

CDS

Important Mathematics

Questions

POWERED BY:



1. If $3^x + 27(3^{-x}) = 12$, then what is the value of x?

- A. 1 only B. 2 only
C. 1 or 2 D. 0 or 1

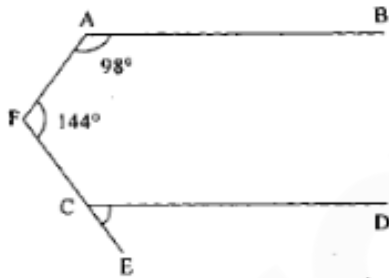
2. ABCDEF is a regular polygon. Two poles at C and D are standing vertically and subtend angles of elevation 30° and 60° at A respectively. What is the ratio of the height of the pole at C to that of the pole at D?

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

3. In an examination, a student was asked to divide a certain number by 8. By mistake he multiplied it by 8 and got the answer 2016 more than the correct answer, what was the number?

- A. 252 B. 256
C. 258 D. 260

4.



In the figure above, AB is parallel to CD. If $\angle BAF = 98^\circ$ and $\angle AFC = 144^\circ$, then what is $\angle ECD$ equal to?

- A. 62° B. 64°
C. 82° D. 84°

5. Twelve (12) men work 8 hours per day and require 10 days to build a wall. If 8 men are available, how many hours per day must they work to finish the work in 8 days?

- A. 10 hours B. 12 hours
C. 15 hours D. 18 hours

6. The average score of class X is 83.

The average score of class Y is 76

The average score of class Z is 85

The average score of class X and Y is 79

And average score of class Y and Z is 81.

What is the average score of X, Y and Z?

- A. 81.5 B. 80.5
C. 79.0 D. 78.0

7. What is the value of k that $(2x - 1)$ may be a factor of $4x^2 - (k-1)x^3 + kx^2 - 6x + 1$?

- A. 8 B. 9
C. 12 D. 13

8. A train is travelling at 48 km/hour completely crosses another train having half its length and travelling in opposite direction at 42 km/hour in 12s. It also passes a railway platform in 45s. What is the length of the platform?

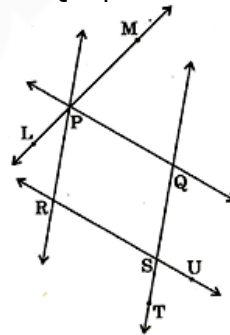
- A. 600 m B. 400 m
C. 300 m D. 200 m

9. Two men on either side of a tower 75 m high observe the angle of elevation of the top of the tower to be 30° and 60° . What is the distance between the two men?

- A. $100\sqrt{3}$ m B. $\frac{100\sqrt{3}}{3}$ m

- C. $75\sqrt{3}$ m D. $60\sqrt{3}$ m

10. In the figure given below, PQ is parallel to RS and PR is parallel to QS. If $\angle LPR = 35^\circ$ and $\angle UST = 70^\circ$, then what is $\angle MPQ$ equal to?



- A. 55° B. 70°
C. 75° D. 80°

11. The volume of a cone is equal to that of sphere. If the diameter of base of cone is equal to the diameter of the sphere, what is the ratio of height of cone to the diameter of the sphere?

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

12. If $\tan^2 x + \frac{1}{\tan^2 x} = 2$ and $0^\circ < x < 90^\circ$,

then what is the value of X?

- A. 15° B. 30°
C. 45° D. 60°

13. Two equal circular regions of greatest possible area are cut off from a given circular sheet of area A. What is the remaining area of the sheet?

- A. $A/2$ B. $A/3$
 C. $3A/5$ D. $2A/5$

14. The value of $(\overline{0.63} + \overline{0.37})$ is

- A. 1 B. $\frac{100}{91}$
 C. $\frac{100}{99}$ D. $\frac{1000}{999}$

15. What is the smallest number that must be added to 1780 to make it a perfect square?

- A. 39 B. 49
 C. 59 D. 69

16. There are two numbers P and q such that their HCF is 1. Which of the following statements are correct?

- 1) Both p and q may be prime.
 - 2) One number may be prime and the other composite.
 - 3) Both the numbers may be composite.
- Select the correct answer using the code given below:

- A. 1 and 2 only B. 2 and 3 only
 C. 1 and 3 only D. 1, 2 and 3

17. From the top of a building 90 m high, the angles of depression of the top and the bottom of a tree are 30 and 45 respectively. What is the height of the tree?

- A. $30\sqrt{3}$ m B. $90 - 30\sqrt{3}$ m
 C. $90 + 30\sqrt{3}$ m D. $60 + 30\sqrt{3}$ m

18. The arithmetic mean and geometric mean of two numbers are 14 and 12 respectively. What is the harmonic mean of the numbers?

- A. 10 B. 13
 C. $32/3$ D. $72/7$

19. The following table show the percentage of male and female coffee drinkers and non-coffee drinkers in two Towns A and B:

Attributes	Town-A		Town-B	
	Male	Female	Male	Female
Coffee drinkers	40%	5%	25%	15%
Non-coffee drinkers	20 %	35%	30%	30%

If the total population of the Towns A and B 10,000 and 20,000 respectively, then what is the total number of female coffee drinkers in both towns?

- A. 8,000 B. 6,000
 C. 3,500 D. 2,500

20. The mean weight of 150 students in a certain class is 60 kg. the mean weight of the boys from the class is 70 kg, while that of girls is 55 kg. what is the number of girls in the class?

- A. 105 B. 100
 C. 95 D. 60

21. It is observed that when the angle of elevation of sun increases from 30° to 60°, length of shadow of a lamp post decreases by 6 meters. What is the height of lamp post?

- A. 3 m B. $3\sqrt{3}$ m
 C. $6/\sqrt{3}$ m D. $3(\sqrt{3} + 1)$ m

22. A kingfisher bird above the lake was aiming a fish to prey. A man of height h standing by the side of lake observed that the angle of elevation of the bird was α and the angle of depression of image of bird in the lake was β from what height the kingfisher bird was aiming his prey?

- A. $H = \frac{h \cos(\alpha - \beta)}{\sin(\beta - \alpha)}$ B. $H = \frac{h \sin(\alpha + \beta)}{\sin(\beta + \alpha)}$
 C. $H = \frac{h \sin(\alpha + \beta)}{\cos(\beta - \alpha)}$ D. $H = \frac{h \sin(\alpha + \beta)}{\sin(\beta - \alpha)}$

23. If λ is an integer and α, β are the roots of $4x^2 - 16x + \frac{\lambda}{4} = 0$ such that $1 < \alpha < 2$ and $2 < \beta < 3$, then how many values can λ take?

- A. 3 B. 9
 C. 14 D. 15

24. What is the value of k for which the system of equations $x + 2y - 3 = 0$ and $5x + ky + 7 = 0$ has no solution?

- A. $-\frac{3}{14}$ B. $-\frac{14}{3}$
 C. $\frac{1}{10}$ D. 10

25. What is the remainder when $x^5 - 2x^2 + 125$ is divided by $x + 5$?

- A. 0 B. 125
 C. -3125 D. -3050

26. A cricketer has a certain average of 10 innings. In the eleventh inning he scored 108 runs, thereby increasing his average by 6 runs. What is his new average?

- A. 42 B. 47
 C. 48 D. 60

27. Two circles touch externally and sum of their areas is 130 cm and the distance between their centres is 14 cm. What is the difference in the radii of the circles?

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

28. Let ABC be a right angled triangle with $BC = 5$ cm and $AC = 12$ cm. Let D be a point on the hypotenuse AB such that $\angle BCD = 30^\circ$. What is length of CD?

- A. $\frac{60}{13}$ cm B. $\frac{17}{2}$ cm
 C. $\frac{120}{5+12\sqrt{2}}$ cm D. $\frac{120}{5+12\sqrt{3}}$ cm

29. ABCDA is a con-cyclic quadrilateral of a circle ABCD with radius r and centre at O. If AB is the diameter and CD is parallel and half of AB and if the circle completes one rotation about the centre O, then the locus of the middle point of CD is a circle of radius

- A. $\frac{3r}{2}$ B. $\frac{2r}{3}$
 C. $\frac{2\sqrt{3}r}{3}$ D. $\frac{\sqrt{3}r}{2}$

30. Consider a circle with centre at C. Let OP, OQ denote respectively the tangents to the circle drawn from a point O outside the circle. Let R be a point on OP and S be a point on OQ such that $OR \times SQ = OS \times RP$. Which of the following statements is/are correct?

1) If X is the circle with centre at O and radius OR, and Y is the circle with centre at O and radius OS, then $X = Y$.

2) $\angle POC + \angle QCO = 90$

Select the correct answer using the code given below.

- A. 1 only B. 2 only
 C. Both 1 and 2 D. Neither 1 nor 2

31. 197\$5462 is completely divisible by 9. Which of the following can replace \$?

- A. 2 B. 5
 C. 11 D. A and C both

32. If the sum of the squares of three consecutive natural numbers is 110, then the sum of their cubes is

- A. 625 B. 654
 C. 684 D. 725

33. The HCF of two natural numbers m and n is 24 and their product is 552. How many sets of values of m and n are possible?

- A. 1
 B. 2
 C. 4

D. No set of m and n is possible satisfying the given conditions

34. Assuming that profit of a shopkeeper in a particular commodity is a linear expression of transportation charge (t) and the quantity of commodity (q). He earns a profit of Rs. 10,000 by selling 20 units at the transport charge of Rs. 400. He also earns a profit of Rs. 12,000 by selling 25 units at the transport charge of Rs. 600. What is the linear expression in t and q ?

- A. $600q - 5t$ B. $500q - 4t$
 C. $600q - 4t$ D. $500q - 5t$

35. A seller brought a quintal tomato to sell. He sold half of tomato at 20% profit. One third of the remaining at 9% profit and at the time of leaving he sold rest of them at 15% loss. What is the overall profit % in the selling?

- A. 5% profit B. $3\frac{1}{3}\%$ profit
 C. $5\frac{3}{2}\%$ profit D. 9% profit

ANSWERS

1. Ans. C.

$$3^x + 27(3^{-x}) - 12 = 0$$

$$(3^x)^2 - 12(3^x) + 27 = 0$$

$$(3^x)^2 - 3(3^x) - 9(3^x) + 27 = 0$$

$$(3^x - 3)(3^x - 9) = 0$$

Thus $x=1$ and $x=2$

2. Ans. B.

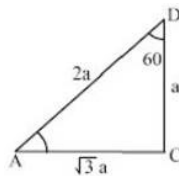
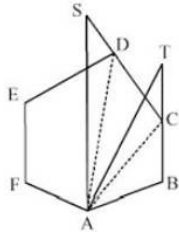
$\angle ABC = 120^\circ$ [Angle of regular hexagon]

$$\angle BAC = \angle BCA = \frac{180^\circ - 120^\circ}{2} = 30^\circ$$

$$\angle DCA = 120^\circ - 30^\circ = 90^\circ$$

Thus, $\triangle ADC$ is a right triangle.

Let side $DC = a$

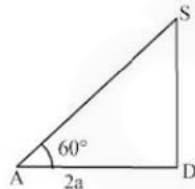


$$\frac{AC}{a} = \cot 30^\circ \Rightarrow AC = \sqrt{3}a$$

$$\frac{AD}{a} = \operatorname{cosec} 30^\circ \Rightarrow AD = 2a$$

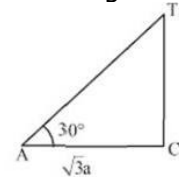
Now taking triangle ASD:

Let S is the vertex of pole



$$\frac{DS}{AD} = \tan 60^\circ \Rightarrow DS = 2\sqrt{3}$$

In triangle TCA:



$$\frac{TC}{AC} = \tan 30^\circ \Rightarrow TC = \frac{\sqrt{3}a}{\sqrt{3}} = a$$

Thus, ratio ϕ

$$\frac{CT}{DS} = \frac{a}{2\sqrt{3}a} = \frac{1}{2\sqrt{3}}$$

Hence $CT : DS = 1 : 2\sqrt{3}$

Hence option (b)

3. Ans. B.

Let the number be x

According to question,

$$8x - \frac{x}{8} = 2016$$

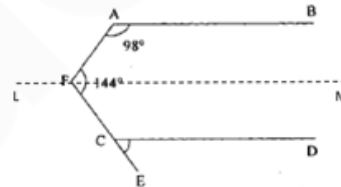
$$\Rightarrow \frac{64x - x}{8} = 2016$$

$$\Rightarrow 63x = 2016 \times 8$$

$$\Rightarrow x = \frac{2016 \times 8}{63} = 256$$

Hence option (b)

4. Ans. A.



Draw LM parallel to CD

$$\angle BAF + \angle AFM = 180$$

$$98 + \angle AFM = 180$$

$$\angle AFM = 82$$

$$\angle AFM + \angle MFC = 144$$

$$82 + \angle MFC = 144$$

$$\angle MFC = 62$$

$$\angle MFC = \angle DCE \text{ (Corresponding angle)}$$

$$\angle DCE = 62$$

5. Ans. C.

$$M \times D \times H = \text{Work}$$

$$M_1 D_1 H_1 = M_2 D_2 H_2$$

$$12 \times 8 \times 10 = 8 \times H \times 8$$

$$H = 15 \text{ hours per day}$$

6. Ans. A.

Total score of class X = $83x$

Total score of class Y = $76y$

Total score of class Z = $85z$

According to question,

$$\frac{83x + 76y}{x + y} = 79$$

$$\Rightarrow 83x + 76y = 79x + 79y$$

$$\Rightarrow 4x - 3y \dots\dots(i)$$

Also,

$$\frac{76y + 85z}{y + z} = 81$$

$$\Rightarrow 76y + 85z = 81y + 81z$$

$$\Rightarrow 4z = 5y \dots\dots(ii)$$

From equation (i) and (ii), we get

$$\frac{x}{3} = \frac{y}{4} = \frac{z}{5} = t \text{ (say)}$$

Then, $x = 3t$, $y = 4t$, $z = 5t$

Now,

$$\frac{83x + 76y + 85z}{x + y + z} = \frac{83 \times 3t + 76 \times 4t + 85 \times 5t}{3t + 4t + 5t}$$

$$= \frac{249t + 304t + 425t}{12t} = \frac{978}{12} = 81.5$$

Hence average score of x, y and z be 81.5

7. Ans. D.

On putting $2x=1$ in the expression

$$4x^2 - (k-1)x^3 + kx^2 - 6x + 1$$

$$4(1/2)^4 - (k-1)(1/2)^3 + k(1/2)^2 - 6 \times 1/2 + 1 = 0$$

$$k/4 - (k-1)/8 = 7/4$$

$$k = 13$$

8. Ans. B.

$$\text{Speed of Train A} = 48 \times \frac{5}{18} = \frac{40}{3} \text{ m/s}$$

$$\text{Speed of Train B} = 42 \times \frac{5}{18} = \frac{35}{3} \text{ m/s}$$

Let length of Train A = $2x$ m

Length of Train B = x m

Total length = $2x + x = 3x$ m

Combined speed

$$= \frac{40}{3} + \frac{35}{3} = \frac{75}{3} = 25 \text{ m/s}$$

As, distance = speed \times time

$$\Rightarrow 3x = 25 \times 12$$

$$\Rightarrow x = \frac{25 \times 12}{3} = 100 \text{ m}$$

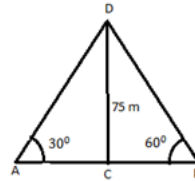
Let length of platform = y m

According to question,

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

$$\Rightarrow y = 600 - 200 = 400 \text{ m}$$

9. Ans. A.



In Triangle ACD:

$$\tan \tan 30^\circ = \frac{CD}{AC}$$

$$\Rightarrow AC = \frac{CD}{\tan \tan 30^\circ} = \frac{75}{\left(\frac{1}{\sqrt{3}}\right)}$$

$$\Rightarrow AC = 75\sqrt{3}$$

In Triangle BCD:

$$\tan \tan 60^\circ = \frac{CD}{BC}$$

$$\Rightarrow BC = \frac{CD}{\tan \tan 60^\circ}$$

$$\Rightarrow BC = \frac{75}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$$

$$\Rightarrow BC = \frac{75\sqrt{3}}{3}$$

$$\Rightarrow BC = 25\sqrt{3}$$

Then,

$$AB = AC + BC$$

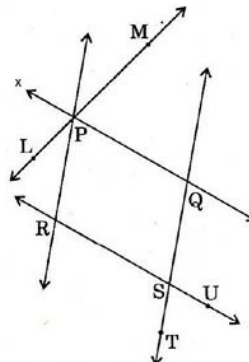
$$\Rightarrow AB = 75\sqrt{3} + 25\sqrt{3}$$

$$\Rightarrow AB = 100\sqrt{3}$$

Hence required distance be $100\sqrt{3}$ m

Hence option (a)

10. Ans. C.



$\angle UST = \angle QSR = 70^\circ$
 [vertically opposite angle]
 $\angle PQS + \angle QSR = 180^\circ$
 [As, PQ parallel to RS]
 $\angle PQS = 180^\circ - 70^\circ = 110^\circ$
 [As, $\angle QSR = 70^\circ$]
 Now,
 $\angle PQS + \angle QPR = 180^\circ$
 [As, PR parallel to QS]
 $\angle QPR = 180^\circ - 110^\circ = 70^\circ$
 Again,
 $\angle XPL + \angle LPR + \angle RPQ = 180^\circ$
 $\Rightarrow \angle XPL = 180^\circ - 35^\circ - 70^\circ = 75^\circ$
 [As, $\angle LPR = 35^\circ$]
 Hence, $\angle MPQ = \angle XPL = 75^\circ$
 [Vertically opposite angle]
 Hence option (c)

11. Ans. A.
 Let the radius of cone and sphere be r
 Volume of cone = Volume of sphere
 $\frac{1}{3}\pi r^2 h_1 = \frac{4}{3}\pi r^3$
 $h_1/2r = 2/1$
 12. Ans. C.

As,
 $x + \frac{1}{x} = 2$ (i)
 $0^\circ < x < 90^\circ$
 As,
 $a^2 + \frac{1}{a^2} = 2$
 $\Rightarrow a = 1$ (ii)
 Comparing (i) and (ii) we can conclude
 $\tan x = 1$

$\Rightarrow \tan x = \tan 45^\circ$
 $\Rightarrow x = 45^\circ$

Hence option (c)

13. Ans. A.
 Area of a circle A = πr^2
 Area of greatest possible circle A' = $\pi r^2/4$
 $A - 2A' = \pi r^2/2 = A/2$

14. Ans. C.
 Let $x = 0.63636363\dots$
 $100x = 63.63633$
 Subtracting the two equations we get
 $99x = 63 \rightarrow x = 63/99$
 For $0.37373737\dots$ we get $37/99$
 Adding the two we get $100/99$

15. Ans. D.

$$\sqrt{1780} = 42.19$$

Hence next perfect square would be square of 43 i.e. 1849

$$\begin{aligned} \text{Required number to be added} \\ &= (43)^2 - 1780 \\ &= 1849 - 1780 = 69 \end{aligned}$$

We should add 69 to get that perfect sq. **So, the smallest number is 69**

16. Ans. D.

Statement 1:

If we take two prime numbers viz 2 and 3 then HCF be 1

Statement 2:

If 7 and 25 be the prime and composite numbers respectively

Then the HCF of 7 and 25 be 1

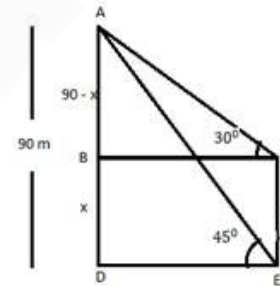
Statement 3:

If 25 and 16 be the two composite numbers

Then their HCF be also 1

Hence all the three statements are correct.

17. Ans. B.



In $\triangle ADE$:

$$\tan 45^\circ = \frac{AD}{DE} = \frac{90}{DE}$$

$$\Rightarrow 1 = \frac{90}{DE}$$

$$\Rightarrow DE = 90$$

In $\triangle ABC$:

$$\tan 30^\circ = \frac{AB}{BC}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{90 - x}{DE}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{90-x}{90}$$

$$\Rightarrow \frac{90}{\sqrt{3}} = 90-x$$

$$\Rightarrow x = 90 - \frac{90}{\sqrt{3}}$$

$$\Rightarrow x = 90 - \frac{3 \times 30}{\sqrt{3}}$$

$$\Rightarrow x = 90 - 30\sqrt{3}$$

Hence height of tree be $(90 - 30\sqrt{3})m$

Hence option (b)

18. Ans. D.

Arithmetic Mean (AM) = 14

Geometric Mean (GM) = 12

Let Harmonic Mean = HM

As $AM \times HM = (GM)^2$

$$14 \times HM = (12)^2$$

$$HM = \frac{144}{14} = \frac{72}{7}$$

19. Ans. C.

Required number

$$= \frac{5}{100} \times 10000 + \frac{15}{100} \times 20000$$

$$= 500 + 3000$$

$$= 3500$$

20. Ans. B.

Let the number of girls in the class be x

Then the number of boys in the class = $150-x$

As per question,

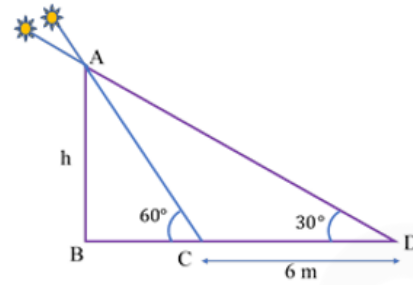
$$\therefore (150-x) \times 70 + (x) \times 55 = 150 \times 60$$

$$\Rightarrow 10500 - (70-55)x = 9000$$

$$\Rightarrow 15x = 10500 - 9000$$

$$\therefore x = \frac{1500}{15} = 100$$

21. Ans. B.



Let $AB = h$ meter is the height of lamp post. Then BD and BC are the initial and final length of shadows respectively. $CD = 6$ m

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

$$\Rightarrow BC = \frac{h}{\sqrt{3}}$$

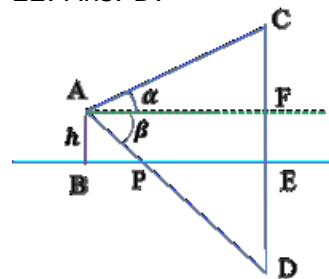
$$\text{Again, } \tan 30^\circ = \frac{h}{BC + 6}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{\frac{h}{\sqrt{3}} + 6} = \frac{h\sqrt{3}}{h + 6\sqrt{3}}$$

$$h + 6\sqrt{3} = 3h$$

$$h = \frac{6\sqrt{3}}{2} = 3\sqrt{3} \text{ m}$$

22. Ans. D.



Let the bird at C and image is at D .

$$AB = EF = h$$

Let $CE = ED = H$

$$\tan \alpha = \frac{H-h}{AF} \Rightarrow AF = \frac{H-h}{\tan \alpha}$$

$$\tan \beta = \frac{H+h}{AF} \Rightarrow AF = \frac{H+h}{\tan \beta}$$

$$\therefore \frac{H-h}{\tan \alpha} = \frac{H+h}{\tan \beta}$$

$$H \tan \beta - h \tan \beta = H \tan \alpha + h \tan \alpha$$

$$H = \frac{h(\tan \alpha + \tan \beta)}{\tan \beta - \tan \alpha}$$

$$\Rightarrow H = \frac{h(\sin \alpha \cdot \cos \beta + \sin \beta \cdot \cos \alpha)}{\sin \beta \cdot \cos \alpha - \sin \alpha \cdot \cos \beta}$$

$$H = \frac{h \sin(\alpha + \beta)}{\sin(\beta - \alpha)}$$

23. Ans. D.

As, $4x^2 - 16x + \frac{\lambda}{4} = 0$

$\Rightarrow x^2 - 4x + \frac{\lambda}{16} = 0$

Sum of roots $(\alpha + \beta) = 4$

Product of roots $(\alpha\beta) = \frac{\lambda}{16}$

As $1 < \alpha < 2$ (i)

$2 < \beta < 3$ (ii)

From (i) and (ii)

$2 < \alpha\beta < 6$

$1 < \alpha\beta < 3$

[It is not possible because $\alpha + \beta = 4$]

So, $1 \times 3 < \alpha\beta < 2 \times 2$

$3 < \alpha\beta < 4$

$\Rightarrow 3 < \frac{\lambda}{16} < 4$

Hence total value of would be 15.

Hence option (d)

24. Ans. D.

$x + 2y - 3 = 0$ and $5x + ky + 7 = 0$ has no solution

$\therefore \frac{1}{5} = \frac{2}{k} \neq \frac{3}{-7}$

$\therefore k = 10$

Hence Option D is correct

25. Ans. D.

To Calculate the remainder

F(-5) will give the remainder

$F(-5) = (-5)^5 - 2(-5)^2 + 125 = -3050$

26. Ans. C.

Let the cricketer's average be x run per match

According to question,

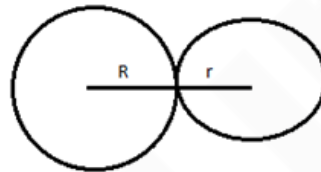
$\frac{10x + 108}{11} = x + 6$

$\Rightarrow 11x + 66 = 10x + 108 \Rightarrow x = 42$

New average = $42 + 6 = 48$

Hence option (c)

27. Ans. D.



Given, $R + r = 14 \text{ cm}$ (i)

and $\pi R^2 + \pi r^2 = 130\pi$

$\Rightarrow R^2 + r^2 = 130$ (ii)

$(R + r)^2 = R^2 + r^2 + 2Rr$

$\Rightarrow (14)^2 = 130 + 2Rr$

$\Rightarrow 2Rr = 196 - 130 = 66$

$\Rightarrow Rr = 33$ (iii)

Also, $(R + r)^2 = (R - r)^2 + 4Rr$

$\Rightarrow (R - r)^2 = (14)^2 - 4 \times 33$

$\Rightarrow (R - r)^2 = 196 - 132 = 64$

$\Rightarrow (R - r) = \sqrt{64} = 8 \text{ cm}$

28. Ans. C.

Figure 1:

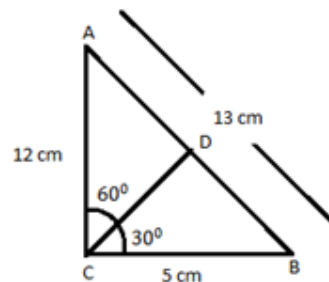
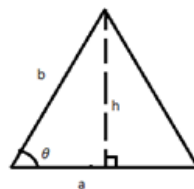


Figure 2:



$$\sin \theta = \frac{h}{b}$$

$$\Rightarrow h = b \sin \theta$$

Area of triangle

$$= \frac{1}{2} \times a \times b \sin \theta$$

$$= \frac{1}{2} ab \sin \theta$$

Now, From Figure (i)

Area of $\triangle BCD$ + Area of $\triangle ACD$ = Area of $\triangle ACD$

$$\Rightarrow \frac{1}{2} \times 5 \times x \times \sin 30^\circ + \frac{1}{2} \times 12 \times x \times \sin 60^\circ = \frac{1}{2} \times 12 \times 5$$

$$\Rightarrow 5x \times \frac{1}{2} + 12x \times \frac{\sqrt{3}}{2} = 12 \times 5$$

$$\Rightarrow x \left(\frac{5}{2} + \frac{12\sqrt{3}}{2} \right) = 12 \times 5$$

$$\Rightarrow x \left(\frac{5+12\sqrt{3}}{2} \right) = 12 \times 5$$

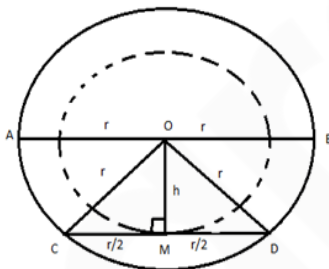
$$\Rightarrow x = \frac{120}{5+12\sqrt{3}}$$

Hence length of CD = x

$$= \frac{120}{5+12\sqrt{3}} \text{ cm}$$

Hence option (c)

29. Ans. D.



Here OCD be an equilateral triangle.

In right angled triangle OCM

$$OC^2 = CM^2 + OM^2$$

$$\Rightarrow r^2 = \left(\frac{r}{2} \right)^2 + h^2$$

$$\Rightarrow h^2 = r^2 - \frac{r^2}{4}$$

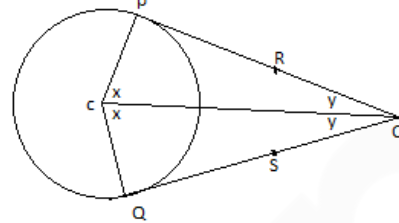
$$\Rightarrow h^2 = \frac{3r^2}{4}$$

$$\Rightarrow h = \frac{\sqrt{3}r}{2}$$

Here, required radius of circle be $\frac{\sqrt{3}r}{2}$

Hence option (d)

30. Ans. C.



As $OR \times (OQ - OS) = OS (OP - OR)$

$$OR \cdot OP - OR \cdot OS = OS \cdot OP - OS \cdot OR$$

$$OR \cdot OP = OS \cdot OP$$

$$OR = OS$$

Hence pt 1 is correct.

$$2. x + x + y + y = 180$$

$$x + y = 90$$

$$\angle POC + \angle QCO = 90$$

Pt 2 is also correct

31. Ans. D.

A number is divisible by 9 if sum of its digit is divisible by 9. Then,

$$1 + 9 + 7 + \$ + 5 + 4 + 6 + 2 = 34 + \$$$

For $(34 + \$)$ to be divisible by 9, \$ must be 2, 11, 20 etc.

32. Ans. C.

Let numbers be $x, x + 1, x + 2$

$$x^2 + (x + 1)^2 + (x + 2)^2 = 110$$

$$x^2 + x^2 + x + 2x + x^2 + 4 + 4x = 110$$

$$3x^2 + 6x - 105 = 0$$

$$x^2 + 2x - 35 = 0$$

$$x^2 + 7x - 5x - 35 = 0$$

$$x(x + 7) - 5(x + 7) = 0$$

$$(x - 5)(x + 7) = 0$$

$$x = 5, x = -7$$

As x is a natural number, hence $x = 5$.

Number are 5, 6, 7

$$= (5)^3 + (6)^3 + (7)^3$$

$$= 125 + 216 + 343 = 684.$$

33. Ans. D.

HCF is 24 and thus the numbers are 24m and 24n

$$\text{Product} = 576m^2n^2$$

$$576 m^2 n^2 = 552$$

$$m^2 n^2 = 552/576$$

Thus there is no set of m and n is possible satisfying the given conditions

34. Ans. A.

Let the linear expression of transportation charge (t) and the quantity of commodity (q) is as follows-

Earned profit = xt + yq

Then as per the question

$$10000 = 400t + 20q$$

$$500 = 20t + q$$

$$12000 = 600t + 25q$$

$$480 = 24t + q$$

On solving the two equations we get t = -5 and q = 600

Required linear expression = 600q - 5t

35. Ans. C.

$$P \text{ or } L \% = \frac{1}{2}(20) + \left(\frac{1}{2} \times \frac{1}{3}\right)(9) + \left(\frac{1}{2} - \frac{1}{2} \times \frac{1}{3}\right)(-15)$$

$$= 10 + \frac{3}{2} - 5$$

$$= \frac{13}{2} = 5\frac{3}{2} \% \text{ profit}$$