



SSC CGL Tier-2 12th September 2019 Maths

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SSC CGL Tier-2 12th September 2019 Quant

Instructions

For the following questions answer them individually

Question 1

Two-third of the number of employees of a company are males and the rest are females. If $\frac{3}{8}$ of the male employees and $\frac{2}{5}$ of the female employees are temporary employees and the total number of permanent employees is 740. then $\frac{7}{15}$ of the total number of employees exceeds the number of temporary female employees by:

- A 400
- B 340
- C 308
- D 320

Answer: A

Explanation:

let the total employees be x .

$$\text{Male employees} = \frac{2x}{3}$$

$$\text{Female employees} = x - \frac{2x}{3} = \frac{x}{3}$$

$$\text{Permanent male employees} = \frac{3}{8} \text{ of the male employee} = \frac{2x}{3} \times \frac{3}{8} = \frac{5x}{12}$$

$$\text{Permanent female employees} = \frac{2}{5} \text{ of the female employee} = \frac{x}{3} \times \frac{2}{5} = \frac{2x}{15}$$

Total number of permanent employees = 740

$$\frac{5x}{12} + \frac{2x}{15} = 740$$

$$\frac{37x}{60} = 740$$

$$x = 740 \times \frac{60}{37} = 1200$$

$$\frac{7}{15} \text{ of the total number of employees} = 1200 \times \frac{7}{15} = 560$$

$$\text{Number of temporary female employees} = \frac{x}{3} \times \frac{3}{5} = \frac{2x}{5}$$

$$= \frac{2 \times 1200}{5} = 480$$

$$\frac{7}{15} \text{ of the total number of employees exceeds the number of temporary female employees by} = 560 - 480 = 80$$

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Question 2

Three fractions x, y and z are such that $x > y > z$. When small of them divided by the greatest, the result is $\frac{9}{16}$, which exceeds y by 0.0625 . If $x + y + z = \frac{13}{24}$, then the value of $x + z$ is

- A $\frac{7}{8}$
- B 1
- C $\frac{25}{24}$
- D $\frac{7}{6}$

Answer: C

Explanation:

$$\frac{z}{x} = \frac{9}{16}$$

$$\frac{9}{16} = y + 0.0625$$

$$y = \frac{1}{16}$$

$$\begin{aligned}
 x + y + z &= 124 \\
 x + z &= 24 \\
 x + z &= 24 - 24 = 14
 \end{aligned}$$

Question 3

If the 11-digit number 5678x43267y is divisible by 72, then the value of $\sqrt{5x + 8y}$ is:

- A 6
- B 4
- C 7
- D 8

Answer: A

Explanation:

11-digit number 5678x43267y is divisible by 72.

It will be divisible by 9 and 8.

For the divisibility by 8,

67y divisible by 8.

So value of y = 2

For the divisibility by 9,

$(5+6+7+8+x+4+3+2+6+7+y) = 50 + x$ divisible by 8.

So value of x = 54 - 50 = 4

$$\sqrt{5x + 8y}$$

$$= \sqrt{5 \times 4 + 8 \times 2}$$

$$= \sqrt{36} = 6$$

Question 4

What is the ratio of the third proportional to 0.4 and 0.8, to the mean proportional between 13.5 and 0.24?

- A 5 : 4
- B 7 : 8
- C 8 : 9
- D 9 : 10

Answer: C

Explanation:

$$\text{Third proportional} = \frac{(0.8)^2}{0.4} = \frac{0.64}{0.4} = 1.6$$

$$\text{Mean proportional} = \sqrt{13.5 \times 0.24} = \sqrt{3.24} = 1.8$$

Ratio of the third proportional to 0.4 and 0.8, to the mean proportional between 13.5 and 0.24 = 1.6 : 1.8 = 8 : 9

∴ The correct answer is option C.

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Question 5

If $x + \frac{1}{16x} = 3$ then the value of $16x^3 + \frac{1}{256x^3}$ is

- A 423
- B 441

C 432

D 414

Answer: A

Explanation:

$$x + \frac{1}{16}x = 3$$

On multiply by 4,

$$4x + \frac{1}{4}x = 12$$

$$(4x + \frac{1}{4}x)^3 = (12)^3$$

$$64x^3 + 64x^3 + 3(4x + \frac{1}{4}x) = 1728$$

$$64x^3 + 64x^3 + 3(12) = 1728$$

$$\frac{1}{4}(64x^3 + 64x^3) = \frac{1}{4}(1728 - 36)$$

$$(16x^3 + 256x^3) = 423$$

Question 6

If 60% of a number is 120 more than 20% of the number, then 28% of the number is less than $33\frac{1}{3}\%$ of the number by:

A 14

B 12

C 16

D 15

Answer: C

Explanation:

Let the number be x.

ATQ,

$$60\%x - 20\%x = 120$$

$$40\%x = 120$$

$$x = 120 \times \frac{100}{40} = 300$$

$$28\% \text{ of the number} = 300 \times \frac{28}{100} = 84$$

$$33\frac{1}{3}\% \text{ of the number} = 300 \times \frac{1}{3} = 100$$

$$28\% \text{ of the number is less than } 33\frac{1}{3}\% \text{ of the number} = 100 - 84 = 16$$

Question 7

A sum lent out at simple interest amounts to ₹6076 in 1 year and ₹7504 in 4 years. The sum and the rate of interest p.a. are respectively:

A ₹5,600 and 9%

B ₹5,600 and 8.5%

C ₹5,400 and 9%

D ₹5,400 and 10%

Answer: B

Explanation:

B the option B,

Principle = 5600

Rate(r) = 8.5%

Interest for 1 year = 6076 - 5600 = 476

Interest of 4 year = 7504 - 5600 = 1904

$$\text{Interest} = \frac{prt}{100} = \frac{5600 \times 8.5 \times 1}{100} = \text{Rs.}476$$

$$\text{Interest} = 476 \times 4 = \text{Rs.}1904$$

∴ The correct answer is option B.

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Question 8

In $\triangle ABC$, the medians AD, BE and CF meet at O. What is the ratio of the area of $\triangle ABD$ to the area of $\triangle AOE$?

A 2 : 1

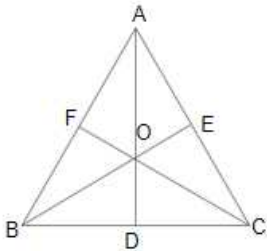
B 3 : 1

C 5 : 2

D 3 : 2

Answer: B

Explanation:



The ratio of the area of $\triangle ABD$ to the area of $\triangle AOE = 1 + 1 + 1 : 1 = 3 : 1$

Question 9

If $x + y + z = 2$, $xy + yz + zx = -11$ and $xyz = -12$, then what is the value of $\sqrt{x^3 + y^3 + z^3 - 2}$?

A 6

B 12

C 9

D 8

Answer: A

Explanation:

$$x^3 + y^3 + z^3 - 3xyz = (x + y + z)[(x + y + z)^2 - 3(xy + yz + zx)]$$

$$x^3 + y^3 + z^3 - 3(-12) = (2)[(2)^2 - 3(-11)]$$

$$x^3 + y^3 + z^3 + 36 = (2)[4 + 33]$$

$$x^3 + y^3 + z^3 = 74 - 36$$

$$x^3 + y^3 + z^3 - 2 = 36$$

$$\sqrt{x^3 + y^3 + z^3 - 2} = 6$$

Question 10

The value of $(1\frac{1}{3} \div 2\frac{6}{7} \text{ of } 5\frac{3}{5}) \div (6\frac{2}{5} \div 4\frac{1}{2} \text{ of } 5\frac{1}{3}) \times (4 \times 2\frac{2}{3} \div 9 \text{ of } 1\frac{1}{5}) = 1 + k$, where k lies between

A -0.07 and -0.06

- B -0.08 and -0.07
 C -0.06 and -0.05
 D -0.05 and -0.04

Answer: A

Explanation:

$$\left(\frac{1}{3} \div \frac{2}{7} \text{ of } \frac{3}{5}\right) \div \left(\frac{2}{5} \div \frac{4}{2} \text{ of } \frac{1}{5}\right) \times \left(\frac{3}{4} \times \frac{2}{3} \div \frac{5}{9} \text{ of } \frac{1}{15}\right) = 1 + k$$

$$\left(\frac{3}{4} \div \frac{7}{5} \text{ of } \frac{3}{5}\right) \div \left(\frac{5}{5} \div \frac{2}{2} \text{ of } \frac{1}{3}\right) \times \left(\frac{3}{4} \times \frac{8}{3} \div \frac{2}{3} \text{ of } \frac{6}{5}\right) = 1 + k$$

$$\frac{1}{12} \div \frac{4}{15} \times (4 \times 4) = 1 + k$$

$$\frac{1}{12} \div \frac{4}{15} \times 3 = 1 + k$$

$$\frac{1}{12} \times \frac{15}{4} \times 3 = 1 + k$$

$$15/16 = 1 + k$$

$$k = 0.9375 - 1 = -0.0625$$

So, k lies between -0.07 and -0.06.

∴ The correct answer is option A.

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Question 11

5 years ago, the ratio of the age of A to that of B was 4 : 5. Five years hence, the ratio of the age of A to that of B will be 6 : 7. If, at present, C is 10 years younger than B, then what will be the ratio of the present age of A to that of C?

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

Answer: B

Explanation:

5 years ago, the ratio of the age of A to B = 4 : 5

Let 5 years ago, the age of A and B be 4x and 5x.

Five years hence, the ratio of the age of A to B = 6 : 7

ATQ,

$$\frac{4x+10}{5x+10} = \frac{6}{7}$$

$$28x + 70 = 30x + 60$$

$$2x = 10$$

$$x = 5$$

$$\text{Present age of A} = 4x + 5 = 4 \times 5 + 5 = 25$$

$$\text{Present age of B} = 5x + 5 = 5 \times 5 + 5 = 30$$

$$\text{Present age of C} = 30 - 10 = 20$$

$$\text{Ratio of the present age of A to that of C} = 25 : 20 = 5 : 4$$

Question 12

The area of the base of a right circular cone is 40π and its height is 15 cm. The curved surface area of the cone (in cm^2) is:

- A 480π
 B 500π
 C 450π

D 560π

Answer: B

Explanation:

Base of a right circular cone = 400π

$$2\pi r = 40\pi$$

$$r = 20$$

$$h = 15$$

$$l^2 = r^2 + h^2$$

$$l^2 = (20)^2 + (15)^2$$

$$l^2 = 400 + 225$$

$$l^2 = (25)^2$$

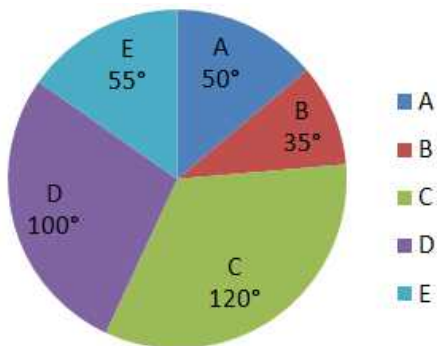
$$l = 25$$

The curved surface area of the cone = $\pi r l = \pi \times 20 \times 25 = 500\pi$

Question 13

The given pie chart shows the quantity wise sales distribution of five products (A, B, C, D and E) of a company in 2016.

Quantity wise sales distribution of five products (A, B, C, D and E)



If 1500 units of product D were sold in 2016 and the total number of units sold by the company in 2017 was 18% more than that sold in 2016, then the total units sold by the company in 2017 is:

A 6336

B 6390

C 6372

D 6354

Answer: C

Explanation:

Quantity of product D were sold in 2016 = 1500 units

$$100^\circ = 1500$$

$$\text{Total product}(360^\circ) = \frac{1500}{100} \times 360 = 5400$$

Total number of units sold by the company in 2017 = 18% more than that sold in 2016

$$= 5400 \times \frac{118}{100} = 6372$$

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Question 14

The given bar graph shows the imports and exports (in ₹ crores) of steel by a country from 2013 to 2017.



What is the ratio of the total imports in 2015 and 2017 to the total exports in 2013 and 2016?

- A 11 : 4
- B 9 : 8
- C 25 : 21
- D 9 : 11

Answer: C

Explanation:

Total imports in 2015 and 2017 = 450 + 550 = 1000

The total exports in 2013 and 2016 = 400 + 440 = 840

Ratio of the total imports in 2015 and 2017 to the total exports in 2013 and 2016 = 1000 : 840 = 25 : 21

∴ The correct answer is option C.

Question 15

An article is sold at a certain price. If it is sold at 80% of this price, then there will be a loss of 10%. What is the percentage profit when the article is sold at the original selling price?

- A $15\frac{1}{2}$
- B $12\frac{1}{2}$
- C 15
- D 12

Answer: B

Explanation:

Let the original selling price be Rs.100.

It is sold at 80% of this price, then there will be a loss of 10%.

So, selling price = Rs.80

$$\text{Cost price} = \frac{80}{90} \times 100 = \frac{800}{9}$$

$$\text{Profit} = 100 - \frac{800}{9} = \frac{100}{9}$$

$$\text{Profit percentage} = \frac{\frac{100}{9}}{\frac{800}{9}} \times 100 = \frac{100}{8}$$

$$= 12\frac{1}{2}$$

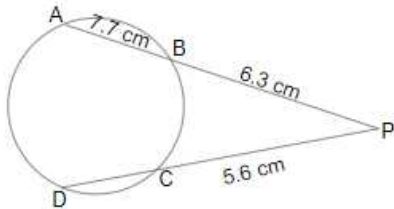
Question 16

In a circle, AB and DC are two chords. When AB and DC are produced, they meet at P. If PC = 5.6 cm, PB = 6.3 cm and AB = 7.7 cm, then the length of CD is:

- A 8.35 cm
- B 9 cm
- C 10.15 cm
- D 9.25 cm

Answer: C

Explanation:



By the property,

$$PB \times PA = PC \times PD$$

$$6.3 \times (PB + AB) = 5.6 \times (PC + CD)$$

$$6.3 \times (6.3 + 7.7) = 5.6 \times (5.6 + CD)$$

$$6.3 \times (14) = 5.6 \times (5.6 + CD)$$

$$88.2 = 5.6 \times (5.6 + CD)$$

$$15.75 = (5.6 + CD)$$

$$CD = 10.15 \text{ cm}$$

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Question 17

The value of $\left(\frac{\sin A}{1 - \cos A} + \frac{1 - \cos A}{\sin A} \right) \div \left(\frac{\cot^2 A}{1 + \operatorname{cosec} A} + 1 \right)$ is:

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

Answer: D

Explanation:

$$\left(\frac{\sin A}{1 - \cos A} + \frac{1 - \cos A}{\sin A} \right) \div \left(\frac{\cot^2 A}{1 + \operatorname{cosec} A} + 1 \right)$$

Let the value of $\theta = 45^\circ$,

$$\left(\frac{1}{1 - \frac{1}{\sqrt{2}}} + \frac{1 - \frac{1}{\sqrt{2}}}{1} \right) \div \left(\frac{1}{1 + \sqrt{2}} + 1 \right)$$

$$= \left(\frac{\frac{1}{2} + (1 - \frac{1}{\sqrt{2}})^2}{(\sqrt{2})(1 - \frac{1}{\sqrt{2}})} \right) \div \left(\frac{1 + 1 + \sqrt{2}}{1 + \sqrt{2}} \right)$$

$$= \left(\frac{\frac{1}{2} + 1 + \frac{1}{2} - \sqrt{2}}{(\sqrt{2})(1 - \frac{1}{\sqrt{2}})} \right) \div \left(\frac{2 + \sqrt{2}}{1 + \sqrt{2}} \right)$$

$$= \left(\frac{2 - \sqrt{2}}{(\sqrt{2} - 2)} \right) \div \left(\frac{2 + \sqrt{2}}{1 + \sqrt{2}} \right)$$

$$= \left(\frac{2-\sqrt{2}}{2\sqrt{2}} \right) \div \left(\frac{2+\sqrt{2}}{1+\sqrt{2}} \right)$$

$$= 2\sqrt{2} \times \frac{1+\sqrt{2}}{2+\sqrt{2}} = 2$$

Question 18

A is 25% more than B and B is 40% less than C. If C is 30% more than D, then by what percent is A less than D?

- A 1.5
- B 2.5
- C 4
- D 5

Answer: B

Explanation:

Let the D be x.

$$C = 1.3x$$

$$B = 60\% \text{ of } C = 1.3x \times \frac{60}{100} = 0.78x$$

$$A = 0.78x \times \frac{125}{100} = 0.975x$$

$$\text{Required percentage} = \frac{x - 0.975x}{x} \times 100 = \frac{0.025x}{x} \times 100 = 2.5\%$$

Question 19

In a class, $83\frac{1}{3}\%$ of the number of students are girls and the rest are boys. If 60% of the number of boys and 80% of the number of girls are present, then what percentage of the total number of students in the class is absent?

- A $26\frac{2}{3}$
- B $22\frac{2}{3}$
- C $23\frac{1}{3}$
- D $12\frac{1}{3}$

Answer: C

Explanation:

Let the total students be x.

$$\text{Girls} = 83\frac{1}{3}\% \text{ of } x = \frac{250x}{300} = \frac{5x}{6}$$

$$\text{Boys} = x - \frac{5x}{6} = \frac{x}{6}$$

Absent boys = (100% - 60% = 40%) of the number of boys

$$= \frac{x}{6} \times \frac{40}{100} = \frac{x}{15}$$

Absent girls = (100% - 80% = 20%) of the number of girls

$$= \frac{5x}{6} \times \frac{20}{100} = \frac{x}{6}$$

$$\text{Absent students} = \frac{x}{15} + \frac{x}{6} = \frac{7x}{30}$$

$$\text{Percentage absent students} = \frac{\frac{7x}{30}}{x} \times 100 = 23\frac{1}{3}\%$$

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Question 20

A spends 65% of his income. His income is increased by 20.1% and his expenditure is increased by 25%. His savings:

- A Increase by 11%
- B Increase by 5%
- C Decrease by 5%
- D Decrease by 11%

Answer: A

Explanation:

Let the income be Rs.100.

Expenditure = 65

Saving = 100 - 65 = 35

Income is increased by 20.1%..

So,

Income = Rs.120.1

Expenditure is increased by 25%..

So,

Expenditure = $65 \times \frac{125}{100} = 81.25$

Saving = 120.1 - 81.25 = Rs.38.85

Increment in saving = 38.85 - 35 = 3.85

Percentage increment in saving = $\frac{3.85}{35} \times 100 = 11\%$

Question 21

The average weight of a certain number of students in a group is 72 kg. If 10 students having an average weight of 78 kg leave and 4 students having an average weight of 80 kg join the group, the average weight of the students in the group decreases by 0.7 kg, The number of students initially in the group is:

- A 56
- B 46
- C 44
- D 54

Answer: B

Explanation:

Let the total number of students be n.

Sum of the weight = 72n

Average weight of 10 students = 78 kg

Sum of the weight of 10 students = $78 \times 10 = 780$

Sum of the weight of 4 students = $80 \times 4 = 320$

ATQ,

Average = sum of the terms/number of the term

$$\frac{72n - 780 + 320}{n - 10 + 4} = 72 - 0.7$$

$$72n - 460 = 71.3 \times (n - 6)$$

$$72n - 460 = 71.3n - 427.8$$

$$0.7n = 32.2$$

$$n = 46$$

The number of students initially in the group is 46.

Question 22

If $\frac{1 + \sin \phi}{1 - \sin \phi} = \frac{p^2}{q^2}$, then $\sec \phi$ is equal to

- A $\frac{2P^2Q^2}{p^2+q^2}$
- B $\frac{1}{2} \left(\frac{q}{p} + \frac{p}{q} \right)$
- C $\frac{1}{p^2} + \frac{1}{q^2}$
- D $\frac{P^2q^2}{p^2+q^2}$

Answer: B

Explanation:

$$\frac{1+\sin\phi}{1-\sin\phi} = \frac{p^2}{q^2}$$

By componendo dividendo rule,

$$\frac{(1+\sin\phi)+(1-\sin\phi)}{(1+\sin\phi)-(1-\sin\phi)} = \frac{p^2+q^2}{p^2-q^2}$$

$$2\sin\phi = \frac{p^2+q^2}{p^2-q^2}$$

$$\sin\phi = \frac{p^2+q^2}{p^2-q^2} = \frac{\text{perpendicular}}{\text{hypotenuse}}$$

By the Pythagoras theorem,

$$\text{Base} = \sqrt{(p^2+q^2)^2 - (p^2-q^2)^2} = \sqrt{4p^2q^2} = 2pq$$

$$\sec\phi = \frac{\text{hypotenuse}}{\text{base}} = \frac{p^2+q^2}{2pq}$$

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Question 23

The marked price of an article is ₹800 and it is sold at a discount of 19%. If there is a gain of 8%, then by what percent above the cost price was the article marked?

- A $33\frac{1}{3}$
- B 35
- C 27
- D $36\frac{2}{3}$

Answer: A

Explanation:

The marked price of an article = ₹800

Discount = 19%

Selling price = (100 - 19 - 81%) of the marked price

$$= 800 \times \frac{81}{100} = \text{Rs.}648$$

Gain 8%

$$\text{Cost price} = 648 \times \frac{100}{108} = 600$$

$$\text{Required percentage} = \frac{800-600}{600} \times 100 = \frac{200}{600} \times 100 = 33\frac{1}{3}\%$$

Question 24

The base of a right prism is a triangle with sides 20 cm, 21 cm and 29 cm. If its volume is 7560 cm^3 , then its lateral surface area (in cm^2) is:

- A 2484

- B 2556
C 2520
D 2448

Answer: C

Explanation:

By triplet 20-21-29,

Base = 20,

height = 21

Base area = $\frac{1}{2} \times 20 \times 21 = 210$

Volume = $base\ area \times h$

$7560 = 210 \times h$

$h = 36\ cm$

Lateral surface area = perimeter $\times h = (20 + 21 + 29) \times 36$

$= 70 \times 36 = 2520^2\ cm$

Question 25

The expression $\sqrt{10 + 2(\sqrt{6} - \sqrt{15} - \sqrt{10})}$ is equal to:

A $\sqrt{3} + \sqrt{2} - \sqrt{5}$

B $\sqrt{3} - \sqrt{2} - \sqrt{5}$

C $\sqrt{3} - \sqrt{2} + \sqrt{5}$

D $\sqrt{2} - \sqrt{3} - \sqrt{5}$

Answer: A

Explanation:

$$\sqrt{10 + 2(\sqrt{6} - \sqrt{15} - \sqrt{10})}$$

$$= \sqrt{3 + 2 + 5 + 2(\sqrt{3} \times \sqrt{2} - \sqrt{2} \times \sqrt{5} - \sqrt{5} \times \sqrt{2})}$$

$$= \sqrt{(\sqrt{3})^2 + (\sqrt{2})^2 + (-\sqrt{5})^2 + 2(\sqrt{3} \times \sqrt{2} - \sqrt{2} \times \sqrt{5} - \sqrt{5} \times \sqrt{2})}$$

$$= \sqrt{(\sqrt{3} + \sqrt{2} - \sqrt{5})^2}$$

$$= \sqrt{3} + \sqrt{2} - \sqrt{5}$$

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Question 26

A cylindrical vessel of radius 3.5 m is full of water. If 15400 litres of water is taken out from it, then the drop in the water level in the vessel will be:

A 72 cm

B 40 cm

C 35 cm

D 60 cm

Answer: B

Explanation:

Volume of water = 15400 litres = 15400000 ml

radius(r) = 3.5 m = 350 cm

ATQ,

$$\pi r^2 h = 15400000$$

$$\frac{22}{7} \times 350 \times 350 \times h = 15400000$$

$$h = 15400000/385000 = 40 \text{ cm}$$

Question 27

The value of $\frac{\sec\phi(1-\sin\phi)(\sin\phi+\cos\phi)(\sec\phi+\tan\phi)}{\sin\phi(1+\tan\phi)+\cos\phi(1+\cot\phi)}$ is equal to:

A $2\cos\phi$

B $\operatorname{cosec}\phi\sec\phi$

C $2\sin\phi$

D $\sin\phi\cos\phi$

Answer: D

Explanation:

$$\frac{\sec\phi(1-\sin\phi)(\sin\phi+\cos\phi)(\sec\phi+\tan\phi)}{\sin\phi(1+\tan\phi)+\cos\phi(1+\cot\phi)}$$

Put the value of $\phi = 60^\circ$,

$$\frac{\sec 60^\circ(1-\sin 60^\circ)(\sin 60^\circ+\cos 60^\circ)(\sec 60^\circ+\tan 60^\circ)}{\sin 60^\circ(1+\tan 60^\circ)+\cos 60^\circ(1+\cot 60^\circ)}$$

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

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

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

$$= \frac{\sqrt{3}+1}{\sqrt{3}(1+\sqrt{3})+\left(\frac{1+\sqrt{3}}{\sqrt{3}}\right)}$$

$$= \frac{1}{\sqrt{3}+\frac{1}{\sqrt{3}}} = \frac{\sqrt{3}}{4}$$

From the option D,

$$\sin\phi\cos\phi$$

Put the value of $\phi = 60^\circ$,

$$= \sin 60^\circ \cos 60^\circ$$

$$= \frac{\sqrt{3}}{2} \times \frac{1}{2}$$

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

Question 28

A, B and C start a business. A invests $33\frac{1}{3}\%$ of the total capital, B invests 25% of the remaining and C invests the rest. If the total profit at the end of a year is ₹1,62,000, then A's share in profit is:

A ₹81,000

B ₹60,000

C ₹54,000

D ₹90,000

Answer: C

Explanation:

Let the total investment be x

$$\text{Investment of A} = 33\frac{1}{3}\%x = x/3$$

$$\text{Remaining} = x - x/3 = 2x/3$$

$$\text{Investment of B} = \frac{2x}{3} \times \frac{25}{100} = \frac{x}{6}$$

$$\text{Investment of C} = \frac{2x}{3} - \frac{x}{6} = \frac{x}{2}$$

$$\text{Ratio of the investment of A, B and C} = \frac{x}{3} : \frac{x}{6} : \frac{x}{2} = 2 : 1 : 3$$

$$\text{Total profit} = 1,62,000$$

$$\text{A's share} = 162000 \times \frac{2}{2+1+3} = 162000 \times \frac{2}{6} = \text{Rs. } 54000$$

General Science Notes for SSC CGL

Question 29

A solid metallic sphere of radius 8 cm is melted and drawn into a wire of uniform cross-section. If the length of the wire is 24 m, then its radius (in mm) is:

A 6

B 5

C $\frac{1}{53}$

D $\frac{2}{63}$

Answer: C

Explanation:

Volume of solid metallic sphere = Volume of wire

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

$$\frac{4}{3} \times 8^3 = r_2^2 \times 2400$$

$$r_2^2 = \frac{4}{3} \times \frac{8 \times 8 \times 8}{2400}$$

$$r_2 = \frac{16}{30} \text{ cm}$$

$$= \frac{16}{3} \text{ mm} = 5\frac{1}{3} \text{ mm}$$

Question 30

The sides of a triangle are 56 cm, 90 cm and 106 cm. The circumference of its circumcircle is:

A 106π

B 109π

C 108π

D 112π

Answer: A

Explanation:

By the triplet 56-90-106,

$$\text{Diameter of circumcircle (D)} = 2 \times \frac{\text{hypotenuse}}{2} = 106 \text{ cm}$$

$$\text{The circumference of its circumcircle} = \pi D = 106\pi$$

Question 31

The speed of a boat in still water is 18 km/h and the speed of the current is 6 km/h. In how much time (in hours) will the boat travel a distance of 90 km upstream and the same distance downstream?

- A $9\frac{1}{2}$
- B $11\frac{1}{4}$
- C 12
- D 10

Answer: B

Explanation:

Speed of boat (v) = 18 km/h

Speed of the current (u) = 6 km/h

Speed in upstream = $v - u = 18 - 6 = 12$ km/h

Speed in downstream = $v + u = 18 + 6 = 24$ km/h

Distance = 90 km

Time taken by boat = $\frac{90}{12} + \frac{90}{24} = \frac{270}{24} = 11\frac{1}{4}$

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Question 32

The HCF of two numbers is 21 and their LCM is 221 times the HCF. If one of the numbers lies between 200 and 300, then the sum of the digits of the other number is:

- A 14
- B 17
- C 18
- D 15

Answer: D

Explanation:

HCF = 21

LCM = 221×21

Number of products = HCF \times LCM

Number of products = $221 \times 21 \times 21$

= $13 \times 17 \times 21 \times 21$

So 1 number = $13 \times 21 = 273$

Another number = $17 \times 21 = 357$

Sum of the digits of the other number = $3 + 5 + 7 = 15$

Question 33

$\triangle ABC$ and $\triangle DBC$ are on the same BC but on opposite sides of it. AD and BC intersect each other at O. If $AO = a$ cm, $DO = b$ cm and the area of $\triangle ABC = x$ cm², then what is the area (in cm²) of $\triangle DBC$

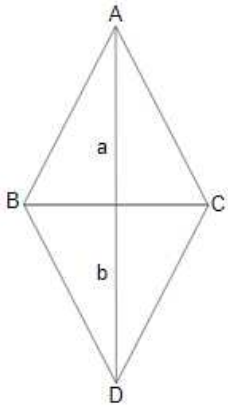
- A $\frac{a}{b}x$
- B $\frac{ab}{2}x$

C $\frac{bx}{a}$

D $\frac{(a+b)}{2} x$

Answer: C

Explanation:



Area of $\triangle ABC$: area of $\triangle DBC = \frac{1}{2} \times a \times BC : \frac{1}{2} \times b \times BC$
 x : area of $\triangle DBC = \frac{a}{b}$
Area of $\triangle DBC = \frac{ax}{b}$

Question 34

The value of $\tan^2\phi + \cot^2\phi - \sec^2\phi \operatorname{cosec}^2\phi$ is equal to

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

Answer: A

Explanation:

$$\tan^2\phi + \cot^2\phi - \sec^2\phi \operatorname{cosec}^2\phi$$

Put the $\theta = 45^\circ$

$$= \tan^2 45^\circ + \cot^2 45^\circ - \sec^2 45^\circ \operatorname{cosec}^2 45^\circ$$

$$= 1 + 1 - 2 \times 2$$

$$= 1 + 1 - 4 = -2$$

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Question 35

The point of intersection of the graphs of the equations $3x - 5y = 19$ and $3y - 7x + 1 = 0$ is P (α, β) . What is the value of $(3\alpha - \beta)$?

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

Answer: B

Explanation:

The point of intersection of the graphs of the equations $3x - 5y = 19$ and $3y - 7x + 1 = 0$ is P (α, β)

So,

$$3\alpha - 5\beta = 19 \quad \text{---(1)}$$

$$7\alpha - 3\beta = 1 \quad \text{---(2)}$$

Eq(1) multiply by 3 and eq (2) multiply by 5,

$$9\alpha - 15\beta = 57 \quad \text{---(3)}$$

$$35\alpha - 15\beta = 5 \quad \text{---(4)}$$

From eq (3) and (4),

$$26\alpha = -52$$

$$\alpha = -2$$

From eq (1),

$$3 \times -2 - 5\beta = 19$$

$$\beta = -5$$

Now,

$$(3\alpha - \beta)$$

$$= (3 \times -2 + 5)$$

$$= -1$$

Question 36

$$(\sec \phi - \tan \phi)^2 (1 + \sin \phi)^2 \div \sin^2 \phi = ?$$

A $\cos \phi$

B $\cot^2 \phi$

C $\sec \phi$

D $\cos^2 \phi$

Answer: B

Explanation:

$$(\sec \phi - \tan \phi)^2 (1 + \sin \phi)^2 \div \sin^2 \phi$$

Put the $\theta = 45^\circ$,

$$= (\sqrt{2} - 1)^2 \left(1 + \frac{1}{\sqrt{2}}\right)^2 \div \frac{1}{2}$$

$$= (\sqrt{2} - 1)^2 \left(\frac{\sqrt{2} + 1}{\sqrt{2}}\right)^2 \div \frac{1}{2}$$

$$= (\sqrt{2} - 1)^2 (\sqrt{2} + 1)^2$$

$$= (2 + 1 - 2\sqrt{2})(2 + 1 + 2\sqrt{2})$$

$$= (3 - 2\sqrt{2})(3 + 2\sqrt{2})$$

$$= 9 - 8 = 1$$

From the option B,

$$\cot^2 \phi$$

Put the $\theta = 45^\circ$,

$$= \cot^2 45^\circ$$

$$= 1$$

Question 37

By selling two articles for ₹800, a person gains the cost price of three articles. The profit percent is:

A 125

B 140

C 120

D 150

Answer: D

Explanation:

By selling two articles, a person gains the cost price of three articles.

Let the cost price of 2 articles be Rs.2

Selling price 2 articles = 5

Profit = 5 - 2 = 3

Profit percentagge = $\frac{3}{2} \times 100 = 150\%$

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Question 38

What is the compound interest on a sum of ₹7200 for $2\frac{2}{5}$ years at 20% p.a., interest compounded yearly (nearest to an integer)?

A ₹4,290

B ₹3,960

C ₹4,205

D ₹3,997

Answer: D

Explanation:

Principle(p) = 7200

Time(t) = $2\frac{2}{5}$ years = 2 + 2/5 years

r = 20%

Compound interest for 2 years = $p(1 + \frac{r}{100})^2 - p$

= $7200(1 + \frac{20}{100})^2 - 7200 = 7200(\frac{6}{5})^2 - 7200$

= $7200 \times \frac{36}{25} - 7200 = 10368 - 7200 = \text{Rs.}3168$

Now,

p1 = Rs.10368

Compound interest for 2/5 years = $\frac{prt}{100}$

= $\frac{10368 \times 20 \times 2}{100 \times 5} = 829.44$

Total interest = 3168 + 829.44 = Rs.3997.44

Question 39

The value of $\frac{(0.545)(0.081)(0.51)(5.2)}{(0.324)^3 + (0.221)^3 - (0.545)^3}$ is:

A -1

B 1

C 3

D -3

Answer: A

Explanation:

$\frac{(0.545)(0.081)(0.51)(5.2)}{(0.324)^3 + (0.221)^3 - (0.545)^3}$

= $\frac{(0.545)(0.081)(0.51)(5.2)}{3(0.324)(0.221)(0.545)}$

$$\begin{aligned} (\because (a + b)^3 &= a^3 + b^3 + 3ab(a + b)) \\ (0.081)(0.51)(5.2) & \\ = 3(0.324)(0.221) &= 1 \end{aligned}$$

Question 40

The base of a right pyramid is an equilateral triangle with side 8 cm, and the height of the pyramid is $24\sqrt{3}$ cm. The volume (in cm^3) of the pyramid is:

- A 1152
- B 480
- C 576
- D 384

Answer: D

Explanation:

$$\text{Base area} = \frac{\sqrt{3}}{4} a^2$$

$$a = 8 \text{ cm}$$

$$= \frac{\sqrt{3}}{4} 8^2 = \frac{\sqrt{3}}{4} 64$$

$$\text{Base area} = 16\sqrt{3}$$

$$\text{Volume} = \frac{1}{3} \times \text{base area} \times h = \frac{1}{3} \times 16\sqrt{3} \times 24\sqrt{3}$$

$$= 16 \times 24 = 384 \text{ cm}^3$$

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Question 41

The sum of the interior angles of a regular polygon is 1260° , What is the difference between an exterior angle and an interior angle of the polygon?

- A 105°
- B 100°
- C 120°
- D 90°

Answer: B

Explanation:

The sum of the interior angles of a regular polygon = 1260°

$$(n - 2) \times 180 = 1260^\circ$$

$$n - 2 = 7$$

$$n = 9$$

$$\text{Exterior angle} = 360/9 = 40^\circ$$

$$\text{Interior angle} = 180 - 40 = 140$$

$$\text{Difference} = 140 - 40 = 100^\circ$$

Question 42

In circle with centre O. AC and BD are two chords. AC and BD meet at E when produced. If AB is the diameter and $\angle AEB = 68^\circ$, then the measure of $\angle DOC$ is

- A 32°

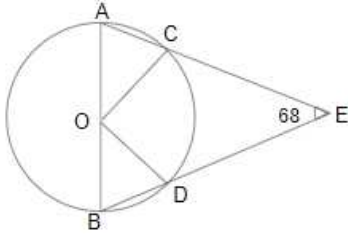
B 30°

C 22°

D 44°

Answer: D

Explanation:



In $\triangle AEB$,

$$\angle EAB + \angle EBA + 68 = 180$$

$$\angle EAB + \angle EBA = 112$$

$$\angle EAB = \angle OCA$$

$$\angle EBA = \angle ODB$$

In quadrilateral EDOC,

$$68 + \angle OCE + \angle DOC + \angle ODE = 360$$

$$68 + 180 - \angle OCA + 180 - \angle ODB + \angle DOC = 360$$

$$68 + 180 - \angle EAB + 180 - \angle EBA + \angle DOC = 360$$

$$68 + 180 - 112 + \angle DOC = 360$$

$$\angle DOC = 44^\circ$$

Question 43

In $\triangle ABC$, the perpendiculars drawn from A, B and C meet the opposite sides at D, E and F , respectively. AD, BE and CF intersect at point P . If $\angle EPD = 116^\circ$ and the bisectors of $\angle A$ and $\angle B$ meet at Q , then the measure of $\angle AQB$ is:

A 96°

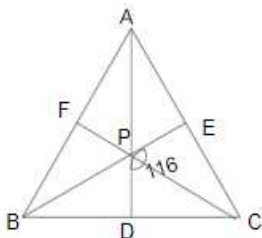
B 122°

C 124°

D 64°

Answer: B

Explanation:



In quadrilateral EPDC,

$$\angle PDC + \angle DCE + \angle CEP + \angle EPD = 360$$

$$\angle DCE = 360 - 90 - 90 - 116$$

$$\angle DCE = 64^\circ$$

$$\angle AQB = 90 + \frac{\angle DCE}{2}$$

$$= 90 + \frac{64}{2} = 90 + 32 = 122^\circ$$

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Question 44

The perimeters of two similar triangles ABC and PQR are 78 cm and 46.8 cm, respectively. If PQ = 11.7, then the length of AB is:

- A 19.5 cm
- B 23.4 cm
- C 24 cm
- D 20 cm

Answer: A

Explanation:

Triangles ABC and PQR are similar.

So,
 $\frac{\text{perimeter of } ABC}{\text{perimeter of } PQR} = \frac{\text{side of } ABC}{\text{side of } PQR}$

$$\frac{78}{46.8} = \frac{AB}{11.7}$$
$$46.8 \times 11.7 = AB$$
$$AB = 19.5 \text{ cm}$$

Question 45

If the diameter of the base of a right circular cylinder is reduced by $33\frac{1}{3}\%$ and its height is doubled, then the volume of the cylinder will:

- A increase by $1\frac{1}{9}\%$
- B remain unchanged
- C increase by $11\frac{1}{9}\%$
- D decrease by $11\frac{1}{9}\%$

Answer: D

Explanation:

Let the radius be r.

Initially volume of right circular cylinder = $\pi r^2 h$

Final volume of right circular cylinder = $\pi \left(r - \frac{r}{3}\right)^2 \times 2h = \frac{8}{9} \pi r^2 h$

Decrement = $\pi r^2 h - \frac{8}{9} \pi r^2 h = \frac{1}{9} \pi r^2 h$

Percentage decrement = $\frac{\frac{1}{9} \pi r^2 h}{\pi r^2 h} \times 100 = 11\frac{1}{9}\%$

Question 46

A right circular solid cone of radius 3.2 cm and height 7.2 cm is melted and recast into a right circular cylinder of height 9.6 cm. What is the diameter of the base of the cylinder?

- A 4.2 cm
- B 4.5 cm
- C 3.5 cm
- D 3.2 cm

Answer: D

Explanation:

$$\text{Volume of cone} = \frac{1}{3}\pi r^2 h$$

$$\text{Volume of cylinder} = \pi r^2 h$$

Volume of cone = volume of cylinder

$$\frac{1}{3}\pi(3.2)^2 \times 7.2 = \pi r^2 \times 9.6$$

$$10.24 \times 2.4 = r^2 \times 9.6$$

$$r^2 = 10.24/4 = 2.56$$

$$r = 1.6 \text{ cm}$$

$$\text{Diameter} = 1.6 \times 2 = 3.2 \text{ cm}$$

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Question 47

40 litres of 60% concentration of acid solution is added to 35 litres of 80% concentration of acid solution. What is the concentration of acid in the new solution?

- A 66%
- B $66\frac{2}{3}\%$
- C $69\frac{1}{3}\%$
- D 69%

Answer: C

Explanation:

$$\text{Acid in 40 litres mixture} = 40 \times \frac{60}{100} = 24 \text{ litres}$$

$$\text{Water in 40 litres mixture} = 40 - 24 = 16 \text{ litres}$$

$$\text{Acid in 35 litres mixture} = 35 \times \frac{80}{100} = 28 \text{ litres}$$

$$\text{Water in 35 litres mixture} = 35 - 28 = 7 \text{ litres}$$

$$\text{Total acid in the new solution} = 24 + 28 = 52$$

$$\text{Total water in the new solution} = 16 + 7 = 23$$

$$\text{Concentration of acid in the new solution} = \frac{52}{52+23} \times 100 = \frac{52}{75} \times 100 = 69\frac{1}{3}\%$$

Question 48

In $\triangle PQR$, I is the incentre of the triangle. If $\angle QIR = 107^\circ$, then what is the measure of $\angle P$?

- A 37°
- B 43°
- C 73°
- D 34°

Answer: D

Explanation:

$$\angle QIR = 90^\circ + \angle P/2$$

$$107 = 90^\circ + \angle P/2$$

$$\angle P/2 = 17^\circ$$

$$\angle P = 34^\circ$$

Question 49

If $x^4 - 83x^2 + 1 = 0$, then a value of $x^3 - x^{-3}$ can be:

- A 758
- B 756
- C 739
- D 737

Answer: B

Explanation:

$$x^4 - 83x^2 + 1 = 0$$

$$x^2 - 83 + \frac{1}{x^2} = 0$$

$$x^2 + \frac{1}{x^2} - 2 = 81$$

$$\left(x + \frac{1}{x}\right)^2 = 9^2$$

$$x + \frac{1}{x} = 9$$

$$x^3 - \frac{1}{x^3} = \left(x + \frac{1}{x}\right)^3 + 3\left(x + \frac{1}{x}\right) \\ = (9)^3 + 3(9) = 729 + 27 = 756$$

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Question 50

Sujata marks an article 36% above the cost price and allows a 40% discount on the marked price. The loss percentage is:

- A 15
- B 16.8
- C 18.4
- D 4

Answer: C

Explanation:

Let the cost price be Rs.100.

Marked price = 136

Discount = 40%

Selling price = $136 \times \frac{60}{100} = \text{Rs}81.6$

Loss = $100 - 81.6 = \text{Rs}18.4$

The loss percentage = $\frac{18.4}{100} \times 100 = 18.4\%$

Question 51

If $3(\cot^2 \phi - \cos \phi) = \cos^2 \phi$, $0^\circ < \phi < 90^\circ$, then the value of $(\tan^2 \phi + \operatorname{cosec}^2 \phi + \sin^2 \phi)$ is:

- A $\frac{13}{3}$
- B $\frac{61}{12}$
- C $\frac{25}{12}$
- D $\frac{15}{4}$

Answer: B

Explanation:

$$3(\cot^2 \phi - \cos \phi) = \cos^2 \phi$$

Put the value of $\phi = 60^\circ$,

$$3(\cot^2 60^\circ - \cos 60^\circ) = \cos^2 60^\circ$$

$$3\left(\frac{1}{3} - \frac{1}{4}\right) = \frac{1}{4}$$

$$3\left(\frac{1}{12}\right) = \frac{1}{4}$$

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

Now,

$$(\tan^2 \phi + \operatorname{cosec}^2 \phi + \sin^2 \phi)$$

Put the value of $\phi = 60^\circ$

$$= (\tan^2 60^\circ + \operatorname{cosec}^2 60^\circ + \sin^2 60^\circ)$$

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

$$= \frac{36+16+9}{12} = \frac{61}{12}$$

Question 52

A hemispherical bowl of internal diameter 36 cm is full of a liquid. This liquid is to be filled into cylindrical bottles each of radius 3 cm and height 12 cm. How many such bottles are required to empty the bowl?

A 72

B 54

C 36

D 27

Answer: C

Explanation:

Radius of hemispherical bowl = $36/2 = 18$ cm

Radius of cylindrical bottle = 3 cm

Height of cylindrical bottle = 12 cm

Volume of n bottles = volume of hemispherical bowl

$$n \times \pi r^2 \times 12 = \frac{2}{3} \pi r^3$$

$$n \times 3^2 \times 12 = \frac{2}{3} \times 18^3$$

$$n = \frac{2 \times 18^3}{27 \times 12}$$

$$n = 36$$

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Question 53

If $(5x + 1)^3 + (x - 3)^3 + 8(3x - 4)^3 = 6(5x + 1)(x - 3)(3x - 4)$, then x is equal to:

A $\frac{5}{6}$

B $\frac{1}{3}$

C $\frac{2}{3}$

D $\frac{3}{4}$

Answer: A

Explanation:

$$(5x + 1)^3 + (x - 3)^3 + 8(3x - 4)^3 = 6(5x + 1)(x - 3)(3x - 4)$$

$$(5x + 1)^3 + (x - 3)^3 + (6x - 8)^3 = 3(5x + 1)(x - 3)(6x - 8)$$

When $a^3 + b^3 + c^3 = 3abc$ then $a + b + c = 0$.

$$5x + 1 + x - 3 + 6x - 8 = 0$$

$$12x = 10$$

$$x = 5/6$$

Question 54

The average of 33 numbers is 74. The average of the first 17 numbers is 72.8 and that of the last 17 numbers is 77.2. If the 17th number is excluded, then what will be the average of the remaining numbers (correct to one decimal place)?

- A 72.9
- B 73.4
- C 71.6
- D 70.8

Answer: A

Explanation:

Average = sum of the terms/number of terms

$$\text{Sum of the 33 numbers} = 74 \times 33 = 2442$$

$$\text{The average of the first 17 numbers} = 72.8$$

$$\text{Sum of the first 17 numbers} = 72.8 \times 17 = 1237.6$$

$$\text{The average of the last 17 numbers} = 77.2$$

$$\text{Sum of the last 17 numbers} = 77.2 \times 17 = 1312.4$$

$$17^{\text{th}} \text{ number} = \text{sum of the first 17 numbers} + \text{sum of the last 17 numbers} - \text{sum of the 33 numbers} = 1237.6 + 1312.4 - 2442 = 108$$

$$\text{Sum of the 32 numbers without } 17^{\text{th}} \text{ number} = 2442 - 108 = 2334$$

$$\text{Average of 32 numbers} = 2334/32 = 72.93$$

Question 55

A solid cube is cut into three cuboids of same volumes. What is the ratio of the surface area of the cube to the sum of the surface areas of any two of the cuboids so formed?

- A 9 : 10
- B 27 : 16
- C 20 : 10
- D 9 : 8

Answer: A

Explanation:

Let the side of cube be 3 cm.

Length of cuboid = 3 cm

Breadth of cuboid = 3 cm

Height of cuboid = 3/3 = 1 cm

$$\text{Ratio of the surface area of the cube to the sum of the surface areas of any two of the cuboids} = 6 \times (a)^2 : 2 \times 2(lb + bh + lh)$$

$$= 6 \times (3)^2 : 2 \times 2(3 \times 3 + 3 \times 1 + 1 \times 3)$$

$$= 6 \times 9 : 2 \times 2(9 + 3 + 3)$$

$$= 54 : 60 = 9 : 10$$

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Question 56

If $\frac{\sin^2 \phi - 3 \sin \phi + 2}{\cos^2 \phi} = 1$ where $0^\circ < \phi < 90^\circ$, then what is the value of $(\cos 2\phi + \sin 3\phi + \operatorname{cosec} 2\phi)$?

- A $\frac{2+\sqrt{3}}{3}$
 B $\frac{3+4\sqrt{3}}{6}$
 C $\frac{9+4\sqrt{3}}{6}$
 D $\frac{3+2\sqrt{3}}{3}$

Answer: C

Explanation:

$$\frac{\sin^2 \phi - 3 \sin \phi + 2}{\cos^2 \phi} = 1$$

On putting the $\phi = 30^\circ$,

$$\frac{\sin^2 30^\circ - 3 \sin 30^\circ + 2}{\cos^2 30^\circ} = 1$$

$$\frac{1}{4} - 3 \times \frac{1}{2} + 2 = 1$$

$$\frac{1-6+8}{3} = 1$$

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

$$1 = 1$$

Now,

$$(\cos 2\phi + \sin 3\phi + \operatorname{cosec} 2\phi)$$

On putting the $\phi = 30^\circ$,

$$= (\cos 2 \times 30^\circ + \sin 3 \times 30^\circ + \operatorname{cosec} 2 \times 30^\circ)$$

$$= (\cos 60^\circ + \sin 90^\circ + \operatorname{cosec} 60^\circ)$$

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

$$= \frac{3\sqrt{3}+4}{2\sqrt{3}}$$

$$= \frac{3\sqrt{3}+4}{2\sqrt{3}} \times \frac{2\sqrt{3}}{2\sqrt{3}}$$

$$= \frac{18+8\sqrt{3}}{12}$$

$$= \frac{9+4\sqrt{3}}{6}$$

Question 57

A loan has to be returned in two equal yearly instalments each of ₹44,100. If the rate of interest is 5% p.a.. compounded annually, then the total interest paid is:

- A ₹5,840
 B ₹6,000
 C ₹6,200
 D ₹6,280

Answer: C

Explanation:

$$\text{Loan amount} = \frac{\text{installment}}{1+100} + \frac{\text{installment}}{(1+100)^2}$$

$$= \frac{44100}{1+100} + \frac{44100}{(1+100)^2}$$

$$= 44100 \times \frac{105}{100} + 44100 \times \left(\frac{105}{100}\right)^2$$

$$= 42000 + 40000 = 82000$$

$$\text{Installment amount} = 44100 \times 2 = 88200$$

$$\text{The total interest paid} = 88200 - 82000 = \text{Rs.}6200$$

Question 58

A sum of ₹x is divided among A, B and C such that the ratio of the shares of A and B is 6 : 7 and that of B and C is 3 : 2. If the difference between the shares of A and C is ₹540, then the value of x is:

- A 7425
- B 7020
- C 7155
- D 7290

Answer: C

Explanation:

Ratio of the shares of A and B = 6 : 7 = 18 : 21

Ratio of the shares of B and C = 3 : 2 = 21 : 14

Ratio of the shares of A, B and C = 18 : 21 : 14

Value of x = 18 + 21 + 14 = 53 units

Difference between the shares of A and C = ₹540

18 - 14 units = 540

4 unit = 540

1 unit = 135

53 units = 135 × 53 = 7155

Value of x = Rs.7155

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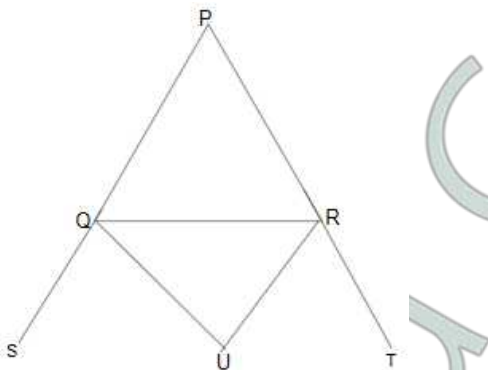
Question 59

The sides PQ and PR of $\triangle PQR$ are produced to points S and T, respectively. The bisectors of $\angle SQR$ and $\angle TRQ$ meet at U. If $\angle QUR = 79^\circ$, then the measure of $\angle P$ is:

- A 41°
- B 49°
- C 22°
- D 23°

Answer: C

Explanation:



$$\angle QUR = 79^\circ$$

By the property,

$$\angle QUR = 90 - \angle P/2$$

$$\angle P/2 = 90 - 79 = 11$$

$$\angle P = 22^\circ$$

Question 60

The value of $\frac{\sin(78^\circ + \theta) - \cos(12^\circ - \theta) + (\tan^2 70^\circ - \operatorname{cosec}^2 20^\circ)}{\sin 25^\circ \cos 65^\circ + \cos 25^\circ \sin 65^\circ}$ is:

A 2

B -1

C -2

D 0

Answer: B

Explanation:

$$\begin{aligned} & \frac{\sin(78^\circ + \theta) - \cos(12^\circ - \theta) + (\tan^2 70^\circ - \operatorname{cosec}^2 20^\circ)}{\sin 25^\circ \cos 65^\circ + \cos 25^\circ \sin 65^\circ} \\ &= \frac{\sin(78^\circ + \theta) - \cos(90 - 78^\circ + \theta) + (\tan^2 70^\circ - \operatorname{cosec}^2(90 - 70^\circ))}{\sin 25^\circ \cos(90 - 25^\circ) + \cos 25^\circ \sin(90 - 25^\circ)} \\ &= \frac{\sin(78^\circ + \theta) - \sin(78^\circ + \theta) + (\tan^2 70^\circ - \sec^2 70^\circ)}{\sin 25^\circ \sin 25^\circ + \cos 25^\circ \cos 25^\circ} \\ &= \frac{(\tan^2 70^\circ - \sec^2 70^\circ)}{\sin^2 25^\circ + \cos^2 25^\circ} = -1 \end{aligned}$$

Question 61

Alloy A contains copper and zinc in the ratio of 4 : 3 and alloy B contains copper and zinc in the ratio of 5 : 2. A and B are taken in the ratio of 5 : 6 and melted to form a new alloy. The percentage of zinc in the new alloy is closest to:

A 54

B 34.2

C 36.8

D 35

Answer: D

Explanation:

Ratio of the copper to zinc in alloy A = 4 : 3

$$\text{Quantity of copper in alloy A} = \frac{4}{4+3} = \frac{4}{7}$$

$$\text{Quantity of zinc in alloy A} = \frac{3}{4+3} = \frac{3}{7}$$

Ratio of the copper to zinc in alloy B = 5 : 2

$$\text{Quantity of copper in alloy B} = \frac{5}{5+2} = \frac{5}{7}$$

$$\text{Quantity of zinc in alloy B} = \frac{2}{5+2} = \frac{2}{7}$$

A and B are taken in the ratio of 5 : 6 and melted to form a new alloy.

So,

$$\text{Quantity of copper in new alloy} = 5 \times \frac{4}{7} + 6 \times \frac{5}{7} = \frac{20}{7} + \frac{30}{7} = \frac{50}{7}$$

$$\text{Quantity of zinc in new alloy} = 5 \times \frac{3}{7} + 6 \times \frac{2}{7} = \frac{15}{7} + \frac{12}{7} = \frac{27}{7}$$

$$\text{The percentage of zinc in the new alloy} = \frac{\frac{27}{7}}{\frac{50}{7} + \frac{27}{7}} \times 100 = \frac{27}{77} \times 100 = 35\%$$

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Question 62

If the price of petrol increases by 19%, and Sunitha intends to spend only an additional 12% on petrol, by what percent should she reduce the quantity of petrol purchased (nearest to an integer)?

- A 7
- B 6
- C 5
- D 8

Answer: B

Explanation:

Let the price of petrol be Rs.100 and Sunitha spent Rs.100.

After increment price of petrol = 119

Expenditure of petrol = 112

$$\text{Reduce quantity of petrol} = \frac{119-112}{119} \times 100 = \frac{7}{119} \times 100 = 5.88 \sim 6\%$$

Question 63

The value of $\sqrt{\frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi + \cot \phi}} \div \frac{\sin \phi}{1 + \cos \phi}$ is equal to:

- A cosec ϕ
- B $\frac{1}{2}$
- C sec ϕ
- D 1

Answer: D

Explanation:

$$\begin{aligned} & \sqrt{\frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi + \cot \phi}} \div \frac{\sin \phi}{1 + \cos \phi} \\ &= \sqrt{\frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi + \cot \phi}} \times \frac{1 + \cos \phi}{\sin \phi} \\ &= \sqrt{\frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi + \cot \phi} \times \frac{\operatorname{cosec} \phi - \cot \phi}{\operatorname{cosec} \phi - \cot \phi}} \times \frac{1 + \cos \phi}{\sin \phi} \\ &= \sqrt{\frac{(\operatorname{cosec} \phi - \cot \phi)^2}{\operatorname{cosec}^2 \phi - \cot^2 \phi}} \times \frac{1 + \cos \phi}{\sin \phi} \\ &= (\operatorname{cosec} \phi - \cot \phi) \times \frac{1 + \cos \phi}{\sin \phi} \\ &= (\operatorname{cosec} \phi - \cot \phi) \times (\operatorname{cosec} \phi + \cot \phi) \\ &= \operatorname{cosec}^2 \phi - \cot^2 \phi = 1 \end{aligned}$$

Question 64

A, B and C invested their capitals in the ratio of 2 : 3 : 5. The ratio of months for which A, B and C invested is 4 : 2 : 3. If C gets a share of profit which is ₹1,47,000 more than that of A, then B's share of profit is:

- A ₹1,26,000
- B ₹1,68,000
- C ₹1,05,000
- D ₹1,89,000

Answer: A

Explanation:

The ratio of invested capital of A, B and C = 2 : 3 : 5

Let the invested capital of A, B and C be $2x$, $3x$ and $5x$ respectively.
 The ratio of month which A, B and C invested = $4 : 2 : 3$
 Let the month which A, B and C invested be $4y$, $2y$ and $3y$ respectively.
 Profit of A, B and C = $2x \times 4y : 3x \times 2y : 5x \times 3y = 8 : 6 : 15$
 Share of C = ₹1,47,000 more than that of A = $147000 +$ share of A
 Share of C - share of A = 147000
 $15 - 8$ units = 147000
 7 units = 147000
 Share of B = 6 units
 6 units = $\frac{147000}{7} \times 6 = 126000$
 Share of B = Rs.126000

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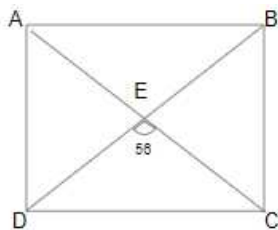
Question 65

In a quadrilateral $ABCD$, the bisectors of $\angle C$ and $\angle D$ meet at E . If $\angle CED = 56^\circ$ and $\angle A = 49^\circ$, then the measure of $\angle B$ is:

- A 71°
- B 54°
- C 63°
- D 67°

Answer: C

Explanation:



In $\triangle CED$,

$$\angle EDC + \angle ECD + \angle CED = 180$$

$$\angle EDC + \angle ECD = 180 - 56 = 124$$

$$\angle C + \angle D = 2(\angle EDC + \angle ECD)$$

(\because angle bisector.)

$$\angle C + \angle D = 2 \times 124 = 248$$

In quadrilateral $ABCD$,

$$\angle A + \angle B + \angle C + \angle D = 360$$

$$\angle 49 + \angle B + 248 = 360$$

$$\angle B = 360 - 297 = 63^\circ$$

Question 66

If $8x^3 - 27y^3 = (Ax + By)(Cx^2 - Dy^2 + 6xy)$, then $(A + B + C - D)$ is equal to:

- A -12
- B 12
- C 15
- D 9

Answer: B

Explanation:

$$8x^3 - 27y^3 = (Ax + By)(Cx^2 - Dy^2 + 6xy)$$

$$(2x)^3 - (3y)^3 = (2x - 3y)(4x^2 + 9y^2 + 6xy) = (Ax + By)(Cx^2 - Dy^2 + 6xy)$$

$$a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

by comparing,

$$A = 2$$

$$B = -3$$

$$C = 4$$

$$D = -9$$

$$(A + B + C - D) = 2 - 3 + 4 + 9 = 12$$

Question 67

The number of factors of 3600 is:

A 45

B 44

C 43

D 42

Answer: A

Explanation:

$$\text{Factors of } 3600 = 2^4 \times 5^2 \times 3^2$$

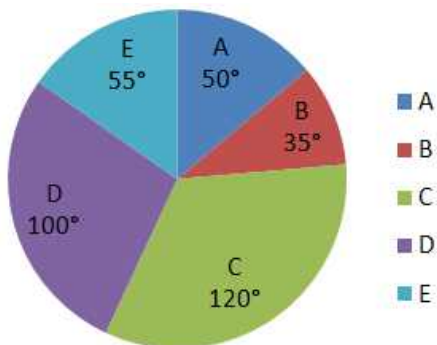
$$\text{The number of factors} = (4 + 1) \times (2 + 1) \times (2 + 1) = 5 \times 3 \times 3 = 45$$

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Question 68

The given pie chart shows the quantity wise sales distribution of five products (A, B, C, D and E) of a company in 2016.

Quantity wise sales distribution of five products (A, B, C, D and E)



If 320 units of product A were sold by the company, then how many units of products B and E together were sold by the company?

A 567

B 576

C 512

D 640

Answer: B

Explanation:

Units sold of product A by company = 320

$$50^\circ = 320$$

Units sold of product B and E by company = $35 + 55 = 90^\circ$

$$90^\circ = \frac{320}{50} \times 90 = 576$$

Question 69

4 men and 5 women can complete a work in 15 days, whereas 9 men and 6 women can do it in 10 days. To complete the same work in 7 days, how many women should assist 4 men?

- A 11
- B 14
- C 12
- D 13

Answer: D

Explanation:

Total work = men/women \times days \times h

ATQ,

$$(4m + 5w) \times 15 = (9m + 6w) \times 10$$

$$60m + 75w = 90m + 60w$$

$$15w = 30m$$

$$w = 2m$$

Let the x women should assist 4 men.

Now,

$$(4m + 5w) \times 15 = (4m + xw) \times 7$$

$$60m + 75w = 28m + 7xw$$

$$30w + 75w = 14w + 7xw$$

$$7x = 91$$

$$x = 13$$

\therefore 13 women should assist 4 men.

Question 70

If $x = (164)^{169} + (333)^{337} - (727)^{726}$, then what is the units digit of x?

- A 5
- B 7
- C 8
- D 9

Answer: C

Explanation:

$$x = (164)^{169} + (333)^{337} - (727)^{726}$$

For the units digit of x,

$$= (\text{unit digit})^{\text{remainder}}$$

$$\text{Remainder} = 169/4 = 1, 337/4 = 1, 726/4 = 2$$

$$\text{Units digit of } x = (4)^1 + (3)^1 - (7)^2$$

$$= 4 + 3 - 9 = -2$$

$$= 10 - 2 = 8$$

Units digit of x = 8

Question 71

Pipes A and B can fill a tank in 16 hours and 24 hours, respectively. and pipe C alone can empty the full tank in x hours. All the pipes were opened together at 10:30 a.m., but C was closed at 2:30 p.m. If the tank was full at 8:30 p.m. on the same day, then what is the value of x?

- A 64
- B 48
- C 45
- D 96

Answer: D

Explanation:

Let the total work be 48.

(∵ LCM of 16, 24, x is 48x)

Efficiency of pipe A = $48x/16 = 3x$

Efficiency of pipe B = $48x/24 = 2x$

Efficiency of pipe C = $-48x/x = -48$

(- sign shows the empty pipe.)

Pipe A and B Works 10:30 a.m to 8:30 p.m.

So, time = 8:30 p.m. - 10:30 a.m = 10 hr

Work done in 10 hr = efficiency \times time = $(3x + 2x) \times 10 = 50x$

Work done by pipe C = $50x - 48x = 2x$

pipe C opened at 10:30 a.m. to 2:30 p.m

So, time taken by pipe C = 2:30 p.m - 10:30 = 4 hr

Work done in 4 hr by pipe C = $2x$

$48 \times 4 = 2x$

$x = 96$

Question 72

Let x be the least number which when divided by 15, 18, 20 and 27, the remainder in each case is 10 and x is a multiple of 31. What least number should be added to x to make it a perfect square?

- A 39
- B 37
- C 43
- D 36

Answer: A

Explanation:

LCM of 15, 18, 20 and 27 = 540

Number = $\frac{540k+10}{31}$

= $\frac{527k+13k+10}{31}$

Value of k = 4

So, number = $540 \times 4 + 10 = 2160 + 10 = 2170$

Square of 47 = 2209

Number added to make it perfect square = $2209 - 2170 = 39$

Question 73

The given bar graph shows the imports and exports (in ₹ crores) of steel by a country from 2013 to 2017.



The total imports of steel in 2014, 2016 and 2017 is what percent less than the total exports in 2013, 2015 and 2017 (correct to one decimal place)?

- A 13.4
- B 15.8
- C 16.2
- D 14.5

Answer: D

Explanation:

The total imports of steel in 2014, 2016 and 2017 = $360 + 500 + 550 = 1410$

Total exports in 2013, 2015 and 2017 = $400 + 600 + 650 = 1650$

Required percentage = $\frac{1650-1410}{1650} \times 100 = \frac{240}{1650} \times 100 = 14.54$

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Question 74

A person sells an article at 16% below its cost price. Had he sold it for ₹33 more, he would have gained 14%. To gain 25%, he should sell the article for:

- A ₹128
- B ₹137.5
- C ₹135
- D ₹130.5

Answer: B

Explanation:

Let the cost price be 100%

Selling price = $100\% - 16\% = 84\%$

He sold it for ₹33 more, he would have gained 14%.

$114\% = 84\% + 33$

$30\% = 33$

Cost price(100%) = $\frac{33}{30} \times 100 = 110$

To gain 25%, Selling price = $110 \times \frac{125}{100} = \text{Rs}137.5$

Question 75

The given bar graph shows the imports and exports (in ₹ crores) of steel by a country from 2013 to 2017.



In how many years were the imports more than 80% of the average exports (per year) of the country during the given 5 years?

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

Answer: D

Explanation:

Average export = $\frac{400 + 450 + 600 + 440 + 650}{5} = \frac{2540}{5} = 508$

80% of the average exports = $508 \times \frac{80}{100} = 406.4$

3 years were the imports more than 80% of the average exports (per year) of the country during the given 5 year.

Question 76

Renu was sitting inside train A, which was travelling at 50 km/h. Another train, B, whose length was two times the length of A crosses in the opposite direction in 15 seconds. If the speed of train B was 58 km/h, then the length of train A (in m) is:

- A 210
- B 180
- C 160
- D 150

Answer: D

Explanation:

Relative speed in opposite direction = $50 + 58 = 108$ km/hr = $108 \times \frac{5}{18} = 30$ m/sec

Time = 15 sec

Let the length of train A be l

So, length of train B = $3l$

Length = speed \times time

$l + 2l = 30 \times 15$

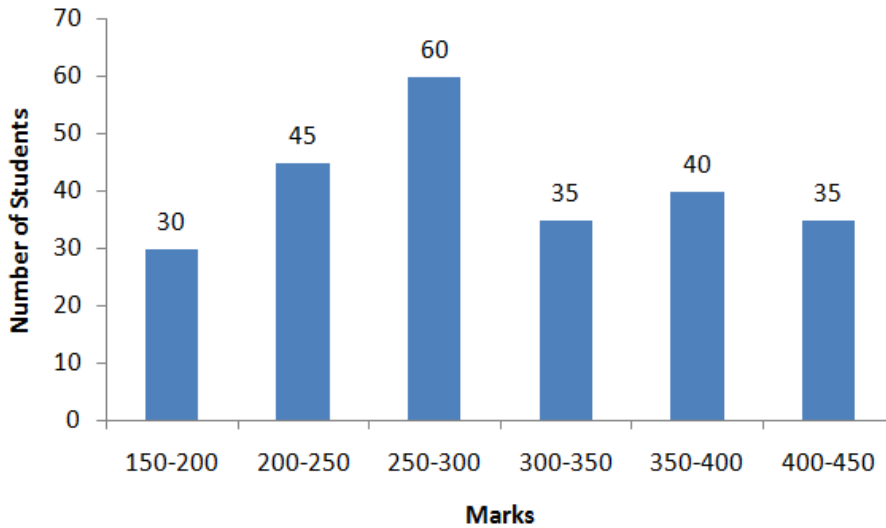
$3l = 450$

$l = 150$ m

So, the length of train A (in m) is 150 m.

Question 77

The given graph shows the marks obtained by students in an examination.



The number of students who obtained less than 300 marks is what percent more than the number of students who obtained 350 or more marks?

- A 80%
- B 28%
- C 44.4%
- D 22.7%

Answer: A

Explanation:

The number of students who obtained less than 300 marks = $30 + 45 + 60 = 135$

The number of students who obtained 350 or more marks = $40 + 35 = 75$

Required percentage = $\frac{135 - 75}{75} \times 100 = \frac{60}{75} \times 100 = 80\%$

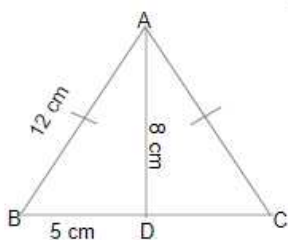
Question 78

In $\triangle ABC$, $AB = AC$ and D is a point on BC. If $BD = 5$ cm, $AB = 12$ cm and $AD = 8$ cm, then the length of CD is:

- A 14.8 cm
- B 16.2 cm
- C 16 cm
- D 14 cm

Answer: C

Explanation:



by Stewart theorem,

$$(AB)^2 CD + (AC)^2 BD = BC[(AD)^2 + BD \cdot CD]$$

$$(12)^2 CD + (12)^2 \times 5 = (5 + CD)[(8)^2 + 5CD]$$

$$144CD + 720 = (5 + CD)[64 + 5CD]$$

$$144CD + 720 = 320 + 25CD + 64CD + 5(CD)^2$$

$$5(CD)^2 - 55CD + 400 = 0$$

$$(CD)^2 - 11CD + 80 = 0$$

$$(CD)^2 - 16CD + 5CD + 80 = 0$$

$$(CD - 16)(CD + 5) = 0$$

$$CD = 16 \text{ cm}$$

Question 79

The ratio of the incomes of A and B last year was 4 : 3, respectively. The ratios of their individual incomes of the last year and the present year are 3 : 4 and 5 : 6, respectively. If their total income for the present year is ₹8.04 lakh, then the income of B last year was:

- A ₹2.7 lakh
- B ₹3.6 lakh
- C ₹2.4 lakh
- D ₹2.8 lakh

Answer: A

Explanation:

Let the last year and present income of the A be 3x and 4x respectively.

Let the last year and present income of the B be 5y and 6y respectively.

The ratio of the last year incomes of A and B = 4 : 3

$$3x : 5y = 4 : 3$$

$$\frac{3x}{5y} = \frac{4}{3}$$

$$x = \frac{20y}{9}$$

Total income for the present year = ₹8.04 lakh

$$4x + 6y = ₹8.04 \text{ lakh}$$

$$4 \times \frac{20y}{9} + 6y = 8.04$$

$$\frac{136y}{9} = 8.04$$

$$y = 72.36/136 = 18.09/34$$

$$\text{Last year income of B} = 5y = 5 \times \frac{18.09}{34} = 2.66 \sim ₹2.7 \text{ lakh}$$

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Question 80

When a two-digit number is multiplied by the sum of its digits, the product is 424. When the number obtained by interchanging its digits is multiplied by the sum of the digits, the result is 280. The sum of the digits of the given number is:

- A 6
- B 9
- C 8
- D 7

Answer: C

Explanation:

Let the ten's digit x and unit digit be y.

$$\text{Number} = 10x + y$$

A two-digit number is multiplied by the sum of its digits, the product is 424..

So,

$$(10x + y)(x + y) = 424$$

$$10x^2 + 11xy + y^2 = 424 \text{---(1)}$$

And,

$$(10y + x)(x + y) = 280$$

$$11xy + 10y^2 + x^2 = 280 \text{---(2)}$$

Eq (1) \div eq (2),

$$\frac{10x+y}{10y+x} = \frac{424}{280}$$

$$\frac{10x+y}{10y+x} = \frac{53}{35}$$

$$10x + y = 53 \text{---(3)}$$

$$10y + x = 35 \text{---(4)}$$

Eq (4) multiply by 10,

$$100y + 10x = 350 \text{---(5)}$$

From eq (3) and (5),

$$99y = 297$$

$$y = 3$$

From eq(4),

$$30 + x = 35$$

$$x = 5$$

$$\text{Number} = 10x + y = 10 \times 5 + 3 = 53$$

The sum of the digits of the given number = $5 + 3 = 8$

Question 81

To do a certain work, the ratio of the efficiencies of X and Y is 5 : 4. Working together, they can complete the same work in 10 days. Y alone starts the work and leaves after 5 days. The remaining work will be completed by X alone in:

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

Answer: A

Explanation:

Let the efficiency of X and Y be $5p$ and $4p$ respectively.

$$\text{Total work} = \text{efficiency} \times \text{times} = (5p + 4p) \times 10 = 90p$$

$$\text{Work done by Y in 5 days} = 4p \times 5 = 20p$$

$$\text{Remaining work} = 90p - 20p = 70p$$

$$\text{Time taken by X to complete work} = 70p / 5p = 14 \text{ days}$$

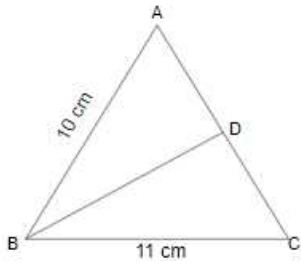
Question 82

The bisector of $\angle B$ in $\triangle ABC$ meets AC at D . If $AB = 10\text{cm}$, $BC = 11\text{cm}$ and $AC = 14\text{cm}$, then the length of AD is:

- A 6 cm
- B $\frac{22}{3}$ cm
- C 7 cm
- D $\frac{20}{3}$ cm

Answer: D

Explanation:



by the property,

$$\frac{BC}{CD} = \frac{AB}{AD}$$

$$\frac{11}{14-AD} = \frac{10}{AD}$$

$$\frac{11}{14-AD} = \frac{10}{AD}$$

$$11AD = 140 - 10AD$$

$$21AD = 140$$

$$AD = \frac{20}{3} \text{ cm}$$

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Question 83

The value of $0.56 - 0.723 + 0.39 \times 0.7$ is:

A 0.154

B 0.154

C 0.158

D 0.158

Answer: A

Explanation:

$$0.56 - 0.723 + 0.39 \times 0.7$$

$$= 0.56 - 0.723 + \frac{39}{90} \times \frac{7}{10}$$

$$= 0.56 - 0.723 + \frac{28}{90}$$

$$= 0.56 - 0.723 + 0.31$$

$$= 0.87 - 0.723$$

$$= 0.154$$

Question 84

A circle is inscribed in a quadrilateral ABCD touching AB, BC, CD and AD at the points P, Q, R and S, respectively, and $\angle B = 90^\circ$. If $AD = 24$ cm, $AB = 27$ cm and $DR = 6$ cm, then what is the circumference of the circle?

A 20π

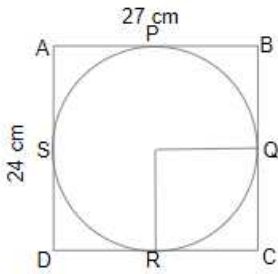
B 18π

C 15π

D 12π

Answer: B

Explanation:



$$DR = DS = 6 \text{ cm}$$

$$AS = AD - DS = 24 - 6 = 18 \text{ cm}$$

$$AS = AP = 18 \text{ cm}$$

$$PB = AB - AP = 27 - 18 = 9 \text{ cm}$$

$$PB = r = 9 \text{ cm}$$

$$\text{Circumference of the circle} = 2\pi r = 2 \times 9\pi = 18\pi$$

Question 85

Places A and B are 396 km apart. Train X leaves from A for B and train Y leaves from B for A at the same time on the same day on parallel tracks. Both trains meet after $5\frac{1}{2}$ hours. The speed of Y is 10 km/h more than that of X. What is the speed (in km/h) of Y?

- A 41
- B 54
- C 31
- D 56

Answer: A

Explanation:

Let the speed of train X be s_1 .

Speed of train Y = $s_1 + 10$

Relative speed in opposite direction = $s_1 + s_1 + 10 = 2s_1 + 10$

Time = $5\frac{1}{2} = \frac{11}{2}$ hours

Distance = speed \times time

$$396 = (2s_1 + 10) \times \frac{11}{2}$$

$$2s_1 + 10 = 72$$

$$s_1 = 31 \text{ km/hr}$$

$$\text{Speed of train Y} = s_1 + 10 = 31 + 10 = 41 \text{ km/hr}$$

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Question 86

If the curved surface area of a solid cylinder is one-third of its total surface area, then what is the ratio of its diameter to its height?

- A 5 : 2
- B 1 : 1
- C 2 : 1
- D 4 : 1

Answer: D

Explanation:

Curved surface area of a solid cylinder = $\frac{1}{3} \times$ total surface area

$$2\pi rh = \frac{1}{3} \times 2\pi r(r + h)$$

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

$$r = 3 - 1 = 2 \text{ units}$$

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

$$\text{Diameter} = 2r = 2 \times 2 = 4$$

$$\text{Ratio of its diameter to its height} = 4 : 1$$

Question 87

A sum amounts to ₹14,395.20 at 9.25 % p.a. simple interest in 5.4 years. What will be the simple interest on the same sum at 8.6 % p.a. in 4.5 years?

A ₹3,715.20

B ₹3,627

C ₹3,797.76

D ₹3,672

Answer: A

Explanation:

$$\text{Sum of amount} = 14395.2$$

$$\text{Principle + interest} = 100 + \frac{prt}{100} = p$$

$$14395.2 = p \left(1 + \frac{rt}{100} \right)$$

$$14395.2 = p \left(1 + \frac{9.25 \times 5.4}{100} \right)$$

$$14395.2 = \frac{149.95p}{100}$$

$$p = \frac{1439520}{149.95} = \text{Rs. } 9600$$

Now,

$$r = 8.6\%$$

$$t = 4.5 \text{ years}$$

$$\text{Simple interest} = \frac{9600 \times 8.6 \times 4.5}{100} = 3715.2$$

Question 88

When an article is sold at its marked price, it gives a profit of 25%. If a discount of 9.6% is allowed on the marked price, then the profit percent will be:

A 13

B 15.4

C 15

D 16.6

Answer: A

Explanation:

Let the cost price be Rs.100.

Profit = 25%

Marked or selling price = 125

Discount = 9.6%

Selling price after discount = (100% - 9.6 = 90.4%) of the marked price

$$= 125 \times \frac{90.4}{100} = \text{Rs. } 113$$

Profit after discount = 113 - 100 = Rs.13

$$\text{Profit percentage} = \frac{13}{100} \times 100 = 13\%$$

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Question 89

A man sells his goods at a certain price, 20% of which is his profit. If the price at which he buys the goods increases by 10% and he sells them at an 8% higher price, then what will be his profit percent (correct to one decimal place)?

- A 21.8
- B 23.4
- C 21.4
- D 22.7

Answer: D

Explanation:

Let the selling price be Rs.100.

Profit = 20%

profit = Rs.20

Cost price = $100 - 20 = \text{Rs } 80$

Now,

He buys the goods increases by 10% and he sells them at an 8% higher price.

So,

New cost price = $80 \times \frac{110}{100} = \text{Rs } 88$

New selling price = $100 \times \frac{108}{100} = \text{Rs } 108$

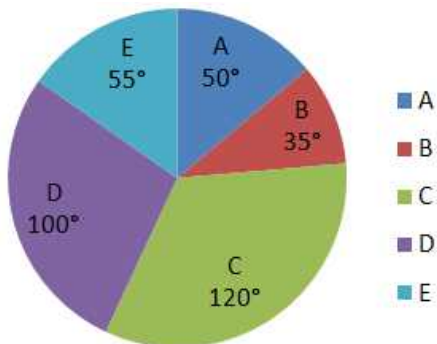
Profit = $108 - 88 = \text{Rs } 20$

Profit percentage = $\frac{20}{88} \times 100 = 22.72\%$

Question 90

The given pie chart shows the quantity wise sales distribution of five products (A, B, C, D and E) of a company in 2016.

Quantity wise sales distribution of five products (A, B, C, D and E)



In 2016, if a total of 14616 units were sold, then the number of units of products D sold was:

- A 4263
- B 4872
- C 4060
- D 4096

Answer: C

Explanation:

The number of units of products D sold = $14616 \times \frac{100}{360} = 4060$

Question 91

The value of $9 \times 6 \div 24 + 8 \div 2$ of $5 - 30 \div 4$ of $4 + 27 \times 5 \div 9$ is:

A $\frac{647}{40}$

B $\frac{243}{8}$

C $\frac{493}{8}$

D $\frac{259}{8}$

Answer: A

Explanation:

$$9 \times 6 \div 24 + 8 \div 20 \div 5 - 30 \div 40 \div 4 + 27 \times 5 \div 9$$

$$= 4 + 8 \div 10 - 30 \div 16 + 15$$

$$= 4 + \frac{4}{5} - \frac{15}{8} + 15$$

$$= \frac{90 + 32 - 75 + 600}{40} = \frac{647}{40}$$

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Question 92

A field roller, in the shape of a cylinder, has a diameter of 1 m and length of $1\frac{1}{4}$ m. If the speed at which the roller rolls is 14 revolutions per minute, then the maximum area (in m^2) that it can roll in 1 hour is: (Take $\pi = \frac{22}{7}$)

A 3960

B 3600

C 3300

D 3560

Answer: C

Explanation:

$$\text{Radius} = 1/2 \text{ m}$$

$$\text{Length} = 1\frac{1}{4} = \frac{5}{4}$$

$$1 \text{ revolution} = 2\pi r l = 2 \times \frac{22}{7} \times \frac{1}{2} \times \frac{5}{4} = \frac{55}{14}$$

$$\text{Maximum rolling area in 1 hr} = \frac{55}{14} \times 14 \times 60 = 3300$$

Question 93

If the volume of a sphere is 4851 cm^3 , then its surface area (in cm^2) is: (Take $\pi = \frac{22}{7}$)

A 1386

B 2772

C 1323

D 1337

Answer: A

Explanation:

$$\text{The volume of a sphere} = 4851 \text{ cm}^3$$

$$\frac{4}{3} \times \pi \times r^3 = 4851 \text{ cm}^3$$

$$\frac{4}{3} \times \frac{22}{7} \times r^3 = 4851 \text{ cm}^3$$

$$r^3 = 1157.625$$

$$r = 10.5 \text{ cm}$$

$$\begin{aligned} \text{Surface area} &= 4\pi r^2 = 4 \times \frac{22}{7} \times (10.5)^2 \\ &= \frac{88}{7} \times 110.25 = 1386 \text{ cm}^2 \end{aligned}$$

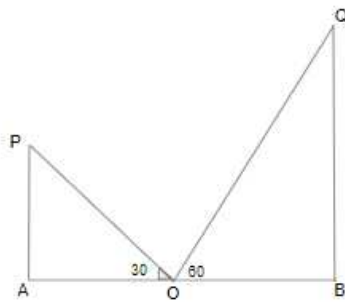
Question 94

From a point exactly midway between the foot of two towers P and Q, the angles of elevation of their tops are 30° and 60° , respectively. The ratio of the height of P to that of Q is:

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

Answer: A

Explanation:



$$AO = OB$$

In $\triangle AOP$,

$$\tan 30^\circ = \frac{AP}{AO}$$

$$\frac{1}{\sqrt{3}} = \frac{AP}{AO}$$

$$AP = 1$$

$$AO = \sqrt{3}$$

In $\triangle BOP$,

$$\tan 60^\circ = \frac{BQ}{BO}$$

$$\sqrt{3} = \frac{BQ}{BO}$$

$$\frac{BQ}{BO} = \frac{3}{\sqrt{3}}$$

$$BQ = 3$$

$$BO = \sqrt{3}$$

The ratio of the height of P to that of Q = 1 : 3

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Question 95

The graphs of the equations $2x + 3y = 11$ and $x - 2y + 12 = 0$ intersect at $P(x_1, y_1)$ and the graph of the equations $x - 2y + 12 = 0$ intersects the x-axis at $Q(x_2, y_2)$. What is the value of $(x_1 - x_2 + y_1 + y_2)$?

- A 13
- B -11
- C 15
- D -9

Answer: C

Explanation:

$$2x + 3y = 11 \text{ --(1)}$$

$$x - 2y + 12 = 0$$

$$2x - 4y = -24 \text{ --(2)}$$

From eq (1) and (2),

$$7y = 35$$

$$y = 5 = y_1$$

From eq (1),

$$2x + 3 \times 5 = 11$$

$$2x = -4$$

$$x = -2 = x_1$$

Now,

The graph of the equations $x - 2y + 12 = 0$ intersects the x-axis.

So,

$$y = y_1 = 0$$

$$x - 0 + 12 = 0$$

$$x = -12 = x_1$$

$$(x_1 - x_2 + y_1 + y_2)$$

$$= -2 + 12 + 5 + 0 = 15$$

Question 96

If $x = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ and y is the reciprocal of x , then what is the value of $(x^3 + y^3)$?

A 488

B 504

C 472

D 476

Answer: A

Explanation:

$$x = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$$

$$x = \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}} \times \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}-\sqrt{3}}$$

$$x = \frac{(\sqrt{5}-\sqrt{3})^2}{(\sqrt{5})^2 - (\sqrt{3})^2}$$

$$x = \frac{5+3-2\sqrt{15}}{2}$$

$$x = 4 - \sqrt{15}$$

$$y = 4 + \sqrt{15}$$

Now,

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

$$(x^3 + y^3) = (4 - \sqrt{15} + 4 + \sqrt{15})^3 - 3(4 - \sqrt{15})(4 + \sqrt{15})(4 - \sqrt{15} + 4 + \sqrt{15})$$

$$(x^3 + y^3) = (8)^3 - 3[(4)^2 - (\sqrt{15})^2](8)$$

$$(x^3 + y^3) = 512 - 24 = 488$$

Question 97

A man starts from his house and travelling at 30 km/h, he reaches his office late by 10 minutes, and travelling at 24 km/h, he reaches his office late by 18 minutes. The distance (in km) from his house to his office is:

A 18

B 16

C 12

D 20

Answer: B



Explanation:

Ratio of the speed = $30 : 24 = 5 : 4$

Ratio of time = $4 : 5$

Difference in ratio = $5 - 4 = 1$ unit

Difference in time = $18 - 10 = 8$ min

1 units = 8 min

4 units = $4 \times 8 = 32$ min

Distance = $speed \times time = 30 \times 32/60 = 16$ km

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Question 98

The value of

$(\tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ) + \cot^2 54^\circ - \sec^2 36^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$ is:

A $20\frac{1}{2}$

B 21

C $22\frac{1}{2}$

D 22

Answer: A

Explanation:

$(\tan 29^\circ \cot 61^\circ - \operatorname{cosec}^2 61^\circ) + \cot^2 54^\circ - \sec^2 36^\circ + (\sin^2 1^\circ + \sin^2 3^\circ + \sin^2 5^\circ + \dots + \sin^2 89^\circ)$

$= (\tan(90 - 61^\circ) \cot 61^\circ - \operatorname{cosec}^2 61^\circ) + \cot^2(90 - 36^\circ) - \sec^2 36^\circ + (22 + \sin^2 45^\circ)$

$= (\cot^2 61^\circ - \operatorname{cosec}^2 61^\circ) + \cot^2 36^\circ - \sec^2 36^\circ + 22 + \frac{1}{2}$

$= -1 - 1 + 22 + \frac{1}{2}$

$= 20\frac{1}{2}$

Question 99

If $\sqrt{10 - 2\sqrt{21}} + \sqrt{8 + 2\sqrt{15}} = \sqrt{a} + \sqrt{b}$, where a and b are positive integers, then the value of \sqrt{ab} is closest to:

A 4.6

B 5.9

C 6.8

D 7.2

Answer: B

Explanation:

$\sqrt{10 - 2\sqrt{21}} + \sqrt{8 + 2\sqrt{15}} = \sqrt{a} + \sqrt{b}$

$\sqrt{(7 + 3 - 2\sqrt{7 \times 3})} + \sqrt{(5 + 3 + 2\sqrt{5 \times 3})} = \sqrt{a} + \sqrt{b}$

$\sqrt{(\sqrt{7} - \sqrt{3})^2} + \sqrt{(\sqrt{5} + \sqrt{3})^2} = \sqrt{a} + \sqrt{b}$

$$\sqrt{7} - \sqrt{3} + \sqrt{5} + \sqrt{3} = \sqrt{a} + \sqrt{b}$$

$$\sqrt{7} + \sqrt{5} = \sqrt{a} + \sqrt{b}$$

by comparing,

$$a = 7$$

$$b = 5$$

$$\sqrt{ab} = \sqrt{7 \times 5}$$

$$= \sqrt{35}$$

$$= 5.9$$

Question 100

A can do 40% of a work in 12 days, whereas B can do 60% of the same work in 15 days. Both work together for 10 days. C completes the remaining work alone in 4 days. A, B and C together will complete 28% of the same work in:

A $2\frac{1}{2}$ days

B 3 days

C $1\frac{1}{2}$ days

D 2 days

Answer: D

Explanation:

$$\text{Time taken by A to complete whole work} = \frac{12}{40} \times 100 = 30 \text{ days}$$

$$\text{Time taken by B to complete whole work} = \frac{15}{60} \times 100 = 25 \text{ days}$$

Let the total work be 150 units.

(\because LCM of 30 and 25 is 150.)

$$\text{Efficiency of A} = 150/30 = 5$$

$$\text{Efficiency of B} = 150/25 = 6$$

$$\text{Work done by A and B in 10 days} = (5 + 6) \times 10 = 110$$

$$\text{Remaining work} = 150 - 110 = 40$$

$$\text{Efficiency of C} = 40/4 = 10$$

$$28\% \text{ of the work} = 150 \times \frac{28}{100} = 42$$

$$\text{Time taken to complete 28\% of the work by A, B and C} = \frac{42}{5+6+10} = 42/21 = 2 \text{ days}$$

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