

Book For
Maharashtra Public Service Commission



MPSC Police Constable Mathematics Sample Paper



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(1) 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 : [B]

Explanation:

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

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

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

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(2) 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 : [C]

Explanation:

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

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

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

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

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

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

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

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

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(3) 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 : [D]

Explanation:

$$\text{(P + Q + R)'s 1 hour's work} = \frac{1}{8} + \frac{1}{10} + \frac{1}{12} = \frac{37}{240}$$

$$\text{Work done by P, Q and R in 2 hours} = \left(\frac{8}{120} + \frac{37}{120} \right) \times 2 = \frac{120}{60}$$

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

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

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

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

So, the work will be finished approximately 2 hours after 11 A.M., i.e., around 1 P.M.

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(4) 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 : [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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(5) X and Y can do a piece of work in 20 days and 12 days respectively. X started the work alone and then after 4 days Y joined him till the completion of the work. How long did the work last?

[A] 6 days

[B] 10 days

[C] 15 days

[D] 20 days

Answer : [B]

Explanation:

$$\text{Work done by X in 4 days} = \left(\frac{1}{20} \times 4 \right) = \frac{1}{5}$$

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

$$(X + Y)\text{'s 1 day's work} = \left(\frac{1}{20} + \frac{1}{12} \right) = \frac{8}{60} = \frac{2}{15}$$

Now, $\frac{2}{15}$ work is done by X and Y in 1 day.

So, $\frac{4}{5}$ work will be done by X and Y in $\left(\frac{15}{2} \times \frac{4}{5}\right) = 6$ days.

Hence, total time taken = (6 + 4) days = 10 days.

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(6) There is 60% increase in an amount in 6 years at simple interest. What will be the compound interest of Rs. 12,000 after 3 years at the same rate?

[A] Rs. 2160

[B] Rs. 3120

[C] Rs. 3972

[D] Rs. 6240

[E] None of these

Answer : [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.

$$\begin{aligned}\therefore \text{C.I.} &= \text{Rs.} \left[12000 \times \left\{ \left(1 + \frac{10}{100} \right)^3 - 1 \right\} \right] \\ &= \text{Rs.} \left(12000 \times \frac{331}{1000} \right) \\ &= 3972.\end{aligned}$$

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(7) A bank offers 5% compound interest calculated on half-yearly basis. A customer deposits Rs. 1600 each on 1st January and 1st July of a year. At the end of the year, the amount he would have gained by way of interest is:

[A] Rs. 120

[B] Rs. 121

[C] Rs. 122

[D] Rs. 123

Answer : [B]

Explanation:

$$\begin{aligned}\text{Amount} &= \text{Rs.} \left[1600 \times \left(1 + \frac{5}{2 \times 100} \right)^2 + 1600 \times \left(1 + \frac{5}{2 \times 100} \right) \right] \\ &= \text{Rs.} \left[1600 \times \frac{41}{40} \times \frac{41}{40} + 1600 \times \frac{41}{40} \right] \\ &= \text{Rs.} \left[1600 \times \frac{41}{40} \left(\frac{41}{40} + 1 \right) \right] \\ &= \text{Rs.} \left[\frac{1600 \times 41 \times 81}{40 \times 40} \right] \\ &= \text{Rs.} 3321.\end{aligned}$$

$$\therefore \text{C.I.} = \text{Rs.} (3321 - 3200) = \text{Rs.} 121$$

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(8) Albert invested an amount of Rs. 8000 in a fixed deposit scheme for 2 years at compound interest rate 5 p.c.p.a. How much amount will Albert get on maturity of the fixed deposit?

- [A] Rs. 8600
 [B] Rs. 8620
 [C] Rs. 8820
 [D] None of these

Answer : [C]

Explanation:

$$\begin{aligned} \text{Amount} &= \text{Rs.} \left[8000 \times \left(1 + \frac{5}{100} \right)^2 \right] \\ &= \text{Rs.} \left(8000 \times \frac{21}{20} \times \frac{21}{20} \right) \\ &= \text{Rs.} 8820. \end{aligned}$$

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(9) If the simple interest on a sum of money for 2 years at 5% per annum is Rs. 50, what is the compound interest on the same at the same rate and for the same time?

- [A] Rs. 51.25
 [B] Rs. 52
 [C] Rs. 54.25
 [D] Rs. 60

Answer : [A]

Explanation:

$$\text{Sum} = \text{Rs.} \left(\frac{50 \times 100}{2 \times 5} \right) = \text{Rs.} 500.$$

$$\begin{aligned} \text{Amount} &= \text{Rs.} \left[500 \times \left(1 + \frac{5}{100} \right)^2 \right] \\ &= \text{Rs.} \left(500 \times \frac{21}{20} \times \frac{21}{20} \right) \\ &= \text{Rs.} 551.25 \end{aligned}$$

$$\therefore \text{C.I.} = \text{Rs.} (551.25 - 500) = \text{Rs.} 51.25$$

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(10) The compound interest on a certain sum for 2 years at 10% per annum is Rs. 525. The simple interest on the same sum for double the time at half the rate percent per annum is:

- [A] Rs. 400
 [B] Rs. 500
 [C] Rs. 600
 [D] Rs. 800

Answer : [B]

Explanation:

Let the sum be Rs. P.

$$\text{Then,} \left[P \left(1 + \frac{10}{100} \right)^2 - P \right] = 525$$

$$\Rightarrow P \left[\left(\frac{11}{10} \right)^2 - 1 \right] = 525$$

$$\Rightarrow P = \left(\frac{525 \times 100}{21} \right) = 2500.$$

$$\therefore \text{Sum} = \text{Rs.} 2500.$$

$$\text{So, S.I.} = \text{Rs.} \left(\frac{2500 \times 5 \times 4}{100} \right) = \text{Rs. } 500$$

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(11) 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
[E] None of these

Answer : [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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(12) 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 : [B]

Explanation:

$$\text{Area of the park} = (60 \times 40) \text{ m}^2 = 2400 \text{ m}^2.$$

$$\text{Area of the lawn} = 2109 \text{ m}^2.$$

$$\therefore \text{Area of the crossroads} = (2400 - 2109) \text{ m}^2 = 291 \text{ m}^2.$$

Let the width of the road be x metres. Then,

$$60x + 40x - x^2 = 291$$

$$\Rightarrow x^2 - 100x + 291 = 0$$

$$\Rightarrow (x - 97)(x - 3) = 0$$

$$\Rightarrow x = 3.$$

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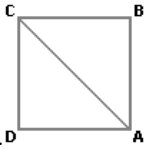
(13) A man walked diagonally across a square lot. Approximately, what was the percent saved by not walking along the edges?

- [A] 20
[B] 24
[C] 30
[D] 33

Answer : [C]

Explanation:

Let the side of the square(ABCD) be x metres.



Then, $AB + BC = 2x$ metres.

$AC = 2x = (1.41x)$ m.

Saving on $2x$ metres = $(0.59x)$ m.

Saving % = $\left(\frac{0.59x}{2x} \times 100\right)\%$ = 30% (approx.)

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(14) 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 : [B]

Explanation:

$$l^2 + b^2 = 41.$$

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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(15) 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 : [C]

Explanation:

$$\text{Area to be plastered} = [2(l + b) \times h] + (l \times b)$$

$$= \{[2(25 + 12) \times 6] + (25 \times 12)\} \text{ m}^2$$

$$= (444 + 300) \text{ m}^2$$

$$= 744 \text{ m}^2.$$

$$\therefore \text{Cost of plastering} = \text{Rs.} \left(744 \times \frac{75}{100}\right) = \text{Rs.} 558.$$

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(16) 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]
 $1\frac{13}{17}$ hours

[B]
 $2\frac{8}{11}$ hours

[C]
 $3\frac{9}{17}$ hours

[D]
 $4\frac{1}{2}$ hours

Answer : [C]

Explanation:

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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(17) A tank is filled by three pipes with uniform flow. The first two pipes operating simultaneously fill the tank in the same time during which the tank is filled by the third pipe alone. The second pipe fills the tank 5 hours faster than the first pipe and 4 hours slower than the third pipe. The time required by the first pipe is:

[A] 6 hours

[B] 10 hours

[C] 15 hours

[D] 30 hours

Answer : [C]

Explanation:

Suppose, first pipe alone takes x hours to fill the tank .

Then, second and third pipes will take $(x - 5)$ and $(x - 9)$ hours respectively to fill the tank.

$$\therefore \frac{1}{x} + \frac{1}{(x - 5)} = \frac{1}{(x - 9)}$$

$$\Rightarrow \frac{x - 5 + x}{x(x - 5)} = \frac{1}{(x - 9)}$$

$$\Rightarrow (2x - 5)(x - 9) = x(x - 5)$$

$$\Rightarrow x^2 - 18x + 45 = 0$$

$$(x - 15)(x - 3) = 0$$

$$\Rightarrow x = 15. \quad [\text{neglecting } x = 3]$$

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(18) Two pipes A and B can fill a cistern in $37\frac{1}{2}$ minutes and 45 minutes respectively. Both pipes are opened. The cistern will be filled in just half an hour, if the B is turned off after:

[A] 5 min.

[B] 9 min.

[C] 10 min.

[D] 15 min.

Answer : [B]

Explanation:

Let B be turned off after x minutes. Then,

Part filled by (A + B) in x min. + Part filled by A in $(30 - x)$ min. = 1.

$$\therefore x\left(\frac{2}{75} + \frac{1}{45}\right) + (30 - x) \cdot \frac{2}{75} = 1$$

$$\Rightarrow \frac{11x}{225} + \frac{(60 - 2x)}{75} = 1$$

$$\Rightarrow 11x + 180 - 6x = 225.$$

$$\Rightarrow x = 9.$$

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(19) Two pipes can fill a tank in 20 and 24 minutes respectively and a waste pipe can empty 3 gallons per minute. All the three pipes working together can fill the tank in 15 minutes. The capacity of the tank is:

- [A] 60 gallons
- [B] 100 gallons
- [C] 120 gallons
- [D] 180 gallons

Answer : [C]

Explanation:

$$\text{Work done by the waste pipe in 1 minute} = \frac{1}{15} - \left(\frac{1}{20} + \frac{1}{24} \right)$$

$$= \left(\frac{1}{15} - \frac{11}{120} \right)$$

$$= -\frac{1}{40}. \quad [\text{-ve sign means emptying}]$$

\therefore Volume of $\frac{1}{40}$ part = 3 gallons.

Volume of whole = (3 x 40) gallons = 120 gallons.

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(20) 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 : [D]

Explanation:

$$\text{Part filled by (A + B) in 1 minute} = \left(\frac{1}{60} + \frac{1}{40} \right) = \frac{1}{24}.$$

Suppose the tank is filled in x minutes.

$$\text{Then, } \frac{x}{2} \left(\frac{1}{24} + \frac{1}{40} \right) = 1$$

$$\Rightarrow \frac{x}{2} \times \frac{1}{15} = 1$$

$$\Rightarrow x = 30 \text{ min.}$$

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