CDS II 2020: Mathematics Solution

1. Ans. D.

We have, H.M. = 10 and G.M. = 12

Let a and b two numbers.

We know that G.M. = $\sqrt{ab}$ and H.M. = $\frac{2ab}{a+b}$

$\Rightarrow \quad 12 = \sqrt{ab}$

$\Rightarrow \quad ab = 144$

and, $10 = \frac{2ab}{a+b}$

$\Rightarrow \quad 10 = \frac{2 \times 144}{a+b}$

$\Rightarrow \quad \frac{a+b}{2} = \frac{144}{10} = 14.4$

We know that A.M. = $\frac{a+b}{2}$

$\Rightarrow$ A.M. = 14.4

2. Ans. D.

We have,

2, 4, 6, …… , 100

So, here n numbers in this A.P. series.

We know that $T_n = a + (n-1)d$

$\Rightarrow \quad 100 = 2 + (n-1)2$

$\Rightarrow \quad n - 1 = 49$

$\Rightarrow \quad n = 50$

Since there are 50, an even number of items . Therefore median is the arithmetic mean of $\left(\frac{50}{2}\right)^{th}$ and $\left(\frac{50}{2}+1\right)^{th}$ observations.

So, 25th observation = $2+(25-1)2=50$

& 26th observation = $2+(26-1)2=52$

Median = $\frac{50+52}{2}=51$

3. Ans. C.

We have, five observations $x, x+2, x+4, x+6, x+8$

And mean of five observation = m

$\Rightarrow \quad \frac{x+x+2+x+4+x+6+x+8}{5}=m$

$\Rightarrow \quad 5x+20=5m$

$\Rightarrow \quad x=m-4$

And, mean of first three observations = $\frac{x+x+2+x+4}{3}$

= $\frac{3x+6}{3}$

= $x+2$

= $m-4+2$

= $m-2$

4. Ans. B.

We have the values 25, 65,73,75,83,76,17,15,7,14.

In ascending order , 7, 14,15,17,25,65, 73,75, 76, 83

$\therefore$ Mean = $\frac{7+14+15+17+25+65+73+75+76+83}{10}$

= 45

deviations from the mean of the set of values = -38, -31, -30, -28, -20, 20,28,30,31,38

So algebraic sum of deviation of the mean of the set of values

= -38-31-30-28-20+20+28+30+31+38

= 0

5. Ans. C.

Let no of boys x and no of girls y.

So, $x+y=100$ ....(i)

and, the mean weight of the boys = 50 kg

$\Rightarrow$ total weight of boys = $50x$ $\left[\because \text{mean} = \frac{\text{total sum}}{\text{no}}\right]$

and, the mean weight of the girls = 40 kg

$\Rightarrow$ total weight of girls = $40y$

We have, the mean weight of 100 students = 46 kg

$\Rightarrow$ $\frac{50x+40y}{100}=46$

$\Rightarrow$ $5x+4y=460$ ....(ii)

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

$x=60$ and $y=40$

So, no of boys is exceed by 20 from no the girls.

6. Ans. B.

We have the 7 family members are 2,5,12,18,38,40 and 60 years respectively.

So, mean = $\frac{2+5+12+18+38+40+60}{7}$

= 25

After 5 years a new member x age is added. and mean is increase 1.5 years.

So, now mean = 26.5 years

$\Rightarrow \frac{7+10+17+23+43+45+65+x}{8} = 26.5$

$\Rightarrow 210 + x = 212$

$\Rightarrow x = 2$

7. Ans. D.

A histogram is the most commonly used graph to show frequency distributions and its display of statistical information. A histogram uses rectangle to show frequency of data items of successive class interval having equal width .

Hence, Height of a rectangle in a histogram represents frequency of the class.

8. Ans. D.

We want to average size of shoe sold in the shop it means what is the popular or maximum demand in shoe size.

So, in a measure in central tendency , mode is the most appropriate measure because it is repeated the highest number of times in the series.

9. Ans. C.

We have, the yield of barely from the 7 plots of size one square yard each are

180, 191,175,111,154,141 and 176

In ascending order , 111, 141, 154, 175, 176, 180, 191

Here, 7 is the odd number of items. Therefore, median is the value of $\left(\frac{7+1}{2}\right)^{th}$ observations.

i.e 4th observations. then 175gm is the median.

10. Ans. A.

We have, the marks of 10 passed students are 9,6,7,8,8,9,6,5,4 and 7.

In ascending order , 4,5,6,6,7,7,8,8,9,9.

And appeared students = 15

So, number 15 is odd then median is the value of $\left(\frac{15+1}{2}\right)^{th}$ means 8th observations.

but we don't have the marks of 5 failed students which are obviously marks less than 4.

So including the unknown 5 observations , 8th observations is 6.

11. Ans. C.

We have,

$ab + xy - xb = 0$

$\Rightarrow \quad ab + x(y-b) = 0$

$\Rightarrow \quad x(y-b) = -ab$

$\Rightarrow \quad \frac{x}{a} = \frac{-b}{y-b}$ ....(i)

And, $bc + yz - cy = 0$

$\Rightarrow \quad yz + c(b-y) = 0$

$\Rightarrow \quad c(b-y) = -yz$

$\Rightarrow \frac{c}{z}=\frac{-y}{b-y}$ ....(ii)

Adding eq (i) and eq (ii) , we get

$$\frac{x}{a}+\frac{c}{z}=\frac{-b}{y-b}-\frac{y}{b-y}$$

$$\Rightarrow \frac{x}{a}+\frac{c}{z}=\frac{-b}{y-b}+\frac{y}{y-b}$$

$$\Rightarrow \frac{x}{a}+\frac{c}{z}=\frac{-b+y}{y-b}=1$$

12. Ans. A.

We have, the number of items in a booklet =

If first year x % increase in this number.

So, now the number of items in a booklet = $N+x\% \text{ of } N$

$$= N+\frac{Nx}{100}$$

In subsequent year there is a decrease of $x\%$.

So, now the number of items in a booklet = $\left(N+\frac{Nx}{100}\right)-x\% \text{ of } \left(N+\frac{Nx}{100}\right)$

$$= \left(N+\frac{Nx}{100}\right)-\frac{x}{100}\left(N+\frac{Nx}{100}\right)$$

$$= \left(N+\frac{Nx}{100}\right)\left(1-\frac{x}{100}\right)$$

$$= N\left(1+\frac{x}{100}\right)\left(1-\frac{x}{100}\right)$$

$$= N\left(1-\frac{x^2}{1,00,000}\right)$$

So, No. of items is less than N .

13. Ans. B.

We have, age of Mahesh = 60 years.

Ram age = Mahesh age – 5 = Raju age + 4

Babu age = Raju age – 6

So, Mahesh age = Raju age + 9

Then the difference of age between Mahesh and babu = 9 + 6 =15 years

14. Ans. C.

We have, Ena is the daughter.

Her mother is 24 years older than Ena and Ena was born 4 years after her parents marriage.

So, her mother age is 20 years old at marriage.

And her mother is 3 years younger than her father.

So, Ena’s father age at marriage = 23 years

15. Ans. D.

We have, x varies with y means $x = ky$.

(i) $x^2 + y^2 = k^2y^2 + y^2 \Rightarrow x^2 + y^2 = y^2\left(k^2+1\right)$

and $x^2 - y^2 = k^2y^2 - y^2 \Rightarrow x^2 - y^2 = y^2\left(k^2-1\right)$

so, $\frac{x^2+y^2}{x^2-y^2} = \frac{y^2\left(k^2+1\right)}{y^2\left(k^2-1\right)} = \frac{k^2+1}{k^2-1}$

$\Rightarrow x^2 + y^2 = \frac{k^2+1}{k^2-1}\left(x^2-y^2\right)$

It means $x^2 + y^2$ varies as $x^2 - y^2$

(ii) $\frac{x}{y^2} = \frac{ky}{y^2} = \frac{k}{y}$

So $\frac{x}{y^2}$ is inversely proportional to y .

(iii) $\sqrt[2n]{x^4y^2} = \sqrt[2n]{\left(x^2y\right)^2} = \sqrt[n]{x^2y}$

So, $\sqrt[2n]{x^2y}$ varies with $\sqrt[n]{x^2y}$.

Hence (i), (ii) and (iii) all are correct.

16. Ans. A.

We have, three persons start a business with capitals in the ratio = $\frac{1}{3}:\frac{1}{4}:\frac{1}{5}$.

= 20:15:12

So, first investment = $20x$

second investment = $15x$

third investment = $12x$

Given that first withdraws half its capitals after 4 months.

So, first investment after 12 months = $20x \times 4 + 10x \times 8 = 160x$

second investment after 12 months = $15x \times 12 = 180x$

third investment after 12 months = $12x \times 12 = 144x$

Total investment = $160x + 180x + 144x = 484x$

Total annual profit = 96,800 rs

Then first share = $\frac{160x \times 96800}{484x} = 32,000$ rs.

17. Ans. C.

Let original speed of car = x km/hr

And the distance that covers = 300 km

So, time = $\frac{300}{x}$ hr

If speed of his car = ($x+15$) km/hr

Then time = $\frac{300}{x}-1$

So, distance = speed$\times$time

$\Rightarrow$ $300=(x+15)\left(\frac{300}{x}-1\right)$

$\Rightarrow$ $300=(x+15)\left(\frac{300-x}{x}\right)$

$\Rightarrow$ $300x=300x+4500-x^2-15x$

$\Rightarrow$ $x^2+15x-4500=0$

$\Rightarrow$ $x=60\ \&\ -75$ so speed cannot negative.

Then original speed = 60 k/hr.

18. Ans. D.

Let television is purchase at 100 Rs.

If television is sold at x Rs, a loss of 28% would be incurred.

We know that $\text{loss}\% = \frac{\text{loss}\times 100}{\text{C.P.}}$

$\Rightarrow$ $28=\frac{100-x}{100}\times 100$

$\Rightarrow$ $28=100-x$

$\Rightarrow$ $x=100-28=72$

If television is sold at y Rs, a profit of 12% would be incurred.

We know that $\text{profit\%} = \frac{\text{profit} \times 100}{\text{C.P.}}$

$\Rightarrow \quad 12 = \frac{y-100}{100} \times 100$

$\Rightarrow \quad 12 = y - 100$

$\Rightarrow \quad y = 100 + 12 = 112$

So, $\quad \frac{y}{x} = \frac{112}{72} = \frac{14}{9}$

19. Ans. A.

We have, the depth of the river means height = 3 m

the width of the river = 40 m

Velocity of the river = 2 km/hour

So, it means in one hour water in river can flow = 2 km

And in 60 minutes = 2000 m

So, in 1 minute water can flow = $\frac{2000}{60} = \frac{100}{3}$ m

So, for 1 minute river length = $\frac{100}{3} m$

$\therefore$ Volume of water falling in a sea = volume of the river which is like cuboid

$= \frac{100}{3} \times 3 \times 40$

= 4000 m^3 or 40,00,000 litres

20. Ans. B.

Given that a shopkeeper sells his articles at their cost price but by default balance which reads 1000 gm for 800 gm.

If he purchase and sell 1 kg article at 100 Rs. but due to faulty balance he gain 20 Rs at every 1 kg article because it only sell 800 gm. and its cost price for 800 gm is 80 Rs. and its sell price is 100 Rs for 800 gm because of faulty balance.

Then gain = 20

So, gain % = $\frac{\text{gain}\times 100}{\text{costprice}}$

$\Rightarrow$ gain % = $\frac{20}{80}\times 100$

= 25 %

21. Ans. A.

Consider statement (1)

$\cos 61^\circ + \sin 29^\circ = \cos(90-29)^\circ + \sin 29^\circ = 2\sin 29^\circ$

For , $\sin 30^\circ = \frac{1}{2}$

$\Rightarrow$ $2\sin 30^\circ = 1$

We know that

$\Rightarrow$ $\sin 29^\circ < \sin 30^\circ$

$\Rightarrow$ $2\sin 29^\circ < 2\sin 30^\circ$

$\Rightarrow$ $2\sin 29^\circ < 1$

$\Rightarrow$ $\cos 61^\circ + \sin 29^\circ$ < 1

Hence, statement (1) is correct.

Consider statement (2)

$\tan 23^\circ - \cot 67^\circ = \tan 23^\circ - \cot(90-23)^\circ = \tan 23^\circ - \tan 23^\circ = 0$

Hence, statement (2) is not correct.

22. Ans. B.

$\cos(\alpha-\beta)=1$

$\Rightarrow \cos(\alpha-\beta)=\cos 0^\circ$

$\Rightarrow (\alpha-\beta)=0^\circ$

$\Rightarrow \alpha=\beta$

Hence, $\sin\alpha-\sin\beta+\cos\alpha-\cos\beta$ = $\sin\alpha-\sin\alpha+\cos\alpha-\cos\alpha=0$

23. Ans. B.

$\cos ec\theta-\sin\theta=p^3$

$\Rightarrow \frac{1}{\sin\theta}-\sin\theta=p^3$

$\Rightarrow \frac{1-\sin^2\theta}{\sin\theta}=p^3$

$\Rightarrow \frac{\cos^2\theta}{\sin\theta}=p^3$ ....(1)

$\sec\theta-\cos\theta=q^3$

=> $\frac{1}{\cos\theta}-\cos\theta=q^3$

=> $\frac{1-\cos^2\theta}{\cos\theta}=q^3$

=> $\frac{\sin^2\theta}{\cos\theta}=q^3$ ....(2)

Divide (2) by (1)

$\Rightarrow \frac{\frac{\sin^2\theta}{\cos\theta}}{\frac{\cos^2\theta}{\sin\theta}}=\frac{q^3}{p^3}$

$\Rightarrow \dfrac{\sin^3\theta}{\cos^3\theta} = \dfrac{q^3}{p^3}$

$\Rightarrow \tan\theta = \dfrac{q}{p}$

24. Ans. A.

$\cos 47^\circ + \sin 47^\circ$ = k ....(1)

Hence, $\cos^2 47^\circ - \sin^2 47^\circ = \left(\cos 47^\circ + \sin 47^\circ\right)\left(\cos 47^\circ - \sin 47^\circ\right)$ =
k $\left(\cos 47^\circ - \sin 47^\circ\right)$ ......(2)

Squaring equation (1)

$\Rightarrow \cos^2 47^\circ + \sin^2 47^\circ + 2\sin 47^\circ \cos 47^\circ = k^2$

$\Rightarrow 2\sin 47^\circ \cos 47^\circ = k^2 - 1$

Now,

$\left(\cos 47^\circ - \sin 47^\circ\right)^2 = \cos^2 47^\circ + \sin^2 47^\circ - 2\sin 47^\circ \cos 47^\circ = 1 - \left(k^2 - 1\right) = 2 - k^2$

$\Rightarrow \left(\cos 47^\circ - \sin 47^\circ\right) = \sqrt{2 - k^2}$ ....(3)

From (2) and (3)

$\Rightarrow \cos^2 47^\circ - \sin^2 47^\circ$ = $k\sqrt{2 - k^2}$

25. Ans. B.

Least value of $9\sin^2\theta + 16\cos^2\theta$

$\Rightarrow 9\sin^2\theta + 16\cos^2\theta$ = $9\sin^2\theta + 16(1 - \sin^2\theta) = 9\sin^2\theta + 16 - 16\sin^2\theta = 16 - 7\sin^2\theta$

We know that maximum value of $\sin^2\theta$ is 1.

⇒ Least value of $9\sin^2\theta + 16\cos^2\theta$ = 16 – 7 (1) = 9

26. Ans. D.

If $\sin\theta + \cos\theta = \sqrt{2}$

Squaring both sides

$$1 + 2\sin\theta\cos\theta = 2$$
$$\sin\theta\cos\theta = \frac{1}{2}$$

$$\Rightarrow \sin^6\theta + \cos^6\theta + 6\sin^2\theta\cos^2\theta$$
$$= \left(\sin^2\right)^3 + \left(\cos^2\right)^3 + 6\sin^2\theta.\cos^2\theta$$
$$= \left(\sin^2\theta + \cos^2\theta\right)\left(\sin^4\theta + \cos^4\theta - \sin^2\theta\cos^2\theta\right) + 6\sin^2\theta\cos^2\theta$$
$$= \left[\left(\sin^2\theta + \cos^2\theta\right)^2 - 3\sin^2\theta\cos^2\theta\right] + 6\sin^2\theta.\cos^2\theta$$
$$= \left(1 - \frac{3}{4}\right) + 6\left(\frac{1}{4}\right)$$
$$= \frac{7}{4}$$

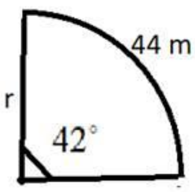
27. Ans. B.

Maximum value of $3\sin\theta - 4$

We know that maximum value of $\sin\theta$ is 1

Hence, Maximum value of $3\sin\theta - 4$ = $3(1) - 4 = 3 - 4 = -1$

28. Ans. A.



We know that

Perimeter of the arc = θr

$\Rightarrow$ $44 = \theta r$

$\Rightarrow$ $r = \frac{44}{\theta}$

$\Rightarrow \quad r = \dfrac{44}{42 \times \dfrac{\pi}{180}} = 60 \text{ m}$

29. Ans. B.

Consider statement 1 :

$2\cos^2\theta + \cos\theta - 6 = 0$

=> $2\cos^2\theta + 4\cos\theta - 3\cos\theta - 6 = 0$

$2\cos\theta(\cos\theta + 4) - 3(\cos\theta + 4) = 0$

$(\cos\theta + 4)(2\cos\theta - 3) = 0$

$\cos\theta = -4$ and $\cos\theta = \dfrac{3}{2}$

We know that $\cos\theta$ can never take value of -4 and $\frac{3}{2}$

Hence, there is no value of θ for which the above equation holds.

Consider statement 2 :

$A.M. \geq G.M.$

$$\frac{\tan\theta + \cot\theta}{2} \geq \sqrt{\tan\theta \times \cot\theta}$$

$$\frac{\tan\theta + \cot\theta}{2} \geq \sqrt{\tan\theta \times \frac{1}{\tan\theta}}$$

$\tan\theta + \cot\theta \geq 2$

tan θ + cot θ is always greater than or equal to 2, where $0 < \theta < \frac{\pi}{2}$.

Hence, only statement (2) is correct.

30. Ans. B.

$A - B = 15^\circ$

$A + B = \frac{5\pi}{12} = \frac{5\pi}{12} \times \frac{180^\circ}{\pi} = 75^\circ$

$2A = 90^\circ$

$A = 45^\circ$

$\Rightarrow$ $45^\circ - B = 15^\circ$

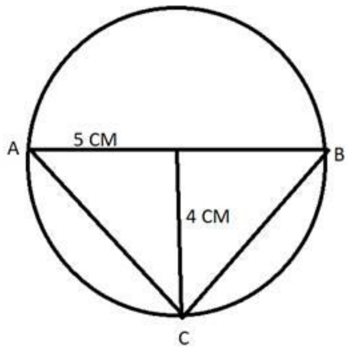
$B = 30^\circ$

Clearly, $30^\circ \times \frac{3}{2} = 45^\circ$

Hence, k = $\frac{3}{2}$

31. Ans. A.

Radius of the circumcircle = 5 cm



Altitude drawn to the hypotenuse = 4 cm

As, ABC is a right angled triangle with $\angle C = 90^\circ$

AND we know that the angle inscribed in a semicircle is always a right angle.

The hypotenuse of the triangle is the diameter of the circle.

Hence, Hypotenuse = $2 \times 5 = 10cm$

Area of a right-angled triangle = $\frac{1}{2} \times 4 \times 10 = 20 \text{ cm}^2$

32. Ans. C.

Let length of one diagonal is a unit and length of another diagonal is b unit.

It is given that diagonals of a rhombus differ by 2 units

$\Rightarrow a = b + 2$

Perimeter of the rhombus = $2\sqrt{a^2 + b^2}$

According to question

$\Rightarrow 2\sqrt{a^2 + b^2} - (a + b) = 6$

$\Rightarrow 2\sqrt{(b+2)^2 + b^2} - (b + 2 + b) = 6$

$\Rightarrow 2\sqrt{2b^2 + 4 + 4b} = 2b + 8$

$\Rightarrow 4(2b^2 + 4b + 4) = 4b^2 + 64 + 32b$

$\Rightarrow 4b^2 - 16b - 48 = 0$

$\Rightarrow b^2 - 4b - 12 = 0$

$\Rightarrow b^2 - 6b + 2b - 12 = 0$

$\Rightarrow b(b-6) + 2(b-6) = 0$

$\Rightarrow (b-6)(b+2) = 0$

$\Rightarrow b = 6 \text{ or } b = -2$

Length of diagonal can not be negative.

Hence, Length of diagonal is 6 cm

Also, a = b +2 = 6 + 2 = 8 units

Hence, Area of rhombus = $\frac{1}{2} \times d_1 \times d_2 = \frac{1}{2} \times 8 \times 6 = 24 \text{ cm}^2$

33. Ans. D.

The two sides of a tringle are 40 cm and 41cm and the perimeter of the triangle is 90 cm.

Hence, the third side of the triangle = 90 cm - (40 + 41) cm = 90 cm – 81 cm = 9 cm

Clearly,

$\Rightarrow (40)^2+(9)^2=(41)^2$

Hence, the triangle is right angled triangle.

So, Area of triangle = $\frac{1}{2}\times 40\times 9=180\text{ cm}^2$

34. Ans. D.

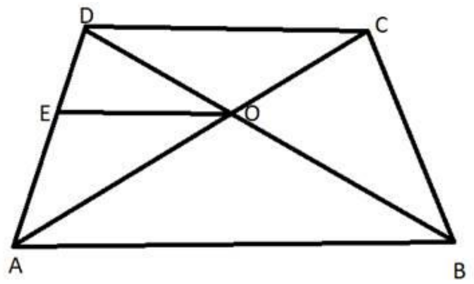
Required number of solid lead balls = $\dfrac{\frac{4}{3}\times\pi\times R^3}{\frac{4}{3}\times\pi\times r^3}=\dfrac{(8)^3}{(0.1)^3}=\dfrac{512}{0.001}=512000$

35. Ans. A.

H, C and V are respectively the height, curved surface area and volume of a cone.

$$\Rightarrow 3\pi VH^3+9V^2$$
$$=3\pi H^3\times\left(\frac{1}{3}\times\pi r^2H\right)+9\left(\frac{1}{3}\times\pi r^2H\right)^2$$
$$=\pi^2r^2H^4+\pi^2r^4H^2$$
$$=\pi^2r^2H^2\left(H^2+r^2\right)$$
$$=\pi^2r^2H^2\left(l^2\right)$$
$$=\left(\pi rl\right)^2H^2$$
$$=C^2H^2$$

36. Ans. C.



Given :

A trapezium ABCD in which AB∥DC and its diagonals AC and BD intersect at O.

Construction :

Through O, draw EO∥AB, meeting AD at E.

Proof :

In △ADC, EO∥DC

Therefore,

$\Rightarrow \frac{AE}{ED} = \frac{AO}{OC}$ ……………..(1)

In △DAB,EO∥AB

Therefore,

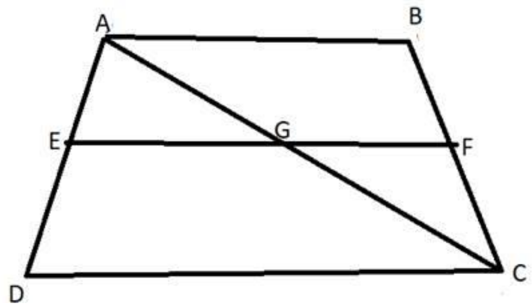
$\Rightarrow \frac{AE}{ED} = \frac{BO}{OD}$ ....(2)

From 1 and 2, we get,

$\Rightarrow \frac{AO}{OC} = \frac{BO}{OD}$

Hence, We can say that The diagonals of a trapezium divide each other proportionally.

Consider second statement :



Here, ABCD is a trapezium such that EF||AB||DC

Join EF to cut AC at G.

$\triangle ADC$, EG||DC , so by basic proportionality theorem , we have

$\Rightarrow \frac{AE}{ED} = \frac{AG}{GC}$ ……………..(1)

$\triangle ACB$, GF||AB , so by basic proportionality theorem , we have

$\Rightarrow \frac{AG}{GC} = \frac{BF}{FC}$ ……………..(2)

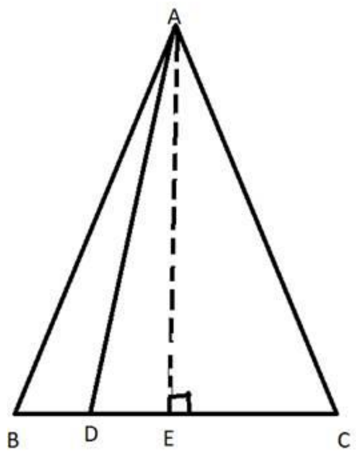
From (1) and (2)

$\Rightarrow \frac{AE}{ED} = \frac{BF}{FC}$

Hence, we can say that Any line drawn parallel to the parallel sides of a trapezium divides the non-parallel sides proportionally.

Hence, both the statements are true.

37. Ans. A.



Let side = x

Draw $AE \perp BC$

As triangle ABC is equilateral triangle.

BE = $\frac{x}{2}$

BD = $\frac{x}{3}$

DE = BE – BD = $\frac{x}{2}-\frac{x}{3}=\frac{x}{6}$

In triangle ADE by Pythagoras theorem

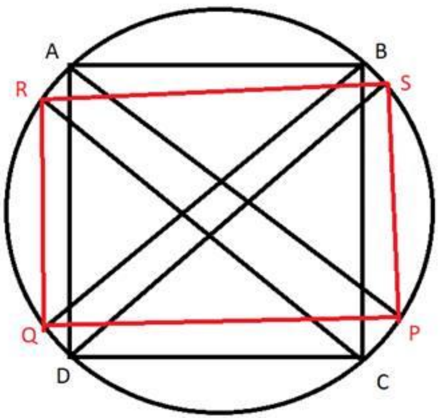
$\Rightarrow AD^2 = AE^2 + DE^2$

$\Rightarrow AD^2 = \left(\frac{\sqrt{3}}{2}x\right)^2+\frac{x^2}{36}=\frac{7x^2}{9}=\frac{7}{9}AB^2$

$\Rightarrow 9AD^2 = 7AB^2$

$\Rightarrow \frac{AD^2}{AB^2}=\frac{7}{9}$

38. Ans. C.



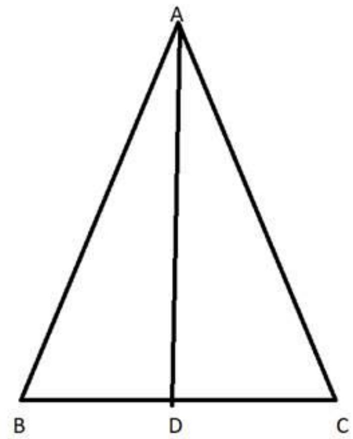
Now, PQRS is also a cyclic quadrilateral.

⇒ Sum of opposite angle of cyclic quadrilateral is 180°.

Hence, ∠PQR + ∠RSP = 180°

39. Ans. B.

If A ray bisects an angle of a triangle , then it divides the opposite sides of the triangle into segments that are proportional to the other two sides.



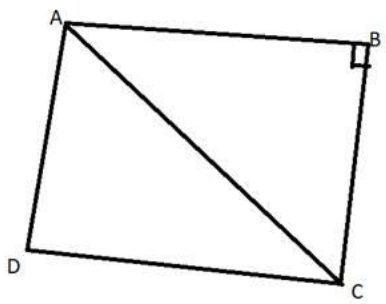
$\Rightarrow \frac{AB}{BD} = \frac{AC}{CD}$

$\Rightarrow \frac{16}{4} = \frac{12}{CD}$

$\Rightarrow CD = \frac{12}{4} = 3 \text{ cm}$

40. Ans. C.

In a quadrilateral ABCD, ∠B = 90°



Also,

$AB^2 + BC^2 + CD^2 - AD^2 = 0$ ……………(1)

In right angled triangle ABC

⇒ $AC^2 = AB^2 + BC^2$ ……………(2)

Put the value of (2) in (1)

⇒ $AC^2 + CD^2 - AD^2 = 0$

⇒ $AC^2 + CD^2 = AD^2$ ……………..(3)

From (3), we can conclude that triangle ACD is a right angled triangle.

⇒ $\angle ACD = 90°$

41. Ans. C.

p, q, r, s and t represent length, breadth, height, surface area and volume of a cuboid respectively

Volume of a cuboid (t)= pqr

Surface area of a cuboid (s)= $2(pq+qr+rs)$

⇒ $\frac{1}{p}+\frac{1}{q}+\frac{1}{r}=\frac{qr+rp+pq}{pqr}=\frac{s}{2t}$

42. Ans. B.

We can say that bucket is in the form of frustum of a cone.

It is given that radii of the flat circular faces of a bucket are x and 2x.

The height of the bucket (h) = 3x

Required capacity of the bucket = $\frac{1}{3}\pi\left(R^2+r^2+Rr\right)\times h$

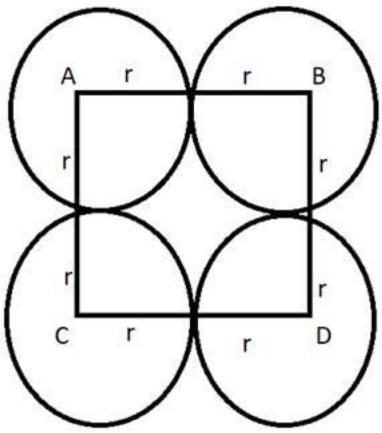
= $\frac{1}{3}\pi\left(x^2+4x^2+2x^2\right)\times 3x$

= $\frac{22}{7}\times\left(7x^2\right)\times x=22x^3$

43. Ans. B.

Let radius of each circular coin = r cm

the uncovered area of the square = 42 cm^2



Uncovered area of the square = Area of square – Area of 4 circles that is covering square.

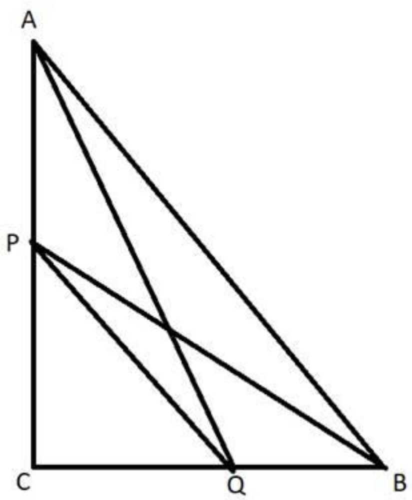
⇒ $(2r)^2 - \pi r^2 = 4r^2 - \pi r^2 = 42$

⇒ $r^2\left(4 - \frac{22}{7}\right) = 42$

⇒ $r^2 = 42 \times \frac{7}{6} = 49$

⇒ $r = 7 \text{ cm}$

44. Ans. A.



In right angled triangle PCQ

$PQ^2 = CQ^2 + PC^2$ ……………..(1)

In Right angled triangle ABC

$AB^2 = CB^2 + AC^2$ ....(2)

Adding (1) and (2)

$\Rightarrow$ $AB^2 + PQ^2 = CB^2 + AC^2 + CQ^2 + PC^2$

$\Rightarrow$ $AB^2 + PQ^2 = (AC^2 + CQ^2) + (CB^2 + PC^2)$

$AB^2 + PQ^2 = AQ^2 + BP^2$

Hence, statement (1) is correct.

Consider statement (2)

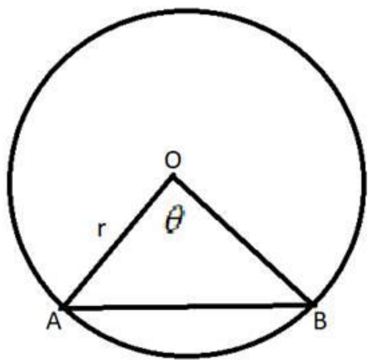
Now,

AB = 2PQ is true only if P and Q are midpoints of AC and BC respectively.

But it is not mentioned in question that P and Q are midpoints of AC and BC respectively.

Hence, statement (2) is not correct.

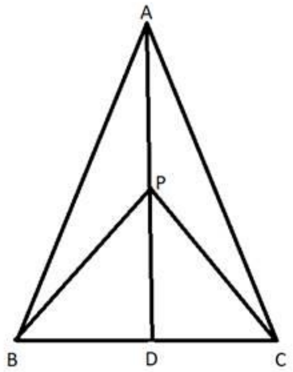
45. Ans. B.



Required area = Area of sector – area of triangle

$= \frac{1}{2}r^2\theta - \frac{1}{2}r^2 \times \sin\theta = \frac{1}{2}r^2\left(\theta - 2\sin\frac{\theta}{2}\cos\frac{\theta}{2}\right)$

46. Ans. B.



As AD is the median of triangle ABC.

We know that each median divides the triangle into two similar triangles of equal area.

⇒ $ar(\triangle ABD) = ar(\triangle ACD)$ ....(1)

Similarly, PD is the median of triangle PBC.

We know that each median divides the triangle into two similar triangles of equal area.

⇒ $ar(\triangle PBD) = ar(\triangle PCD)$ ....(2)

From (1) and (2)

⇒ $ar(\triangle PAB) = ar(\triangle PAC)$

Hence, option B is correct.

47. Ans. C.

Ratio of area of two squares = $m^2 : n^4$

Ratio of sides of two squares = Ratio of perimeter of two squares = $m : n^2$

48. Ans. B.

Let base of triangle = base of parallelogram = b

Altitude of parallelogram = a

Altitude of triangle= ka

Area of parallelogram = Area of triangle

$\Rightarrow ab = \frac{1}{2} \times ka \times b$

⇒ k = 2

49. Ans. D.

Let the sides of right angled triangle are a unit and b unit.

Length of its hypotenuse = h units

Using Pythagoras theorem

$\Rightarrow a^2 + b^2 = h^2$ ………………..(1)

According to question

$a^2 + b^2 + h^2 = 8450$

From (1)

$2h^2 = 8450$

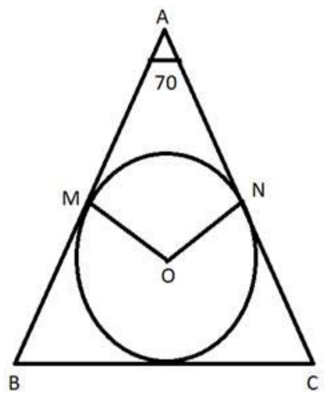
$h^2 = 4225$

$h = 65$

Hence, Length of hypotenuse = 65 units

50. Ans. C.

We know that the radius from the center of the circle to the point of tangency is perpendicular to the tangent line.



Hence, $\angle AMO = 90^\circ$

Also, $\angle ANO = 90^\circ$

It is also given that $\angle MAN = 70^\circ$

Now in quadrilateral AMON ,

$\Rightarrow \angle AMO + \angle MON + \angle ONA + \angle NAM = 360^\circ$

$\Rightarrow 90^\circ + \angle MON + 90^\circ + 70^\circ = 360^\circ$

$\Rightarrow \angle MON = 110^\circ$

51. Ans. A.

we know that $x^n - a^n$ is always divisible by $(x-a)$; where n is a natural number.

52. Ans. A.

given that $LCM = 28(HCF)$ and $LCM + HCF = 1740$

$28(HCF) + HCF = 1740$
$29(HCF) = 1740$
$HCF = 60$
$LCM = 1680$

If one of the number is 240 then another number is $= \frac{1680 \times 60}{240} = 420$

53. Ans. C.

we know that cycle of 3 is 4.

	3^{n+1}	3^{n+2}	3^{n+3}	3^n or 3^{n+4}
Unit digit	3	9	7	1

So, unit digit of $3^{99} = 3^{4\times24+3}$ is 7.

54. Ans. B.

let $N = 1^5 + 2^5 + 3^5 + 4^5 + 5^5 = 1 + 4 \times 2^3 + 3^5 + 4^5 + 5^5$

$$R\left[\frac{1+2^5+3^5+4^5+5^5}{4}\right]=R\left[\frac{1+4.2^3+(4-1)^5+4^5+(4+1)^5}{4}\right]$$
$$=R\left[\frac{1+4.2^3+4^5+2\left(4^5+10.4^3+5.4\right)}{4}\right]$$

All the term is divisible by 4 except 1, So remainder is 1.

55. Ans. A.

the smallest odd composite number is 9. And 23P62971335 is exactly divisible by 9. So sum of all the digits of the number is also divisible by 9.

Hence $2+3+P+6+2+9+7+1+3+3+5=41+P=9k$; $k \in I$

So P should be 4 to 23P62971335 is exactly divisible by 9.

56. Ans. D.

given that $I=a^2+b^2+c^2$; where a and b are consecutive integer and c = ab.

So, $b=a+1$ and $c=a(a+1)=a^2+a$

$$I=a^2+(a+1)^2+a^2(a+1)^2$$
$$=a^2+a^2+2a+1+a^4+2a^3+a^2$$
$$=a^4+2a^3+3a^2+2a+1$$
$$=(a^2+a+1)^2$$
$$=[a(a+1)+1]^2$$
$$=(ab+1)^2$$
$$=(c+1)^2$$

The product of any two consecutive number is always a even number, so c is a even number and I is a square of an odd integer.

57. Ans. C.

given that $x+y+z=12$; where $x,y,z \in 1,2,3,4,5,,6,7,8,9,10,11,12$

We have to choose 3 numbers to be sum 12, the number of ways $={}^{12-1}C_{3-1}={}^{11}C_2=55$

Or

$$
\begin{aligned}
(x,y,z) &= (1,1,10) \Rightarrow \text{ number of solutions} = 3!/2! = 3 \\
&= (1,2,9) \Rightarrow \text{ number of solutions} = 3! = 6 \\
&= (1,3,8) \Rightarrow \text{ number of solutions} = 3! = 6 \\
&= (1,4,7) \Rightarrow \text{ number of solutions} = 3! = 6 \\
&= (1,5,6) \Rightarrow \text{ number of solutions} = 3! = 6 \\
&= (2,2,8) \Rightarrow \text{ number of solutions} = 3!/2! = 3 \\
&= (2,3,7) \Rightarrow \text{ number of solutions} = 3! = 6 \\
&= (2,4,6) \Rightarrow \text{ number of solutions} = 3! = 6 \\
&= (2,5,5) \Rightarrow \text{ number of solutions} = 3!/2! = 3 \\
&= (3,3,6) \Rightarrow \text{ number of solutions} = 3!/2! = 3 \\
&= (3,4,5) \Rightarrow \text{ number of solutions} = 3! = 6 \\
&= (4,4,4) \Rightarrow \text{ number of solutions} = 3!/3! = 1
\end{aligned}
$$

Total number of possible solution = 3+6+6+6+6+3+6+6+3+3+6+1 = 55

58. Ans. D.

given that the roots of the equation $x^2 - 4x - \log_{10} N = 0$ is real then

$$
\begin{aligned}
& D^2 \geq 0 \\
& 16 + 4\log_{10} N \geq 0 \\
& \log_{10} N \geq -4 \\
& N \geq 10^{-4} \\
& N_{\min} = 10^{-4} = \frac{1}{10000}
\end{aligned}
$$

59. Ans. B.

given that $abc = 30$; a, b and c are positive integer

$$
\begin{aligned}
& abc = 30 = 1\times 1\times 30 \Rightarrow \text{ number of solution} = 3!/2! = 3 \\
& abc = 30 = 1\times 2\times 15 \Rightarrow \text{ number of solution} = 3! = 6 \\
& abc = 30 = 1\times 3\times 10 \Rightarrow \text{ number of solution} = 3! = 6 \\
& abc = 30 = 1\times 5\times 6 \Rightarrow \text{ number of solution} = 3! = 6 \\
& abc = 30 = 2\times 3\times 5 \Rightarrow \text{ number of solution} = 3! = 6
\end{aligned}
$$

Total number of solutions = 3+6+6+6+6 = 27

60. Ans. C.

let $f(x)=x^3+x^2+16$ is exactly divisible by x. When we divide $f(x)$ is divided by x then remainder will be zero.

$$\frac{f(x)}{x}=x^2+x+\frac{16}{x}$$

For $f(x)=x^3+x^2+16$ is exactly divisible by x, x should be divisor of 16

And $d(16)=5$

61. Ans. D.

we have $A_n=P_n+1$; where P_n is the product of first n prime numbers.

$P_n=2,3,5,7,11,13,....$

we know that when we add one in product of first n prime numbers it becomes also a prime number.

So A_n is a prime numbers not composite number.

All the prime number (except 2) are odd number. So A_n +1 is always even numbers

And A_n +2 is always a odd numbers.

62. Ans. B.

given that $d(n)$ = positive divisor of n

5=1,5
11=1,11
55=1,5,11,55

d(5) = 2
d(11) = 2
d(55) = 4

So statement 1 and 2 are correct.

63. Ans. D.

total units of work when x men working x hours per day in x day = units x

total units of work when y men working y hours per day in y day = units k

$$\frac{x\times x\times x}{x}=\frac{y\times y\times y}{k}$$
$$k=x^{-2}y^{3}$$

64. Ans. B.

given that the number of pages = 60 and number of lines per page = n

So, total number of lines in book = 60n

After reducing 3 lines per page and increasing 10 pages gives the same writing space, then

$$60n=(60+10)(n-3)$$
$$60n=70n-210$$
$$n=21$$

65. Ans. D.

let the sum of amount is $P=Rs.x$. Then $SI=\frac{x}{4}$ and let $\text{time}=\text{t}=\text{r}=\text{rate of interest}$.

$$SI=\frac{\text{P}.r.t}{100}$$
$$\frac{x}{4}=\frac{x.t^{2}}{100}$$
$$t=5$$

66. Ans. C.

total distance $d=110+165=275\,m$

Speed of train $=132\,kmph=\frac{110}{3}\,mps$

Time taken to cross the bridge $=\frac{275}{110/3}=7.5\,s$

67. Ans. C.

we have 10 numbers $\pm 1, \pm 2, \pm 3, \pm 4, \pm 5$

Let S is the sum of all possible products taken two at a time.

We know that, for two numbers $(a+b)^2 = (a^2+b^2) + 2ab = (a^2+b^2) + 2S$

For three numbers $(a+b+c)^2 = (a^2+b^2+c^2) + 2S$

So, $(1+2+3+\ldots-5)^2 = (1^2+2^2+\ldots+(-5)^2) + 2S$

$$0 = 2(1+4+9+16+25) + 2S$$
$$S = -(1+4+9+16+25) = -55$$

68. Ans. A.

we have $x^m = \sqrt[14]{x\sqrt{x\sqrt{x}}}$

$$x^m = \sqrt[14]{x\sqrt{x.x^{\frac{1}{2}}}} = \sqrt[14]{x\sqrt{x^{\frac{3}{2}}}} = \sqrt[14]{x.x^{\frac{3}{4}}} = \sqrt[14]{x^{\frac{7}{4}}} = x^{\frac{7}{56}} = x^{\frac{1}{8}}$$

After comparing the power we get, $m = \frac{1}{8}$

69. Ans. C.

we have $\frac{1}{1+\sqrt{2}} + \frac{1}{\sqrt{2}+\sqrt{3}} + \frac{1}{\sqrt{3}+\sqrt{4}} + \ldots. + \frac{1}{\sqrt{99}+\sqrt{100}}$

Rationalization of each term

$$\Rightarrow \frac{\sqrt{2}-1}{2-1} + \frac{\sqrt{3}-\sqrt{2}}{3-2} + \frac{\sqrt{4}-\sqrt{3}}{4-3} + \ldots. + \frac{\sqrt{100}-\sqrt{99}}{100-99}$$
$$\Rightarrow (\sqrt{2}-1) + (\sqrt{3}-\sqrt{2}) + (\sqrt{4}-\sqrt{3}) + \ldots + (\sqrt{100}-\sqrt{99})$$
$$\Rightarrow \sqrt{100}-1$$
$$\Rightarrow 10-1$$
$$\Rightarrow 9$$

70. Ans. A.

we have to find $R\left[\frac{17^{2020}}{18}\right]$

$17^{2020}=(18-1)^{2020}=18^{2020}-C_1 18^{2019}+.....+(-1)^{2020}.1$

All the term is divisible by 18 except last which will be remainder.

So, remainder $=(-1)^{2020}=1$

71. Ans. C.

given that $CP=Rs.x$ and $SP=Rs.75$ and profit $=x\%$

$$\text{profit}=\frac{SP-CP}{CP}\times 100$$
$$x=\frac{75-x}{x}\times 100$$
$$x^2+100x-7500=0$$
$$(x-50)(x+150)=0$$
$$x=50\%$$

72. Ans. B.

let $f(x)=1-x-x^n+x^{n+1}$

$$=(1-x)-x^n(1-x)$$
$$=(1-x)(1-x^n)$$
$$=(1-x)(1-x)(1+x+x^2+....x^{n-1})$$
$$=(1-x)^2(1+x+x^2+....x^{n-1})$$

73. Ans. B.

Let X takes t hr. to travel a distance with speed of 4 kmph.

Then distance travelled by X, $d=4t$ km.

Now Y takes $(t-2)$ hr. to complete the same distance with speed of 5 kmph.

Then distance $d=4t=5(t-2)$

$4t = 5t - 10$
$t = 10\,hr.$

And $d = 40\,km.$

Let Z starts t_o time after Y starts then

$6(10 - 2 - t_o) = 40$
$60 - 12 - 6t_o = 40$
$6t_0 = 8$
$t_o = \frac{4}{3}hr.$

74. Ans. D.

given that $\frac{x}{b+c} = \frac{y}{c+a} = \frac{z}{b-a} = k$

$x = k(b+c),\ y = k(c+a)\ and\ z = k(b-a)$

Now, $x - y - z = k(b+c-c-a-b+a) = 0$

75. Ans. B.

let the number is $10a+b$ then the reverse number is $10b+a$.

Given that $a+b=13$ ...(i)

$(10a+b)-(10b+a) = 27$
$9(a-b) = 27$
$a - b = 3 \qquad ...(ii)$

From equation (i) and (ii) $a = 8, b = 5$

The product of the digit $ab = 40$

76. Ans. D.

let $f(x) = 4x^4 + 8x^3 - 4x + 1 = (ax^2 + bx + c)^2$

$4x^4 + 8x^3 - 4x + 1 = a^2x^4 + 2abx^3 + (b^2 + 2ac)x^2 + 2bcx + c^2$

By comparison

$a^2 = 4 \Rightarrow a = \pm 2$, $2ab = 8 \Rightarrow b = \pm 2$ and $b^2 + 2ac = 0 \Rightarrow c = -\frac{b^2}{2a} = -\frac{4}{(\pm 4)} = \mp 1$

So, the function is $\pm(2x^2 + 2x - 1)$

77. Ans. D.

we have $\frac{a^2+ac}{a^2c-c^3} - \frac{a^2-c^2}{a^2c+2ac^2+c^3} - \frac{2c}{a^2-c^2} + \frac{3}{a+c}$

$$\Rightarrow \frac{a(a+c)}{c(a-c)(a+c)} - \frac{(a+c)(a-c)}{c(a+c)^2} - \frac{2c}{(a-c)(a+c)} + \frac{3}{(a+c)}$$

$$\Rightarrow \frac{a}{c(a-c)} - \frac{a-c}{c(a+c)} - \frac{2c}{(a-c)(a+c)} + \frac{3}{(a+c)}$$

$$\Rightarrow \frac{a^2+ac-a^2+2ac-c^2}{c(a^2-c^2)} - \frac{2c-3a+3c}{(a^2-c^2)}$$

$$\Rightarrow \frac{c(3a-c)}{c(a^2-c^2)} + \frac{3a-5c}{(a^2-c^2)}$$

$$\Rightarrow \frac{3a-c+3a-5c}{(a^2-c^2)}$$

$$\Rightarrow \frac{6(a-c)}{(a^2-c^2)}$$

$$\Rightarrow \frac{6}{a+c}$$

78. Ans. C.

we have $(p+2)(2q-1) = 2pq - 10$ and $(p-2)(2q-1) = 2pq - 10$

$2pq + 4q - p - 2 = 2pq - 10$ $\quad$ $2pq - 4q - p + 2 = 2pq - 10$

$4q - p + 8 = 0$ and $4q + p - 12 = 0$

After solving both $p = 10, q = \frac{1}{2}$ and $pq = 5$

79. Ans. D.

let $f_1(x) = 6x^2 + 5x + 1 = (3x+1)(2x+1)$

Given that, $HCF = (3x+1)$

And $LCM = 30x^3 + 7x^2 - 10x - 3 = (5x-3)(2x+1)(3x+1)$

We know that $f_1(x) \times f_2(x) = HCF \times LCM$

So, $f_2(x) = \dfrac{HCF \times LCM}{f_1(x)}$

$$= \frac{(3x+1)^2(2x+1)(5x-3)}{(3x+1)(2x+1)}$$
$$= (3x+1)(5x-3)$$
$$= 15x^2 - 4x - 3$$

80. Ans. D.

Let $f_1(x) = x^6 - 3x^4 + 3x^2 - 1 = (x^2-1)^3 = (x-1)^3(x+1)^3$

And $f_2(x) = x^3 + 3x^2 + 3x + 1 = (x+1)^3$

So, $HCF = (x+1)^3$

81. Ans. C.

interior angle of a polygon, $\theta = \dfrac{(n-2)\pi}{n}$

For pentagon $n = 5$, $\theta = \dfrac{(5-2)\pi}{5} = \dfrac{3\pi}{5}$

82. Ans. D.

$$\sin\theta = x + \frac{1}{x} = \frac{x^2+1}{x} = \frac{(1-x)^2 + 2x}{x} = \frac{(1-x)^2}{x} + 2$$

We know that $-1 \le \sin\theta \le 1$

$$-1 \le x + \frac{1}{x} \le 1$$
$$-1 \le \frac{x^2+1}{x} \le 1$$
$$-x \le x^2 + 1 \le x$$
$$x^2 + x + 1 \ge 0 \quad and \quad x^2 - x + 1 \le 0$$

No such value of $x \in R$ exist.

Same for the statement -2.

83. Ans. D.

since triangle is in semicircle, AB is diameter then $\angle C = 90^o$ (inside a semicircle)

Now, $\angle A + \angle B = 90^o$

And $\cos(A+B) + \sin(A+B) = \cos 90^o + \sin 90^o = 1$

84. Ans. B.

given that $\cos\theta + \sec\theta = k$

$$\cos^2\theta + \sec^2\theta + 2 = k^2$$
$$(1-\sin^2\theta) + (1+\tan^2\theta) = k^2 - 2$$
$$\sin^2\theta - \tan^2\theta = 4 - k^2$$

85. Ans. B.

we have $\csc\theta - \sin\theta = m$ and $\sec\theta - \cos\theta = n$

$$\frac{1}{\sin\theta} - \sin\theta = m \qquad \frac{1}{\cos\theta} - \cos\theta = n$$
$$\frac{1-\sin^2\theta}{\sin\theta} = m \qquad \frac{1-\cos^2\theta}{\cos\theta} = n$$
$$\frac{\cos^2\theta}{\sin\theta} = m \quad ...i \qquad \frac{\sin^2\theta}{\cos\theta} = n \quad ...ii$$

$$m^2 n = \frac{\cos^4\theta}{\sin^2\theta} \cdot \frac{\sin^2\theta}{\cos\theta} = \cos^3\theta, \quad mn^2 = \frac{\cos^2\theta}{\sin\theta} \cdot \frac{\sin^4\theta}{\cos^2\theta} = \sin^3\theta$$

$$m^{\frac{4}{3}}n^{\frac{2}{3}}+m^{\frac{2}{3}}n^{\frac{4}{3}}=\left(m^2n\right)^{\frac{2}{3}}+\left(mn^2\right)^{\frac{2}{3}}$$
$$=\left(\cos^3\theta\right)^{\frac{2}{3}}+\left(\sin^3\theta\right)^{\frac{2}{3}}$$
$$=\cos^2\theta+\sin^2\theta$$
$$=1$$

86. Ans. D.

let the radius of a sphere is p (a rational number)

Surface area of sphere $=4\pi p^2=\left(4p^2\right)\pi=irrational$

Volume of sphere $=\frac{4}{3}\pi p^3=\left(\frac{4}{3}p^3\right)\pi=irrational$

Here both are incorrect.

87. Ans. D.

Euclidean algorithm, procedure for finding the Highest Common Factor (HCF) of two numbers, described by the Greek mathematician Euclid in his Elements (c. 300 bc).

88. Ans. B.

given that $6^{3-4x}.4^{x+5}=8$

$$(3-4x)\log 6+(x+5)\log 4=\log 8$$
$$(3-4x)(\log(2\times3))+(x+5)\log 2^2=\log 2^3$$
$$(3-4x)(\log 2+\log 3)+2(x+5)\log 2=3\log 2$$
$$(3-4x)(0.301+0.477)+2(x+5)(0.301)=3(0.301)$$
$$5.344-2.51x=0.903$$
$$x=1.77$$

We can see that, $1<x<2$

89. Ans. A.

Given that the fall of distance, $t\propto\sqrt{s}$

$$t^2=ks \quad or \quad \frac{t^2}{s}=constatnt$$

It takes 4 sec to fall 78.40 m. let it will take t sec to fall 122.5 m

So, $\left(\frac{t_2}{t_1}\right)^2 = \frac{s_2}{s_1} \Rightarrow t_2 = t_1\left(\frac{s_2}{s_1}\right)^{\frac{1}{2}}$

$t_2 = 4\sqrt{\frac{122.5}{78.4}} = 4(1.25) = 5$ sec

90. Ans. B.

let the distance is s km and time taken to complete it is t hr.

Then the speed $= \frac{s}{t}$ kmph

New speed $= \left(\frac{s}{t} + x\right)$ kmph now it takes $(t-y)$ hr.

Distance, $s = \left(\frac{s}{t} + x\right)(t-y)$

$$st = (s + xt)(t-y)$$
$$s(t - t + y) = xt(t-y)$$
$$s = x(t-y)ty^{-1}$$

91. Ans. D.

Assuming sides of right angled triangle as $a, (a+2), (a+4)$

As in triangle the biggest side is the hypotenuse for the right angled triangle

So by Pythagoras theorem - hypotenuse^2 = base^2 + hight^2

$$(a+4)^2 = a^2 + (a+2)^2$$
$$a^2 + 16 + 8a = a^2 + a^2 + 4 + 4a$$
$$a^2 - 4a - 12 = 0$$
$$(a-6)(a+2) = 0$$
$$a = 6,$$

But $a \neq -2$ as a cannot be negative.

Hence the sides are 6 , 8 and 10

So their product = 6×8×10

= 480

92. Ans. D.

it is given that perimeter of circle = perimeter of square

$2\pi r = 4\times a$ ……… (where r is radius of circle and a is side of square)

$r = \frac{2a}{\pi}$ …………(1)

Then $\frac{area\ of\ circle}{area\ of\ square} = \frac{\pi r^2}{a^2}$

$= \frac{\pi\left(\frac{2a}{\pi}\right)^2}{a^2}$

$= \frac{4}{\pi}$

93. Ans. B.

Given that 2 ∠A = 3 ∠B = 6 ∠C ……….(1)

As we know $\angle A + \angle B + \angle C = 180^0$

From equ.(1)

$$\angle A + \frac{2}{3}\angle A + \frac{2}{6}\angle A = 180^0$$
$$\frac{(6+4+2)}{6}\angle A = 180^0$$
$$\frac{12}{6}\angle A = 180^0$$
$$\angle A = 90^0$$

Similarly for $\angle C$

As $\angle A + \angle B + \angle C = 180^0$

From equ.(1)

$$3\angle C + 2\angle C + \angle C = 180^0$$
$$6\angle C = 180^0$$
$$\angle C = 30^0$$

Hence $\angle A + \angle C = 120^0$

94. Ans. A.

as volume of a cone = $\frac{1}{3}\pi r^2 h$

So $\frac{volume\ of\ cone\ 1}{volume\ of\ cone\ 2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2} = \frac{1}{4}$

$\frac{r_1^2 h_1}{r_2^2 h_2} = \frac{1}{4}$ ………………..(1)

But it is given that

$$\frac{d_1}{d_2} = \frac{4}{5}$$
$$\frac{2r_1}{2r_2} = \frac{4}{5}$$
$$\frac{r_1}{r_2} = \frac{4}{5}$$

Putting the ratio in equ. (1)

$$\frac{r_1^2 h_1}{r_2^2 h_2} = \frac{1}{4}$$

$$\frac{4^2 h_1}{5^2 h_2} = \frac{1}{4}$$
$$\frac{h_1}{h_2} = \frac{1}{4} \times \frac{25}{16}$$
$$\frac{h_1}{h_2} = \frac{25}{64}$$

95. Ans. B.

if the perimeter of the wheel be $2\pi r$ then it will cover $2\pi r$ distance in one revolution.

So the number of total revolutions = $\frac{total\ distance\ covered}{perimeter\ of\ the\ wheel}$

$5000 = \frac{1100000}{2\pi r}$ ....(11km=1100000 cm)

$$5000 = \frac{1100000}{2\pi r}$$
$$\pi r = 110$$
$$r = 110 \times \frac{7}{22}$$
$$r = 35cm$$

96. Ans. A.

As we know sum of all interior angles = $(n-2)\times 180^0$

And sum of all exterior angles = 360°

Now the given condition ⇒ $(n-2)\times 180^0$ = 2× 360°

n-2 = 4

n = 6

hence the polygon is Hexagon.

97. Ans. C.

Given for single brick L = 20 cm , b = 15 cm and h=10 cm

Volume of a brick = L.b.h

= 20×15×10 cm^3

=3000 cm^3

Volume of the wall = length of wall × breadth of wall × height of wall

=4500 × 15 × 300 cm^3

Hence total number of bricks required = $\frac{\text{Volume of the wall}}{\text{Volume of a brick}}$

$$= \frac{4500 \times 15 \times 300}{3000}$$
$$= 6750$$

98. Ans. D.

as surface area of sphere = $4\pi r^2$

So $\frac{surface\ area\ of\ sphere\ 1}{urface\ area\ of\ sphere\ 2} = \frac{4\pi r_1^2}{4\pi r_2^2} = \frac{1}{4}$

$$\frac{r_1^2}{r_2^2} = \frac{1}{4}$$
$$r_2 = 2r_1$$

Hence now $\frac{volume\ of\ sphere\ 1}{olume\ of\ sphere\ 2} = \frac{\frac{4}{3}\pi r_1^3}{\frac{4}{3}\pi r_2^3}$

$$\frac{volume\ of\ sphere\ 1}{olume\ of\ sphere\ 2} = \frac{r_1^3}{r_2^3}$$

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

$$= \frac{1}{8}$$

Volume of sphere 1 : Volume of sphere 1 = 1 : 8

99. Ans. C.

Assuming length is denoted by L

And breadth by b.

Then initial area of rectangle = L.b

But as given condition final length (L’) = 1.1L …………..(10% increase).

Final breadth (b’) = 0.9b …………..(10% decrease) .

Hence final area of the rectangle = L’.b’

$=1.1L\times0.9b$

$=0.99Lb$

Thus it is 1% less than initial area.

100. Ans. D.

For option (A) ratio of angles 1 : 2 : 3, So

$$x+2x+3x=180^0$$
$$6x=180^0$$
$$x=30^0$$

Hence all are integers.

For option (B) ratio of angles 3 : 4 : 5

$$3x+4x+5x=180^0$$
$$12x=180^0$$
$$x=15^0$$

Hence all angles, being multiple of 15 , so will be integers.

For option (c) ratio of angles 5 : 6 : 7

$$5x+6x+7x=180^0$$
$$18x=180^0$$
$$x=10^0$$

Hence all angles will be integers.

For option (D) ratio is 6 : 7 : 8

$$6x+7x+8x=180^0$$
$$21x=180^0$$
$$x=8.57^0$$

Hence for this ratio of angles , the angles would not be integers.