \right) = \frac{17}{60} .$$

$$\text{Part filled in 6 hrs} = \left(3 \times \frac{17}{60} \right) = \frac{17}{20} .$$

$$\text{Remaining part} = \left(1 - \frac{17}{20} \right) = \frac{3}{20} .$$

Now, it is the turn of A and B and $\frac{3}{20}$ part is filled by A and B in 1 hour.

∴ Total time taken to fill the tank = (6 + 1) hrs = 7 hrs.

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Three pipes A, B and C can fill a tank in 6 hours. After working at it together for 2 hours, C is closed and A and B can fill the remaining part in 7 hours. The number of hours taken by C alone to fill the tank is:

A. 10

B. 12

C. 14

D. 16

Answer & Explanation

Answer: Option C

Explanation:

$$\text{Part filled in 2 hours} = \frac{2}{6} = \frac{1}{3}$$

$$\text{Remaining part} = \left(1 - \frac{1}{3} \right) = \frac{2}{3} .$$

$$\therefore (A + B)\text{'s 7 hour's work} = \frac{2}{3}$$

$$(A + B)\text{'s 1 hour's work} = \frac{2}{21}$$

$$\therefore \text{C's 1 hour's work} = \{ (A + B + C)\text{'s 1 hour's work} \} - \{ (A + B)\text{'s 1 hour's work} \}$$

$$\left(\frac{1}{6} - \frac{2}{21} \right) = \frac{1}{14}$$

$$\therefore \text{C alone can fill the tank in 14 hours.}$$

Logarithm

Formulas

Logarithm:

If a is a positive real number, other than 1 and $a^m = x$, then we write: $m = \log_a x$ and we say that the value of $\log x$ to the base a is m .

Examples:

$$(i). 10^3 = 1000 \Rightarrow \log_{10} 1000 = 3.$$

$$(ii). 3^4 = 81 \Rightarrow \log_3 81 = 4.$$

$$(iii). 2^{-3} = \frac{1}{8} \Rightarrow \log_2 \frac{1}{8} = -3.$$

$$(iv). (.1)^2 = .01 \Rightarrow \log_{(.1)} .01 = 2.$$

Properties of Logarithms:

$$1. \log_a (xy) = \log_a x + \log_a y$$

$$2. \log_a \left(\frac{x}{y} \right) = \log_a x - \log_a y$$

$$\log_x x = 1$$

$$\log_a 1 = 0$$

$$\log_a (x^n) = n(\log_a x)$$

$$6. \log_a x = \frac{1}{\frac{\log_x a}{\log_b x}} = \frac{\log x}{\log a}$$

$$7. \log_a x = \frac{\log_b x}{\log_b a} = \log_a x$$

Common Logarithms:

Logarithms to the base 10 are known as common logarithms.

The logarithm of a number contains two parts, namely 'characteristic' and 'mantissa'.

Characteristic: The internal part of the logarithm of a number is called its **characteristic**.

Case I: When the number is greater than 1.

In this case, the characteristic is one less than the number of digits in the left of the decimal point in the given number.

Case II: When the number is less than 1.

In this case, the characteristic is one more than the number of zeros between the decimal point and the first significant digit of the number and it is negative.

Instead of -1, -2 etc. we write 1 (one bar), 2 (two bar), etc.

Examples:-

Number	Characteristic	Number	Characteristic
654.24	2	0.6453	1
26.649	1	0.06134	2
8.3547	0	0.00123	3

Mantissa:

The decimal part of the logarithm of a number is known as its **mantissa**. For mantissa, we look through log table.

Which of the following statements is not correct?

$$\log_{10} 10 = 1$$

$$\log (2 + 3) = \log (2 \times 3)$$

$$\log_{10} 1 = 0$$

$$\log (1 + 2 + 3) = \log 1 + \log 2 + \log 3$$

Answer & Explanation

Answer: Option **B**

Explanation:

Since $\log_a a = 1$, so $\log_{10} 10 = 1$.

$\log (2 + 3) = \log 5$ and $\log (2 \times 3) = \log 6 = \log 2 + \log 3$

$\therefore \log (2 + 3) \neq \log (2 \times 3)$

Since $\log_a 1 = 0$, so $\log_{10} 1 = 0$.

$\log (1 + 2 + 3) = \log 6 = \log (1 \times 2 \times 3) = \log 1 + \log 2 + \log 3$.

So, (b) is incorrect.

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If $\log 2 = 0.3010$ and $\log 3 = 0.4771$, the value of $\log_5 512$ is:

A. 2.870

B. 2.967

C. 3.876

D. 3.912

Answer & Explanation

Answer: Option **C**

Explanation:

$$\begin{aligned}\log_5 512 &= \frac{\log 512}{\log 5} \\ &= \frac{\log 2^9}{\log (10/2)} \\ &= \frac{9 \log 2}{\log 10 - \log 2} \\ &= \frac{(9 \times 0.3010)}{-0.3010} \\ &= \frac{2.709}{-0.3010} \\ &= -2.709 \times 0.699 \\ &= -2.709 \times 0.699\end{aligned}$$

$$= 3.876$$

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$\frac{\log 8}{\log 8}$ is equal to: $\log 8$

A. $\frac{1}{8}$

B. $\frac{1}{4}$

C. $\frac{1}{2}$

D. $\frac{1}{8}$

Answer & Explanation

Answer: Option C

Explanation:

$$\frac{\log 8}{\log 8} = \frac{\log (8)^{1/2}}{\log 8} = \frac{\frac{1}{2} \log 8}{\log 8} = \frac{1}{2}$$

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If $\log 27 = 1.431$, then the value of $\log 9$ is:

A. 0.934

B. 0.945

C. 0.954

D. 0.958

Answer & Explanation

Answer: Option C

Explanation:

$$\log 27 = 1.431$$

$$\Rightarrow \log (3^3) = 1.431$$

$$\Rightarrow 3 \log 3 = 1.431$$

$$\Rightarrow \log 3 = 0.477$$

$$\therefore \log 9 = \log(3^2) = 2 \log 3 = (2 \times 0.477) = 0.954.$$

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5. If $\log_a b + \log_b a = \log(a + b)$, then:

A. $a + b = 1$

B. $a - b = 1$

C. $a = b$

D. $a^2 - b^2 = 1$

Answer & Explanation

Answer: Option A

Explanation:

$$\log \frac{a}{b} + \log \frac{b}{a} = \log (a + b)$$
$$\Rightarrow \log (a + b) = \log \left(\frac{a}{b} \times \frac{b}{a} \right) = \log 1.$$

So, $a + b = 1$.

6. If $\log_{10} 7 = a$, then $\log_{10} \left(\frac{1}{70} \right)$ is equal to:

- $(1 + a)$

$(1 + a)^{-1}$

C. $\frac{a}{10}$

D. $\frac{1}{10^a}$

Answer & Explanation

Answer: Option A

Explanation:

$$\log_{10} \left(\frac{1}{70} \right) = \log_{10} 1 - \log_{10} 70$$
$$= - \log_{10} (7 \times 10)$$
$$= - (\log_{10} 7 + \log_{10} 10)$$
$$= - (a + 1).$$

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If $\log_{10} 2 = 0.3010$, then $\log_2 10$ is equal to:

A. $\frac{699}{301}$

B. $\frac{1000}{301}$

C. 0.3010

D. 0.6990

Answer & Explanation

$$\Rightarrow \log_{10} 5 + \log_{10} (5x + 1) = \log_{10} (x + 5) + \log_{10} 10$$

$$\Rightarrow \log_{10} [5 (5x + 1)] = \log_{10} [10(x + 5)]$$

$$\Rightarrow 5(5x + 1) = 10(x + 5)$$

$$\Rightarrow 5x + 1 = 2x + 10$$

$$\Rightarrow 3x = 9$$

$$\Rightarrow x = 3.$$

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10. The value of $\left(\frac{1}{\log_3 60} + \frac{1}{\log_4 60} + \frac{1}{\log_5 60} \right)$ is:

A. 0

B. 1

C. 5

D. 60

Answer & Explanation

Answer: Option **B**

Explanation:

Given expression = $\log_{60} 3 + \log_{60} 4 + \log_{60} 5$

$$\log_{60} (3 \times 4 \times 5)$$

$$\log_{60} 60$$

$$1$$

If $\log 2 = 0.30103$, the number of digits in 2^{64} is:

A. 18

B. 19

C. 20

D. 21

Answer & Explanation

Answer: Option **C**

Explanation:

$$\log (2^{64}) = 64 \times \log 2$$

$$(64 \times 0.30103)$$

$$19.26592$$

Its characteristic is 19.

Hence, then number of digits in 2^{64} is 20.

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12. If $\log_x \left(\frac{9}{16} \right) = -\frac{1}{2}$, then x is equal to:

A. $-\frac{3}{4}$

B. $\frac{3}{4}$

C. $\frac{81}{256}$

D. $\frac{256}{81}$

Answer & Explanation

Answer: Option D

Explanation:

$$\log_x \left(\frac{9}{16} \right) = -\frac{1}{2}$$
$$\Rightarrow x^{-1/2} = 16^9$$

$$\Rightarrow \frac{1}{\sqrt{x}} = 16^9$$

$$\Rightarrow x = \left(\frac{16}{9} \right)^2$$

$$\Rightarrow x = \frac{256}{81}$$

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If $a^x = b^y$, then:

A. $\log \bar{b} = \frac{x}{y}$

B. $\frac{\log a}{\log b} = \frac{x}{y}$

C. $\frac{\log a}{\log b} = x$

None of these

Answer & Explanation

Answer: Option C

Explanation:

$$a^x = b^y$$

$$\Rightarrow \log a^x = \log b^y$$

$$\Rightarrow x \log a = y \log b$$

$$\Rightarrow \frac{\log a}{\log b} = \frac{y}{x}$$

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If $\log_x y = 100$ and $\log_2 x = 10$, then the value of y is:

A. 2^{10}

B. 2^{100}

C. 2^{1000}

D. 2^{10000}

Answer & Explanation

Answer: Option C

Explanation:

$$\log_2 x = 10 \Rightarrow x = 2^{10}.$$

$$\therefore \log_x y = 100$$

$$\Rightarrow y = x^{100}$$

$$\Rightarrow y = (2^{10})^{100} \text{ [put value of } x\text{]}$$

$$\Rightarrow y = 2^{1000}.$$

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The value of $\log_2 16$ is:

A. $\frac{1}{4}$ **B.** 4 8

C. 8

D. 16

Answer & Explanation

Answer: Option **B**

Explanation:

Let $\log_2 16 = n$.

Then, $2^n = 16 = 2^4 \Rightarrow n = 4$.

$\therefore \log_2 16 = 4$.

Probability

Formulas

Experiment:

An operation which can produce some well-defined outcomes is called an experiment.

Random Experiment:

An experiment in which all possible outcomes are known and the exact output cannot be predicted in advance, is called a random experiment.

Examples:

Rolling an unbiased dice.

Tossing a fair coin.

Drawing a card from a pack of well-shuffled cards.

Picking up a ball of certain colour from a bag containing balls of different colours.

Details:

When we throw a coin, then either a Head (H) or a Tail (T) appears.

A dice is a solid cube, having 6 faces, marked 1, 2, 3, 4, 5, 6 respectively. When we throw a die, the outcome is the number that appears on its upper face.

A pack of cards has 52 cards.

It has 13 cards of each suit, name **Spades, Clubs, Hearts and Diamonds**.

Cards of spades and clubs are **black cards**.

Cards of hearts and diamonds are **red cards**.

There are 4 honours of each unit.

There are **Kings, Queens and Jacks**. These are all called **face cards**.

Sample Space:

When we perform an experiment, then the set S of all possible outcomes is called the **sample space**.

Examples:

In tossing a coin, $S = \{H, T\}$

If two coins are tossed, the $S = \{HH, HT, TH, TT\}$.

In rolling a dice, we have, $S = \{1, 2, 3, 4, 5, 6\}$.

Event:

Any subset of a sample space is called an **event**.

Probability of Occurrence of an Event:

Let S be the sample and let E be an event.

Then, $E \subseteq S$.

$$n(E)$$

$$\therefore P(E) = \frac{n(E)}{n(S)}$$

Results on Probability:

$$P(S) = 1$$

$$0 \leq P(E) \leq 1$$

$$P(\Phi) = 0$$

$$\text{For any events } A \text{ and } B \text{ we have : } P(A \cup B) = P(A) + P(B) - P(A \cap B)$$

$$\text{If } A \text{ denotes (not-}A\text{), then } P(\bar{A}) = 1 - P(A).$$

Tickets numbered 1 to 20 are mixed up and then a ticket is drawn at random. What is the probability that the ticket drawn has a number which is a multiple of 3 or 5?

A. $\frac{1}{2}$

B. $\frac{2}{5}$

C. $\frac{8}{15}$

D. $\frac{9}{20}$

Answer & Explanation

Answer: Option **D**

Explanation:

Here, $S = \{1, 2, 3, 4, \dots, 19, 20\}$.

Let $E =$ event of getting a multiple of 3 or 5 $= \{3, 6, 9, 12, 15, 18, 5, 10, 20\}$.

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{9}{20}$$

$$n(S) = 20$$

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A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

A. $\frac{10}{21}$

B. $\frac{11}{21}$

C. $\frac{2}{7}$

D. $\frac{5}{7}$

Answer & Explanation

Answer: Option A

Explanation:

Total number of balls = $(2 + 3 + 2) = 7$.

Let S be the sample space.

Then, $n(S) =$ Number of ways of drawing 2 balls out of 7

$$\begin{aligned} & {}^7C_2 \\ & \frac{(7 \times 6)}{(2 \times 1)} \\ & 21. \end{aligned}$$

Let E = Event of drawing 2 balls, none of which is blue.

$\therefore n(E) =$ Number of ways of drawing 2 balls out of $(2 + 3)$ balls.

$$= {}^5C_2$$

$$= \frac{(5 \times 4)}{(2 \times 1)}$$

$$= 10.$$

$$n(E) = 10$$

$$\therefore P(E) = \frac{10}{21} = \frac{10}{21}.$$

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In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green?

A. $\frac{1}{3}$

B. $\frac{3}{13}$

C. $\frac{7}{19}$

E. $\frac{9}{21}$

D. $\frac{4}{21}$

Answer & Explanation

Answer: Option A

Explanation:

Total number of balls = $(8 + 7 + 6) = 21$.

Let E = event that the ball drawn is neither red nor green
 = event that the ball drawn is blue.

$\therefore n(E) = 7$
 $n(E) = 7$

$\therefore P(E) = \frac{7}{21} = \frac{1}{3}$

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What is the probability of getting a sum 9 from two throws of a dice? _____

A. $\frac{1}{6}$

C. $\frac{1}{9}$

B. $\frac{1}{8}$

D. $\frac{1}{12}$

Answer & Explanation

Answer: Option C

Explanation:

In two throws of a die, $n(S) = (6 \times 6) = 36$.

Let E = event of getting a sum = $\{(3, 6), (4, 5), (5, 4), (6, 3)\}$.
 $n(E) = 4$

$\therefore P(E) = \frac{4}{36} = \frac{1}{9}$

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5. _____
 Three unbiased coins are tossed. What is the probability of getting at most two heads?

A. $\frac{3}{4}$

B. $\frac{1}{4}$

C. $\frac{3}{8}$

D. $\frac{7}{8}$

Answer & Explanation

Answer: Option **D**

Explanation:

Here $S = \{TTT, TTH, THT, HTT, THH, HTH, HHT, HHH\}$

Let $E =$ event of getting at most two heads.

Then $E = \{TTT, TTH, THT, HTT, THH, HTH, HHT\}$.

$$n(E) = 7$$

$$\therefore P(E) = \frac{7}{8} = \frac{7}{8}$$

Two dice are thrown simultaneously. What is the probability of getting two numbers whose product is even?

A. $\frac{1}{2}$

B. $\frac{3}{4}$

C. $\frac{3}{8}$

D. $\frac{5}{16}$

Answer & Explanation

Answer: Option **B**

Explanation:

In a simultaneous throw of two dice, we have $n(S) = (6 \times 6) = 36$.

Then, $E = \{(1, 2), (1, 4), (1, 6), (2, 1), (2, 2), (2, 3), (2, 4), (2, 5), (2, 6), (3, 2), (3, 4), (3, 6), (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (5, 2), (5, 4), (5, 6), (6, 1), (6, 2), (6, 3), (6, 4), (6, 5), (6, 6)\}$

$$\therefore n(E) = 27.$$

$$n(E) = 27 \quad 3$$

$$\therefore P(E) = \frac{27}{36} = \frac{3}{4} = \frac{3}{4}$$

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In a class, there are 15 boys and 10 girls. Three students are selected at random. The probability that 1 girl and 2 boys are selected, is:

A. $\frac{21}{46}$

B. $\frac{25}{117}$

C. $\frac{1}{50}$

D. $\frac{3}{25}$

Answer & Explanation

Answer: Option A

Explanation:

Let S be the sample space and E be the event of selecting 1 girl and 2 boys.

Then, $n(S)$ = Number ways of selecting 3 students out of 25

$$= {}^{25}C_3$$

$$= \frac{(25 \times 24 \times 23)}{(3 \times 2 \times 1)}$$

$$= 2300.$$

$$n(E) = ({}^{10}C_1 \times {}^{15}C_2)$$

$$\left[\frac{10 \times (15 \times 14)}{(2 \times 1)} \right]$$

$$1050.$$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{1050}{2300} = \frac{21}{46}.$$

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In a lottery, there are 10 prizes and 25 blanks. A lottery is drawn at random. What is the probability of getting a prize?

A. $\frac{1}{10}$

B. $\frac{2}{5}$

C. $\frac{2}{7}$

D. $\frac{5}{7}$

Answer & Explanation

Answer: Option C

Explanation:

$$P(\text{getting a prize}) = \frac{10}{(10 + 25)} = \frac{10}{35} = \frac{2}{7}.$$

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From a pack of 52 cards, two cards are drawn together at random. What is the probability of both the cards being kings?

A. $\frac{1}{15}$

B. $\frac{25}{57}$

C. $\frac{35}{256}$

D. $\frac{1}{221}$

Answer & Explanation

Answer: Option D

Explanation:

Let S be the sample space.

$$\text{Then, } n(S) = {}^{52}C_2 = \frac{(52 \times 51)}{(2 \times 1)} = 1326.$$

Let E = event of getting 2 kings out of 4.

$$\therefore n(E) = {}^4C_2 = \frac{(4 \times 3)}{(2 \times 1)} = 6.$$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{6}{1326} = \frac{1}{221}.$$

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Two dice are tossed. The probability that the total score is a prime number is:

A. $\frac{1}{6}$

B. $\frac{5}{12}$

C. $\frac{1}{2}$

D. $\frac{7}{9}$

Answer & Explanation

Answer: Option B

Explanation:

Clearly, $n(S) = (6 \times 6) = 36$.

Let E = Event that the sum is a prime number.

Then $E = \{ (1, 1), (1, 2), (1, 4), (1, 6), (2, 1), (2, 3), (2, 5), (3, 2), (3, 4), (4, 1), (4, 3), (5, 2), (5, 6), (6, 1), (6, 5) \}$

$$\therefore n(E) = 15.$$

$$n(E) = \frac{15}{52}$$

$$\therefore P(E) = \frac{15}{52} = \frac{15}{52}$$

A card is drawn from a pack of 52 cards. The probability of getting a queen of club or a king of heart is:

A. $\frac{1}{13}$

B. $\frac{2}{13}$

C. $\frac{1}{26}$

D. $\frac{1}{52}$

Answer & Explanation

Answer: Option **C**

Explanation:

Here, $n(S) = 52$.

Let E = event of getting a queen of club or a king of heart.

Then, $n(E) = 2$.

$$n(E) = \frac{2}{52}$$

$$\therefore P(E) = \frac{2}{52} = \frac{1}{26}$$

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A bag contains 4 white, 5 red and 6 blue balls. Three balls are drawn at random from the bag. The probability that all of them are red, is:

A. $\frac{1}{22}$

B. $\frac{3}{77}$

C. $\frac{2}{91}$

D. $\frac{2}{77}$

Answer & Explanation

Answer: Option **C**

Explanation:

Let S be the sample space.

Then, $n(S) =$ number of ways of drawing 3 balls out of 15

$${}^{15}C_3$$

$$\frac{(15 \times 14 \times 13)}{(3 \times 2 \times 1)}$$

455.

Let E = event of getting all the 3 red balls.

$$\therefore n(E) = {}^5C_3 = {}^5C_2 = \frac{(5 \times 4)}{(2 \times 1)} = 10.$$

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{10}{100} = \frac{1}{10}$$

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Two cards are drawn together from a pack of 52 cards. The probability that one is a spade and one is a heart, is:

A. $\frac{3}{20}$

B. $\frac{29}{34}$

C. $\frac{47}{100}$

D. $\frac{13}{100}$

Answer & Explanation

Answer: Option D

Explanation:

Let S be the sample space.

$$\text{Then, } n(S) = {}^{52}C_2 = \frac{(52 \times 51)}{(2 \times 1)} = 1326.$$

Let E = event of getting 1 spade and 1 heart.

$\therefore n(E)$ = number of ways of choosing 1 spade out of 13 and 1 heart out of 13

$$({}^{13}C_1 \times {}^{13}C_1)$$

$$(13 \times 13)$$

169.

$$\therefore P(E) = \frac{n(E)}{n(S)} = \frac{169}{1326} = \frac{13}{102}$$

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One card is drawn at random from a pack of 52 cards. What is the probability that the card drawn is a face card (Jack, Queen and King only)?

A. $\frac{1}{13}$

B. $\frac{3}{13}$

C. $\frac{1}{4}$

D. $\frac{9}{52}$

Answer & Explanation

Answer: Option B

Explanation:

Clearly, there are 52 cards, out of which there are 12 face cards.

$\therefore P(\text{getting a face card}) = \frac{12}{52} = \frac{3}{13}$.

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A bag contains 6 black and 8 white balls. One ball is drawn at random. What is the probability that the ball drawn is white?

A. $\frac{3}{4}$

B. $\frac{4}{7}$

C. $\frac{1}{8}$

D. $\frac{3}{7}$

Answer & Explanation

Answer: Option B

Explanation:

Let number of balls = $(6 + 8) = 14$.

Number of white balls = 8.

$P(\text{drawing a white ball}) = \frac{8}{14} = \frac{4}{7}$.

Odd Man Out and Series

Find the odd man out.
3, 5, 11, 14, 17, 21

A. 21

B. 17

C. 14

D. 3

Answer & Explanation

Answer: Option C

Explanation:

Each of the numbers except 14 is an odd number.

The number '14' is the only EVEN number.

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8, 27, 64, 100, 125, 216, 343

A. 27

B. 100

C. 125

D. 343

Answer & Explanation

Answer: Option B

Explanation:

The pattern is $2^3, 3^3, 4^3, 5^3, 6^3, 7^3$. But, 100 is not a perfect cube.

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10, 25, 45, 54, 60, 75, 80

A. 10

B. 45

C. 54

D. 75

Answer & Explanation

Answer: Option C

Explanation:

Each of the numbers except 54 is multiple of 5.

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396, 462, 572, 427, 671, 264

A. 396

B. 427

C. 671

D. 264

Answer & Explanation

Answer: Option B

Explanation:

In each number except 427, the middle digit is the sum of other two.

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6, 9, 15, 21, 24, 28, 30

A. 28

B. 21

C. 24

D. 30

Answer & Explanation

Answer: Option A

Explanation:

Each of the numbers except 28, is a multiple of 3.
Find the odd man out.
1, 4, 9, 16, 23, 25, 36

A. 9

B. 23

C. 25

D. 36

Answer & Explanation

Answer: Option B

Explanation:

Each of the numbers except 23, is perfect square.

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1, 4, 9, 16, 20, 36, 49

A. 1

B. 9

C. 20

D. 49

Answer & Explanation

Answer: Option C

Explanation:

The pattern is $1^2, 2^2, 3^2, 4^2, 5^2, 6^2, 7^2$. But, instead of 5^2 , it is 20 which to be turned out.

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2, 5, 10, 17, 26, 37, 50, 64

A. 50

B. 26

C. 37

D. 64

Answer & Explanation

Answer: Option D

Explanation:

$(1*1)+1, (2*2)+1, (3*3)+1, (4*4)+1, (5*5)+1, (6*6)+1, (7*7)+1,$

$(8*8)+1$ But, 64 is out of pattern.

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10, 14, 16, 18, 21, 24, 26

A. 26

B. 24

C. 21

D. 18

Answer & Explanation

Answer: Option C

Explanation:

Each of the numbers except 21 is an even number.

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16, 25, 36, 72, 144, 196, 225

A. 36

B. 72

C. 196

D. 225

Answer & Explanation

Answer: Option **B**

Explanation:

Each of the numbers except 72 is a perfect square

Find the odd man out.

331, 482, 551, 263, 383, 362, 284

A. 263

B. 383

C. 331

D. 551

Answer & Explanation

Answer: Option **B**

Explanation:

In each number except 383, the product of first and third digits is the middle one.

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835, 734, 642, 751, 853, 981, 532

A. 751

B. 853

C. 981

D. 532

Answer & Explanation

Answer: Option **A**

Explanation:

In each number except 751, the difference of third and first digit is the middle one.

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41, 43, 47, 53, 61, 71, 73, 81

A. 61

B. 71

C. 73

D. 81

Answer & Explanation

Answer: Option D

Explanation:

Each of the numbers except 81 is a prime number.

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3, 5, 7, 12, 17, 19

A. 19

B. 17

C. 5

D. 12

Answer & Explanation

Answer: Option D

Explanation:

Each of the numbers is a prime number except 12.

Find out the wrong number in the given sequence of numbers.

582, 605, 588, 611, 634, 617, 600

A. 634

B. 611

C. 605

D. 600

Answer & Explanation

Answer: Option A

Explanation:

Alternatively 23 is added and 17 is subtracted from the terms. So, 634 is wrong.

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22, 33, 66, 99, 121, 279, 594

A. 33

B. 121

C. 279

D. 594

Answer & Explanation

Answer: Option **C**

Explanation:

Each of the number except 279 is a multiple of 11.

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8, 13, 21, 32, 47, 63, 83

A. 47

B. 63

C. 32

D. 83

Answer & Explanation

Answer: Option **A**

Explanation:

Go on adding 5, 8, 11, 14, 17, 20.

So, the number 47 is wrong and must be replaced by 46.

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1, 8, 27, 64, 124, 216, 343

A. 8

B. 27

C. 64

D. 124

Answer & Explanation

Answer: Option **D**

Explanation:

The numbers are 1^3 , 2^3 , 3^3 , 4^3 etc. So, 124 is wrong; it must have been 5^3 i.e., 125.

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1, 2, 6, 15, 31, 56, 91

A. 31

B. 91

C. 56

D. 15

Answer & Explanation

Answer: Option **B**

Explanation:

$$1, 1 + 1^2 = 2, 2 + 2^2 = 6, 6 + 3^2 = 15, 15 + 4^2 = 31, 31 + 5^2 = 56, 56 + 6^2 = 92$$

Last number of given series must be 92 not 91.

Find out the wrong number in the given sequence of numbers.

52, 51, 48, 43, 34, 27, 16

A. 27

B. 34

C. 43

D. 48

Answer & Explanation

Answer: Option **B**

Explanation:

Subtract 1, 3, 5, 7, 9, 11 from successive numbers.

So, 34 is wrong.

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4, 6, 8, 9, 10, 11, 12

A. 10

B. 11

C. 12

D. 9

Answer & Explanation

Answer: Option **B**

Explanation:

Each number is a composite number except 11.

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105, 85, 60, 30, 0, -45, -90

A. 0

B. 85

C. -45

D. 60

Answer & Explanation

Answer: Option **A**

Explanation:

Subtract 20, 25, 30, 35, 40, 45 from successive numbers.

So, 0 is wrong.

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5, 16, 6, 16, 7, 16, 9

A. 9

B. 7

C. 6

D. None of these

Answer & Explanation

Answer: Option **A**

Explanation:

Terms at odd places are 5, 6, 7, 8 etc. and each term at even place is 16.

So, 9 is wrong.

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125, 127, 130, 135, 142, 153, 165

A. 130

B. 142

C. 153

D. 165

Answer & Explanation

Answer: Option **D**

Explanation:

Prime numbers 2, 3, 5, 7, 11, 13 are to be added successively.

So, 165 is wrong
Find out the wrong number in the given sequence of numbers.
46080, 3840, 384, 48, 24, 2, 1

A. 1

B. 2

C. 24

D. 384

Answer & Explanation

Answer: Option **C**

Explanation:

The terms are successively divided by 12, 10, 8, 6, ...etc.

So, 24 is wrong, it should be 8 ($48/6 = 8$).

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6, 13, 18, 25, 30, 37, 40

A. 25

B. 30

C. 37

D. 40

Answer & Explanation

Answer: Option **D**

Explanation:

The differences between two successive terms from the beginning are 7, 5, 7, 5, 7, 5.

So, 40 is wrong.

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36, 54, 18, 27, 9, 18.5, 4.5

A. 4.5

B. 18.5

C. 54

D. 18

Answer & Explanation

Answer: Option **B**

Explanation:

The terms are alternatively multiplied by 1.5 and divided by 3. However, 18.5 does not satisfy it.

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56, 72, 90, 110, 132, 150

A. 72

B. 110

C. 132

D. 150

[Answer & Explanation](#)

Answer: Option **D**

Explanation:

The numbers are 7×8 , 8×9 , 9×10 , 10×11 , 11×12 , 12×13 .

So, 150 is wrong.

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25, 36, 49, 81, 121, 169, 225

A. 36

B. 49

C. 121

D. 169

[Answer & Explanation](#)

Answer: Option **A**

Explanation:

The numbers are squares of odd natural numbers, starting from 5 up to 15.

So, 36 is wrong.

Insert the missing number.
16, 33, 65, 131, 261, (...)

A. 523

B. 521

C. 613

D. 721

Answer & Explanation

Answer: Option **A**

Explanation:

Each number is twice the preceding one with 1 added or subtracted alternatively.

So, the next number is $(2 \times 261 + 1) = 523$.

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10, 5, 13, 10, 16, 20, 19, (...)

A. 22

B. 40

C. 38

D. 23

Answer & Explanation

Answer: Option **B**

Explanation:

There are two series (10, 13, 16, 19) and (5, 10, 20, 40), one increasing by 3 and the other multiplied by 2.

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1, 4, 9, 16, 25, 36, 49, (....)

A. 54

B. 56

C. 64

D. 81

Answer & Explanation

Answer: Option **C**

Explanation:

Numbers are $1^2, 2^2, 3^2, 4^2, 5^2, 6^2, 7^2$.

So, the next number is $8^2 = 64$.

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2, 4, 12, 48, 240, (....)

A. 27

B. 108

C. 68

D. 72

Answer & Explanation

Answer: Option **A**

Explanation:

Numbers are alternatively multiplied by 3 and divided by 2.

So, the next number = $54 \div 2 = 27$.

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2, 6, 12, 20, 30, 42, 56, (....)

A. 61

B. 64

C. 72

D. 70

Answer & Explanation

Answer: Option **C**

Explanation:

The pattern is $1 \times 2, 2 \times 3, 3 \times 4, 4 \times 5, 5 \times 6, 6 \times 7, 7 \times 8$.

So, the next number is $8 \times 9 = 72$.

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4, -8, 16, -32, 64, (....)

A. 128

B. -128

C. 192

D. -192

Answer & Explanation

Answer: Option **B**

Explanation:

Each number is the proceeding number multiplied by -2.

So, the required number is -128.

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7, 26, 63, 124, 215, 342, (....)

A. 481

B. 511

C. 391

D. 421

[Answer & Explanation](#)

Answer: Option **B**

Explanation:

Numbers are $(2^3 - 1)$, $(3^3 - 1)$, $(4^3 - 1)$, $(5^3 - 1)$, $(6^3 - 1)$, $(7^3 - 1)$ etc.

So, the next number is $(8^3 - 1) = (512 - 1) = 511$.

Insert the missing number.

5, 10, 13, 26, 29, 58, 61, (....)

A. 122

B. 64

C. 125

D. 128

[Answer & Explanation](#)

Answer: Option **A**

Explanation:

Numbers are alternatively multiplied by 2 and increased by 3.

So, the missing number = $61 \times 2 = 122$.

[View Answer Workspace Report Discuss in Forum](#)

15, 31, 63, 127, 255, (....)

A. 513

B. 511

C. 517

D. 523

[Answer & Explanation](#)

Answer: Option B

Explanation:

Each number is double the preceding one plus 1.

So, the next number is $(255 \times 2) + 1 = 511$.

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1, 8, 27, 64, 125, 216, (....)

A. 354

B. 343

C. 392

D. 245

Answer & Explanation

Answer: Option B

Explanation:

Numbers are $1^3, 2^3, 3^3, 4^3, 5^3, 6^3$.

So, the missing number is $7^3 = 343$.

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3, 7, 6, 5, 9, 3, 12, 1, 15, (....)

A. 18

B. 13

C. -1

D. 3

Answer & Explanation

Answer: Option C

Explanation:

There are two series, beginning respectively with 3 and 7. In one 3 is added and in another 2 is subtracted.

The next number is $1 - 2 = -1$.

Find out the wrong number in the series.

7, 8, 18, 57, 228, 1165, 6996

A. 8

B. 18

C. 57

D. 228

1165

Answer & Explanation

Answer: Option **D**

Explanation:

Let the given numbers be A, B, C, D, E, F, G.

Then, A, $A \times 1 + 1$, $B \times 2 + 2$, $C \times 3 + 3$, $D \times 4 + 4$, $E \times 5 + 5$, $F \times 6 + 6$ are the required numbers.

Clearly, 228 is wrong.

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1, 1, 2, 6, 24, 96, 720

A. 720

B. 96

C. 24

D. 6

2

Answer & Explanation

Answer: Option **B**

Explanation:

Go on multiplying with 1, 2, 3, 4, 5, 6 to get next number.

So, 96 is wrong.

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196, 169, 144, 121, 100, 80, 64

A. 169

B. 144

C. 121

D. 100

80

Answer & Explanation

Answer: Option **E**

Explanation:

Numbers must be $(14)^2$, $(13)^2$, $(12)^2$, $(11)^2$, $(10)^2$, $(9)^2$, $(8)^2$.

So, 80 is wrong.

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445, 221, 109, 46, 25, 11, 4

A. 221

B. 109

C. 46

D. 25

11

Answer & Explanation

Answer: Option **C**

Explanation:

Go on subtracting 3 and dividing the result by 2 to obtain the next number.

Clearly, 46 is wrong.

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190, 166, 145, 128, 112, 100, 91

A. 100

B. 166

C. 145

D. 128

112

Answer & Explanation

Answer: Option **D**

Explanation:

Go on subtracting 24, 21, 18, 15, 12, 9 from the numbers to get the next number.

$$190 - 24 = 166$$

$$166 - 21 = 145$$

$$145 - 18 = 127 \text{ [Here, 128 is placed instead of 127]}$$

$$127 - 15 = 112$$

$$112 - 12 = 100 \dots \text{ and so on.}$$

Therefore, 128 is wrong.

Find out the wrong number in the series.

19, 26, 33, 46, 59, 74, 91

A. 26

B. 33

C. 46

D. 59

74

Answer & Explanation

Answer: Option **B**

Explanation:

Go on adding 7, 9, 11, 13, 15, 17 respectively to obtain the next number.

So, 33 is wrong. It must be 35

[View Answer Workspace Report Discuss in Forum](#)

1, 3, 10, 21, 64, 129, 356, 777

A. 10

B. 21

C. 64

D. 129

356

Answer & Explanation

Answer: Option **E**

Explanation:

$A \times 2 + 1$, $B \times 3 + 1$, $C \times 2 + 1$, $D \times 3 + 1$ and so on.

So, 356 is wrong.

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6, 12, 48, 100, 384, 768, 3072

A. 768

B. 384

C. 100

D. 48

12

Answer & Explanation

Answer: Option C

Explanation:

Each even term of the series is obtained by multiplying the previous term by 2.

$$2^{\text{nd}} \text{ term} = (1^{\text{st}} \text{ term}) \times 2 = 6 \times 2 = 12$$

$$4^{\text{th}} \text{ term} = (3^{\text{rd}} \text{ term}) \times 2 = 48 \times 2 = 96.$$

$$6^{\text{th}} \text{ term} = (5^{\text{th}} \text{ term}) \times 2 = 384 \times 2 = 768.$$

\therefore 4th term should be 96 instead of 100.

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40960, 10240, 2560, 640, 200, 40, 10

A. 640

B. 40

C. 200

D. 2560

10240

Answer & Explanation

Answer: Option C

Explanation:

Go on dividing by 4 to get the next number.

So, 200 is wrong.

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3, 7, 15, 39, 63, 127, 255, 511

A. 7

B. 15

C. 39

D. 63

127

Answer & Explanation

Answer: Option C

Explanation:

Go on multiplying 2 and adding 1 to get the next number.

So, 39 is wrong.

Find out the wrong number in the series.

64, 71, 80, 91, 104, 119, 135, 155

A. 71

B. 80

C. 104

D. 119

135

Answer & Explanation

Answer: Option E

Explanation:

Go on adding 7, 9, 11, 13, 15, 17, 19 respectively to obtain the next number.

So, 135 is wrong.

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15, 16, 34, 105, 424, 2124, 12756

A. 16

B. 34

C. 105

D. 424

2124

Answer & Explanation

Answer: Option E

Explanation:

$$2^{\text{nd}} \text{ term} = (1^{\text{st}} \text{ term}) \times 1 + 1 = 15 \times 1 + 1 = 16.$$

$$3^{\text{rd}} \text{ term} = (2^{\text{nd}} \text{ term}) \times 2 + 2 = 16 \times 2 + 2 = 34.$$

$$4^{\text{th}} \text{ term} = (3^{\text{th}} \text{ term}) \times 3 + 3 = 34 \times 3 + 3 = 105.$$

$$5^{\text{th}} \text{ term} = (4^{\text{th}} \text{ term}) \times 4 + 4 = 105 \times 4 + 4 = 424$$

$$6^{\text{th}} \text{ term} = (5^{\text{th}} \text{ term}) \times 5 + 5 = 424 \times 5 + 5 = 2125$$

\therefore 6th term should be 2125 instead of 2124.

[View Answer Workspace Report Discuss in Forum](#)

10, 26, 74, 218, 654, 1946, 5834

A. 26

B. 74

C. 218

D. 654

1946

[Answer & Explanation](#)

Answer: Option **D**

Explanation:

$$2^{\text{nd}} \text{ term} = (1^{\text{st}} \text{ term}) \times 3 - 4 = 10 \times 3 - 4 = 26.$$

$$3^{\text{rd}} \text{ term} = (2^{\text{nd}} \text{ term}) \times 3 - 4 = 26 \times 3 - 4 = 74.$$

$$4^{\text{th}} \text{ term} = (3^{\text{th}} \text{ term}) \times 3 - 4 = 74 \times 3 - 4 = 218.$$

$$5^{\text{th}} \text{ term} = (4^{\text{th}} \text{ term}) \times 3 - 4 = 218 \times 3 - 4 = 650.$$

\therefore 5th term must be 650 instead of 654.

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2880, 480, 92, 24, 8, 4, 4

A. 480

B. 92

C. 24

D. 8

4

Answer & Explanation

Answer: Option **B**

Explanation:

Go on dividing by 6, 5, 4, 3, 2, 1 respectively to obtain the next number.

Clearly, 92 is wrong.

[View Answer Workspace Report Discuss in Forum](#)

3, 7, 15, 27, 63, 127, 255

A. 7

B. 15

C. 27

D. 63

127

Answer & Explanation

Answer: Option **C**

Explanation:

Go on multiplying the number by 2 and adding 1 to it to get the next number.

So, 27 is wrong.

Gather and Edited By

Yasir Shahzad(Gujrat)

Math Book Part 3

Best Of Luck

*You Can Not Help Every one But Every
One Can Help Someone*

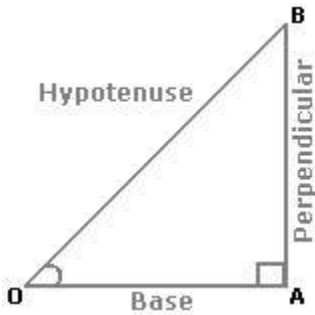
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Height and Distance

Formulas

1. Trigonometry:

In a right angled $\triangle OAB$, where $\angle BOA = \theta$,



$$\text{i. } \sin \theta = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{AB}{OB};$$

$$\text{ii. } \cos \theta = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{OA}{OB};$$

$$\text{iii. } \tan \theta = \frac{\text{Perpendicular}}{\text{Base}} = \frac{AB}{OA};$$

$$\text{iv. } \operatorname{cosec} \theta = \frac{1}{\sin \theta} = \frac{OB}{AB};$$

$$\text{v. } \sec \theta = \frac{1}{\cos \theta} = \frac{OB}{OA};$$

$$\text{vi. } \cot \theta = \frac{1}{\tan \theta} = \frac{OA}{AB};$$

Trigonometrical Identities:

$$\begin{aligned} \sin^2 \theta + \cos^2 \theta &= 1, \\ 1 + \tan^2 \theta &= \sec^2 \theta, \\ 1 + \cot^2 \theta &= \operatorname{cosec}^2 \theta. \end{aligned}$$

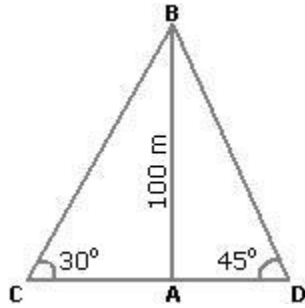
Values of T-ratios:

θ	0°	$(\pi/6)$	$(\pi/4)$	$(\pi/3)$	$(\pi/2)$
		30°	45°	60°	90°
$\sin \theta$	0	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{2}$	1
$\cos \theta$	1	$\frac{3}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	0

Answer: Option C

Explanation:

Let AB be the lighthouse and C and D be the positions of the ships.



Then, $AB = 100$ m, $\angle ACB = 30^\circ$ and $\angle ADB = 45^\circ$.

$$\frac{AB}{AC} = \tan 30^\circ = \frac{1}{3} \Rightarrow AC = AB \times 3 = 100 \times 3 = 300 \text{ m.}$$

$$\frac{AB}{AD} = \tan 45^\circ = 1 \Rightarrow AD = AB = 100 \text{ m.}$$

$$\therefore CD = (AC + AD) = (300 + 100) \text{ m}$$

$$= 100(3 + 1)$$

$$= (100 \times 4) \text{ m}$$

$$= 400 \text{ m.}$$

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A man standing at a point P is watching the top of a tower, which makes an angle of elevation of 30° with the man's eye. The man walks some distance towards the tower to watch its top and the angle of the elevation becomes 60° . What is the distance between the base of the tower and the point P?

A. 43 units

B. 8 units

C. 12 units

D. Data inadequate

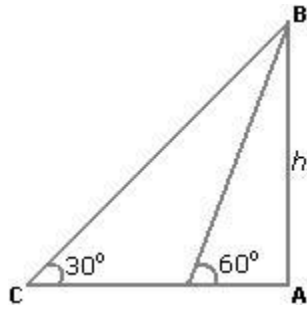
None of these

Answer & Explanation

Answer: Option D

Explanation:

One of AB, AD and CD must have given.



So, the data is inadequate.

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The angle of elevation of a ladder leaning against a wall is 60° and the foot of the ladder is 4.6 m away from the wall. The length of the ladder is:

- | | |
|-----------------|-----------------|
| A. 2.3 m | B. 4.6 m |
| C. 7.8 m | D. 9.2 m |

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An observer 1.6 m tall is 203 away from a tower. The angle of elevation from his eye to the top of the tower is 30° . The heights of the tower is:

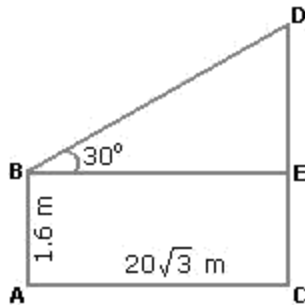
- | | |
|-------------------|-------------------------|
| A. 21.6 m | B. 23.2 m |
| C. 24.72 m | D. None of these |

Answer & Explanation

Answer: Option **A**

Explanation:

Let AB be the observer and CD be the tower.



Draw $BE \perp CD$.

Then, $CE = AB = 1.6$ m,

$$BE = AC = 203 \text{ m.}$$

$$\frac{DE}{BE} = \tan 30^\circ = \frac{1}{3}$$

$$\Rightarrow DE = \frac{203}{3} \text{ m} = 20 \text{ m.}$$

$$\therefore CD = CE + DE = (1.6 + 20) \text{ m} = 21.6 \text{ m.}$$

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From a point P on a level ground, the angle of elevation of the top tower is 30° . If the tower is 100 m high, the distance of point P from the foot of the tower is:

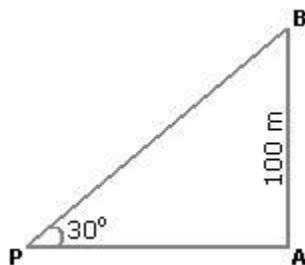
- A.** 149 m
- B.** 156 m
- C.** 173 m
- D.** 200 m

Answer & Explanation

Answer: Option C

Explanation:

Let AB be the tower.



Then, $\angle APB = 30^\circ$ and $AB = 100$ m.

$$\frac{AB}{AP} = \tan 30^\circ = \frac{1}{3}$$

$$\Rightarrow AP = (AB \times 3) \text{ m}$$

$$100 \times 3 \text{ m}$$

$$(100 \times 1.73) \text{ m}$$

$$173 \text{ m.}$$

The angle of elevation of the sun, when the length of the shadow of a tree 3 times the height of the tree, is:

A. 30°

B. 45°

C. 60°

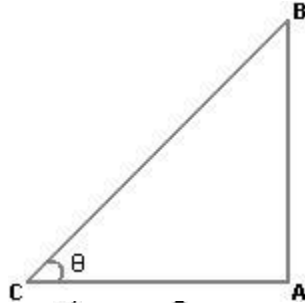
D. 90°

Answer & Explanation

Answer: Option A

Explanation:

Let AB be the tree and AC be its shadow.



Let $\angle ACB = \theta$

$$\text{Then, } \frac{AC}{AB} = 3 \Rightarrow \cot \theta = 3$$

$$\therefore \theta = 30^\circ.$$

Compound Interest

Formulas

Let Principal = P, Rate = R% per annum, Time = n years.

When interest is compounded Annually:

$$\text{Amount} = P \left(1 + \frac{R}{100} \right)^n$$

When interest is compounded Half-yearly:

$$\text{Amount} = P \left[1 + \frac{R}{200} \right]^{2n}$$

Answer: Option C

Explanation:

Let P = Rs. 100. Then, S.I. Rs. 60 and T = 6 years.

$$\therefore R = \left(\frac{100 \times 60}{100 \times 6} \right) = 10\% \text{ p.a.}$$

Now, P = Rs. 12000. T = 3 years and R = 10% p.a.

$$\begin{aligned} \therefore \text{C.I.} &= \text{Rs.} \left[12000 \times \left\{ \left(1 + \frac{10}{100} \right)^3 - 1 \right\} \right] \\ &= \text{Rs.} \left(\frac{331}{100} \right) \times 12000 \\ &= 3972. \end{aligned}$$

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4. What is the difference between the compound interests on Rs. 5000 for $1\frac{1}{2}$ years at 4% per annum compounded yearly and half-yearly?

A. Rs. 2.04

B. Rs. 3.06

C. Rs. 4.80

D. Rs. 8.30

Answer & Explanation

Answer: Option A

Explanation:

$$\text{C.I. when interest compounded yearly} = \text{Rs.} \left[5000 \times \left(1 + \frac{4}{100} \right) \times \left(1 + \frac{1}{2} \times \frac{4}{100} \right) \right]$$

$$\text{Rs.} \left(5000 \times \frac{25}{100} \times \frac{51}{50} \right)$$

Rs. 5304.

$$\text{C.I. when interest is compounded half-yearly} = \text{Rs.} \left[5000 \times \left(1 + \frac{2}{100} \right)^3 \right]$$

$$= \text{Rs.} \left(5000 \times \frac{51}{50} \times \frac{51}{50} \times \frac{51}{50} \right)$$

$$= \text{Rs.} 5306.04$$

∴ Difference = Rs. (5306.04 - 5304) = Rs. 2.04

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The compound interest on Rs. 30,000 at 7% per annum is Rs. 4347. The period (in years) is: _____

- | | |
|-------------|--------------------------|
| A. 2 | B. $\frac{1}{22}$ |
| C. 3 | D. 4 |

Answer & Explanation

Answer: Option **A**

Explanation:

Amount = Rs. (30000 + 4347) = Rs. 34347.

Let the time be n years.

$$\text{Then, } 30000 \left(1 + \frac{7}{100} \right)^n = 34347$$

$$\Rightarrow \left(\frac{107}{100} \right)^n = \frac{34347}{30000} = \frac{11449}{10000} = \left(\frac{107}{100} \right)^2$$

∴ $n = 2$ years.

What will be the compound interest on a sum of Rs. 25,000 after 3 years at the rate of 12 p.c.p.a.?

- | | |
|------------------------|------------------------|
| A. Rs. 9000.30 | B. Rs. 9720 |
| C. Rs. 10123.20 | D. Rs. 10483.20 |

None of these

Answer & Explanation

Answer: Option **C**

Explanation:

$$\text{Amount} = \text{Rs.} \left[500 \times \left(1 + \frac{10}{100} \right)^2 \right]$$

$$\text{Rs.} \left[500 \times \frac{21}{20} \times \frac{21}{20} \right]$$

Rs. 551.25

$$\therefore \text{C.I.} = \text{Rs.} (551.25 - 500) = \text{Rs.} 51.25$$

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The difference between simple interest and compound on Rs. 1200 for one year at 10% per annum reckoned half-yearly is:

A. Rs. 2.50

B. Rs. 3

C. Rs. 3.75

D. Rs. 4

None of these

Answer & Explanation

Answer: Option **B**

Explanation:

$$\text{S.I.} = \text{Rs.} \left(\frac{1200 \times 10 \times 1}{100} \right) = \text{Rs.} 120.$$

$$\text{C.I.} = \text{Rs.} \left[1200 \times \left(1 + \frac{5}{100} \right)^2 - 1200 \right] = \text{Rs.} 123.$$

$$\therefore \text{Difference} = \text{Rs.} (123 - 120) = \text{Rs.} 3.$$

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The difference between compound interest and simple interest on an amount of Rs. 15,000 for 2 years is Rs. 96. What is the rate of interest per annum?

A. 8

B. 10

C. 12

D. Cannot be determined

None of these

Percentage

Formulas

Concept of Percentage:

By a certain **percent**, we mean that many hundredths.

Thus, x percent means x hundredths, written as $x\%$.

To express $x\%$ as a fraction: We have, $x\% = \frac{x}{100}$.

Thus, $20\% = \frac{20}{100} = \frac{1}{5}$.

To express $\frac{a}{b}$ as a percent: We have, $\frac{a}{b} = \left(\frac{a}{b} \times 100 \right)\%$.

Thus, $\frac{1}{4} = \left(\frac{1}{4} \times 100 \right)\% = 25\%$.

Percentage Increase/Decrease:

If the price of a commodity increases by $R\%$, then the reduction in consumption so as not to increase the expenditure is:

$$\left[\frac{R}{(100 + R)} \times 100 \right]\%$$

If the price of a commodity decreases by $R\%$, then the increase in consumption so as not to decrease the expenditure is:

$$\left[\frac{R}{(100 - R)} \times 100 \right]\%$$

Results on Population:

Let the population of a town be P now and suppose it increases at the rate of $R\%$ per annum, then:

1. Population after n years = $P \left(1 + \frac{R}{100} \right)^n$
2. Population n years ago = $\frac{P}{\left(1 + \frac{R}{100} \right)^n}$

Answer: Option C

Explanation:

Let their marks be $(x + 9)$ and x .

$$\text{Then, } x + 9 = \frac{100}{56}(x + 9 + x)$$

$$\Rightarrow 25(x + 9) = 14(2x + 9)$$

$$\Rightarrow 3x = 99$$

$$\Rightarrow x = 33$$

So, their marks are 42 and 33.

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A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had:

A. 588 apples

B. 600 apples

C. 672 apples

D. 700 apples

Answer & Explanation

Answer: Option D

Explanation:

Suppose originally he had x apples.

Then, $(100 - 40)\%$ of $x = 420$.

$$\Rightarrow \frac{60}{100}x = 420$$

$$\Rightarrow x = \left(\frac{420 \times 100}{60} \right) = 700.$$

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What percentage of numbers from 1 to 70 have 1 or 9 in the unit's digit?

A. 1

B. 14

C. 20

D. 21

Answer & Explanation

Answer: Option C

Explanation:

Clearly, the numbers which have 1 or 9 in the unit's digit, have squares that end in the digit 1. Such numbers from 1 to 70 are 1, 9, 11, 19, 21, 29, 31, 39, 41, 49, 51, 59, 61, 69.

Number of such number = 14

$$\therefore \text{Required percentage} = \left(\frac{14}{70} \times 100 \right) \% = 20\%.$$

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5. If $A = x\%$ of y and $B = y\%$ of x , then which of the following is true?

A is smaller than B.

A is greater than B

Relationship between A and B cannot be determined.

If x is smaller than y , then A is greater than B.

None of these

Answer & Explanation

Answer: Option E

Explanation:

$$x\% \text{ of } y = \left(\frac{x}{100} \times y \right) = \left(\frac{y}{100} \times x \right) y\% \text{ of } x$$

$$\therefore A = B.$$

If 20% of $a = b$, then $b\%$ of 20 is the same as:

A. 4% of a

B. 5% of a

C. 20% of a

D. None of these

Answer & Explanation

Answer: Option A

Explanation:

$$20\% \text{ of } a = b \Rightarrow \frac{20}{100}a = b.$$

$$\therefore b\% \text{ of } 20 = \left(\frac{b}{100} \times 20 \right) = 20 \left(\frac{b}{100} \times 1 \times 20 \right) = 4a = 4\% \text{ of } a.$$

Answer: Option **A**

Explanation:

Number of valid votes = 80% of 7500 = 6000.

∴ Valid votes polled by other candidate = 45% of 6000

$$= \left(\frac{45}{100} \times 6000 \right) = 2700.$$

Three candidates contested an election and received 1136, 7636 and 11628 votes respectively. What percentage of the total votes did the winning candidate get?

A. 57%

B. 60%

C. 65%

D. 90%

Answer & Explanation

Answer: Option **A**

Explanation:

Total number of votes polled = (1136 + 7636 + 11628) = 20400.

∴ Required percentage = $\left(\frac{11628}{20400} \times 100 \right) \% = 57\%$.

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Two tailors X and Y are paid a total of Rs. 550 per week by their employer. If X is paid 120 percent of the sum paid to Y, how much is Y paid per week?

A. Rs. 200

B. Rs. 250

C. Rs. 300

D. None of these

Answer & Explanation

Answer: Option **B**

Explanation:

Let the sum paid to Y per week be Rs. z.

Then, z + 120% of z = 550.

$$\Rightarrow z + \frac{120}{100}z = 550$$

$$\Rightarrow \frac{11}{5}z = 550$$

$$\Rightarrow z = \left(\frac{550 \times 5}{11} \right) = 250.$$

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Gauri went to the stationers and bought things worth Rs. 25, out of which 30 paise went on sales tax on taxable purchases. If the tax rate was 6%, then what was the cost of the tax free items?

A. Rs. 15

B. Rs. 15.70

C. Rs. 19.70

D. Rs. 20

Answer & Explanation

Answer: Option C

Explanation:

Let the amount taxable purchases be Rs. x .

$$\text{Then, } 6\% \text{ of } x = \frac{30}{100}$$

$$\Rightarrow x = \left(\frac{30}{100} \times \frac{100}{6} \right) = 5.$$

$$\therefore \text{Cost of tax free items} = \text{Rs. } [25 - (5 + 0.30)] = \text{Rs. } 19.70$$

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Rajeev buys good worth Rs. 6650. He gets a rebate of 6% on it. After getting the rebate, he pays sales tax @ 10%. Find the amount he will have to pay for the goods.

A. Rs. 6876.10

B. Rs. 6999.20

C. Rs. 6654

D. Rs. 7000

Answer & Explanation

Answer: Option A

Explanation:

$$\text{Rebate} = 6\% \text{ of Rs. } 6650 = \text{Rs. } \left(\frac{6}{100} \times 6650 \right) = \text{Rs. } 399.$$

$$\text{Sales tax} = 10\% \text{ of Rs. } (6650 - 399) = \text{Rs. } \left(\frac{10}{100} \times 6251 \right) = \text{Rs. } 625.10$$

∴ Final amount = Rs. (6251 + 625.10) = Rs. 6876.10

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The population of a town increased from 1,75,000 to 2,62,500 in a decade. The average percent increase of population per year is:

A. 4.37%

B. 5%

C. 6%

D. 8.75%

Answer & Explanation

Answer: Option B

Explanation:

Increase in 10 years = (262500 - 175000) = 87500.

$$\text{Increase\%} = \left(\frac{87500}{175000} \times 100 \right) \% = 50\%.$$

$$\text{∴ Required average} = \left(\frac{50}{10} \right) \% = 5\%.$$

Clock

Formulas

Minute Spaces:

The face or dial of watch is a circle whose circumference is divided into 60 equal parts, called minute spaces.

Hour Hand and Minute Hand:

A clock has two hands, the smaller one is called the **hour hand** or **short hand** while the larger one is called **minute hand** or **long hand**.

2.

In 60 minutes, the minute hand gains 55 minutes on the hour on the hour hand.

In every hour, both the hands coincide once.

The hands are in the same straight line when they are coincident or opposite to each other.

When the two hands are at right angles, they are 15 minute spaces apart.

When the hands are in opposite directions, they are 30 minute spaces apart.

Angle traced by hour hand in 12 hrs = 360°

C. 155°

D. 160°

Answer & Explanation

Answer: Option C

Explanation:

Angle traced by hour hand in 12 hrs = 360° .

Angle traced by hour hand in 5 hrs 10 min. *i.e.*, $\frac{31}{6}$ hrs = $\left(\frac{360}{12} \times \frac{31}{6}\right)^\circ = 155^\circ$.

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A watch which gains 5 seconds in 3 minutes was set right at 7 a.m. In the afternoon of the same day, when the watch indicated quarter past 4 o'clock, the true time is:

A. $5\frac{7}{12}$ min. past 3

B. 4 p.m.

C. $5\frac{7}{11}$ min. past 3

D. $2\frac{3}{11}$ min. past 4

Answer & Explanation

Answer: Option B

Explanation:

Time from 7 a.m. to 4.15 p.m. = 9 hrs 15 min. = $\frac{37}{4}$ hrs.

3 min. 5 sec. of this clock = 3 min. of the correct clock.

$\Rightarrow \frac{37}{720}$ hrs of this clock = $\frac{1}{20}$ hrs of the correct clock.

$\Rightarrow \frac{37}{4}$ hrs of this clock = $\left(\frac{1}{20} \times \frac{720}{37} \times \frac{37}{4}\right)$ hrs of the correct clock.

= 9 hrs of the correct clock.

∴ The correct time is 9 hrs after 7 a.m. *i.e.*, 4 p.m.

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How much does a watch lose per day, if its hands coincide every 64 minutes?

A. $32\frac{8}{11}$ min.

B. $36\frac{5}{11}$ min.

C. 90 min.

D. 96 min.

Answer & Explanation

Answer: Option A

Explanation:

55 min. spaces are covered in 60 min.

60 min. spaces are covered in $\left(\frac{60}{55} \times 60\right)$ min. $= 65\frac{5}{11}$ min.

Loss in 64 min. = $\left(65\frac{5}{11} - 64\right) = \frac{16}{11}$ min.

Loss in 24 hrs = $\left(\frac{16}{11} \times \frac{1}{64} \times 24 \times 60\right)$ min. $= 32\frac{8}{11}$ min.

At what time between 7 and 8 o'clock will the hands of a clock be in the same straight line but, not together?

A. 5 min. past 7

B. $5\frac{2}{11}$ min. past 7

C. $5\frac{3}{11}$ min. past 7

D. $5\frac{5}{11}$ min. past 7

Answer & Explanation

Answer: Option D

Explanation:

When the hands of the clock are in the same straight line but not together, they are 30 minute spaces apart.

At 7 o'clock, they are 25 min. spaces apart.

∴ Minute hand will have to gain only 5 min. spaces.

55 min. spaces are gained in 60 min.

5 min. spaces are gained in $\left(\frac{60}{55} \times 5\right)$ min. $= 5\frac{5}{11}$ min.

∴ Required time = $5\frac{5}{11}$ min. past 7.

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At what time between 5.30 and 6 will the hands of a clock be at right angles?

A. $43\frac{5}{11}$ min. past 5

B. $43\frac{7}{11}$ min. past 5

C. 40 min. past 5

D. 45 min. past 5

Answer & Explanation

Answer: Option **B**

Explanation:

At 5 o'clock, the hands are 25 min. spaces apart.

To be at right angles and that too between 5.30 and 6, the minute hand has to gain $(25 + 15) = 40$ min. spaces.

55 min. spaces are gained in 60 min.

40 min. spaces are gained in $\left(\frac{60}{55} \times 40\right)$ min = $43\frac{7}{11}$ min.

∴ Required time = $43\frac{7}{11}$ min. past 5.

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— The angle between the minute hand and the hour hand of a clock when the time is 4.20, is: —

A. 0°

B. 10°

C. 5°

D. 20°

Answer & Explanation

Answer: Option **B**

Explanation:

Angle traced by hour hand in $\frac{13}{3}$ hrs = $\left(\frac{360}{12} \times \frac{13}{3}\right)^\circ = 130^\circ$.

Angle traced by min. hand in 20 min. = $\left(\frac{360}{60} \times 20\right)^\circ = 120^\circ$.

∴ Required angle = $(130 - 120)^\circ = 10^\circ$.

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— At what angle the hands of a clock are inclined at 15 minutes past 5? —

A. $\frac{1^\circ}{582}$

B. 64°

C. $\frac{1^\circ}{672}$

D. $72 \frac{1^\circ}{2}$

Answer & Explanation

Answer: Option C

Explanation:

Angle traced by hour hand in $\frac{21}{4}$ hrs = $\left(\frac{360}{12} \times \frac{21}{4}\right)^\circ = 157\frac{1}{2}^\circ$

Angle traced by min. hand in 15 min. = $\left(\frac{360}{60} \times 15\right)^\circ = 90^\circ$.

\therefore Required angle = $\left(157\frac{1}{2}\right)^\circ - 90^\circ = 67\frac{1}{2}^\circ$

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At 3:40, the hour hand and the minute hand of a clock form an angle of:

A. 120°

B. 125°

C. 130°

D. 135°

Answer & Explanation

Answer: Option C

Explanation:

Angle traced by hour hand in 12 hrs. = 360° .

Angle traced by it in $\frac{11}{3}$ hrs = $\left(\frac{360}{12} \times \frac{11}{3}\right)^\circ = 110^\circ$.

Angle traced by minute hand in 60 min. = 360° .

Angle traced by it in 40 min. = $\left(\frac{360}{60} \times 40\right)^\circ = 240^\circ$.

\therefore Required angle $(240 - 110)^\circ = 130^\circ$.

How many times are the hands of a clock at right angle in a day?

A. 22

B. 24

C. 44

D. 48

Answer & Explanation

Answer: Option C

Explanation:

In 12 hours, they are at right angles 22 times.

∴ In 24 hours, they are at right angles 44 times.

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The angle between the minute hand and the hour hand of a clock when the time is 8.30, is:

A. 80°

B. 75°

C. 60°

D. 105°

Answer & Explanation

Answer: Option B

Explanation:

$$\text{Angle traced by hour hand in } \frac{17}{2} \text{ hrs} = \left(\frac{360}{12} \times \frac{17}{2} \right)^\circ = 255.$$

$$\text{Angle traced by min. hand in 30 min.} = \left(\frac{360}{60} \times 30 \right)^\circ = 180.$$

∴ Required angle = $(255 - 180)^\circ = 75^\circ$.

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How many times in a day, are the hands of a clock in straight line but opposite in direction?

A. 20

B. 22

C. 24

D. 48

Answer & Explanation

Answer: Option B

Explanation:

The hands of a clock point in opposite directions (in the same straight line) 11 times in every 12 hours. (Because between 5 and 7 they point in opposite directions at 6 o'clock only).

So, in a day, the hands point in the opposite directions 22 times.

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At what time between 4 and 5 o'clock will the hands of a watch point in opposite directions?

A. 45 min. past 4

B. 40 min. past 4

C. $50\frac{4}{11}$ min. past 4

D. $54\frac{6}{11}$ min. past 4

Answer & Explanation

Answer: Option D

Explanation:

At 4 o'clock, the hands of the watch are 20 min. spaces apart.

To be in opposite directions, they must be 30 min. spaces apart.

∴ Minute hand will have to gain 50 min. spaces.

55 min. spaces are gained in 60 min.

50 min. spaces are gained in $\left(\frac{60}{55} \times 50\right)$ min. or $54\frac{6}{11}$ min.

∴ Required time = $54\frac{6}{11}$ min. past 4.

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At what time between 9 and 10 o'clock will the hands of a watch be together?

A. 45 min. past 9

B. 50 min. past 9

C. $49\frac{1}{11}$ min. past 9

D. $48\frac{2}{11}$ min. past 9

Answer & Explanation

Answer: Option C

Explanation:

To be together between 9 and 10 o'clock, the minute hand has to gain 45 min. spaces.

55 min. spaces are gained in 60 min.

45 min. spaces are gained in $\left(\frac{60}{55} \times 45\right)$ min. or $49\frac{1}{11}$ min.

∴ The hands are together at $49\frac{55}{11}$ min. past 9.

At what time, in minutes, between 3 o'clock and 4 o'clock, both the needles will coincide each other?

A. $5\frac{1}{11}$

B. $12\frac{4}{11}$

C. $13\frac{4}{11}$

D. $16\frac{4}{11}$

Answer & Explanation

Answer: Option D

Explanation:

At 3 o'clock, the minute hand is 15 min. spaces apart from the hour hand.

To be coincident, it must gain 15 min. spaces.

55 min. are gained in 60 min.

15 min. are gained in $\left(\frac{60}{55} \times 15\right)_{\text{min}} = 16\frac{4}{11}$ min.

∴ The hands are coincident at $16\frac{4}{11}$ min. past 3.

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How many times do the hands of a clock coincide in a day?

A. 20

B. 21

C. 22

D. 24

Answer & Explanation

Answer: Option C

Explanation:

The hands of a clock coincide 11 times in every 12 hours (Since between 11 and 1, they coincide only once, *i.e.*, at 12 o'clock).

AM

12:00

1:05

2:11

A. 2 p.m. on Tuesday

B. 2 p.m. on Wednesday

C. 3 p.m. on Thursday

D. 1 p.m. on Friday

Answer & Explanation

Answer: Option B

Explanation:

Time from 12 p.m. on Monday to 2 p.m. on the following Monday = 7 days 2 hours = 170 hours.

∴ The watch gains $\left(2 + 4 \frac{4}{5}\right)$ min. or $\frac{34}{5}$ min. in 170 hrs.

Now, $\frac{34}{5}$ min. are gained in 170 hrs.

∴ 2 min. are gained in $\left(170 \times \frac{5}{34} \times 2\right)$ hrs = 50 hrs.

∴ Watch is correct 2 days 2 hrs. after 12 p.m. on Monday *i.e.*, it will be correct at 2 p.m. on Wednesday.

Volume and Surface Area

Formulas

CUBOID

Let length = l , breadth = b and height = h units. Then

Volume = $(l \times b \times h)$ cubic units.

Surface area = $2(lb + bh + lh)$ sq. units.

Diagonal = $l^2 + b^2 + h^2$ units.

CUBE

Let each edge of a cube be of length a . Then,

Volume = a^3 cubic units.

Surface area = $6a^2$ sq. units.

Diagonal = $3a$ units.

CYLINDER

Let radius of base = r and Height (or length) = h . Then,

Volume = $(\pi r^2 h)$ cubic units.

Curved surface area = $(2 \pi rh)$ sq. units.
Total surface area = $2 \pi r(h + r)$ sq. units.

CONE

Let radius of base = r and Height = h . Then,

Slant height, $l = \sqrt{h^2 + r^2}$ units.

Volume = $\left(\frac{1}{3} \pi r^2 h\right)$ cubic units.

Curved surface area = (πrl) sq. units.

Total surface area = $(\pi rl + \pi r^2)$ sq. units.

SPHERE

Let the radius of the sphere be r . Then,

Volume = $\left(\frac{4}{3} \pi r^3\right)$ cubic units.

Surface area = $(4 \pi r^2)$ sq. units.

HEMISPHERE

Let the radius of a hemisphere be r . Then,

Volume = $\left(\frac{2}{3} \pi r^3\right)$ cubic units.

Curved surface area = $(2 \pi r^2)$ sq. units.

Total surface area = $(3 \pi r^2)$ sq.

units. Note: 1 litre = 1000 cm^3 .

A right triangle with sides 3 cm, 4 cm and 5 cm is rotated the side of 3 cm to form a cone. The volume of the cone so formed is:

A. $12 \pi \text{ cm}^3$

B. $15 \pi \text{ cm}^3$

C. $16 \pi \text{ cm}^3$

D. $20 \pi \text{ cm}^3$

Answer & Explanation

Answer: Option **A**

Explanation:

Answer & Explanation

Answer: Option C

Explanation:

$$2(15 + 12) \times h = 2(15 \times 12)$$

$$\Rightarrow h = \frac{180}{27} = 20 \text{ m}$$

$$\therefore \text{Volume} = (15 \times 12 \times 20) \text{ m}^3 = 1200 \text{ m}^3$$

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66 cubic centimetres of silver is drawn into a wire 1 mm in diameter. The length of the wire in metres will be:

A. 84

B. 90

C. 168

D. 336

Answer & Explanation

Answer: Option A

Explanation:

Let the length of the wire be h .

Radius = $\frac{1}{2}$ mm = $\frac{1}{20}$ cm. Then,

$$\Rightarrow \frac{22}{7} \times \frac{1}{20} \times \frac{1}{20} \times h = 66.$$

$$\Rightarrow h = \left(\frac{66 \times 20 \times 20 \times 7}{22} \right) = 8400 \text{ cm} = 84 \text{ m}.$$

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A hollow iron pipe is 21 cm long and its external diameter is 8 cm. If the thickness of the pipe is 1 cm and iron weighs 8 g/cm^3 , then the weight of the pipe is:

A. 3.6 kg

B. 3.696 kg

C. 36 kg

D. 36.9 kg

Answer & Explanation

Answer: Option B

Answer: Option **B**

Explanation:

Total volume of water displaced = $(4 \times 50) \text{ m}^3 = 200 \text{ m}^3$.

$$\therefore \text{Rise in water level} = \left(\frac{200}{40 \times 20} \right) \text{ m} = 0.25 \text{ m} = 25 \text{ cm}.$$

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The slant height of a right circular cone is 10 m and its height is 8 m. Find the area of its curved surface.

A. $30\pi \text{ m}^2$

B. $40\pi \text{ m}^2$

C. $60\pi \text{ m}^2$

D. $80\pi \text{ m}^2$

Answer & Explanation

Answer: Option **C**

Explanation:

$$l = 10 \text{ m},$$

$$h = 8 \text{ m}.$$

$$\text{So, } r = \sqrt{l^2 - h^2} = \sqrt{(10)^2 - 8^2} = 6 \text{ m}.$$

$$\therefore \text{Curved surface area} = \pi r l = (\pi \times 6 \times 10) \text{ m}^2 = 60\pi \text{ m}^2.$$

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A cistern 6m long and 4 m wide contains water up to a depth of 1 m 25 cm. The total area of the wet surface is:

A. 49 m^2

B. 50 m^2

C. 53.5 m^2

D. 55 m^2

Answer & Explanation

Answer: Option **A**

Explanation:

Area of the wet surface = $[2(lb + bh + lh) - lb]$

$$2(bh + lh) + lb$$

$$[2(4 \times 1.25 + 6 \times 1.25) + 6 \times 4] \text{ m}^2$$

$$49 \text{ m}^2.$$

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A metallic sheet is of rectangular shape with dimensions 48 m x 36 m. From each of its corners, a square is cut off so as to make an open box. If the length of the square is 8 m, the volume of the box (in m^3) is:

A. 4830

B. 5120

C. 6420

D. 8960

Answer & Explanation

Answer: Option B

Explanation:

Clearly, $l = (48 - 16)\text{m} = 32 \text{ m}$,

$b = (36 - 16)\text{m} = 20 \text{ m}$,

$h = 8 \text{ m}$.

\therefore Volume of the box = $(32 \times 20 \times 8) \text{ m}^3 = 5120 \text{ m}^3$.

The curved surface area of a cylindrical pillar is 264 m^2 and its volume is 924 m^3 . Find the ratio of its diameter to its height.

A. 3 : 7

B. 7 : 3

C. 6 : 7

D. 7 : 6

Answer & Explanation

Answer: Option B

Explanation:

$$\frac{\pi r^2 h}{2\pi r h} = \frac{924}{264} \Rightarrow r = \left(\frac{924}{264} \times 2 \right) = 7 \text{ m}.$$

$$\text{And, } 2\pi r h = 264 \Rightarrow h = \left(\frac{264}{2 \times 7} \times \frac{1}{2} \times \frac{1}{7} \right) = 6 \text{ m}.$$

$$\therefore \text{ Required ratio} = \frac{2r}{h} = \frac{14}{6} = 7 : 3.$$

$$[154(5 + 1)] \text{ cm}^2$$

$$(154 \times 3.236) \text{ cm}^2$$

$$498.35 \text{ cm}^2.$$

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A large cube is formed from the material obtained by melting three smaller cubes of 3, 4 and 5 cm side. What is the ratio of the total surface areas of the smaller cubes and the large cube?

A. 2 : 1

B. 3 : 2

C. 25 : 18

D. 27 : 20

Answer & Explanation

Answer: Option **C**

Explanation:

$$\text{Volume of the large cube} = (3^3 + 4^3 + 5^3) = 216 \text{ cm}^3.$$

Let the edge of the large cube be a .

$$\text{So, } a^3 = 216 \Rightarrow a = 6 \text{ cm.}$$

$$\therefore \text{Required ratio} = \left(\frac{6 \times (3^2 + 4^2 + 5^2)}{6 \times 6^2} \right) = \frac{50}{36} = 25 : 18.$$

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How many bricks, each measuring 25 cm x 11.25 cm x 6 cm, will be needed to build a wall of 8 m x 6 m x 22.5 cm?

A. 5600

B. 6000

C. 6400

D. 7200

Answer & Explanation

Answer: Option **C**

Explanation:

$$\text{Number of bricks} = \frac{\text{Volume of the wall}}{\text{Volume of 1 brick}} = \left(\frac{800 \times 600 \times 22.5}{25 \times 11.25 \times 6} \right) = 6400.$$

Problems on Numbers

Formulas

Some Basic Formulae:

$$(a + b)(a - b) = (a^2 - b^2)$$

$$(a + b)^2 = (a^2 + b^2 + 2ab)$$

$$(a - b)^2 = (a^2 + b^2 - 2ab)$$

$$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$$

$$(a^3 + b^3) = (a + b)(a^2 - ab + b^2)$$

$$(a^3 - b^3) = (a - b)(a^2 + ab + b^2)$$

$$(a^3 + b^3 + c^3 - 3abc) = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac)$$

When $a + b + c = 0$, then $a^3 + b^3 + c^3 = 3abc$.

If one-third of one-fourth of a number is 15, then three-tenth of that number is:

A. 35

B. 36

C. 45

D. 54

Answer & Explanation

Answer: Option D

Explanation:

Let the number be x .

Then, $\frac{1}{3}$ of $\frac{1}{4}$ of $x = 15 \Leftrightarrow x = 15 \times 12 = 180$.

So, required number = $\left(\frac{3}{10} \times 180\right) = 54$.

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ix.

Three times the first of three consecutive odd integers is 3 more than twice the third. The third integer is:

A. 9

B. 11

C. 13

D. 15

Answer & Explanation

Answer: Option D

Explanation:

Let the three integers be x , $x + 2$ and $x + 4$.

Then, $3x = 2(x + 4) + 3 \Leftrightarrow x = 11$.

∴ Third integer = $x + 4 = 15$.

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3.X. _____
The difference between a two-digit number and the number obtained by interchanging the positions of its digits is 36. What is the difference between the two digits of that number?

A. 3

B. 4

C. 9

D. Cannot be determined

None of these

Answer & Explanation

Answer: Option B

Explanation:

Let the ten's digit be x and unit's digit be y .

Then, $(10x + y) - (10y + x) = 36$

$\Rightarrow 9(x - y) = 36$

$\Rightarrow x - y = 4$.

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xi. _____
The difference between a two-digit number and the number obtained by interchanging the digits is 36. What is the difference between the sum and the difference of the digits of the number if the ratio between the digits of the number is 1 : 2 ?

A. 4

B. 8

C. 16

D. None of these

Answer & Explanation

Answer: Option B

Explanation:

Since the number is greater than the number obtained on reversing the digits, so the ten's digit is

greater than the unit's digit.

Let ten's and unit's digits be $2x$ and x respectively.

$$\text{Then, } (10 \times 2x + x) - (10x + 2x) = 36$$

$$\Rightarrow 9x = 36$$

$$\Rightarrow x = 4.$$

$$\therefore \text{ Required difference} = (2x + x) - (2x - x) = 2x = 8.$$

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xii.

A two-digit number is such that the product of the digits is 8. When 18 is added to the number, then the digits are reversed. The number is:

A. 18

B. 24

C. 42

D. 81

Answer & Explanation

Answer: Option **B**

Explanation:

Let the ten's and unit digit be x and $\frac{8}{x}$ respectively.

$$\text{Then, } \left(10x + \frac{8}{x} \right) + 18 = 10 \times \frac{8}{x} + x$$

$$\Rightarrow 10x^2 + 8 + 18x = 80 + x^2$$

$$\Rightarrow 9x^2 + 18x - 72 = 0$$

$$\Rightarrow x^2 + 2x - 8 = 0$$

$$\Rightarrow (x + 4)(x - 2) = 0$$

$$\Rightarrow x = 2.$$

The sum of the digits of a two-digit number is 15 and the difference between the digits is 3. What is the two-digit number?

A. 69

B. 78

C. 96

D. Cannot be determined

None of these

Answer & Explanation

Answer: Option **D**

Explanation:

Let the ten's digit be x and unit's digit be y .

Then, $x + y = 15$ and $x - y = 3$ or $y - x = 3$.

Solving $x + y = 15$ and $x - y = 3$, we get: $x = 9, y = 6$.

Solving $x + y = 15$ and $y - x = 3$, we get: $x = 6, y = 9$.

So, the number is either 96 or 69.

Hence, the number cannot be determined.

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The sum of the squares of three numbers is 138, while the sum of their products taken two at a time is 131. Their sum is:

A. 20

B. 30

C. 40

D. None of these

Answer & Explanation

Answer: Option **A**

Explanation:

Let the numbers be a, b and c .

Then, $a^2 + b^2 + c^2 = 138$ and $(ab + bc + ca) = 131$.

$(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca) = 138 + 2 \times 131 = 400$.

$\Rightarrow (a + b + c) = 400 = 20$.

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A number consists of two digits. If the digits interchange places and the new number is added to the original number, then the resulting number will be divisible by:

A. 3

B. 5

C. 9

D. 11

Answer & Explanation

Answer: Option **D**

Explanation:

Let the ten's digit be x and unit's digit be y .

Then, number = $10x + y$.

Number obtained by interchanging the digits = $10y + x$.

∴ $(10x + y) + (10y + x) = 11(x + y)$, which is divisible by 11.

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In a two-digit, if it is known that its unit's digit exceeds its ten's digit by 2 and that the product of the given number and the sum of its digits is equal to 144, then the number is:

A. 24

B. 26

C. 42

D. 46

Answer & Explanation

Answer: Option **A**

Explanation:

Let the ten's digit be x .

Then, unit's digit = $x + 2$.

Number = $10x + (x + 2) = 11x + 2$.

Sum of digits = $x + (x + 2) = 2x + 2$.

∴ $(11x + 2)(2x + 2) = 144$

$$\Rightarrow 22x^2 + 26x - 140 = 0$$

$$\Rightarrow 11x^2 + 13x - 70 = 0$$

$$\Rightarrow (x - 2)(11x + 35) = 0$$

$$\Rightarrow x = 2.$$

Hence, required number = $11x + 2 = 24$.

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Find a positive number which when increased by 17 is equal to 60 times the reciprocal of the number.

A. 3

B. 10

C. 17

D. 20

Answer & Explanation

Answer: Option **A**

Explanation:

Let the number be x .

$$\text{Then, } x + 17 = \frac{60}{x}$$

$$\Rightarrow x^2 + 17x - 60 = 0$$

$$\Rightarrow (x + 20)(x - 3) = 0$$

$$\Rightarrow x = 3.$$

The product of two numbers is 9375 and the quotient, when the larger one is divided by the smaller, is 15. The sum of the numbers is:

A. 380

B. 395

C. 400

D. 425

Answer & Explanation

Answer: Option **C**

Explanation:

Let the numbers be x and y .

Then, $xy = 9375$ and $\frac{x}{y} = 15$.

$$\underline{xy} = \underline{9375}$$

$$(x/y) = 15$$

$$\Rightarrow y^2 = 625.$$

$$\Rightarrow y = 25.$$

$$\Rightarrow x = 15y = (15 \times 25) = 375.$$

$$\therefore \text{Sum of the numbers} = x + y = 375 + 25 = 400.$$

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The product of two numbers is 120 and the sum of their squares is 289. The sum of the number is:

A. 20

B. 23

C. 169

D. None of these

Answer & Explanation

Answer: Option **B**

Explanation:

Let the numbers be x and y .

Then, $xy = 120$ and $x^2 + y^2 = 289$.

$$\therefore (x + y)^2 = x^2 + y^2 + 2xy = 289 + (2 \times 120) = 529$$

$$\therefore x + y = \sqrt{529} = 23.$$

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A number consists of 3 digits whose sum is 10. The middle digit is equal to the sum of the other two and the number will be increased by 99 if its digits are reversed. The number is:

A. 145

B. 253

C. 370

D. 352

Answer & Explanation

Answer: Option **B**

Explanation:

Let the middle digit be x .

Then, $2x = 10$ or $x = 5$. So, the number is either 253 or 352.

Since the number increases on reversing the digits, so the hundred's digit is smaller than the unit's digit.

Hence, required number = 253.

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The sum of two number is 25 and their difference is 13. Find their product.

A. 104

B. 114

C. 315

D. 325

Answer & Explanation

Answer: Option **B**

Explanation:

Let the numbers be x and y .

Then, $x + y = 25$ and $x - y = 13$.

$$4xy = (x + y)^2 - (x - y)^2$$

$$(25)^2 - (13)^2$$

$$(625 - 169)$$

$$456$$

$$\therefore xy = 114.$$

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What is the sum of two consecutive even numbers, the difference of whose squares is 84?

A. 34

B. 38

C. 42

D. 46

Answer & Explanation

Answer: Option **C**

Explanation:

Let the numbers be x and $x + 2$.

$$\text{Then, } (x + 2)^2 - x^2 = 84$$

$$\Rightarrow 4x + 4 = 84$$

$$\Rightarrow 4x = 80$$

$$\Rightarrow x = 20.$$

$$\therefore \text{ The required sum} = x + (x + 2) = 2x + 2 = 42.$$

Simplification

FORmulas

A man has Rs. 480 in the denominations of one-rupee notes, five-rupee notes and ten-rupee notes. The number of notes of each denomination is equal. What is the total number of notes that he has ?

A. 45

B. 60

C. 75

D. 90

Answer & Explanation

Answer: Option **D**

Explanation:

Let number of notes of each denomination be x .

$$\text{Then } x + 5x + 10x = 480$$

$$\Rightarrow 16x = 480$$

$$\therefore x = 30.$$

Hence, total number of notes = $3x = 90$.

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There are two examinations rooms A and B. If 10 students are sent from A to B, then the number of students in each room is the same. If 20 candidates are sent from B to A, then the number of

students in A is double the number of students in B. The number of students in room A is:

A. 20

B. 80

C. 100

D. 200

Answer & Explanation

Answer: Option C

Explanation:

Let the number of students in rooms A and B be x and y respectively.

Then, $x - 10 = y + 10 \Rightarrow x - y = 20 \dots (i)$

and $x + 20 = 2(y - 20) \Rightarrow x - 2y = -60 \dots (ii)$

Solving (i) and (ii) we get: $x = 100$, $y = 80$.

∴ The required answer A = 100.

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The price of 10 chairs is equal to that of 4 tables. The price of 15 chairs and 2 tables together is Rs. 4000. The total price of 12 chairs and 3 tables is:

A. Rs. 3500

B. Rs. 3750

C. Rs. 3840

D. Rs. 3900

Answer & Explanation

Answer: Option D

Explanation:

Let the cost of a chair and that of a table be Rs. x and Rs. y respectively.

Then, $10x = 4y$ or $y = \frac{5}{2}x$.

∴ $15x + 2y = 4000$

$\Rightarrow 15x + 2 \times \frac{5}{2}x = 4000$

$\Rightarrow 20x = 4000$

$$\therefore x = 200.$$

$$\text{So, } y = \left(\frac{5}{2} \times 200 \right) = 500.$$

Hence, the cost of 12 chairs and 3 tables = $12x + 3y$

$$\text{Rs. } (2400 + 1500)$$

$$\text{Rs. } 3900.$$

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If $a - b = 3$ and $a^2 + b^2 = 29$, find the value of ab .

A. 10

B. 12

C. 15

D. 18

Answer & Explanation

Answer: Option **A**

Explanation:

$$2ab = (a^2 + b^2) - (a - b)^2$$

$$= 29 - 9 = 20$$

$$\Rightarrow ab = 10.$$

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The price of 2 sarees and 4 shirts is Rs. 1600. With the same money one can buy 1 saree and 6 shirts. If one wants to buy 12 shirts, how much shall he have to pay ?

A. Rs. 1200

B. Rs. 2400

C. Rs. 4800

D. Cannot be determined

None of these

Answer & Explanation

Answer: Option **B**

Explanation:

Let the price of a saree and a shirt be Rs. x and Rs. y respectively.

Then, $2x + 4y = 1600$ (i)

and $x + 6y = 1600$ (ii)

Divide equation (i) by 2, we get the below equation.

$\Rightarrow x + 2y = 800$. --- (iii)

Now subtract (iii) from (ii)

$$\begin{array}{r} x + 6y = 1600 \quad (-) \\ x + 2y = 800 \\ \hline 4y = 800 \\ \hline \end{array}$$

Therefore, $y = 200$.

Now apply value of y in (iii)

$\Rightarrow x + 2 \times 200 = 800$

$\Rightarrow x + 400 = 800$

Therefore $x = 400$

Solving (i) and (ii) we get $x = 400, y = 200$.

\therefore Cost of 12 shirts = Rs. $(12 \times 200) = \text{Rs. } 2400$.

6. A sum of Rs. 1360 has been divided among A, B and C such that A gets $\frac{2}{3}$ of what B gets and B gets $\frac{1}{4}$ of what C gets. B's share is:

A. Rs. 120

B. Rs. 160

C. Rs. 240

D. Rs. 300

Answer & Explanation

Answer: Option C

Explanation:

Let C's share = Rs. x

Then, B's share = Rs. $\frac{x}{4}$, A's share = Rs. $\left(\frac{2}{3} \times \frac{x}{4}\right) = \text{Rs. } \frac{x}{6}$

$\therefore \underline{x} + \underline{x} + \underline{x} = 1360$

$$\Rightarrow \frac{17x}{12} = 1360$$

$$\Rightarrow x = \frac{1360 \times 12}{17} = \text{Rs. } 960$$

$$\text{Hence, B's share} = \text{Rs. } \left(\frac{960}{4} \right) = \text{Rs. } 240.$$

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One-third of Rahul's savings in National Savings Certificate is equal to one-half of his savings in Public Provident Fund. If he has Rs. 1,50,000 as total savings, how much has he saved in Public Provident Fund ?

A. Rs. 30,000

B. Rs. 50,000

C. Rs. 60,000

D. Rs. 90,000

Answer & Explanation

Answer: Option **C**

Explanation:

Let savings in N.S.C and P.P.F. be Rs. x and Rs. $(150000 - x)$ respectively. Then,

$$\frac{1}{3} x = \frac{1}{2} (150000 - x)$$

$$\frac{1}{3} x = \frac{1}{2} (150000 - x)$$

$$\Rightarrow \frac{5x}{6} = 75000$$

$$\Rightarrow x = \frac{75000 \times 6}{5} = 90000$$

∴ Savings in Public Provident Fund = Rs. $(150000 - 90000) = \text{Rs. } 60000$

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A fires 5 shots to B's 3 but A kills only once in 3 shots while B kills once in 2 shots. When B has missed 27 times, A has killed:

A. 30 birds

B. 60 birds

C. 72 birds

D. 90 birds

Answer & Explanation

Answer: Option **A**

Explanation:

Let the total number of shots be x . Then,

$$\text{Shots fired by A} = \frac{5}{8}x$$

$$\text{Shots fired by B} = \frac{3}{8}x$$

$$\text{Killing shots by A} = \frac{1}{3} \text{ of } \frac{5}{8}x = \frac{5}{24}x$$

$$\text{Shots missed by B} = \frac{1}{2} \text{ of } \frac{3}{8}x = \frac{3}{16}x$$

$$\therefore \frac{3x}{16} = 27 \text{ or } x = \left(\frac{27 \times 16}{3} \right) = 144.$$

$$\text{Birds killed by A} = \frac{5x}{24} = \left(\frac{5}{24} \times 144 \right) = 30.$$

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Eight people are planning to share equally the cost of a rental car. If one person withdraws from the arrangement and the others share equally the entire cost of the car, then the share of each of the remaining persons increased by:

A. $\frac{1}{7}$

B. $\frac{1}{8}$

C. $\frac{1}{9}$

D. $\frac{7}{8}$

Answer & Explanation

Answer: Option **A**

Explanation:

$$\text{Original share of 1 person} = \frac{1}{8}$$

$$\text{New share of 1 person} = \frac{1}{7}$$

$$\text{Increase} = \left(\frac{1}{7} - \frac{1}{8} \right) = \frac{1}{56}$$

$$\therefore \text{Required fraction} = \frac{(1/56)}{(1/8)} = \left(\frac{1}{56} \times \frac{8}{1} \right) = \frac{1}{7}$$

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To fill a tank, 25 buckets of water is required. How many buckets of water will be required to fill the same tank if the capacity of the bucket is reduced to two-fifth of its present ?

A. 10

B. 35

C. 62.5

D. Cannot be determined

None of these

Answer & Explanation

Answer: Option C

Explanation:

Let the capacity of 1 bucket = x .

Then, the capacity of tank = $25x$.

New capacity of bucket = $\frac{5}{2}x$

\therefore Required number of buckets = $\frac{25x}{(2x/5)}$

$$\left(25x \times \frac{5}{2x} \right)$$
$$\frac{125}{2}$$

= 62.5

In a regular week, there are 5 working days and for each day, the working hours are 8. A man gets Rs. 2.40 per hour for regular work and Rs. 3.20 per hours for overtime. If he earns Rs. 432 in 4 weeks, then how many hours does he work for ?

A. 160

B. 175

C. 180

D. 195

Answer & Explanation

Answer: Option B

Explanation:

Suppose the man works overtime for x hours.

Now, working hours in 4 weeks = $(5 \times 8 \times 4) = 160$.

$$\therefore 160 \times 2.40 + x \times 3.20 = 432$$

$$\Rightarrow 3.20x = 432 - 384 = 48$$

$$\Rightarrow x = 15.$$

Solving (i) and (ii) we get: $x = 26$, $y = 22$.

∴ The required answer = 26.

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$$\frac{(469 + 174)^2 - (469 - 174)^2}{? (469 \times 174)} =$$

A. 2

B. 4

C. 295

D. 643

Answer & Explanation

Answer: Option B

Explanation:

Given exp.
$$= \frac{(a + b)^2 - (a - b)^2}{ab}$$

$$\frac{4ab}{ab}$$

4 (where $a = 469$, $b = 174$.)

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David gets on the elevator at the 11th floor of a building and rides up at the rate of 57 floors per minute. At the same time, Albert gets on an elevator at the 51st floor of the same building and rides down at the rate of 63 floors per minute. If they continue travelling at these rates, then at which floor will their paths cross ?

A. 19

B. 28

C. 30

D. 37

Answer & Explanation

Answer: Option C

Explanation:

Suppose their paths cross after x minutes.

$$\text{Then, } 11 + 57x = 51 - 63x \Leftrightarrow 120x = 40$$

$$x = \frac{1}{3}$$

Number of floors covered by David in $(1/3)$ min. = $\left(\frac{1}{3} \times 57\right) = 19$.

So, their paths cross at $(11 + 19)$ i.e., 30th floor.

Ratio and Proportion

Formulas

Ratio:

The ratio of two quantities a and b in the same units, is the fraction $\frac{a}{b}$ and we write it as $a : b$.

In the ratio $a : b$, we call a as the first term or **antecedent** and b , the second term or **consequent**.

Eg. The ratio 5 : 9 represents $\frac{5}{9}$ with antecedent = 5, consequent = 9.

Rule: The multiplication or division of each term of a ratio by the same non-zero number does not affect the ratio.

Eg. $4 : 5 = 8 : 10 = 12 : 15$. Also, $4 : 6 = 2 : 3$.

Proportion:

The equality of two ratios is called proportion.

If $a : b = c : d$, we write $a : b :: c : d$ and we say that a, b, c, d are in proportion.

Here a and d are called **extremes**, while b and c are called **mean terms**.

Product of means = Product of extremes.

Thus, $a : b :: c : d \Leftrightarrow (b \times c) = (a \times d)$.

Fourth Proportional:

If $a : b = c : d$, then d is called the fourth proportional to a, b, c .

Third Proportional:

$a : b = c : d$, then c is called the third proportion to a and b .

Mean Proportional:

$$\Rightarrow \frac{A}{B} = \frac{3}{2}$$

$$\Rightarrow A : B = 3 : 2.$$

$$\therefore \text{B's share} = \text{Rs.} \left(1210 \times \frac{2}{5} \right) = \text{Rs.} 484.$$

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Two numbers are respectively 20% and 50% more than a third number. The ratio of the two numbers is:

A. 2 : 5

B. 3 : 5

C. 4 : 5

D. 6 : 7

Answer & Explanation

Answer: Option C

Explanation:

Let the third number be x .

$$\text{Then, first number} = 120\% \text{ of } x = \frac{120x}{100} = \frac{6x}{5}$$

$$\text{Second number} = 150\% \text{ of } x = \frac{150x}{100} = \frac{3x}{2}$$

$$\therefore \text{Ratio of first two numbers} = \left(\frac{6x}{5} : \frac{3x}{2} \right) = 12x : 15x = 4 : 5.$$

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A sum of money is to be distributed among A, B, C, D in the proportion of 5 : 2 : 4 : 3. If C gets Rs. 1000 more than D, what is B's share?

A. Rs. 500

B. Rs. 1500

C. Rs. 2000

D. None of these

Answer & Explanation

Answer: Option C

Explanation:

Let the shares of A, B, C and D be Rs. $5x$, Rs. $2x$, Rs. $4x$ and Rs. $3x$ respectively.

Then, $4x - 3x = 1000$

$\Rightarrow x = 1000.$

\therefore B's share = Rs. $2x = \text{Rs. } (2 \times 1000) = \text{Rs. } 2000.$

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Seats for Mathematics, Physics and Biology in a school are in the ratio 5 : 7 : 8. There is a proposal to increase these seats by 40%, 50% and 75% respectively. What will be the ratio of increased seats?

A. 2 : 3 : 4

B. 6 : 7 : 8

C. 6 : 8 : 9

D. None of these

Answer & Explanation

Answer: Option **A**

Explanation:

Originally, let the number of seats for Mathematics, Physics and Biology be $5x$, $7x$ and $8x$ respectively.

Number of increased seats are (140% of $5x$), (150% of $7x$) and (175% of $8x$).

$\Rightarrow \left(\frac{140}{100} \times 5x \right), \left(\frac{150}{100} \times 7x \right)$ and $\left(\frac{175}{100} \times 8x \right)$

$\Rightarrow 7x, \frac{21x}{2}$ and $14x.$

\therefore The required ratio = $7x : \frac{21x}{2} : 14x$

$\Rightarrow 14x : 21x : 28x$

$\Rightarrow 2 : 3 : 4.$

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In a mixture 60 litres, the ratio of milk and water 2 : 1. If this ratio is to be 1 : 2, then the quantity of water to be further added is:

A. 20 litres

B. 30 litres

C. 40 litres

D. 60 litres

Answer & Explanation

Answer: Option **D**

Explanation:

Quantity of milk $\left(= \frac{2}{60} \times 3 \right)$ litres = 40 litres.

Quantity of water in it = (60 - 40) litres = 20 litres.

New ratio = 1 : 2

Let quantity of water to be added further be x litres.

Then, milk : water = $\left(\frac{40}{20 + x} \right)$.

Now, $\left(\frac{40}{20 + x} \right) = \frac{1}{2}$

$$\Rightarrow 20 + x = 80$$

$$\Rightarrow x = 60.$$

∴ Quantity of water to be added = 60 litres.

The ratio of the number of boys and girls in a college is 7 : 8. If the percentage increase in the number of boys and girls be 20% and 10% respectively, what will be the new ratio?

A. 8 : 9

B. 17 : 18

C. 21 : 22

D. Cannot be determined

Answer & Explanation

Answer: Option **C**

Explanation:

Originally, let the number of boys and girls in the college be $7x$ and $8x$ respectively.

Their increased number is (120% of $7x$) and (110% of $8x$).

$$\Rightarrow \left(\frac{120}{100} \times 7x \right) \text{ and } \left(\frac{110}{100} \times 8x \right)$$

$$\Rightarrow \frac{42x}{5} \text{ and } \frac{44x}{5}$$

∴ The required ratio = $\left(\frac{42x}{5} : \frac{44x}{5} \right) = 21 : 22.$

A. 20

B. 30

C. 48

D. 58

Answer & Explanation

Answer: Option B

Explanation:

Let the three parts be A, B, C. Then,

$$A : B = 2 : 3 \text{ and } B : C = 5 : 8 = \left(5 \times \frac{3}{5} \right) : \left(8 \times \frac{3}{5} \right) = 3 : \frac{24}{5}$$

$$\Rightarrow A : B : C = 2 : 3 : \frac{24}{5} = 10 : 15 : 24$$

$$\Rightarrow B = \left(\frac{15}{98 \times 49} \right) = 30.$$

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10. If Rs. 782 be divided into three parts, proportional to $\frac{1}{2} : \frac{2}{3} : \frac{3}{4}$, then the first part is:

A. Rs. 182

B. Rs. 190

C. Rs. 196

D. Rs. 204

Answer & Explanation

Answer: Option D

Explanation:

$$\text{Given ratio} = \frac{1}{2} : \frac{2}{3} : \frac{3}{4} = 6 : 8 : 9.$$

$$\therefore \text{1st part} = \text{Rs.} \left(782 \times \frac{6}{23} \right) = \text{Rs.} 204$$

The salaries A, B, C are in the ratio 2 : 3 : 5. If the increments of 15%, 10% and 20% are allowed respectively in their salaries, then what will be new ratio of their salaries?

A. 3 : 3 : 10

B. 10 : 11 : 20

C. 23 : 33 : 60

D. Cannot be determined

Answer & Explanation

Answer: Option C

Explanation:

Let $A = 2k$, $B = 3k$ and $C = 5k$.

$$\begin{aligned} \text{A's new salary} &= \frac{115}{100} \text{ of } 2k = \left(\frac{115}{100} \times 2k \right) = \frac{23k}{10} \\ \text{B's new salary} &= \frac{110}{100} \text{ of } 3k = \left(\frac{110}{100} \times 3k \right) = \frac{33k}{10} \\ \text{C's new salary} &= \frac{120}{100} \text{ of } 5k = \left(\frac{120}{100} \times 5k \right) = 6k \\ \therefore \text{New ratio} &\left(\frac{23k}{10} : \frac{33k}{10} : 6k \right) = 23 : 33 : 60 \end{aligned}$$

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If 40% of a number is equal to two-third of another number, what is the ratio of first number to the second number?

A. 2 : 5

B. 3 : 7

C. 5 : 3

D. 7 : 3

Answer & Explanation

Answer: Option **C**

Explanation:

Let 40% of $A = \frac{2}{3} B$

$$\text{Then, } \frac{40A}{100} = \frac{2B}{3}$$

$$\Rightarrow \frac{2A}{5} = \frac{2B}{3}$$

$$\Rightarrow \frac{A}{B} = \left(\frac{2}{3} \times \frac{5}{2} \right) = \frac{5}{3}$$

$\therefore A : B = 5 : 3$.

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The fourth proportional to 5, 8, 15 is:

A. 18

B. 24

C. 19

D. 20

Answer & Explanation

Answer: Option B

Explanation:

Let the fourth proportional to 5, 8, 15 be x.

Then, $5 : 8 :: 15 : x$

$$\Rightarrow 5x = (8 \times 15)$$

$$x = \frac{(8 \times 15)}{5} = 24.$$

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Two number are in the ratio 3 : 5. If 9 is subtracted from each, the new numbers are in the ratio 12 : 23. The smaller number is:

A. 27

B. 33

C. 49

D. 55

Answer & Explanation

Answer: Option B

Explanation:

Let the numbers be 3x and 5x.

$$\text{Then, } \frac{3x - 9}{5x - 9} = \frac{12}{23}$$

$$\Rightarrow 23(3x - 9) = 12(5x - 9)$$

$$\Rightarrow 9x = 99$$

$$\Rightarrow x = 11.$$

∴ The smaller number = $(3 \times 11) = 33$.

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In a bag, there are coins of 25 p, 10 p and 5 p in the ratio of 1 : 2 : 3. If there is Rs. 30 in all, how many 5 p coins are there?

A. 50

B. 100

C. 150

D. 200

Answer & Explanation

Answer: Option C

Explanation:

Let the number of 25 p, 10 p and 5 p coins be x , $2x$, $3x$ respectively.

$$\text{Then, sum of their values} = \text{Rs. } \left(\frac{25x}{100} + \frac{10 \times 2x}{100} + \frac{5 \times 3x}{100} \right) = \text{Rs. } \frac{60x}{100}$$
$$\therefore \frac{60x}{100} = 30 \Leftrightarrow x = \frac{30 \times 100}{60} = 50.$$

Hence, the number of 5 p coins = $(3 \times 50) = 150$.

Boats and Streams

Formulas

A boat can travel with a speed of 13 km/hr in still water. If the speed of the stream is 4 km/hr, find the time taken by the boat to go 68 km downstream.

A. 2 hours

B. 3 hours

C. 4 hours

D. 5 hours

Answer & Explanation

Answer: Option C

Explanation:

Speed downstream = $(13 + 4)$ km/hr = 17 km/hr.

$$\text{Time taken to travel 68 km downstream} = \left(\frac{68}{17} \right) \text{ hrs} = 4 \text{ hrs.}$$

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A man's speed with the current is 15 km/hr and the speed of the current is 2.5 km/hr. The man's speed against the current is:

A. 8.5 km/hr

B. 9 km/hr

C. 10 km/hr

D. 12.5 km/hr

Answer & Explanation

Answer: Option C

Explanation:

Man's rate in still water = $(15 - 2.5)$ km/hr = 12.5 km/hr.

Man's rate against the current = $(12.5 - 2.5)$ km/hr = 10 km/hr.

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A boat running upstream takes 8 hours 48 minutes to cover a certain distance, while it takes 4 hours to cover the same distance running downstream. What is the ratio between the speed of the boat and speed of the water current respectively?

A. 2 : 1

B. 3 : 2

C. 8 : 3

D. Cannot be determined

None of these

Answer & Explanation

Answer: Option C

Explanation:

Let the man's rate upstream be x kmph and that downstream be y kmph.

Then, distance covered upstream in 8 hrs 48 min = Distance covered downstream in 4 hrs.

$$\Rightarrow \left(x \times \frac{4}{85} \right) = (y \times 4)$$

$$\Rightarrow \frac{44}{5}x = 4y$$

$$\Rightarrow y = \frac{11}{5}x.$$

$$\therefore \text{Required ratio} = \left(\frac{y+x}{2} \right) : \left(\frac{y-x}{2} \right)$$

$$= \left(\frac{16x}{5} \times \frac{1}{2} \right) : \left(\frac{6x}{5} \times \frac{1}{2} \right)$$

$$\frac{8}{5} : \frac{3}{5}$$

8 : 3.

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A motorboat, whose speed in 15 km/hr in still water goes 30 km downstream and comes back in a total of 4 hours 30 minutes. The speed of the stream (in km/hr) is:

A. 4

B. 5

C. 6

D. 10

Answer & Explanation

Answer: Option B

Explanation:

Let the speed of the stream be x km/hr. Then,

Speed downstream = $(15 + x)$ km/hr,

Speed upstream = $(15 - x)$ km/hr.

$$\therefore \frac{30}{(15 + x)} + \frac{30}{(15 - x)} = 4\frac{1}{2}$$

$$\Rightarrow \frac{90}{225 - x^2} = \frac{9}{2}$$

$$\Rightarrow 9x^2 = 225$$

$$\Rightarrow x^2 = 25$$

$$\Rightarrow x = 5 \text{ km/hr.}$$

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In one hour, a boat goes 11 km/hr along the stream and 5 km/hr against the stream. The speed of the boat in still water (in km/hr) is:

A. 3 km/hr

B. 5 km/hr

C. 8 km/hr

D. 9 km/hr

Answer & Explanation

Answer: Option C

Explanation:

Speed in still water = $\frac{1}{2}(11 + 5)$ kmph = 8 kmph.

A boat running downstream covers a distance of 16 km in 2 hours while for covering the same

$$(10 - x)(10 + x) = 60$$

$$\Rightarrow 72x \times 60 = 90(100 - x^2)$$

$$\Rightarrow x^2 + 48x - 100 = 0$$

$$\Rightarrow (x + 50)(x - 2) = 0$$

$$\Rightarrow x = 2 \text{ mph.}$$

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A man can row at 5 kmph in still water. If the velocity of current is 1 kmph and it takes him 1 hour to row to a place and come back, how far is the place?

A. 2.4 km

B. 2.5 km

C. 3 km

D. 3.6 km

Answer & Explanation

Answer: Option **A**

Explanation:

Speed downstream = $(5 + 1)$ kmph = 6 kmph.

Speed upstream = $(5 - 1)$ kmph = 4 kmph.

Let the required distance be x km.

$$\text{Then, } \frac{x}{6} + \frac{x}{4} = 1$$

$$\Rightarrow 2x + 3x = 12$$

$$\Rightarrow 5x = 12$$

$$\Rightarrow x = 2.4 \text{ km.}$$

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10.

A boat covers a certain distance downstream in 1 hour, while it comes back in $1\frac{1}{4}$ hours. If the speed of the stream be 3 kmph, what is the speed of the boat in still water?

A. 12 kmph

B. 13 kmph

C. 14 kmph

D. 15 kmph

None of these

Answer & Explanation

Answer: Option D

Explanation:

Let the speed of the boat in still water be x kmph. Then,

Speed downstream = $(x + 3)$ kmph,

Speed upstream = $(x - 3)$ kmph.

$$\therefore (x + 3) \times 1 = (x - 3) \times \frac{3}{2}$$

$$\Rightarrow 2x + 6 = 3x - 9$$

$$\Rightarrow x = 15 \text{ kmph.}$$

Races and Games

Formulas

Races: A contest of speed in running, riding, driving, sailing or rowing is called a race.

Race Course: The ground or path on which contests are made is called a race course.

Starting Point: The point from which a race begins is known as a starting point.

Winning Point or Goal: The point set to bound a race is called a winning point or a goal.

Winner: The person who first reaches the winning point is called a winner.

Dead Heat Race: If all the persons contesting a race reach the goal exactly at the same time, the race is said to be dead heat race.

Start: Suppose A and B are two contestants in a race. If before the start of the race, A is at the starting point and B is ahead of A by 12 metres, then we say that 'A gives B, a start of 12 metres'.

To cover a race of 100 metres in this case, A will have to cover 100 metres while B will have to cover only $(100 - 12) = 88$ metres.

In a 100 race, 'A can give B 12 m' or 'A can give B a start of 12 m' or 'A beats B by 12 m' means that while A runs 100 m, B runs $(100 - 12) = 88$ m.

Games: 'A game of 100, means that the person among the contestants who scores 100 points first is the winner'.

∴ Time taken by B to cover 92 m = $(72 + 8) = 80$ sec.

∴ B's speed = $\left(\frac{92}{80} \times \frac{18}{5}\right)$ kmph = 4.14 kmph.

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In a 500 m race, the ratio of the speeds of two contestants A and B is 3 : 4. A has a start of 140 m. Then, A wins by:

A. 60 m

B. 40 m

C. 20 m

D. 10 m

Answer & Explanation

Answer: Option **C**

Explanation:

To reach the winning post A will have to cover a distance of $(500 - 140)$ m, *i.e.*, 360 m.

While A covers 3 m, B covers 4 m.

While A covers 360 m, B covers $\left(\frac{4}{3} \times 360\right)$ m = 480 m.

Thus, when A reaches the winning post, B covers 480 m and therefore remains 20 m behind.

∴ A wins by 20 m.

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In a 100 m race, A beats B by 10 m and C by 13 m. In a race of 180 m, B will beat C by:

A. 5.4 m

B. 4.5 m

C. 5 m

D. 6 m

Answer & Explanation

Answer: Option **D**

Explanation:

A : B = 100 : 90.

A : C = 100 : 87.

$$\frac{B}{C} = \frac{B}{A} \times \frac{A}{C} = 100 \times \frac{90}{87} = \frac{30}{29}.$$

When B runs 30 m, C runs 29 m.

$$\text{When B runs 180 m, C runs } \left(\frac{29}{30} \times 180 \right) \text{ m} = 174 \text{ m.}$$

∴ B beats C by (180 - 174) m = 6 m.

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At a game of billiards, A can give B 15 points in 60 and A can give C to 20 points in 60. How many points can B give C in a game of 90?

A. 30 points

B. 20 points

C. 10 points

D. 12 points

Answer & Explanation

Answer: Option C

Explanation:

A : B = 60 : 45.

A : C = 60 : 40.

$$\therefore \frac{B}{C} = \left(\frac{B}{A} \times \frac{A}{C} \right) = \left(\frac{45}{60} \times \frac{60}{40} \right) = \frac{45}{40} = \frac{90}{80} = 90 : 80.$$

∴ B can give C 10 points in a game of 90

In a race of 200 m, A can beat B by 31 m and C by 18 m. In a race of 350 m, C will beat B by:

A. 22.75 m

B. 25 m

C. 19.5 m

D. $\frac{4}{7}$ m

Answer & Explanation

Answer: Option B

Explanation:

Explanation:

$$A : B = 100 : 80.$$

$$A : C = 100 : 72.$$

$$\therefore \frac{B}{C} = \left(\frac{B}{A} \times \frac{A}{C} \right) = \left(\frac{80}{100} \times \frac{100}{72} \right) = \frac{10}{9} = \frac{100}{90} = 100 : 90.$$

∴ B can give C 10 points.

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In a 200 metres race A beats B by 35 m or 7 seconds. A's time over the course is:

A. 40 sec

B. 47 sec

C. 33 sec

D. None of these

Answer & Explanation

Answer: Option **C**

Explanation:

B runs 35 m in 7 sec.

$$\therefore \text{B covers 200 m in } \left(\frac{7}{35} \times 200 \right) = 40 \text{ sec.}$$

B's time over the course = 40 sec.

∴ A's time over the course (40 - 7) sec = 33 sec.

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A can run 22.5 m while B runs 25 m. In a kilometre race B beats A by:

1

A. 100 m

B.

111 $\bar{9}$ m

C. 25 m

D.

50 m

Answer & Explanation

Answer: Option **A**

Explanation:

When B runs 25 m, A runs $\frac{45}{2}$ m.

When B runs 1000 m, A runs $\left(\frac{45}{2} \times \frac{1}{25} \times 1000\right)_m = 900$ m.

∴ B beats A by 100 m.

In a 300 m race A beats B by 22.5 m or 6 seconds. B's time over the course is:

A. 86 sec

B. 80 sec

C. 76 sec

D. None of these

Answer & Explanation

Answer: Option B

Explanation:

B runs $\frac{45}{2}$ m in 6 sec.

∴ B covers 300 m in $\left(6 \times \frac{2}{45} \times 300\right)_{\text{sec}} = 80$ sec.

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12.

A runs $1\frac{2}{3}$ times as fast as B. If A gives B a start of 80 m, how far must the winning post be so that A and B might reach it at the same time?

A. 200 m

B. 300 m

C. 270 m

D. 160 m

Answer & Explanation

Answer: Option A

Explanation:

Ratio of the speeds of A and B = $\frac{5}{3} : 1 = 5 : 3$.

Thus, in race of 5 m, A gains 2 m over B.

2 m are gained by A in a race of 5 m.

80 m will be gained by A in race of $\left(\frac{5}{2} \times 80\right)_m = 200$ m.

∴ Winning post is 200 m away from the starting point.

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In a 100 m race, A can beat B by 25 m and B can beat C by 4 m. In the same race, A can beat C by:

A. 21 m

B. 26 m

C. 28 m

D. 29 m

Answer & Explanation

Answer: Option **C**

Explanation:

A : B = 100 : 75

B : C = 100 : 96.

$$\therefore A : C = \left(\frac{A}{B} \times \frac{B}{C} \right) = \left(\frac{100}{75} \times \frac{100}{96} \right) = \frac{100}{72} = 100 : 72.$$

∴ A beats C by $(100 - 72)$ m = 28 m.

True Discount

Formulas

IMPORTANT CONCEPTS

Suppose a man has to pay Rs. 156 after 4 years and the rate of interest is 14% per annum. Clearly, Rs. 100 at 14% will amount to Rs. 156 in 4 years. So, the payment of Rs. now will clear off the debt of Rs. 156 due 4 years hence. We say that:

Sum due = Rs. 156 due 4 years hence;

Present Worth (P.W.) = Rs. 100;

True Discount (T.D.) = Rs. $(156 - 100)$ = Rs. 56 = (Sum due) - (P.W.)

We define: **T.D. = Interest on P.W.;** **Amount = (P.W.) + (T.D.)**

Interest is reckoned on P.W. and true discount is reckoned on the amount.

$$\begin{aligned} \text{P.W. of Rs. 12,880 due 8 months hence} &= \text{Rs. } \left[\frac{12880 \times 100}{100 + \left(18 \times \frac{8}{12}\right)} \right] \\ &= \text{Rs. } \left(\frac{12880 \times 100}{112} \right) \\ &= \text{Rs. 11500.} \end{aligned}$$

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If Rs. 10 be allowed as true discount on a bill of Rs. 110 due at the end of a certain time, then the discount allowed on the same sum due at the end of double the time is:

- | | |
|------------------|---------------------|
| A. Rs. 20 | B. Rs. 21.81 |
| C. Rs. 22 | D. Rs. 18.33 |

Answer & Explanation

Answer: Option **D**

Explanation:

S.I. on Rs. (110 - 10) for a certain time = Rs. 10.

S.I. on Rs. 100 for double the time = Rs. 20.

T.D. on Rs. 120 = Rs. (120 - 100) = Rs. 20.

T.D. on Rs. 110 = Rs. $\left(\frac{20}{120} \times 110 \right) = \text{Rs. 18.33}$

Goods were bought for Rs. 600 and sold the same for Rs. 688.50 at a credit of 9 months and thus gaining 2% The rate of interest per annum is:

- | | |
|-----------------------------|-----------------------------|
| A. $16\frac{2}{3}$ % | B. $14\frac{1}{2}$ % |
| C. $13\frac{1}{3}$ % | D. 15% |

Answer & Explanation

Answer: Option **A**

Explanation:

S.P. = 102% of Rs. 600 = $\left(\frac{102}{100} \times 600 \right) = \text{Rs. 612.}$

Now, P.W. = Rs. 612 and sum = Rs. 688.50.

$$\therefore \text{T.D.} = \text{Rs. } (688.50 - 612) = \text{Rs. } 76.50.$$

Thus, S.I. on Rs. 612 for 9 months is Rs. 76.50.

$$\therefore \text{Rate} = \left(\frac{100 \times 76.50}{612 \times \frac{3}{4}} \right) \% = 16\frac{2}{3}\%$$

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The true discount on a bill due 9 months hence at 16% per annum is Rs. 189. The amount of the bill is:

A. Rs. 1386

B. Rs. 1764

C. Rs. 1575

D. Rs. 2268

Answer & Explanation

Answer: Option **B**

Explanation:

Let P.W. be Rs. x .

Then, S.I. on Rs. x at 16% for 9 months = Rs. 189.

$$\therefore x \times 16 \times \frac{9}{12} \times \frac{1}{100} = 189 \text{ or } x = 1575.$$

$$\therefore \text{P.W.} = \text{Rs. } 1575.$$

$$\therefore \text{Sum due} = \text{P.W.} + \text{T.D.} = \text{Rs. } (1575 + 189) = \text{Rs. } 1764.$$

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A man buys a watch for Rs. 1950 in cash and sells it for Rs. 2200 at a credit of 1 year. If the rate of interest is 10% per annum, the man:

A. gains Rs. 55

B. gains Rs. 50

C. loses Rs. 30

D. gains Rs. 30

Answer & Explanation

Answer: Option **B**

Explanation:

S.P. = P.W. of Rs. 2200 due 1 year hence

$$= \text{Rs.} \left[\frac{2200 \times 100}{100 + (10 \times 1)} \right]$$
$$= \text{Rs. } 2000.$$

∴ Gain = Rs. (2000 - 1950) = Rs. 50.

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The true discount on Rs. 1760 due after a certain time at 12% per annum is Rs. 160. The time after which it is due is:

A. 6 months

B. 8 months

C. 9 months

D. 10 months

Answer & Explanation

Answer: Option **D**

Explanation:

P.W. = Rs. (1760 - 160) = Rs. 1600.

∴ S.I. on Rs. 1600 at 12% is Rs. 160.

$$\therefore \text{Time} = \left(\frac{100 \times 160}{1600 \times 12} \right) = \frac{5}{6} \text{ years} = \left(\frac{5}{6} \times 12 \right) \text{ months} = 10 \text{ months.}$$

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10. The present worth of Rs. 2310 due $2\frac{1}{2}$ years hence, the rate of interest being 15% per annum, is:

A. Rs. 1750

B. Rs. 1680

C. Rs. 1840

D. Rs. 1443.75

Answer & Explanation

Answer: Option **B**

A. Rs. 768

B. Rs. 968

C. Rs. 1960

D. Rs. 2400

Answer & Explanation

Answer: Option A

Explanation:

$$\text{P.W.} = \frac{100 \times \text{T.D.}}{\text{R} \times \text{T}} = \frac{100 \times 168}{14 \times 2} = 600.$$

$$\therefore \text{Sum} = (\text{P.W.} + \text{T.D.}) = \text{Rs. } (600 + 168) = \text{Rs. } 768.$$