

## SSC CGL Tier-2 01-December-2016 Maths

### Instructions

For the following questions answer them individually

### Question 1

Let  $0 < x < 1$ . Then the correct inequality is

A  $x < \sqrt{x} < x^2$

B  $\sqrt{x} < x < x^2$

C  $x^2 < x < \sqrt{x}$

D  $\sqrt{x} < x^2 < x$

Answer: C

### Explanation:

Let us take an example of 0.25 ( $0 < 0.25 < 1$ )

$$x^2 = .0625$$

$$\sqrt{0.25} = 0.5$$

$$0.0625 < 0.25 < 0.5$$

So, the correct order is  $x^2 < x < \sqrt{x}$ .

So, the answer would be option c)  $x^2 < x < \sqrt{x}$

### Question 2

Three bells ring at interval of 36 seconds, 40 seconds and 48 seconds respectively. They start ringing together at a particular time. They will ring together after every

A 6 minutes

B 12 minutes

C 18 minutes

D 24 minutes

Answer: B

### Explanation:

Given that Three bells ring at interval of 36 seconds, 40 seconds and 48 seconds respectively

To find particular time after which they will ring together, we need to find L.C.M of 36,40 & 48.

L.C.M of 36,40 & 48 is 720. Therefore three bells will ring together after every 720seconds i.e., 12minutes.

### Question 3

If the sum of the digits of a three digit number is subtracted from that number, then it will always be divisible by

A 3 only

B 9 only

C both 3 and 9

D all of 3,6 and 9

Answer: C

**Explanation:**

Let the three digit number be xyz.

$(100x + 10y + z) - (x + y + z) = 99x - 9y$ , which is divisible by both 3 and 9.

So, the answer would be option c) both 3 and 9

**Question 4**

Which of the following is correct ?

A  $\frac{2}{3} < \frac{3}{5} < \frac{11}{5}$

B  $\frac{3}{5} < \frac{2}{3} < \frac{11}{5}$

C  $\frac{11}{5} < \frac{3}{5} < \frac{2}{3}$

D  $\frac{3}{5} < \frac{11}{15} < \frac{2}{3}$

Answer: B

**Explanation:**

$\frac{2}{3}, \frac{3}{5}, \frac{11}{5}$

Take denominator as 15,

$\frac{10}{15}, \frac{9}{15}, \frac{33}{15}$

So, the correct order will be  $\frac{3}{5} < \frac{2}{3} < \frac{11}{5}$

So, the answer would be option b)  $\frac{3}{5} < \frac{2}{3} < \frac{11}{5}$ .

**Question 5**

The greater of the two numbers whose product is 900 and sum exceeds their difference by 30 is

A 60

B 75

C 90

D 100

Answer: A

**Explanation:**

Let's consider two numbers as x & y.

Given that, Product of two numbers x & y is  $xy=900$  --- (1)

and sum of the two numbers exceeds the difference by 30

i.e.,  $(x + y) - (x - y) = 30$

$\Rightarrow 2y=30$

$\Rightarrow y=15$

Substituting  $y=15$  in equation 1, we get  $x=60$

### Question 6

The smallest fraction, which should be added to the sum of  $2\frac{1}{2}$ ,  $3\frac{1}{4}$ ,  $4\frac{1}{4}$  and  $5\frac{1}{5}$  to make the result a whole number, is

A  $\frac{13}{60}$

B  $\frac{1}{4}$

C  $\frac{17}{60}$

D  $\frac{43}{60}$

Answer: D

#### Explanation:

Take only fractional parts and add them ,

$$\begin{aligned} & \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \frac{1}{5} \\ &= \frac{77}{60} \end{aligned}$$

Nearest whole number will be 2 , i.e  $\frac{120}{60}$

$$2 - \frac{77}{60} = \frac{43}{60}$$

So, the answer would be option d)  $\frac{43}{60}$ .

### Question 7

Find the cube root of (-13824)

OR

Find the value of  $\sqrt[3]{-13824}$

A 38

B -38

C 24

D -24

Answer: D

#### Explanation:

$$\begin{aligned} & \sqrt[3]{-13824} \\ &= \sqrt[3]{(-24)^3} \\ &= -24 \end{aligned}$$

So, the answer would be option d) - 24.

### Question 8

The sum of three positive numbers is 18 and their product is 162. If the sum of two numbers is equal to the third then the sum of squares of the numbers is

A 120

B 126

C 132

D 138

**Answer: B**

**Explanation:**

Let us consider the three positive numbers as  $x, y$  and  $z$ .

Sum of three positive numbers  $x+y+z=18$  -----> (1)

product of three numbers  $xyz=162$  -----> (2)

Given that sum of two numbers is equal to the third. i.e.,  $x+y=z$

$$\Rightarrow 2z=18$$

$$\Rightarrow z=9$$

replacing  $z=9$  in equation (1) & (2), we get  $x+y=9$  and  $xy=18$

Solving above, we get  $x=6$  and  $y=3$

therefore, sum of squares of the numbers =  $6^2 + 3^2 + 9^2=126$

**Question 9**

**The sum of three consecutive even numbers is 28 more than the average of these three numbers. Then the smallest of these three numbers is**

A 6

B 12

C 14

D 16

**Answer: B**

**Explanation:**

Given that, Sum of the three consecutive even numbers is 28 more than the average of those three numbers

Lets consider the three numbers as  $2n, 2n+2, 2n+4$

$$\text{Therefore, } 2n + 2n + 2 + 2n + 4 = \frac{2n+2n+2+2n+4}{3} + 28$$

$$\Rightarrow 6n + 6 = 2n + 2 + 28$$

$$\Rightarrow 4n=24 \Rightarrow n=6$$

Therefore, smallest number  $2n= 2(6)=12$

**Question 10**

**In a division sum, the divisor 'd' is 10 times the quotient 'q' and 5 times the remainder'r'. If  $r = 46$ , the dividend will be**

A 5042

B 5348

C 5336

D 4276

**Answer: C**

**Explanation:**

We know that

$$\text{Dividend} = (\text{Divisor} \times \text{Quotient}) + \text{Remainder} \text{ --- (1)}$$

Given that Divisor = 10 times the Quotient

$$\Rightarrow \text{Divisor} = 10Q \text{ --- (2)}$$

and Divisor = 5 times the remainder

$$\Rightarrow \text{Divisor} = 5R = 5(46) = 230$$

Substituting divisor value in (2), we get,  $Q = 23$

Substituting all values in equation (1), we get

$$\text{Dividend} = (230 \times 23) + 46 = 5336$$

### Question 11

A man can do a piece of work in 30 hours. If he works with his son then the same piece of work is finished in 20 hours. If the son works alone he can do the work in

- A 60 hours
- B 50 hours
- C 25 hours
- D 10 hours

**Answer:** A

### Explanation:

Given that man can do a work in 30 hr

$$\text{In 1hr, work done by Man} = \frac{1}{30}$$

Along with Son, Man can do work in 20 hr

$$\text{In 1hr, work done by Man and Son} = \frac{1}{20}$$

$$\Rightarrow \text{In 1hr, work done by son} = \frac{1}{20} - \frac{1}{30}$$

$$\Rightarrow \text{work done by son in 1hr} = \frac{1}{60}$$

Therefore, son takes 60hr to complete the work.

### Question 12

A water tap fills a tub in 'p' hours and a sink at the bottom empties it in 'q' hours. If  $p < q$  and both tap and sink are open, the tank is filled in 'r' hours; then

$$\text{A } \frac{1}{r} = \frac{1}{p} + \frac{1}{q}$$

$$\text{B } \frac{1}{r} = \frac{1}{p} - \frac{1}{q}$$

$$\text{C } r = p + q$$

$$\text{D } r = p - q$$

**Answer:** B

### Explanation:

It is given, A water tap fills a tub in 'p' hours and a sink at the bottom empties it in 'q' hours.

Total time to fill the tank will be

$$\frac{1}{p} - \frac{1}{q}$$

So, the answer would be option b)  $\frac{1}{r} = \frac{1}{p} - \frac{1}{q}$

### Question 13

John does  $\frac{1}{2}$  piece of work in 3 hours, Joe does  $\frac{1}{4}$  of the remaining work in 1 hour and George finishes remaining work in 5 hours. How long would it have taken the three working together to do the work ?

A  $2\frac{1}{7}$  hours

B  $3\frac{1}{7}$  hours

C  $3\frac{8}{11}$  hours

D  $2\frac{8}{11}$  hours

Answer: D

#### Explanation:

John can do  $\frac{1}{2}$  work in 3 hours, So he can complete entire work in 6 hours.

Remaining work =  $1 - \frac{1}{2} = \frac{1}{2}$

Joe does  $\frac{1}{4}$  of the remaining work i.e  $\frac{1}{8}$  work in 1 hour, So he can complete entire work in 8 hours.

Now remaining work =  $\frac{3}{8}$

George finishes remaining work in 5 hour.

George do  $\frac{3}{8}$  work in 5 hours, So he can complete entire work in  $\frac{40}{3}$  hours.

If all three work together, then,

$$\frac{1}{6} + \frac{1}{8} + \frac{3}{40} = \frac{30}{11}$$

So, the answer would be option d)  $2\frac{8}{11}$  hours

### Question 14

A does  $\frac{2}{5}$  of a work in 9 days. Then B joined him and they together completed the remaining work in 6 days. B alone can finish the whole work in

A  $6\frac{12}{13}$  days

B  $8\frac{2}{11}$  days

C 10 days

D 18 days

Answer: D

#### Explanation:

If A can complete  $\frac{2}{5}$  of work in 9 days,

then he can complete whole work in  $\frac{9 \times 5}{2} = \frac{9 \times 5}{2} = 22.5$  days.

Let B take x number of days to complete the work.

A/c to question,

$$\left(\frac{2}{45} + \frac{1}{x}\right) \times 6 = \frac{3}{5}$$

$x = 18$  days.

So, the answer would be option d) 18 days

#### Question 15

The daily wages of A and B respectively are Rs. 3.50 and 2.50. When A finishes a certain work, he gets a total wage of Rs. 63. When B does the same work, he gets a total wage Rs. 75. If both of them do it together what is the cost of the work?

A Rs. 67.50

B Rs. 27.50

C Rs. 60.50

D Rs. 70.50

**Answer: A**

#### Explanation:

daily wage of A = rs 3.50

total wage earned by A = rs 63

no of days A worked =  $\frac{\text{total wage earned}}{\text{daily wage}} = \frac{63}{3.50} = 18$  days

daily wage of B = rs 2.50

total wage earned by B = rs 75

no of days B worked =  $\frac{\text{total wage earned}}{\text{daily wage}} = \frac{75}{2.50} = 30$  days

no of days taken to complete the work when A and B do together =  $\frac{xy}{x+y}$  { when A takes x days and b takes y days}

$\frac{18 \times 30}{18+30} = \frac{90}{8}$  days

Total amount paid to A and B per day = 3.50 + 2.50 = rs 6

Total amount to be paid =  $\frac{90}{8} \times 6 = \frac{135}{2} = \text{Rs } 67.50$

#### Question 16

A man does double the work done by a boy in the same time. The number of days that 3 men and 4 boys will take to finish a work which can be done by 10 men in 8 days is

A 4

B 16

C  $\frac{3}{11}$

D  $\frac{4}{5}$

**Answer: B**

#### Explanation:

work done by man : work done by boy = 2: 1

let work done by a man in 1 day = 2 units

let work done by a boy in 1 day = 1 units

work done by 10 men in 8 days =  $10 \times 2 \times 8 = 160$  units

work done by 3 men and 4 boys in 1 day =  $3 \times 2 + 4 \times 1 = 10$  units

number of days =  $\frac{160}{10} = 16$  days

### Question 17

The marked price of an article is 30% higher than the cost price. If a trader sells the articles allowing 10% discount to customer, then the gain percent will be

- A 17
- B 20
- C 19
- D 15

Answer: A

**Explanation:**

solution

let cost price (CP) = rs 100

MP (marked price) = 30% more than cost price =  $\frac{30}{100} \times 100 = 30 + 100$  { here 100 = CP }

MP = rs 130

discount% = 10%

discount = 10% of 130 = rs 13 {  $\therefore$  discount =  $\frac{\text{discount percent}}{100} \times \text{MP}$  }

So selling price SP = 130 - 13 = 117 {  $\therefore$  SP = MP - discount }

gain = 117 - 100 = 17 {  $\therefore$  gain = SP - CP }

gain % =  $\frac{17}{100} \times 100 = 17\%$

### Question 18

A merchant marked the price of an article by increasing its production cost by 40%. Now he allows 20% discount and gets a profit of Rs. 48 after selling it. The production cost is

- A Rs. 320
- B Rs. 360
- C Rs. 400
- D Rs. 440

Answer: C

**Explanation:**

let the production cost(PC) be rs 100

marked price (MP) = 140% production cost { production cost = rs 100 }

MP = rs 140

discount = 20%

discount =  $\frac{20}{100} \times 140$  {  $\therefore$  discount =  $\frac{\text{discount percentage}}{100} \times \text{MP}$  }

discount = rs 28



selling price (SP) = rs 112

profit = SP - PC = 112 - 100 = 12

here Rs 12 is when PC = rs 100

now when profit = rs 48 {  $\therefore 12 \times 4 = 48$ }

PC =  $4 \times 100 =$  rs 400

**Question 19A** watch dealer pays 10% customs duty on a watch which costs Rs.500 abroad. He desires to make a profit of 20% after giving a discount of 25% to the buyer, The marked price should be

A Rs. 950

B Rs. 800

C Rs. 880

D Rs. 660

**Answer: C**

**Explanation:**

cost price (CP) of watch = cost + custom duty

$$CP = 500 + \frac{10}{100} \times 500 = 500 + 50 = 550$$

profit = 20%

$$\text{profit} = \frac{\text{profit percent}}{100} \times CP = \frac{20}{100} \times 550 = 110$$

selling price (SP) = CP + profit

$$SP = 550 + 110 = 660$$

discount = 25%

SP = 75% of MP {MP= marked price}

$$660 = 75\% \text{ of MP}$$

$$MP = \frac{660}{75} \times 100 = 880$$

**Question 20**

**A shopkeeper allows 20% discount on his advertised price and to make a profit of 25% on his outlay. What is the advertised price (in Rs.) on which he gains Rs.6000?**

A 36000

B 37500

C 39000

D 42500

**Answer: B**

**Explanation:**

**solution**

let MP(marked price) = rs 100

discount = 20% of MP = rs 20

Selling price (SP) = rs 80

$$SP = 125\% \text{ of CP} = \frac{125}{100} \times CP$$

$$80 = \frac{125}{100} \times CP$$

$$CP = \frac{100}{125} \times 80$$

$$CP = \text{rs } 64$$

$$\text{gain} = 80 - 64 = \text{rs } 16$$

$$\text{now real gain} = 6000$$

$$16 = 6000$$

$$1 = 375$$

$$MP = \text{rs } 100 = 100 \times 375 = 37500$$

#### Question 21

Rs.2420 were divided among A, B, C so that A: B=5 : 4 and B : C = 9 : 10 then C gets

A 680

B 800

C 900

D 950

**Answer: B**

**Explanation:**

**solution**

A:B {multiplying A and B with 9}

5:4

B:C {multiplying B and C with 4}

9:10

we get A:B:C = 45:36:40

$$A+B+C = 45+36+40 = 121 \text{ units}$$

$$121 \text{ units} = 2420$$

$$1 \text{ unit} = 20$$

$$\text{amount with C} = 40 \text{ units} = 40 \times 20 = 800$$

#### Question 22

49 Kg of blended tea contain Assam and Darjeeling tea in the ratio 5 : 2. Then the quantity of Darjeeling tea is to be added to the mixture to make the ratio of Assam to Darjeeling tea 2 : 1 is

A 4.5 kg

B 3.5 kg

C 5 kg

D 6 kg

**Answer: B**

**Explanation:**

**solution**

given 49 kg of tea

Assam tea : Darjeeling tea = 5: 2

quantity of Assam tea =  $\frac{5}{7} \times 49 = 35\text{kg}$

quantity of Darjeeling tea =  $\frac{2}{7} \times 49 = 14\text{kg}$

In order to make the ratio of Assam tea : Darjeeling tea = 2: 1

present quantity of Assam tea = 35kg

divide it by 2 we get 17.5 { The required quantity}

quantity of Darjeeling tea at present = 14kg

required quantity is 17.5 kg

amount to be added =  $17.5 - 14 = 3.5 \text{ kg}$

### Question 23

Among 132 examinees of a certain school, the ratio of successful to unsuccessful students is 9 : 2, Had 4 more students passed, then the ratio of successful to unsuccessful students will be

A 14:3

B 14:5

C 28:3

D 28:5

Answer: D

### Explanation:

the ratio of successful to unsuccessful students is 9 : 2

total number of examines = 132

successful students =  $\frac{9}{11} \times 132 = 108$

unsuccessful students =  $\frac{2}{11} \times 132 = 24$

had 4 more students passed

successful students =  $108 + 4 = 112$

unsuccessful students =  $24 - 4 = 20$

new ratio of successful to unsuccessful students is 112 : 20

28:5

### Question 24

In a regiment the ratio between the number of officers to soldiers was 3 : 31 before battle. In a battle 6 officers and 22 soldiers were killed and the ratio became 1 : 13, the number of officers in the regiment before battle was

A 31

B 38

C 21

D 28

Answer: C

**Explanation:**

no of officers : no of soldiers = 3:31

no of officers =  $3x$

no of soldiers =  $31x$

In a battle 6 officers and 22 soldiers were killed

new no of officers =  $3x-6$

new no of soldiers =  $31x-22$

new ratio 1:13

$$\frac{3x-6}{31x-22} = \frac{1}{13}$$

$$13(3x-6) = 31x-22$$

$$39x - 78 = 31x - 22$$

$$8x = 78 - 22$$

$$8x = 56$$

$$x = 7$$

number of officers in the regiment before battle was =  $3x = 3 \times 7 = 21$

**Question 25**

Three containers have their volumes in the ratio 3 : 4 : 5. They are full of mixtures of milk and water. The mixtures contain milk and water in the ratio of (4:1), (3 : 1) and (5 : 2) respectively. The contents of all these three containers are poured into a fourth container. The ratio of milk and water in the fourth container is

- A 4:1
- B 151:48
- C 157:53
- D 5:2

**Answer:** C

**Question 26**

In what proportion must a grocer mix sugar at Rs.12 a kg and Rs.7 a kg so as to make a mixture worth Rs.8 a kg ?

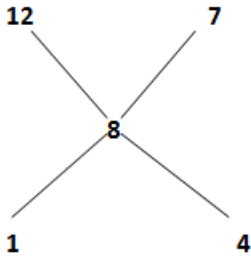
- A 7:12
- B 1:4
- C 2:3
- D 12:7

**Answer:** B

**Explanation:**

solution

using Alligation



required proportion is 1:4

alternatively

$$\frac{12(x)+7(y)}{x+y} = 8$$

$$12x + 7y = 8x + 8y = 4x = y$$

$$\frac{x}{y} = \frac{1}{4}$$

hence 1:4

### Question 27

Fifteen movie theatres average 600 customers per theatre per day. If six of the theatres close down but the total theatre attendance stays the same, then the average daily attendance per theatre among the remaining theatres is

- A 900
- B 1000
- C 1100
- D 1200

**Answer: B**

### Explanation:

average daily attendance per theatre among the remaining theatres to be  $x$

$$15 \times 600 = 9 \times x$$

$$\frac{15 \times 600}{9} = x$$

$$x = 1000$$

### Question 28

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 31 kg
- B 32 kg
- C 29.5kg
- D 35 kg

**Answer: A**

### Explanation:

average weight of A, B and C is 45 kg

$$\frac{A+B+C}{3} = 45$$

$$A+B+C = 45 \times 3 = 135$$

the average weight of A and B is 40 kg

$$\frac{A+B}{2} = 40$$

$$A+B = 40 \times 2 = 80$$

the average weight of B and C is 43 kg

$$\frac{B+C}{2} = 43$$

$$B+C = 43 \times 2 = 86$$

$$\text{adding } A+B + B+C = 80 + 86 = 166$$

subtracting  $A+B+C$  from this we get

$$166 - 135 = 31$$

$$B = 31\text{kg}$$

### Question 29

The batting average for 40 innings of a cricket player is 50 runs. His highest score exceeds his lowest score by 172 runs, If these two innings are excluded, the average of the remaining 38 innings is 48 runs. The highest score of the player is

A 165

B 170

C 172

D 174

**Answer: D**

#### Explanation:

let the score of lowest inning =  $x$

score of highest inning =  $x+172$

avg of 38 innings = 48

total score of 38 innings =  $48 \times 38 = 1824$

total score of 40 innings =  $50 \times 40 = 2000$

$$x+x+172 = 2000 - 1824$$

$$2x+172 = 176$$

$$2x = 4$$

$$x = 2$$

highest score of the player =  $172+2 = 174$

### Question 30

The average of 7 consecutive numbers is 20. The largest of these numbers is

A 20

B 23

C 24

D 26

**Answer: B**

**Explanation:**

let the consecutive no be  $x, x+1, x+2, x+3, x+4, x+5, x+6$

sum of all consecutive numbers  $= x+x+1+x+2+x+3+x+4+x+5+x+6 = 7x+21 = 7(x+3)$

$$\text{average} = \frac{\text{sum of all numbers}}{\text{total numbers}}$$

given average = 20

$$20 = \frac{7(x+3)}{7} = x+3$$

$$x+3=20$$

$$\Rightarrow x=17$$

largest number is  $x+6=17+6=23$

**Question 31**

**Mukesh has twice as much money as Soham, Soham has 50% more money than Pankaj. If the average money with them is Rs.110, then Mukesh has**

- A 155
- B 160
- C 180
- D 175

**Answer: C**

**Explanation:**

let money with pankaj =  $x$

money soham =  $1.5x$

money with mukesh =  $3x$

total amount with all them =  $5.5x$

average money with them = 110

total money with them = 330

$$5.5x = 330$$

$$x = \frac{330}{5.5}$$

$$x = 60$$

amount with mukesh =  $3x = 3 \times 60 = 180$

**Question 32**

**The average daily income of 7 men, 11 women and 2 boys is Rs.257.50. If the average daily income of the men is Rs.10 more than that of women and the average daily income of the women is Rs.10 more than that of boys, the average daily income of a man is**

- A Rs.277.5
- B Rs.250
- C Rs.265
- D Rs.257

**Answer: C**

**Question 33**

The profit on selling an article for Rs.425 is the same as the loss on selling it for Rs.355, then the cost price of the article is

- A 410
- B 380
- C 400
- D 390

**Answer:** D

**Explanation:**

profit on selling an article for Rs.425

profit = SP - CP (cost price)

profit = 425 - CP

loss on selling it for Rs.355

loss = CP - SP

loss = CP - 355

profit = loss

425 - CP = CP - 355

425 + 355 = 2CP

2CP = 780

CP = rs 390

**Question 34**

A & B jointly made a profit of Rs.1650 and they decided to share it such that  $\frac{1}{3}$  of A's profit is equal to  $\frac{2}{5}$  of B's profit. Then profit of B is

- A Rs.700
- B Rs.750
- C Rs.850
- D Rs.800

**Answer:** B

**Explanation:**

$\frac{1}{3}$  of A's profit is equal to  $\frac{2}{5}$  of B's profit

$$\frac{1}{3}A = \frac{2}{5}B$$

A's profit : B's profit = 6: 5

total profit = rs 1650

A+B = 6+5 = 11 units

11 units = rs 1650

1 unit = rs 150

B's profit = 5 × 150 = rs 750



**Question 35**

4% of the selling price of an article is equal to 5% of its cost price. Again 20% of the selling price is Rs.120 more than 22% of its cost price. The ratio of cost price & selling price is

- A 2:3
- B 3:2
- C 4:5
- D 5:4

**Answer: C**

**Explanation:**

let Selling price be SP , Cost price be CP

$$4\% \text{ of SP} = 5\% \text{ CP}$$

$$SP = 100 \times \frac{5}{4} \text{ CP} = \frac{5}{4} \text{ CP}$$

$$SP = \frac{5}{4} \text{ CP} \text{ -----} \rightarrow \text{using this in the below equation}$$

$$20\% \text{ of SP} = 120 + 22\% \text{ of CP}$$

$$\frac{20}{100} \times \frac{5}{4} \text{ CP} = 120 + 22\% \text{ CP}$$

$$\frac{1}{4} \text{ CP} = 120 + \frac{22}{100} \text{ CP}$$

$$\frac{1}{4} \text{ CP} - \frac{22}{100} \text{ CP} = 120$$

$$\frac{3}{100} \text{ CP} = 120$$

$$\text{CP} = 4000$$

$$\text{SP} = \frac{5}{4} \times 4000 = 5000$$

$$\text{CP} : \text{SP} = 4000 : 5000 = 4 : 5$$

**Question 36**

Due to 25% fall in the rate of eggs, one can buy 2 dozen eggs more than before by investing Rs.162. Then the original rate per dozen of the eggs is

- A Rs. 22
- B Rs. 24
- C Rs. 27
- D Rs. 30

**Answer: C**

**Question 37**

Last year Mr. A bought two paintings. This year he sold them for Rs, 20,000 each. On one, he made a 25% profit and on the other he had a 25% loss. Then his net profit or loss is

- A He lost more than Rs.2000
- B He lost less than Rs, 2000

C He earned more than than Rs, 2000

D He earned less than Rs.2000

**Answer: A**

**Explanation:**

SP of each painting = 20000

profit on 1st painting = 25%

loss on 2nd painting = 25%

CP + profit = SP

$$\text{profit} = \frac{\text{profitpercentage}}{100} \times \text{CP}$$

$$\text{CP} + \frac{1}{4}\text{CP} = \text{SP}$$

$$\frac{5}{4}\text{CP} = \text{SP} \{ \text{SP} = 20000 \}$$

$$\text{CP} = \frac{4}{5} \times 20000 = 16000$$

CP - loss = SP

$$\text{loss} = \frac{\text{losspercentage}}{100} \times \text{CP}$$

$$\text{CP} - \frac{1}{4}\text{CP} = \text{SP}$$

$$\frac{3}{4}\text{CP} = \text{SP} \{ \text{SP} = 20000 \}$$

$$\text{CP} = \frac{4}{3} \times 20000 = 26666.66$$

$$\text{Total CP} = 16000 + 26666.66 = 42666.66$$

$$\text{total SP} = 20000 + 20000 = 40000$$

$$\text{loss} = 42666.66 - 40000 = 2666.66$$

∴ loss is more than 2000

### Question 38

A shopkeeper sells rice at 10% profit and uses weight 30% less than the actual measure. His gain percent is

A  $57\frac{2}{3}\%$

B  $57\frac{1}{7}\%$

C  $57\frac{2}{5}\%$

D  $57\frac{3}{7}\%$

**Answer: B**

**Explanation:**

let the weight be 1000 g

profit% = 10%

altered weight = 1000 - 30% of 1000 = 1000 - 300 = 700g

$$\text{gain \%} = \left[ 100 + \text{profit\%} \right] \frac{\text{1000}}{\text{altered weight}} - 100$$

$$\text{gain \%} = [100 + 10] \frac{1000}{700} - 100 = \frac{1100 - 700}{7} = \frac{400}{7}$$

$$= 57\frac{1}{7}\%$$

### Question 39

What % of a day is 30 minutes ?

- A 2.83
- B 2.083
- C 2.09
- D 2.075

Answer: B

### Explanation:

No of minutes in a day =  $24 \times 60$

$$\% \text{ of a day 30 minutes is } = \frac{30}{24 \times 60} \times 100 = \frac{25}{12} = 2.083$$

### Question 40

A businessman's earning increase by 25% in one year but decreases by 4% in the next. Going by this pattern, after 5 years, his total earnings would be Rs.72000. What is his present earning?

- A Rs.10000
- B Rs.80000
- C Rs.40000
- D Rs.54000

Answer: C

### Explanation:

using the chaining method

$$\text{we can write } 25\% = \frac{1}{4}, 4\% = \frac{1}{25}$$

1st year increase  $4 \rightarrow 5$

2nd year decrease  $25 \rightarrow 24$

3rd year increase  $4 \rightarrow 5$

4th year decrease  $25 \rightarrow 24$

5th year increase  $4 \rightarrow 5$

initial  $\rightarrow$  final ratio is  $5 \rightarrow 9$

after 5 years earning is  $9 \rightarrow 72000$

$$\text{present earning} = 5 \times 8000 = \text{rs } 40000$$

### Question 41

In an examination 73% of the candidates passed in quantitative aptitude test, 70% passed in General awareness and 64% passed in both. If 6300 failed in both subjects the total number of examinees were

- A 60000

- B 50000
- C 30000
- D 25000

Answer: C

#### Question 42

A man spends 75% of his income. His income increases by 20% and his expenditure also increases by 10%. Find the percentage increase in his savings.

- A 25%
- B 50%
- C 15%
- D 10%

Answer: B

#### Explanation:

let the income = rs 100

expenditure = 75% of his income = 75% of 100 = rs 75

savings =  $100 - 75 = 25$  (*savings = income - expenditure*)

income increases by 20%

new income =  $100 + \frac{20}{100} \times 100 = 100 + 20 =$  rs 120

new expenditure =  $75 + \frac{10}{100} \times 75 = 75 + 7.5 =$  rs 82.5

new savings =  $120 - 82.5 = 37.5$

increase in savings = new savings - initial savings =  $37.5 - 25 =$  rs 12.5

% increase in savings =  $\frac{\text{increase in savings}}{\text{initial savings}} \times 100 = \frac{12.5}{25} \times 100 = 50\%$

#### Question 43

On river, Q is the mid-point between two points P and R on the same bank of the river. A boat can go from P to Q and back in 12 hours, and from P to R in 16 hours 40 min. How long would it take to go from R to P ?

- A  $3\frac{1}{3}$  hr.
- B 5hr.
- C  $6\frac{2}{3}$  hr.
- D  $7\frac{1}{3}$  hr.

Answer: D

#### Question 44

A car can finish a certain journey in 10 hours at a speed of 42 kmph. In order to cover the same distance in 7 hours, the speed of the car (km/h) must be increased by

- A 12
- B 15
- C 18
- D 24

**Answer: C**

**Explanation:**

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

$$\text{distance} = \text{speed} \times \text{time} = 10 \times 42 = 420 \text{ km}$$

to cover the same distance in 7 hours

$$\text{speed} = \frac{420}{7} = 60 \text{ Km/h}$$

$$\text{increase in speed} = 60 - 42 = 18 \text{ km/h}$$

**Question 45**

A man travels 450 km to his home partly by train and partly by car. He takes 8 hrs 40 mins if he travels 240 km by train and rest by car. He takes 20 mins more if he travels 180 km by train and the rest by car. The speed of the car in km/hr is

- A 45
- B 50
- C 60
- D 48

**Answer: A**

**Question 46**

A train 'B' speeding with 100 kmph crosses another train C, running in the same direction, in 2 mins. If the length of the train B and C be 150m and 250m respectively, what is the speed of the train C (in kmph) ?

- A 75
- B 88
- C 95
- D 110

**Answer: B**

**Explanation:**

Given, speed of train B = 100 kmph

Let speed of train C = x kmph

length of train B = 150 m = 0.15 km

length of train C = 250 m = 0.25 km

$$\text{time taken} = 2 \text{ mins} = \frac{2}{60} = \frac{1}{30}$$

$$\text{time taken} = \frac{\text{lengthtrain.A} + \text{lengthtrain.B}}{\text{difference in speed}} = \frac{0.4}{100 - x}$$

$$\frac{1}{30} = \frac{0.4}{100 - x}$$

$$100 - x = 0.4 \times 30$$

$$100 - 12 = x$$

$$x(\text{ speed of the train C}) = 88 \text{ kmph}$$

#### Question 47

The compound interest on Rs. 30,000 at 7% per annum for n years is Rs. 4347. The value of n is

A 3

B 2

C 4

D 5

Answer: B

#### Explanation:

let A = amount P = principal r = rate of interest n = time

$$A = P\left(1 + \frac{r}{100}\right)^n$$

$$A \text{ after } n \text{ years} = 30000 + 4347 = 34347$$

$$P = 30000$$

$$r = 7\%$$

$$34347 = 30000\left(1 + \frac{7}{100}\right)^n$$

$$\frac{34347}{30000} = \left(\frac{107}{100}\right)^n$$

$$\frac{11449}{10000} = \left(\frac{107}{100}\right)^n \quad (107^2 = 11449)$$

$$n = 2 \text{ years}$$

#### Question 48

If A borrowed Rs. P at x% and B borrowed Rs. Q (>P) at y% per annum at simple interest at the same time, then the amount of their debts will be equal after

A  $100 \left( \frac{Q-P}{Px-Qy} \right) \text{ years}$

B  $100 \left( \frac{Px-Qy}{Q-P} \right) \text{ years}$

C  $100 \left( \frac{Px-Qy}{P-Q} \right) \text{ years}$

D  $100 \left( \frac{P-Q}{Px-Qy} \right) \text{ years}$

Answer: A

#### Question 49

A man invested a sum of money at compound interest. It amounted to Rs. 2420 in 2 years and to Rs. 2662 in 3 years. Find the sum.

A RS.1000

B RS.2000

C RS.5082

D RS.3000

Answer: B

#### Question 50

if a sum of money becomes 4000 in 2 yrs and 5500 in 4 yrs 6 months at the same rate of simple interest per annum. Then the rate of simple interest is

A  $21\frac{3}{7}\%$

B  $21\frac{2}{7}\%$

C  $21\frac{1}{7}\%$

D  $21\frac{5}{7}\%$

Answer: A

#### Explanation:

Amount in 2 years = 4000

amount in 4.5 years = 5500

interest received in 2.5 years =  $5500 - 4000 = 1500$

interest received in 1 year = 600

interest received in 2 years = 1200

amount = principal + interest

amount received in 2 years = principal + 1200

$4000 - 1200 = 2800$

principal = 2800

interest = 600

Rate of interest =  $\frac{600}{2800} \times 100 = 21\frac{3}{7}\%$

#### Question 51

A hollow cylindrical tube 20 cm long is made of iron and its external and internal diameters are 8 cm and 6 cm respectively. The volume (in cubic cm) of iron used in making the tube is (Take  $\pi = \frac{22}{7}$ )

A 1760

B 440

C 220

D 880

Answer: B

#### Explanation:

volume of hollow cylinder =  $\pi(r_1^2 - r_2^2)h$

$h = 20$

$$r_1 \text{ (external radius)} = \text{external diameter} \div 2 = 8 \div 2 = 4$$

$$r_2 \text{ (internal radius)} = \text{internal diameter} \div 2 = 6 \div 2 = 3$$

$$\text{volume of hollow cylinder} = \pi(4^2 - 3^2)20 = \frac{22}{7} (7)20 = 440$$

### Question 52

If the areas of three adjacent faces of a rectangular box which meet in a corner are  $12\text{cm}^2$ ,  $15\text{cm}^2$  and  $20\text{cm}^2$  respectively. Then the volume of the box is

A  $3600\text{ cm}^3$

B  $300\text{ cm}^3$

C  $60\text{ cm}^3$

D  $180\text{ cm}^3$

Answer: C

### Explanation:

let length, breadth, height be  $l, b, h$  respectively

$$l \times b = 12 \text{ ----- eq 1}$$

$$b \times h = 15 \text{ ----- eq 2}$$

$$h \times l = 20 \text{ ----- eq 3}$$

multiply eq 1 by eq 2 and dividing eq 3

we get

$$\frac{l \times b \times b \times h}{h \times l} = b^2 = \frac{12 \times 15}{20}$$

$$b = 3$$

from eq 1 we get  $l = 4$

from eq 2 we get  $h = 5$

$$\text{volume of the cuboid} = l \times b \times h = 3 \times 4 \times 5 = 60\text{ cm}^3$$

### Question 53

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  $12\text{ km/hour}$  completes one round in  $8\text{ minutes}$ , then the area of the park is

A  $153650\text{ m}^2$

B  $135600\text{ m}^2$

C  $153600\text{ m}^2$

D  $156300\text{ m}^2$

Answer: C

### Explanation:

let length =  $l$ , breadth =  $b$

$$l = 3x, b = 2x$$

perimeter of the rectangular park = distance covered by the man in one round



$$= 12 \times \frac{5}{18} \times 8 \times 60 \quad (\because 1 \text{ min} = 60 \text{ secs and converting } 12 \text{ km/hr to m/s by multiplying it by } \frac{5}{18})$$

$$= 1600 \text{ m}$$

$$2(3x+2x) = 1600$$

$$5x = 800$$

$$x = 160$$

$$l = 3x = 160 \times 3 = 480$$

$$b = 2x = 160 \times 2 = 320$$

$$\text{area of the rectangle} = l \times b = 480 \times 320$$

$$= 153600 \text{ m}^2$$

#### Question 54

If the radius of a right circular cylinder open at both the ends, is decreased by 25% and the height of the cylinder is increased by 25%. Then the curved surface area of the cylinder thus formed

- A remains unaltered
- B is increased by 25%
- C is increased by 6.25%
- D is decreased by 6.25%

Answer: D

#### Question 55

A cylindrical pencil of diameter 1.2 cm has one of its end sharpened into a conical shape of height 1.4 cm. The volume of the material removed is

- A  $1.056 \text{ cm}^3$
- B  $4.224 \text{ cm}^3$
- C  $10.56 \text{ cm}^3$
- D  $42.24 \text{ cm}^3$

Answer: A

#### Explanation:

The volume of the material removed = volume of cylinder - volume of cone

$$\begin{aligned} &= \pi r^2 h - \frac{1}{3} \pi r^2 h \\ &= \frac{2}{3} \pi r^2 h \quad \{ r = \frac{1.2}{2} = 0.6, h = 1.4 \} \\ &= \frac{2}{3} \times \frac{22}{7} \times 0.6^2 \times 1.4 = 2 \times 22 \times 0.2 \times 0.2 \times 0.6 = 1.056 \text{ cm}^3 \end{aligned}$$

#### Question 56

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  $2109 \text{ m}^2$  then the width of the road is

- A 3 m

- B 5 m
- C 6 m
- D 2 m

Answer: A

**Question 57**

Four circles of equal radii are described about the four corners of a square so that each touches two of the other circles. If each side of the square is 140 cm then area of the space enclosed between the circumference of the circle is (take  $\pi = \frac{22}{7}$ )

- A  $4200 \text{ cm}^2$
- B  $2100 \text{ cm}^2$
- C  $7000 \text{ cm}^2$
- D  $2800 \text{ cm}^2$

Answer: A

**Question 58**

The amount of concrete required to build a concrete cylindrical pillar whose base has a perimeter 8.8 metre and curved surface area 17.6 sq. metre, is (Take  $\pi = \frac{22}{7}$ )

- A  $8.325 \text{ m}^3$
- B  $9.725 \text{ m}^3$
- C  $10.5 \text{ m}^3$
- D  $12.32 \text{ m}^3$

Answer: D

**Question 59**

A hemispherical bowl of internal radius 9 cm, contains a liquid. This liquid is to be filled into small cylindrical bottles of diameter 3 cm and height 4 cm. Then the number of bottles necessary to empty the bowl is

- A 18
- B 45
- C 27
- D 54

Answer: D

**Explanation:**

hemispherical bowl of internal radius 9 cm

$$r = 9$$

$$\text{volume of hemispherical bowl} = \frac{2}{3} \times \pi \times r^3 = \frac{2}{3} \times \pi \times 9^3 = 486\pi$$

small cylindrical bottles of diameter 3 cm and height 4 cm

$$\text{radius} = \frac{3}{2}$$

$$\text{volume of cylindrical bottles} = \pi r^2 h$$

$$= \pi \times \frac{3}{2} \times \frac{3}{2} \times 4 = 9\pi$$

$$\text{no of bottles required} = \frac{486\pi}{9\pi} = 54$$

#### Question 60

A rectangular water tank is 80 m  $\times$  40 m. Water flows into it through a pipe of 40 sq.cm at the opening at a speed of 10 km/hr. The water level will rise in the tank in half an hour is

A  $\frac{3}{2}$  cm

B  $\frac{4}{9}$  cm

C  $\frac{5}{9}$  cm

D  $\frac{5}{8}$  cm

Answer: D

#### Explanation:

given rectangular water tank is 80 m  $\times$  40 m

volume of rectangular water tank = volume of water filled by the pipe (area of pipe  $\times$  speed of flow of water)

volume of rectangular water tank = 8000  $\times$  4000 { $\because$  80 m = 8000 cm, 40 m = 4000 cm}

$$8000 \times 4000 = 40 \times 10 \times 1000 \times 100 \{1km = 1000m, 1m = 100cm\}$$

$$x = \frac{10}{8} \text{ \{ height raised in 1 hr \}}$$

$$\text{height raised in 30 mins} = \frac{5}{8}$$

#### Question 61

A square and a regular hexagon are drawn such that all the vertices of the square and the hexagon are on circle of radius r cm. The ratio of area of the square and the hexagon is

A 3 : 4

B 4 :  $3\sqrt{3}$

C  $\sqrt{2}$  :  $\sqrt{3}$

D 1 :  $\sqrt{2}$

Answer: B

#### Question 62

A solid cylinder has the total surface area 231 sq.cm. If its curved surface area is  $\frac{2}{3}$  of the total surface area, then the volume of the cylinder is

A 154 cu.cm

B 308 cu.cm

C 269.5 cu.cm

D 370 cu.cm

Answer: C

#### Question 63

The lateral surface area of frustum of a right circular cone, if the area of its base is  $16\pi \text{ cm}^2$  and the diameter of circular upper surface is 4 cm and slant height 6 cm, will be

A  $30\pi \text{ cm}^2$

B  $48\pi \text{ cm}^2$

C  $36\pi \text{ cm}^2$

D  $60\pi \text{ cm}^2$

Answer: C

#### Question 64

The diameter of a sphere is twice the diameter of another sphere, The surface area of the first sphere is equal to the volume of the second sphere, The magnitude of the radius of the first sphere is

A 12

B 24

C 16

D 48

Answer: B

#### Explanation:

let radius of sphere 1 =  $r_1$

radius of sphere 2 =  $r_2$

Given,  $r_1 = 2r_2$

surface area of sphere 1 = volume of sphere 2

$$4\pi(r_1)^2 = \frac{4}{3}\pi(r_2)^3$$

$$r_1 = 2r_2$$

$$4\pi(2r_2)^2 = \frac{4}{3}\pi(r_2)^3$$

$$4 = \frac{1}{3}(r_2)$$

$$r_2 = 12$$

$$r_1 = 2r_2 = 2 \times 12 = 24$$

#### Question 65

A right circular cylinder having diameter 21 cm & height 38 cm is full of ice cream. The ice cream is to be filled in cones of height 12 cm and diameter 7 cm having a hemispherical shape on the top. The number of such cones to be filled with ice cream is

A 54

B 44

C 36

D 24

Answer: A

Question 66

The Simplified value of  $\left(1 - \frac{2xy}{x^2+y^2}\right) \div \left(\frac{x^3-y^3}{x-y} - 3xy\right)$  is

A  $\frac{1}{x^2-y^2}$

B  $\frac{1}{x^2+y^2}$

C  $\frac{1}{x-y}$

D  $\frac{1}{x+y}$

Answer: B

Explanation:

$$\begin{aligned} & \left(1 - \frac{2xy}{x^2+y^2}\right) \div \left(\frac{x^3-y^3}{x-y} - 3xy\right) \\ &= \left(\frac{x^2+y^2-2xy}{x^2+y^2}\right) \div \left(\frac{x^3-y^3-3xy(x-y)}{x-y}\right) \\ & (\because x^2 + y^2 - 2xy = (x - y)^2 \text{ and } x^3 - y^3 - 3xy(x - y) = (x - y)^3) \\ &= \left(\frac{(x-y)^2}{x^2+y^2}\right) \div \left(\frac{(x-y)^3}{x-y}\right) \\ &= \left(\frac{(x-y)^2}{x^2+y^2}\right) \times \left(\frac{x-y}{(x-y)^3}\right) \\ &= \frac{1}{x^2+y^2} \end{aligned}$$

Question 67

If  $a + b + c = 0$  then the value of  $\frac{1}{(a+b)(b+c)} + \frac{1}{(b+c)(c+a)} + \frac{1}{(c+a)(a+b)}$  is

A 0

B 1

C 3

D 2

Answer: A

Explanation:

$$a + b + c = 0$$

$$\frac{1}{(a+b)(b+c)} + \frac{1}{(b+c)(c+a)} + \frac{1}{(c+a)(a+b)}$$

taking LCM we get

$$\frac{c+a}{(a+b)(b+c)(c+a)} + \frac{(a+b)}{(a+b)(b+c)(c+a)} + \frac{(b+c)}{(c+a)(b+c)(a+b)}$$

$$= \frac{c+a+a+b+b+c}{(a+b)(b+c)(c+a)} = \frac{2(a+b+c)}{(a+b)(b+c)(c+a)}$$

we know  $a + b + c = 0$

$$\frac{c+a+a+b+b+c}{(a+b)(b+c)(c+a)} = \frac{2(a+b+c)}{(a+b)(b+c)(c+a)} = 0$$

### Question 68

If  $x^2 + y^2 + 2x + 1 = 0$ , then the value of  $x^{31} + y^{35}$  is

- A -1
- B 0
- C 1
- D 2

Answer: A

Explanation:

$$x^2 + y^2 + 2x + 1 = 0$$

$$x^2 + 2x + 1 + y^2 = 0 \{ \because (x + 1)^2 = x^2 + 2x + 1 \}$$

$$(x + 1)^2 + y^2 = 0$$

$$\therefore (x + 1)^2 = 0, y^2 = 0$$

$$x + 1 = 0 \quad y = 0$$

$$x = -1 \quad y = 0$$

$$x^{31} + y^{35} = -1^{31} + 0^{35} = -1$$

### Question 69

If  $x = \frac{\sqrt{5}+1}{\sqrt{5}-1}$  and  $y = \frac{\sqrt{5}-1}{\sqrt{5}+1}$ , the value of  $\frac{x^2+xy+y^2}{x^2-xy+y^2}$  is

- A  $\frac{3}{4}$
- B  $\frac{4}{3}$
- C  $\frac{3}{5}$
- D  $\frac{5}{3}$

Answer: B

Explanation:

$$x = \frac{\sqrt{5}+1}{\sqrt{5}-1} \text{ and } y = \frac{\sqrt{5}-1}{\sqrt{5}+1}$$

$$x + y = \frac{\sqrt{5}+1}{\sqrt{5}-1} + \frac{\sqrt{5}-1}{\sqrt{5}+1}$$

$$x + y = \frac{5+1+2\sqrt{5}+5+1-2\sqrt{5}}{5-1}$$

$$x + y = \frac{12}{4} = 3$$

$$x \times y = \frac{\sqrt{5}+1}{\sqrt{5}-1} \times \frac{\sqrt{5}-1}{\sqrt{5}+1} = 1$$

$$(x + y)^2 = x^2 + y^2 + 2xy = (3)^2 = x^2 + y^2 + 2$$

$$x^2 + y^2 = 7$$

$$\frac{x^2 + xy + y^2}{x^2 - xy + y^2} \text{ \{substituting } x^2 + y^2 = 7 \text{ and } xy = 1\}}$$

$$\frac{7+1}{7-1} = \frac{8}{6}$$

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

**Question 70**

If  $(x - \frac{1}{x})^2 = 3$ , then the value of  $x^6 + \frac{1}{x^6}$  equals

- A 90
- B 100
- C 110
- D 120

**Answer: C**

**Explanation:**

$$(x - \frac{1}{x})^2 = 3$$

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

$$x^2 + \frac{1}{x^2} = 5 \quad \{ x + \frac{1}{x} = k \text{ then } x^3 + \frac{1}{x^3} = k^3 - 3k \}$$

$$x^6 + \frac{1}{x^6} = 5^3 - 3 \times 5 = 125 - 15 = 110$$

$$x^6 + \frac{1}{x^6} = 110$$

**Question 71**

If  $x^4 + 2x^3 + ax^2 + bx + 9$  is a perfect square, where a and b are positive real numbers, then the value of a and b are

- A a = 5, b = 6
- B a = 6, b = 7
- C a = 7, b = 6
- D a = 7, b = 8

**Answer: C**

**Question 72**

If  $a^2 + b^2 + c^2 = 16$ ,  $x^2 + y^2 + z^2 = 25$  and  $ax + by + cz = 20$ , then the value of  $\frac{a+b+c}{x+y+z}$

- A  $\frac{3}{5}$
- B  $\frac{5}{3}$
- C  $\frac{4}{5}$

D  $\frac{5}{4}$

Answer: C

Explanation:

$$a^2 + b^2 + c^2 = 16, x^2 + y^2 + z^2 = 25 \text{ and } ax + by + cz = 20$$

let  $a = 0, b = 0, x = 0, y = 0$

we get

$$0^2 + 0^2 + c^2 = 16, c^2 = 16, c = 4$$

$$0^2 + 0^2 + z^2 = 25, z^2 = 25, z = 5$$

putting value of c and z

$$0x + 0y + cz = 20$$

satisfy the above equation

putting the values

$$\begin{aligned} a+b+c &= 0+0+4 \\ x+y+z &= 0+0+5 \end{aligned}$$

$\frac{4}{5}$

Question 73

The value of x which satisfies the equation  $\frac{x+a^2+2c^2}{b+c} + \frac{x+b^2+2a^2}{c+a} + \frac{x+c+2b^2}{a+b} = 0$  is

A  $(a^2 + b^2 + c^2)$

B  $-(a^2 + b^2 + c^2)$

C  $(a^2 + 2b^2 + c^2)$

D  $-(a^2 + b^2 + 2c^2)$

Answer: B

Question 74

If  $a^3 = 117 + b^3$  and  $a = 3 + b$ , then the value of  $a + b$  is:

A  $\pm 7$

B  $\pm 49$

C  $\pm 13$

D 0

Answer: A

Question 75

If  $a + \frac{1}{a} = -2$  then the value of  $a^{1000} + a^{-1000}$  is

A 2

B 0



C 1

D  $\frac{1}{2}$

Answer: A

Explanation:

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

let  $a = -1$

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

$$\therefore a = -1$$

$$a^{1000} + a^{-1000} = (-1)^{1000} + (-1)^{-1000} = 1 + 1 = 2$$

Question 76

$\triangle ABC$  is similar to  $\triangle DEF$ . If area of  $\triangle ABC$  is 9 sq.cm. and area of  $\triangle DEF$  is 16 sq.cm. and  $BC = 2.1$  cm. Then the length of  $EF$  will be

A 5.6 cm

B 2.8 cm

C 3.7 cm

D 1.4 cm

Answer: B

Explanation:

if triangle are similar then

$$\frac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF} = \frac{BC^2}{EF^2}$$

$$\frac{9}{16} = \frac{BC^2}{EF^2}$$

$$\frac{2.1}{EF} = \frac{3}{4}$$

$$EF = 2.8 \text{ cm}$$

Question 77

A chord of a circle is equal to its radius. The angle subtended by this chord at a point on the circumference is

A  $80^\circ$

B  $60^\circ$

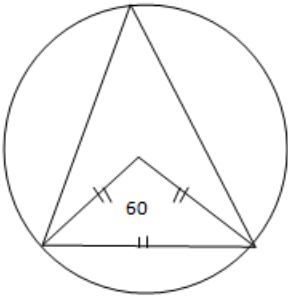
C  $30^\circ$

D  $90^\circ$

Answer: C

Explanation:

length of chord = length of radius



equilateral triangle is formed

angle at the centre =  $60^\circ$

angle subtended by chord at centre = 2 angle subtended by chord at the circumference of circle

angle subtended by chord at the circumference of circle =  $30^\circ$

**Question 78**

Let two chords AB and AC of the larger circle touch the smaller circle having same centre at X and Y. Then XY = ?

- A BC
- B  $\frac{1}{2}$  BC
- C  $\frac{1}{3}$  BC
- D  $\frac{1}{4}$  BC

**Answer: B**

**Question 79**

Let G be the centroid of the equilateral triangle ABC of perimeter 24 cm. Then the length of AG is

- A  $2\sqrt{3}$  cm
- B  $\frac{8}{\sqrt{3}}$  cm
- C  $8\sqrt{3}$  cm
- D  $4\sqrt{3}$  cm

**Answer: B**

**Explanation:**

equilateral triangle ABC of perimeter 24 cm

let a be side of  $\triangle ABC$

perimeter =  $3a = 24$

$a = 8$

height of the equilateral triangle =  $\frac{\sqrt{3}}{2} a = \frac{\sqrt{3}}{2} \times 8 = 4\sqrt{3}$

centroid divides the height in 2:1

length of AG =  $\frac{2}{3}$  height of equilateral triangle =  $\frac{2}{3} \times 4\sqrt{3}$   
 $\frac{8}{\sqrt{3}}$  cm

**Question 80**

A and B are the centres of two circles with radii 11 cm and 6 cm respectively. A common tangent touches these circles at P & Q respectively. If  $AB = 13$  cm, then the length of PQ is

- A 13 cm
- B 17 cm
- C 8.5 cm
- D 12 cm

Answer: D

**Question 81**

ABC is an isosceles triangle inscribed in a circle. If  $AB = AC = 12\sqrt{5}$  and  $BC = 24$  cm then radius of circle is

- A 10 cm
- B 15 cm
- C 12 cm
- D 14 cm

Answer: B

**Question 82**

ABC is an isosceles triangle where  $AB = AC$  which is circumscribed about a circle. If P is the point where the circle touches the side BC, then which of the following is true ?

- A  $BP = PC$
- B  $BP > PC$
- C  $BP < PC$
- D  $BP = \frac{1}{2}PC$

Answer: A

**Question 83**

If D and E are the mid points of AB and AC respectively of  $\triangle ABC$ , then the ratio of the areas of ADE and BCED is ?

- A 1 : 2
- B 1 : 4
- C 2 : 3
- D 1 : 3

Answer: D

Question 84

O is the circumcentre of the isosceles  $\triangle ABC$ . Given that  $AB = AC = 17$  cm and  $BC = 6$  cm. The radius of the circle is

- A 3.015 cm
- B 3.205 cm
- C 3.025 cm
- D 3.125 cm

Answer: D

Question 85

$B_1$  is a point on the side  $AC$  of  $\triangle ABC$  and  $B_1B$  is joined. A line is drawn through  $A$  parallel to  $B_1B$  meeting  $BC$  at  $A_1$  and another line is drawn through  $C$  parallel to  $B_1B$  meeting  $AB$  produced at  $C_1$ . Then

- A  $\frac{1}{CC_1} - \frac{1}{AA_1} = \frac{1}{BB_1}$
- B  $\frac{1}{CC_1} + \frac{1}{AA_1} = \frac{1}{BB_1}$
- C  $\frac{1}{BB_1} - \frac{1}{AA_1} = \frac{1}{CC_1}$
- D  $\frac{1}{AA_1} - \frac{1}{CC_1} = \frac{2}{BB_1}$

Answer: B

Question 86

The value of the expression  $(1 + \sec 22^\circ + \cot 68^\circ)(1 - \operatorname{cosec} 22^\circ + \tan 68^\circ)$  is

- A 0
- B 1
- C -1
- D 2

Answer: D

Explanation:

$$(1 + \sec 22^\circ + \cot 68^\circ)(1 - \operatorname{cosec} 22^\circ + \tan 68^\circ)$$

$$(1 + \sec 22^\circ + \tan 22^\circ)(1 - \operatorname{cosec} 22^\circ + \cot 22^\circ)$$

$$\left(1 + \frac{1}{\cos 22^\circ} + \frac{\sin 22^\circ}{\cos 22^\circ}\right) \left(1 - \frac{1}{\sin 22^\circ} + \frac{\cos 22^\circ}{\sin 22^\circ}\right)$$

$$\left(\frac{1 + \cos 22^\circ + \sin 22^\circ}{\cos 22^\circ}\right) \left(\frac{\cos 22^\circ + \sin 22^\circ - 1}{\sin 22^\circ}\right)$$

$$\frac{\sin^2 22^\circ + \cos^2 22^\circ + 2\cos 22^\circ \times \sin 22^\circ - 1}{\cos 22^\circ \sin 22^\circ}$$

$$\frac{1 + 2\cos 22^\circ \sin 22^\circ - 1}{\cos 22^\circ \sin 22^\circ} = 2$$

**Question 87**

If  $x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$  and  $x \sin \theta - y \cos \theta = 0$ , then the value of  $x^2 + y^2$  equals

- A 1
- B  $\frac{1}{2}$
- C  $\frac{3}{2}$
- D 2

**Answer: A**

**Explanation:**

$$x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta \rightarrow \text{eq 1}$$

$$x \sin \theta - y \cos \theta = 0$$

$$x \sin \theta = y \cos \theta \rightarrow \text{eq 2}$$

substituting in eq1

$$y \cos \theta \sin^2 \theta + y \cos^3 \theta = \sin \theta \cos \theta$$

taking  $y \cos \theta$  common

$$y \cos \theta (\sin^2 \theta + \cos^2 \theta) = \sin \theta \cos \theta \{ \text{we know } \sin^2 \theta + \cos^2 \theta = 1 \}$$

$$y \cos \theta = \sin \theta \cos \theta$$

$$y = \sin \theta$$

substituting in eq 2

$$x \sin \theta = \sin \theta \cos \theta$$

$$x = \cos \theta$$

$$x^2 + y^2 = \sin^2 \theta + \cos^2 \theta = 1$$

**Question 88**

If  $\sec \theta + \tan \theta = m (> 1)$ , then the value of  $\sin \theta$  is ( $0^\circ < \theta < 90^\circ$ )

- A  $\frac{1-m^2}{1+m^2}$
- B  $\frac{m^2-1}{m^2+1}$
- C  $\frac{m^2+1}{m^2-1}$
- D  $\frac{1+m^2}{1-m^2}$

**Answer: B**

**Explanation:**

$$\sec \theta + \tan \theta = m (> 1)$$

$$\text{let } \theta = 45^\circ$$

$$\sqrt{2} + 1 = m$$

$$m^2 = 3 + 2\sqrt{2}$$

$$m^2 - 1 = 3 + 2\sqrt{2} - 1 = 2 + 2\sqrt{2}$$

$$m^2 + 1 = 3 + 2\sqrt{2} + 1 = 4 + 2\sqrt{2}$$

$$\frac{m^2-1}{m^2+1} = \frac{2+2\sqrt{2}}{2+2\sqrt{2}} = \frac{1}{\sqrt{2}} = \sin\theta$$

**Question 89**

If  $(a^2 - b^2) \sin \theta + 2ab \cos \theta = a^2 + b^2$ , then  $\tan \theta =$

**A**  $\frac{2ab}{a^2-b^2}$

**B**  $\frac{a^2-b^2}{2ab}$

**C**  $\frac{ab}{a^2-b^2}$

**D**  $\frac{a^2-b^2}{ab}$

**Answer: B**

**Explanation:**

$$(a^2 - b^2) \sin \theta + 2ab \cos \theta = a^2 + b^2$$

divide it by  $a^2 + b^2$

we get

$$\frac{(a^2-b^2)\sin\theta}{a^2+b^2} + \frac{2ab\cos\theta}{a^2+b^2} = 1 \quad (\because \sin^2\theta + \cos^2\theta = 1)$$

$$\text{here } \sin \theta = \frac{(a^2-b^2)}{a^2+b^2}$$

$$\cos \theta = \frac{2ab}{a^2+b^2}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta} = \frac{(a^2-b^2)}{2ab}$$

**Question 90**

A person from the top of a hill observes a vehicle moving towards him at a uniform speed. It takes 10 minutes for the angle of depression to change from  $45^\circ$  to  $60^\circ$ . After this the time required by the vehicle to reach the bottom of the hill is

**A** 12 min 20 sec

**B** 13 min

**C** 13 min 40 sec

**D** 14 min 24 sec

**Answer: C**

**Question 91**

If  $2y \cos \theta = x \sin \theta$  and  $2x \sec \theta - y \operatorname{cosec} \theta = 3$ , then the value of  $x^2 + 4y^2$  is

**A** 1

**B** 2

**C** 3

**D** 4

**Answer: D**

**Explanation:**

$$\text{let } \theta = 45^\circ$$

$$2y\sqrt{2} = x\sqrt{2} = 2y = x$$

$$2x\sqrt{2} - y\sqrt{2} = 3$$

$$2x - y = \frac{3}{\sqrt{2}} \text{ \{substituting } y = \frac{x}{2}\}$$

$$x = \sqrt{2}$$

$$y = \frac{1}{\sqrt{2}}$$

$$\text{value of } x^2 + 4y^2 = \sqrt{2}^2 + 4 \frac{1}{\sqrt{2}^2} = 2 + 2 = 4$$

### Question 92

From the top of a cliff 100 metre high, the angles of depression of the top and bottom of a tower are  $45^\circ$  and  $60^\circ$  respectively. The height of the tower is

- A  $\frac{100}{3} (3 - \sqrt{3})$  metre
- B  $\frac{100}{3} (\sqrt{3} - 1)$  metre
- C  $\frac{100}{3} (2\sqrt{3} - 1)$  metre
- D  $\frac{100}{3} (\sqrt{3} - \sqrt{2})$  metre

**Answer: A**

### Question 93

A vertical tower stands on a horizontal plane and is surmounted by a vertical flag staff of height  $h$ . At a point on the plane, the angle of elevation of the bottom of the flag staff is  $\alpha$  and that of the top of the flag staff is  $\beta$ . Then the height of the tower is

- A  $h \tan \alpha$
- B  $\frac{h \tan \alpha}{\tan \beta - \tan \alpha}$
- C  $\frac{h \tan \alpha}{\tan \alpha - \tan \beta}$
- D None of these

**Answer: B**

### Question 94

A man on the top of a tower, standing on the sea-shore, finds that a boat coming towards him takes 10 minutes for the angle of depression to change from  $30^\circ$  to  $60^\circ$ . How soon the boat reach the sea-shore ?

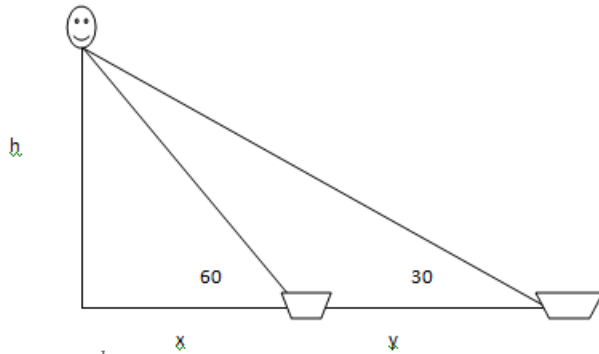
- A 5 minutes
- B 7 minutes
- C 10 minutes

D 15 minutes

Answer: A

Explanation:

height of tower = h



$$\tan 30^\circ = \frac{h}{x+y}$$

$$\tan 60^\circ = \frac{h}{x}$$

$$\frac{h}{\sqrt{3}} = x$$

$$\frac{1}{\sqrt{3}} = \frac{h}{x+y}$$

$$h\sqrt{3} = x + y$$

$$h\sqrt{3} = \frac{h}{\sqrt{3}} + y$$

$$\frac{2h}{\sqrt{3}} = y$$

$$y = 2x$$

time taken to travel y distance = 10mins

time taken to travel x distance ( half of y distance ) = 5 mins

### Question 95

The expression of  $\frac{\cot \theta + \operatorname{cosec} \theta - 1}{\cot \theta + \operatorname{cosec} \theta + 1}$  is equal to

A  $\frac{1 + \cos \theta}{\sin \theta}$

B  $\frac{1 - \cos \theta}{\sin \theta}$

C  $\frac{\cot \theta + 1}{\operatorname{cosec} \theta}$

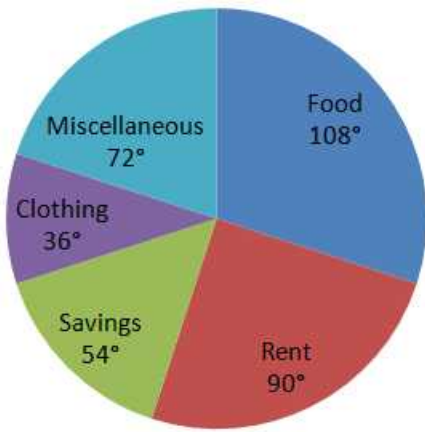
D  $\frac{\cot \theta - 1}{\operatorname{cosec} \theta}$

Answer: A

### Instructions

The following pie-chart shows the monthly expenditure of a family on various items. If the family spends Rs. 825 on clothing, answer the question





**Question 96**

What is the total monthly income of the family ?

- A Rs. 8025
- B Rs. 8250
- C Rs. 8520
- D Rs. 8052

**Answer: B**

**Explanation:**

given  $36^\circ$  (clothing) = Rs825

total income =  $360^\circ = 825 \times 10 = \text{Rs } 8250$

**Question 97**

What percent of the total income does the family save

- A 15%
- B 50%
- C 20%
- D 25%

**Answer: A**

**Explanation:**

savings =  $54^\circ$

total income =  $360^\circ$

$\frac{54^\circ}{360^\circ} \times 100 = 15\%$

**Question 98**

What is the ratio of expenses on food and miscellaneous ?

- A 3 : 4
- B 2 : 3

C 3 : 2

D 2 : 5

**Answer: C**

**Explanation:**

given  $36^\circ = 825$

$$1^\circ = \frac{825}{36}$$

ratio of expenses on food : miscellaneous

$$108^\circ : 72^\circ$$

$$108 \times \frac{825}{36} : 72 \times \frac{825}{36}$$

3:2

**Question 99**

**What is the average of expenses on clothing and rent?**

A Rs. 1443.75

B Rs. 1344.57

C Rs. 1574.34

D Rs. 1734.45

**Answer: A**

**Explanation:**

average of expenses on clothing and rent

$$\text{clothing} = 36^\circ = \text{rs } 825$$

$$\text{rent} = 90^\circ$$

$$\text{average} = \frac{\text{clothing} + \text{rent}}{2} = \frac{36 + 90}{2} = 63^\circ$$

$$36^\circ = 825$$

$$1^\circ = \frac{825}{36}$$

$$63 \times \frac{825}{36} = \frac{5775}{4} = 1443.75$$

**Question 100**

**The ratio of average of expenses on food, clothing and miscellaneous items to the average of expenses on savings and rent is**

A 3 : 2

B 1 : 3

C 2 : 1

D 1 : 1

**Answer: D**