

ANSWERS

1. Ans. B. LCM of 16,36,45 & 48 $16 = 2 \times 2 \times 2 \times 2$ $36 = 2 \times 3 \times 2 \times 3$ $45 = 3 \times 3 \times 5$ $48 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$ LCM = $2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 = 720$ On dividing 9999 (highest 4 digit no.) by 720, we get 639 as remainder, Hence, required number = 9999 - 639 = 9360

2. Ans. A. $x = y^{a}, y = z^{b}, z = x^{c}$ Putting value of Z in y & y in X, we get $y = (x^{c})^{b}$ $x = ((x^{c})^{b})^{c}$ $x = x^{abc}$ On comparing powers, we get abc = 1

3. Ans. A.

 $x = 2 + 2\frac{3}{3} + 2\frac{3}{3}$ x - 2 = $2\frac{2}{3} + 2\frac{1}{3}$ Cubing both sides

 $(x-2)^{3} = \left(2^{\frac{2}{3}} + 2^{\frac{1}{3}}\right)^{3}$ $x^{3} - 8 - 6x^{2} + 12x = 4 + 2 + 3 \times 2^{\frac{2}{3}} \times 2^{\frac{1}{3}} \left(2^{\frac{2}{3}} + 2^{\frac{1}{3}}\right)$ $x^{3} - 8 - 6x^{2} + 12x = 6 + 3 \times 2(x-2)$ $x^{3} - 6x^{2} + 12x - 6x = 6 - 12 + 8$ $x^{3} - 6x^{2} + 6x = 2$

4. Ans. B. $33 = 11 \times 3$ Number x * y * x Divisible by 11 = (x + y + x) - (x + x) = yHence, y being a single digit number must be divisible by 11 or else be zero.

For divisibility by 3, number must be divisible by 3 x + x + 0 + x + x= 4xFor 3,6 &9, we will get 4x' as multiple of 3 Hence, number can be one of below three: 33033, 66066 & 99099 Hence, answer is 3. 5. Ans. C. As x4235 is divisible by 3, x + 4 + 2 + 3 + 5 is divisible by 3 x + 4 + 10 is divisible by 3 Also, x + 4 <= 5, hence (x+4) can be 2 or 5 (as both 12 & 15 are divisible by 3) For x + 4 = 2, solution (1,1), (2,0) For x + y = 5, solution (5,0), (4,1), (3, 2), (2, 3), (1, 4)Hence, there are 7 possible pairs. 6. Ans. C. $x^2 - 6x - 27 > 0$ $x^2 - 9x + 3x - 27 > 0$ x(x-9) + 3(x-9) > 0(x+3)(x-9) > 0Either, x + 3 > 0 & x - 9 > 0or x + 3 < 0 and x - 9 < 0Taking x + 3 > 0 & x - 9 > 0x > -3 & x > 9x > 9

x > 9Taking x + 3 < 0 & x - 9 < 0 X < - 3 & x < 9 X < - 3 Hence, X < - 3 or x > 9

7. Ans. C. 38808 = 2 x 2 x 2 x 3 x 7 x 7 x 11 x 3 = $2^3 \times 3^2 \times 7^2 \times 11^1$ No. of divisors = (3+1)(2+1)(2+1)(1+1) = 72 Excluding one & itself = 72 - 2 = 70



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8. Ans. C. HCF x LCM = p(x) x q(x) $\begin{aligned} &(x+3)(x^3 - 9x^2 - x + 105) = (x^2 - 4x - 21) \times q(x) \\ &(x+3)(x^3 - 9x^2 - x + 105) = (x - 7)(x + 3) \times q(x) \\ &q(x) = \frac{x^3 - 9x^2 - x + 105}{x - 7} \\ &\text{Thus, answer is } x^2 - 2x - 15. \end{aligned}$ 9. Ans. C. As 1Hence, $\alpha + \beta = -\frac{q}{n}$ is negative $lphaeta=rac{\mathbf{r}}{\mathbf{p}}$ is both positive & its magnitude is greater than one. Option (A) $\frac{1}{\alpha + \beta} = -\frac{p}{q}$ is negative Option (B) $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha \beta}$ $=-\frac{q}{n}\left(\frac{p}{r}\right)$ $= -\frac{q}{r}$ is negative Option (C) $-\frac{1}{\sigma^2} = -\frac{p}{r}$ Option (D) $\frac{\alpha\beta}{\alpha+\beta} = \frac{r}{p} \times -\frac{p}{q} = -\frac{r}{q}$ As r > pHence, option a is bigger than option d As q > pHence, option c > option bAs r > q $S_{0}, \frac{1}{r} < \frac{1}{q}$ Hence, $-\frac{p}{r} > -\frac{p}{q}$ Thus, option c is biggest. 10. Ans. D. Let total work = 1

For full work let A takes days = a

1 day work of A = 1/aSimilarly, B takes days b 1 day work of B = 1/b5 days work of: $A + B = 5\left(\frac{1}{2} + \frac{1}{2}\right)$ If A worked twice the original efficiency, then 1 day of work of A = 2/aIf B worked 1/3rd effectively, then 1 day work of B = 1/3b3 days work both = $3\left(\frac{2}{2} + \frac{1}{2b}\right)$ Acc. to the question, $5\left(\frac{1}{a} + \frac{1}{b}\right) = 3\left(\frac{2}{a} + \frac{1}{3b}\right)$ $\frac{5}{a} + \frac{5}{b} = \frac{6}{a} + \frac{1}{b}$ 4 $\overline{b} = \overline{a}$ 4a = bPutting above eq. in (i) $5\left(\frac{1}{2}+\frac{1}{2}\right)=1$ $\frac{5}{4a} = \frac{1}{5}$ $a = 6\frac{1}{4}$ days 11. Ans. B. $x^{6} + \frac{1}{x^{6}} = k\left(x^{2} + \frac{1}{x^{2}}\right)$ Using identity $a^{3} + b^{3} = (a + b)(a^{2} - ab + b^{2})$ $(x^{2})^{3} + (\frac{1}{x^{2}})^{3} = (x^{2} + \frac{1}{x^{2}})(x^{4} - 1 + \frac{1}{x^{4}})$ $\therefore k = x^4 - 1 + \frac{1}{x^4}$





12. 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) = 0x =5, -7 As 'x' is a natural number, hence x = 5Number are 5, 6, 7 $=(5)^{3}+(6)^{3}+(7)^{3}$ = 125 + 216 + 343 = 68413. Ans. C. As 16 is their HCF, hence Let P = 16x & q = 16y $P \times Q = Product$ 16x * 16y = 7168xy = 28As HCF is 16, hence the sum of the two numbers must be a multiple of 16, this removes option (b) & (d) Using option (a), 16x + 16y = 256X + y = 16 & xy = 256On solving, X = 2 & y = 14Thus, P = 16x2 = 32, which is less than 60. Using option (b), 16(x+y) = 176= x + y = 1 & xy = 28= x = 4 & y = 7P = 16x4 = 64 & $Q = 16 \times 7 = 112$ 14. Ans. B. $= \log_{100}(0.72)$

$$= \frac{\log(72) - \log(100)}{\log(100)}$$

= $\frac{\log(2^3 \times 3^2) - \log(10^2)}{\log(10^2)}$
= $\frac{\log(2)^3 + \log(3^2) - 2\log(10)}{2\log(10)}$
= $\frac{3\log(2) + 2\log(3) - 2}{2}$
= $\frac{3(0.301) + 2(0.4771) - 2}{2}$
= $\frac{0.903 + 0.9542 - 2}{2}$
= $\frac{-0.1428}{2}$
= -0.0714
= $\overline{1.9286}$
15. Ans. B.
Let $a^x = b^y = c^z = k$
 $a^x = k$
 $a = k\overline{x}$
 $b = k\overline{y}$
 $c = k\overline{z}$
 $abc = k\overline{x}k\overline{y}k\overline{z}$
 $1 = k(\frac{1}{x} + \frac{1}{y} + \frac{1}{z})$
 $k^0 = k^{\frac{1}{x} + \frac{1}{y} + \frac{1}{z}}$



 $\frac{\log(0.72)}{\log(100)}$

log 100

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$$\frac{1}{x} + \frac{1}{y} + \frac{1}{z} = 0$$

16. Ans. B. As a & β are roots of equation $ax^2 + bx + c = 0$ Then, a + β = -b/a And, a * β = -c/a

From the given: $\frac{1}{a\alpha + b} + \frac{1}{a\beta + b}$ $= [(a\beta + b) + (a\alpha + b)]/[(a\alpha + b)*(a\beta + b)]$

Solving the above, and using above, we get b/ac

17. Ans. C. The three numbers can be written as: xyz = 100x + 10y + z yzx = 100y + 10z + x zxy = 100z + 10x + yAdding above three, we get = 100(x+y+z) + 10(x+y+z) + (x+y+z) = (x+y+z) (100+10+1) = (x+y+z)(111)Hence, this number is divisible by both (x+y+z) & 111. Hence, option C is correct.

18. Ans. C. We can, rewrite this equation 1/m+1/n-1/mn=2/55m+5n-5=2mnIf m=n, then we have 2m2-10m+5=0. There are no integer roots for this. Now suppose m<n. Then we can say that $10n>2mn\Rightarrow5>m$. If m=1 we get 5n=2n; n=0, no solutions. If m=2 we get 5n+5=4n; n=-5, no solutions If m=3 we get 5n+10=6n; n=10. If m=4 we get 5n+15=8n; 3n=15, so n=5. Therefore, there are 4 positive solutions, $(m,n) \in \{(10,3), (3,10), (4,5), (5,4)\}.$

19. Ans. D. Right hand side $= a^{q-r} b^{r-p} c^{p-q}$

 $= (xy^{p-1})^{q-r} (xy^{q-1})^{r-p} (xy^{r-1})^{p-q}$ = $x^{q-r}y^{(p-1)(q-r)} x^{r-p}y^{(q-1)(r-p)} x^{p-q}y^{(r-1)(p-q)}$ = $x^{q-r+r-p+p-q} y^{(p-1)(q-r)+(q-1)(r-p)+(r-1)(p-q)}$ = $x^0 y^{pq-pr-q+r+qr-pq-r+p+pr-qr-p+q}$

 $= 1 \times y^0 = 1 \times 1$

= 1

20. Ans. D. Let the sides be 5x & 4x interior angle of regular polygon = ((n-2)180)/n

$$\therefore \frac{(5x-2)180}{5x} - \frac{(4x-2)180}{4x} = 9$$
$$= \frac{[(20x-8) - (20x-10)]180}{20x} = 9$$

Hence, point 3 is also correct.

21. Ans. B.

$$2x^{2} + 5x + 5$$

$$ax^{2} + bx + c.$$
If a > 0, Min value = $\frac{4ac - b^{2}}{4a}$

$$= \frac{4 \times 2 \times 5 - 25}{8} = \frac{40 - 25}{8} = \frac{15}{8}$$



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22. Ans. B. If H is harmonic mean of P & Q, then

$$H = \frac{2PQ}{P+Q}$$

$$\frac{H}{P} + \frac{H}{Q} = \left[\frac{2PQ}{(P+Q)P} + \frac{2PQ}{Q(P+Q)}\right]$$

$$= \frac{2Q}{P+Q} + \frac{2P}{P+Q}$$

$$= \frac{2(P+Q)}{P+Q} = 2$$

23. Ans. A. Let us multiply first two numbers $\pm 1_{\&} \pm 2_{1\times 2} = -2_{1\times 2} = -2_{2} = 1_{\times 2} = -2_{2}$

 $1 \times 2 = 2$, $1 \times -2 = -2$, $-1 \times 2 = -2$, $-1 \times -2 = 2$ Adding above 4, we get sum as 0.

The same is valid for all the possible combination. Hence, total sum will be zero.

24. Ans. A. $\begin{aligned} f(x) &= 3x^3 - 2x^2y - 13xy^2 + 10y^3 \\ \text{Using remainder theorem,} \\ x - 2y &= 0 \\ x &= 2y \\ f(2y) &= 3(2y)^3 - 2(2y)^2y - 13(2y)y^2 + 10y^3 \\ &= 24y^3 - 8y^3 - 26y^3 + 10y^3 = 0. \end{aligned}$

25. Ans. B. $\frac{(b^{2} - ca)(c^{2} - ab) + (a^{2} - bc)(c^{2} - ab) + (a^{2} - bc)(b^{2} - ca)}{(a^{2} - bc)(b^{2} - ca)(c^{2} - ab)}$ $ab + bc + ca = 0 \dots (i)$ $b^{2} - ca$ $= b^{2} + ab + bc (using (i))$ = b(b + a + c) $= c^{2} - ab$

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= c(a + b + c)
Similarly,

$$a^2 - bc = a(a + b + c)$$

Equation becomes
 $\frac{cb(b + a + c)^2 + ac(a + b + c)^2 + ab(a + b + c)^2}{(a^2 - bc)(b^2 - ca)(c^2 - ab)}$
= $\frac{(b + a + c)^2(cb + ac + ab)}{(a^2 - bc)(b^2 - ca)(c^2 - ab)} = 0$
26. Ans. C.
210 = P $\left(1 + \frac{R}{100}\right) \times \frac{R \times T}{100}$
210 = P $\left(1 + \frac{5}{100}\right) \times \frac{(5 \times 1)}{100}$
= 210 = P $\left(\frac{105}{100}\right) \times \frac{5}{100}$
P = 4000
27. Ans. B.
n(E ∪ H) = n(E) + n(H) - n(E ∩ H)
= 50 + 40 - 15 = 75%

 $= c^{2} + bc + ca$

Percentage pass = 100 - 75 = 25%



28. Ans. D. Total distance = 100 + 100 = 200m Time= 10 sec Speed = Distance / Time = 200/10 = 20m/sec = 20* 18/5 = 72 km/h



29. Ans. B. Let $d_1, d_2 \underset{\text{A}}{\otimes} d_3$ be 20 km, 10 km $\underset{\text{A}}{\otimes}$ 30 km & S1, S2, S3 be 40 km/h, 10m/h & 40km/h. Hence, $T_1 = \frac{d_1}{S_1} = \frac{20}{40} = \frac{1}{2}$ hr. $T_2 = \frac{d_2}{S_2} = \frac{10}{10} = 1$ hr. $T_3 = \frac{d_3^2}{S_3} = \frac{30}{40} = \frac{3}{4}hr.$ Total distance = 20 + 10 + 30 = 60 km Total time = $\frac{1}{2} + 1 + \frac{3}{4}$ = $\frac{2+4+3}{4} = \frac{9}{4}$ hr. Speed = Distance/Time $=\frac{60}{9} \times 4 = 26.67$ kmph 30. Ans. C. As A beats B by 150m, hence Speed of A(S_A)/Speed by B $(S_B) = \frac{1000}{850}$ 20 17 As C beats D by 400m, hence Speed of C(Sc)/Speed by D $(S_{\rm D}) = \frac{3000}{2600} = \frac{15}{13}$ Let speed of A & B be 20x & 17x Let speed of C & D be 15y & 13y As S_B & S_D hence 17x = 13yX = 13/17y $\frac{S_A}{S_C} = \frac{20x}{15y} = \frac{4x}{3y}$ $=\frac{4}{3v}\left(\frac{13y}{17}\right)=\frac{52}{51}$ Let A beats C by K metres, thus

6000 $rac{6000 - K}{51} = rac{51}{51}$ $51 \times 6000 = 52(6000 - K)$ K = 115.38m31. We shall use F for father, M for mother, A for Sonu, B for Savita & C for Sonia (for present ages) F + M + A + B + C = 96When Sonu was born: (F - A) + (M - A) + (A - A) + (B - A) + (C- A) = 66 F + M + A + B + C - 5A = 6696 - 5A = 66 5A = 96 - 66 = 30A = 30/5 = 6Also, $F = 6A = 6 \times 6 = 36$ years After 12 years Father's age = F + 12 = 36 + 12 = 48years 32. Ans. B. Let A takes days to finish work = xLet B takes days to finish work = x + 10As A is thrice more efficient, hence B will take 3 times the time taken by A. x + 10 = 3xSolving, we get: x = 5Time taken by B = x + 10 = 15 days 33. Ans. A. Let total number of boys = xLet total number of girls = 70% of x = 0.7x Total = x + 0.7x85 = 1.7xx = 50Number of boys = 50Number of girls = $0.7 \times 50 = 35$ Number of boys playing only badminton = 50% of 50 = 25 No. of children playing TT only = 40% of 85 = 34No. of children playing both = 12

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No. of girls playing only Badminton = Total students – Boys playing only Badminton –Children playing both games – Children playing only TT = 85 - 25 - 12 - 34 = 14

34. Ans. (A) Solution: Let the price of article X and Y be x and y respectively Price of articles before sales tax= Rs. 130 Price of article after sales tax = Rs. 136.75Difference in prices = sales tax on article Y 136.75 - 130 = 9% of y $6.75 = y^* 9/100$ y = 6.75*100/9 = Rs. 75 35. Ans. (C) Solution: Initially according to the will Mr. Sharma's wife share = 50%Ravi's share = 25% = Raj's share After Ravi's death Ravi's widow share = 25%/2 = 12.5%Raj's share = Raj's initial share + remaining share of raj's = 25% + 12.5%= 37.5%After Raj's Death, Raj's widow share = 37.5/2 % = 18.75% Mr. Sharma's wife's share = 50% + remaining share of Raj = 50% + 18.75%= 68.75% 68.75% of Mr. Sharma's Property = Rs. 88000 100% of Mr. Sharma's Property = 88000* 100/68.75 = Rs. 128000 36. Ans. (B) Solution: Let the price of one lemon juice bottle = Rs. x So, the price of one orange juice bottle = Rs. 2x So the price of one orange and 4 lemon juice bottle will be = 2x + 4*x = 6xZ'share in this will be = 6x/3 = 2x = 50

Therefore 2x = price of orange juice bottle = Rs. 50 37. Ans. (B) Solution: Let the present ages of mother and daughter be x and y So, according to the guestion *x* – 10 3 $\overline{y-10} = \overline{1}$ x = 3y - 30 + 10x = 3y - 20Also x + 10 13 $\frac{1}{y+10} = \frac{15}{7}$ 7x + 70 = 13y + 130Putting the value of x in the above equation, we get 7(3y - 20) + 70 = 13y + 1308v = 200y = 25Therefore x = 3*25 - 20 = 5538. Ans. (C) Solution: Total number of boys = 60Number of boys who play chess = 45Number of boys who play carrom = 30Since all the 60 boys play atleast one game Number of boys who play carrom only will be = 60 - (number of boys who play)chess) = 60 - 45 = 1539. Ans. C. Let total amount is P $P \times R \times T$ 100After 4 years, P×4×4 100 100 36P 405 =100P = 1125

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40. Ans. C. M x D x H =Work

$$M_1D_1H_1 = M_2D_2H_2$$

12 x 8 x 10 = 8 x H x 8
H 15 hours per day

41. Ans. C. Let the water added be x litre Cost price (CP) = 28 x 8.5 = 238 New Volume = 28 + x Selling price (SP) = 8.5 x (28 + x) = 238 + 8.5x Profit = 8.5x Profit % = $\frac{\text{Profit}}{\text{CP}} \times 100$ $12.5 = \frac{8.5x}{238} \times 100$ $x = \frac{238 \times 12.5}{8.5 \times 100}$ x = 3.5 litres

42. In a correct clock, the minute hand gains 55 minutes(space) over the hour hand in 60 minutes.

To be together again, the minute hand must gain 60 minutes over the hour hand. 55 minutes are gained in 60 minutes 60 minutes are gained in (60/55) \times 60 min =720/11 min.

But, they are together after 72 min. Lose in 72 min =72-(720/11) =72/11 min. Lose in 24 hours =(72/11 * (60*24)/72)min = 1440/11 The clock loses 1440/11 = 130(10/11)

minutes in 24 hours. Alternative way to solve above kind of problems in exams is using a direct

formula. Whenever there is an overtaking of a minute hand and loss/gain of time

involved: $\left(\frac{720}{11} - M\right) \left(\frac{60 \times 24}{M}\right)$ minutes

M= intervals of M minutes of correct time

Plugging, M=72 in the above formula we will get the same answer. Negative means clock loses. 43. Ans. B. Let the owner meets thief x hours after discovering theft. Distance travelled by thief till then = 40 (x)+ 1/2)Distance travelled by owner till then = 60(x) According to guestion, 60(x) = 40(x + 1/2)60x = 40x + 2020 x = 20X = 1 hour Distance travelled = $60 \times 1 = 60$ km They meet 60km from owner's house & 1.5 hour after theft. 44. Ans. B. Let Y takes y days to finish the work alone 1 1 1 y'12 1 1 y 6 12 1 1 12 V y = 12 days45. Ans. D. As we know, $\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2}$ $\frac{12 \times 16}{10} = \frac{8}{10}$ $8 \times D_2$ $D_2 = 48$ days. 46. Ans. D. Lets say, $(0.2)^{25} = x$ $\log (0.2)^{25} = \log x$ 25log (0.2)=log x $25(\log 2 - \log 10 = \log x)$



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25(0.30101-1)=log x log x = -17.47475



Therefore, Characteristic=17=number of zeroes immediately after decimal point in $(0.2)^{25}$

47. Ans. B. Let age of father = x Let age of son = y Ac. To question $\frac{x + y}{x - y} = \frac{11}{3}$ 3x + 3y = 11x - 11y 14y = 8x 7y = 4x $7 = \frac{x}{4} = \frac{y}{y}$ x:y = 7:4Age of son after son attains twice his present age = 2y Age of father after son attains, twice his present age = y+x $\frac{7}{4} = \frac{y}{4} + \frac{y}{4$

$$\frac{x+y}{2y} = \frac{\overline{4}y+y}{2y}$$
$$= \frac{7y+4y}{4\times 2y} = \frac{11}{8}$$
$$= 11:8$$
Hence, only B is correct

48. Ans. B.

 $\begin{array}{l} x+y \geq 5\\ a+x=0,\,y=5\\ a+y=0,\,x=5\\ a+x=0,\,y=0,\,\text{the equation is not}\\ \text{satisfied at origin, thus it lies away from}\\ \text{origin} \end{array}$



 $x - y \le 3$ a + x = 0, y = -3a + y = 3, x = 3a + x = 0, y = 0, the equation is satisfied by origin; thus solution lies towards origin. As per graph, solution lies in quadrant I & II. 49. Ans. A. $x^2 - y^2 = 0$ $x^{2} = y^{2}$ $(x-a)^2 + y^2 = 1$ $x^2 + a^2 - 2ax + y^2 = 1$ $x^{2} + a^{2} - 2ax + x^{2} - 1 = 0$ $2x^2 - 2ax + a^2 - 1 = 0$ For a single positive solution, D=0 $b^2 - 4ac = 0$ $(-2a)^2 - 4(2)(a^2 - 1) = 0$ $4a^2 - 8a^2 + 8 = 0$ $-4a^2 + 8 = 0$ $a^2 = 2$ $a = \pm \sqrt{2}$ As it has a single positive solution, that is only possible when $a=\sqrt{2}$ 50. Ans. D. $f(x) = ax^3 + bx^2 + cx + d$ $(\alpha + \beta + \gamma)^2 = \alpha^2 + \beta^2 + \gamma^2 + 2(\alpha\beta + \beta\gamma + \alpha\gamma)$ For a cubic eq. $ax^3 + bx^2 + cx + d = 0$ $\alpha + \beta + \gamma = -\frac{b}{a}$ $\alpha\beta + \beta\gamma + \alpha\gamma = \frac{c}{a}$ $\left(-\frac{b}{a}\right)^{2} = \alpha^{2} + \beta^{2} + \gamma^{2} + 2\left(\frac{c}{a}\right)$



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$$\alpha^2 + \beta^2 + \gamma^2 = \frac{b^2}{a^2} - \frac{2c}{a}$$
$$= \frac{b^2 - 2ca}{a^2}$$

51. Ans. C. $\begin{array}{l}n(A\cup B\cup C)\\ =n(A)+n(B)+n(C)-n(A\cap B)-n(B\cap C)-n(C\cap A)\\ +n(A\cap B\cap C)\end{array}$

A=Biology, B=Physics, C=Chemistry $98 = 55 + 62 + 60 - 25 - 30 - 28 + n(A \cap B \cap C)$

$n(A \cap B \cap C) = 4\%$

Using this, we can find all values of Venn diagram.

52. Ans. B.

Students passed in only Biology = 6%Students passed in only Physics = 11%Students passed in only Chemistry = 6%Total 23%



53. Ans. A. At least 2 pass = 21 + 24 + 26 + 4 = 75% of total students

$$=\frac{75}{360}\times 100=270.$$

54. Ans. B. Students who passed both B & C = 30%Students who passes both A & B but not C = 21%Ratio = 30/21 = 10/7 = 10:7

55. 40. Ans. B. In ordinal scale, the various categories can be logically arranged in a meaningful order; however the difference between categories is not meaningful. Example: 1st, 2nd, 3rd etc.



56. Ans. A. Let the ratio be x:y Average marks of section A = 65 Average marks of section B = 70 Average marks of section B = 70y Total Average = 67 Total marks of both sections = 61(x+y)According to question, 65x + 70y = 67(x+y) 65x + 70y = 67x + 67y 3y = 2x3/2 = x/y

57. Ans. B. Since, of the two added observations one is lesser than the median & another is more. Hence, they will have no effect on the median. Median will be stay 30.

58. With increasing number of observations, the shape of frequency polygon tends to become increasingly smooth.

59. Ans. A.

 $_{\text{Since}} \overline{x}_2 > \overline{x}_1$

On pooling $n_1 \& n_2$, the larger set of

observation $(n_1 + n_2)$ will have a

mean lower than $\overline{\mathbf{X}}_2$ (because of n,

observations) but more than $\mathbf{X_1}$ (because of n_2 observations terms). Thus, it will be

in between $\overline{X}_2 \& \overline{X}_1$

 $\therefore \bar{x}_2 > \bar{x} > \bar{x}_1$

60. Ans. D.

1) Median cannot be computed when the end intervals of a frequency distribution are open.

2) Median is the term that lies at the centre or mid of a given set of observations arranged in ascending order. Hence, median is a positional average.

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Hence, option D is correct.

61. Ans. B. $\cos \theta = \frac{1}{\sqrt{5}} \dots (i)$ Squaring both sides $\cos^2 \theta = \frac{1}{5}$ $1 - \sin^2 \theta = \frac{1}{5}$ $\sin^2 \theta = \frac{4}{5}$ $\sin \theta = \frac{2}{\sqrt{5}} \dots (ii)$ Dividing (ii) by (i) $\tan \theta = 2$ Putting $\tan \theta = 2 \text{ in given equation}$ $\frac{2(2)}{1 - (2)^2} = \frac{4}{3} = -\frac{4}{3}$ 62. Ans. B. $\cos \theta < \cos \emptyset$

& both θ & ϕ are between 0 & 90 as θ increases, cos θ decreases.

Hence $\theta > \emptyset$ 63. Ans. A.



 $In \Delta QCD, \frac{QD}{CD} = \tan 45 = 1$ CD = QD = h + r

 $\Delta ECD, \frac{ED}{CD} = \sin 45 = \frac{1}{\sqrt{2}}$ $CD = ED\sqrt{2} = r\sqrt{2}$ $h + r = r\sqrt{2}$ $h = (\sqrt{2} - 1)r$ 64. Ans. C. $\sin(A + B) = \frac{\sqrt{3}}{2}$ $\sin(A + B) = \sin(60)$ $A + B = 60 \dots (i)$ $\cos B = \frac{\sqrt{3}}{2}$ $\cos B = \cos(30)$ B = 30 Putting B = 30 in eq. (i) A + 30 = 60 A = 60 - 30 = 30 $\tan(2A - B) = \tan(2 \times 30 - 30)$ $= \tan 30 = \frac{1}{\sqrt{3}}$

65. Ans. C.
1)
$$\frac{\cos \theta}{1-\sin \theta} + \frac{\cos \theta}{1+\sin \theta} = 4,$$
Put $\theta = 60$
$$= \frac{\cos 60}{1-\sin 60} + \frac{\cos 60}{1+\sin 60}$$
$$= \frac{\frac{1}{2}}{\frac{1}{2}} + \frac{\frac{1}{2}}{\frac{1}{2}}$$





 $=\frac{1}{2-\sqrt{3}}+\frac{1}{2+\sqrt{3}}$ $=\frac{1}{2-\sqrt{3}}\times\frac{2+\sqrt{3}}{2+\sqrt{3}}+\frac{1}{2+\sqrt{3}}\times\frac{2-\sqrt{3}}{2-\sqrt{3}}$ $=\frac{2+\sqrt{3}}{1}+\frac{2-\sqrt{3}}{1}$ $=\frac{4}{Hence, (1) \text{ is true.}}$ $=\frac{3 \tan \theta + \cot \theta = 5 \csc \theta}{1}$ Put $\theta = 60_{\text{ in LHS & RHS separately}}$ $3 \tan 60 + \cot 60$ $3 \times \sqrt{3} + \frac{1}{\sqrt{3}}$ $=\frac{9+1}{\sqrt{3}} = \frac{10}{\sqrt{3}}$ $5 \csc \theta$ $5 \csc \theta$ $5 \csc \theta$ $5 \csc (60)$ $5 \times \frac{2}{\sqrt{3}} = \frac{10}{\sqrt{3}}$ Hence (2) is also true, so correct option is c.

66. Ans. C.

 $\begin{aligned} \cos^2\theta &= 1 - \frac{p^2 + q^2}{2pq} \\ (p-q)^2 &= p^2 + q^2 - 2pq \\ _{\text{As}} (p-q)^2 &\ge 0 \\ _{\text{Hence,}} p^2 + q^2 - 2pq \\ &\ge 0 \\ p^2 + q^2 &\ge 2pq \end{aligned}$

 $\frac{p^2 + q^2}{2pq} \ge 1$ $1 - \frac{p^2 + q^2}{2pq} \le 0$ $\cos^2\theta \le 0$ $\cos^2 \theta$ cannot be less than 0, hence $\cos^2\theta = 0$, which is possible only when $\frac{p^2 + q^2}{2pq} = 1$ $p^2 + q^2 = 2pq$ $p^2 + q^2 - 2pq = 0$ $(p-q)^2 = 0$ $\mathbf{p} = \mathbf{q}$ $_{(2)} \tan^2 \theta = \frac{4pq}{(p+q)^2} - 1$ $\tan^2 \theta \ge 0$ $\frac{4pq}{(p+q)^2} - 1 \ge 0$ $\frac{4pq - (p+q)^2}{(p+q)^2} \ge 0$ $\frac{4pq-p^2-q^2-2pq}{(p+q)^2} \ge 0$ $-p^{2} + q^{2} + 2pq \ge 0$ $p^{2} + q^{2} - 2pq \le 0$ $(p-q)^2 \le 0$ cannot be negative as it is square $(p-q)^2 = 0$



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p - q = 0p = q67. Ans. C. (1) As we know that $Am \ge GM$ $\frac{a+b}{2} \ge \sqrt{ab}$ $\frac{\cos\theta + \sec\theta}{2} \ge \sqrt{\cos\theta \times \sec\theta}$ $\cos\theta + \sec\theta \ge 2\sqrt{1}$ $\cos\theta + \sec\theta \geq 2$ Hence, (1) is correct. (2) $\sec^2 \theta + \csc^2 \theta$ $1 + \tan^2 \theta + 1 + \cot^2 \theta$ $2 + \tan^2 \theta + \cot^2 \theta^{------(1)}$ Also, we know $\tan^2 \theta + \cot^2 \theta \ge 2$ using equation (1), we have: $2 + \tan^2 \theta + \cot^2 \theta \ge 2 + 2$ $2 + \tan^2 \theta + \cot^2 \theta \ge 4$ Hence (2) is also correct.

68. Ans. C.

$$Sin^{2} x + sin x = 1$$

$$sin x = 1 - sin^{2} x$$

$$sin x = cos^{2} x$$

$$cos^{12} x + 3 cos^{10} x + 3 cos^{8} x + cos^{6} x$$

$$= (cos^{4} x + cos^{2} x)^{3}$$

$$= ((cos^{2} x)^{2} + cos^{2} x)^{3}$$

$$= (sin^{2} x + cos^{2} x)^{3}$$

$$= (1)^{3} = 1$$

69. Ans. D. $3 \sin \theta + 5 \cos \theta = 4$ If $a \sin \theta + b \cos \theta = c$

Then $a\cos\theta - b\sin\theta = \pm \sqrt{a^2 + b^2 - c^2}$ Taking a = 3, b = 5 & c = 4, we get $3\cos\theta - 5\sin\theta = \sqrt{(3)^2 + (5)^2 - (4)^2}$ $=\sqrt{9}+25-16=3\sqrt{2}$ Squaring both sides $(3\cos\theta - 5\sin\theta)^2 = (3\sqrt{2})^2 = 18$ 70. Ans. B. We can write that: $m = \cot \Theta (1 + \sin \Theta)/4$ $n = \cot \Theta (1 - \sin \Theta)/4$ Then, mn=[cot $\theta(1+\sin\theta)/4$][cot $\theta(1$ $sin\theta)/4$ mn=cot $^{2} \Theta(1-\sin ^{2}\Theta)/16$ (using cot $^{2} \Theta = \cos ^{2}\Theta / \sin ^{2}\Theta$ and 1-sin $^{2}\Theta = \cos ^{2}\Theta$ $mn = [(\cos 2\theta / \sin 2\theta) * \cos 2\theta] / 16$ $mn = cos4\theta / 16sin ^{2}\theta - ---- (1)$ Now, let us try to evaluate: (m²-n²)² $\left[\cot^{2}\Theta(1+\sin^{2}\Theta)/16-\cot^{2}\Theta(1-\sin^{2}\Theta)\right]$ $^{2}\Theta)/16]^{2}$ $\{ [\cot^2 \Theta(1+\sin^2\Theta) - \cot^2\Theta(1-\sin^2\Theta) - \cot^2\Theta(1-\sin^2\Theta) \} \}$ ² Θ)]/16} ² [(4 sin0 cot ² 0)/16] ² cos40 /16sin ²0-----(2) As equation (1) is equal to equation (2),

71. Ans. B.

so option B is the answer

The only possible triplet for the above data, with the given area of right-angled triangle is: (P,B,H): (32,126,130)So the perimeter is (32+126+130) = 288 units

72. Ans. D.



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As ABC is an equilateral triangle, then $BL = \frac{1}{2}$ ${}_{In} \Delta ABL,$ $AB^2 = AL^2 + BL^2$ $l^2 = AL^2 + \left(\frac{l}{2}\right)^2$ $AL = \frac{\sqrt{3l}}{2}$ $AO + OL = \frac{\sqrt{31}}{2}$...(i) Also AO:OL=2:1 (property of equilateral triangle, O is the center of the circle) AO = 2 * OLPut above value in eq. (i) $20L + 0L = \frac{\sqrt{3l}}{2}$ $30L = \frac{\sqrt{3l}}{2}$ $OL = \frac{1}{2\sqrt{3}}$ $OL = OR = \frac{1}{2}SQ$ (OL, OR radius and SQ is diameter) $\frac{l}{2\sqrt{3}} = \frac{1}{2}QS$ So other diagonal PR is also of same length: $PR = \frac{l}{\sqrt{3}}$ Area of square PQRS in terms of diagonal is given by: Area PQRS = $\frac{1}{2} \times QS \times PR$

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

$$= \frac{1^{2}}{6}$$
73. Ans. B.
Length (L) = 6m
Breadth (B) = 4m
Height (H) = 2.5m
CSA of room = 2(L+B)H
= 2(6+4) × 2.5
= 50 sq.metre
CSA of 5 rooms = 50 × 5 = 250 sq.metre
Side of window = 2.5m
Area of window = 2.5 × 2.5 = 6.25 sq.
metre
Area of 2 window = 2 × 6.25 = 12.5 sq.
metre
Net area to be painted = 250 - 12.5 =
237.5 sq. metre
20 m² require = 11
1m² require = $\frac{1}{20}$
237.5m² require = $\frac{1}{20} \times 237.5$
= 11.875
Thus, 12 cans are required.
74. Ans. A.
Let us draw a parallel lines joining
opposite vertices of parallelogram S & is
parallel to other two sides
WXZ = $\frac{1}{2}$ area (abxz)

Area 2 (If a triangle & a parallelogram lie on the same base & between same parallel lines then the area of the triangle will be half of the area of parallelogram)







Similarly, Area $xyz = \frac{1}{2} \operatorname{area} (xcdz)$ Adding above two, we get Area $wxyz = \frac{1}{2} \operatorname{area} (abcd)$ Thus, (1) is true. (2) ab = dc (opposites sides of parallelogram)

 $\frac{1}{2}ab = \frac{1}{2}dc$ wb = yc

Also, ws = sy (diagonals of parallelogram bisects each other)

WSX = SYC (corresponding angles)

 $\therefore \Delta WSX$ is congruent to ΔSYC

wx = sc

Similarly, yx = sb, zy = as & zw = dsAdding the above four, we get wx + yx + zy + zw = sc + sb + as + dsPerimeter of S = ac + bd Perimeter of S = Sum of diagonal of T Hence (2) is false.

75. Ans. B. a = 5, b = 6, c = 7 $s = \frac{5+6+7}{2} = 9$ Area $= \sqrt{s(s-a)(s-b)(s-c)}$ $= \sqrt{9(4)(3)(2)}$ $= 3 \times 2\sqrt{6}$ $= 14.69 = 14.7 \text{ cm}^2$ 76. Ans. B. Let r be radius of inner circle. $\pi r^2 = 144\pi$ r = 12mLet R be outer radius of path R = 12 + 5 = 17m Area = πR^2 = $\pi (17)^2 = 289\pi m^2$ 77. Ans. C. LSA of cone = $\pi r l$ = $\frac{22}{7} \times r \times 35 = \frac{21}{5}$ r = 4.2 cm 78. Ans. C. **A b c** Let radius of semi-circle = R Perimeter of semi circle = circumference of base of cone $\pi R = 2\pi r$ In \triangle ABC $\frac{BC}{AC} = \sin \theta$ $\frac{r}{2r} = \sin \theta$

 $\sin \theta = \frac{1}{2}$ $\theta = 30^{\circ}$ 79. Ans. B. Let radius of cylinder be r LSA = $2\pi rh$ = $2\pi r(\pi)$ TSA = $2\pi r(n + r)$ = $2\pi r(\pi + r)$

According to question,



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$$T_{\text{SA}} = 2 \times \text{LSA}$$
$$2\pi r(\pi + r) = 2(2\pi r(\pi))$$

 $\pi + r = 2\pi$

 $r = \pi$ 80. Ans. D. HCF of 10, 15, 20 is 5 Hence, squares are of side 5 cm Volume of cuboid = lbh = 20 × 15 × 10 = 3000 cm³ Volume of cube = $(5)^3 = 125 \text{ cm}^3$

No. of cubes = 3000/125 = 24

81. Ans. D.
Let the side of cube = a
Diagonal =
$$\sqrt{3a}$$

$$1 - \sqrt{2n}$$

 $I = \sqrt{3a}$

 $a = \frac{1}{\sqrt{3}}$ Total surface area (TSA) = $6a^2$

$$= 6 \left(\frac{l}{\sqrt{3}}\right)^2 = 2l^2$$

82. Ans. A. Let a be the side of square Let I be the side of equilateral triangle. Let r be the radius of circle. Let P be the perimeter of each one. For square P = 4a For triangle P = I x 3 L = P/3 Area = $\frac{\sqrt{3}}{4} \left(\frac{P}{3}\right)^2$ $= \frac{P^2}{12\sqrt{3}} = \frac{P^2}{20.78}$

For square, a=P/4, area is $p^2/16$ For circle, $P = 2\pi r$

$$\mathbf{r} = \frac{\mathbf{P}}{2\pi}$$
Area = $\pi \Gamma^2$

$$= \pi \left(\frac{\mathbf{P}}{2\pi}\right)^2$$
Area = $\frac{\mathbf{p}^2}{4\pi} = \frac{\mathbf{p}^2}{12.56}$
Area of circle>area of square > area of triangle
C > S > T

83. Ans. A.
For similar triangles,
Area of triangle 1/Area of triangle 2
$$= \frac{(\text{side})^2}{(\text{side})^2}$$

$$\frac{7 - 4\sqrt{3}}{7 + 4\sqrt{3}} = \left(\frac{l_1}{l_2}\right)^2$$

$$\sqrt{\frac{7 - 4\sqrt{3}}{7 + 4\sqrt{3}}} = \frac{l_1}{l_2}$$

$$= \sqrt{\frac{7 - 4\sqrt{3}}{7 + 4\sqrt{3}}} \approx \frac{7 - 4\sqrt{3}}{7 + 4\sqrt{3}}$$

$$= \sqrt{\frac{(7 - 4\sqrt{3})^2}{49 - 48}}$$

$$= 7 - 4\sqrt{3} = \frac{l_1}{l_2}$$

84. Ans. B.

Let radius be r AB = $\sqrt{3r}$





BL = $\frac{\sqrt{3}}{2}$ r In $\triangle OLB$, $\frac{LB}{OB} = \sin\left(\frac{\theta}{2}\right)$ $\frac{r\sqrt{3}}{2r} = \sin\left(\frac{\theta}{2}\right)$ $\sin\frac{\theta}{2} = \sin(60^{\circ})$ $\frac{\theta}{2} = 60$ $\theta = 60 \times 2 = 120^{\circ}$ Minor angle = 120 Major angle = 360 - 120 = 240 = 2 x 120 Thus, k = 2 85. Ans. B.

In $\triangle ABC$, 50 + x + y = 130 x + y = 130 $x + a + a = 180_{\&}$ y + b + b = 180Adding both, we get x + y + 2a = 2b = 360 130 + 2(a+b) = 3602(a+b) = 230

a + b = 115In $\triangle BCD$, a + b + D = 180



$$115 + D = 180$$

$$D = 65^{\circ}$$
86. Ans. C.
Let $\frac{h_1}{h_2} = \frac{1}{3}$

$$h_1 = \frac{h_2}{3}$$

$$a_1 \frac{r_1}{r_2} = \frac{3}{1}$$

$$r_1 = 3r_2$$

$$\frac{v_1}{v_2} = \frac{\frac{1}{3}\pi r_1^2 h_1}{\frac{1}{3}\pi r_2^2 h_2}$$

$$\frac{v_1}{v_2} = \frac{r_1^2 h_1}{\frac{r_2^2 h_2}{r_2^2 h_2}}$$

$$= \frac{(3r_2)^2 (h_2)}{r_2^2 \times h_2 \times 3}$$

$$= \frac{9r_2^2 h_2}{3r_2^2 h_2}$$

$$\frac{v_1}{v_2} = \frac{3}{1}$$

87. Ans. B.

 $\angle AOC = 5 \angle AOD$ $\angle AOC + \angle AOD = 180$ $\angle AOD + 5 \angle AOD = 180$





 $\angle AOD = \frac{180}{6}$ $\angle AOD = 30 = \angle BOC$ (Vertically opposite) $\angle AOC = 5 \times 30$ $= 150 = \angle BD0$ (Vertically Opposites) ∴ 4 angles are 30, 30, 150, 150 88. Ans. B. The locus is a circle. Standard equation of circle is $(x-a)^{2} + (y-b)^{2} = r^{2}$ where (a,b) is centre & r is the radius of circle. 89. Ans. B. Let us take a set of number which satisfy Pythagoras triplet. Say 3,4,5 (AB, BC & AC respectively) $(3)^2 + (4)^2$ = 9 + 16 = 25 $=(5)^{2}$ $_{Now}$ AB³ = (3)² = 27 $(BC)^3 = (4)^3 = 64$ $(AC)^3 = (5)^3 = 125$ $AC^3 > AB^3 + BC^3$ Thus, option B is correct. 90. Ans. A. Side of square = 2aArea = $(2)^2 = 4a^2$ Radius of circle = a Area = πa^2 Remaining area = $4a^2 - \pi a^2$ $= (4 - \pi)a^2$ Free Test for CDS (2) 2018 Exam

91. Ans. D. Shaded area = area of semi circles with dia AB & AC + area of triangle - area of of semi circle with dia BC. $=\frac{\pi(p)^2}{8} + \frac{\pi(q)^2}{8} + \frac{1}{2}p.q - \frac{\pi(BC)^2}{8}$ In Δ ABC, $AB^2 + AC^2 = BC^2$ $p^2 + q^2 = BC^2$ Putting BC² in above equations Shaded area $=\frac{\pi p^2}{2}+\frac{\pi q^2}{2}+\frac{pq}{2}-\frac{\pi (p^2+q^2)}{2}$ $=\frac{pq}{2}$ 92. Ans. B. OT = OA + ATOT = 6 + 4 = 10 $_{\rm In} \Delta OPT$, $(OP)^2 + (PT)^2 = (OT)^2$ $(6)^2 + (PT)^2 = (10)^2$ $PT^2 = 100 - 36$ PT = 8 cm93. Ans. B. Shaded area = area of (semi circle Y +semi circle Z - semi circle X) As AD = 18 (diameter) AB = BC = CD = 6 cmShaded area $=\frac{\pi}{2}\left(\frac{AD}{2}\right)^2+\frac{\pi}{2}\left(\frac{AB}{2}\right)^2-\frac{\pi}{2}(CD)^2$ $=\frac{\pi}{2}(9)^2+\frac{\pi}{2}(3)^2-\frac{\pi}{2}(6)^2$ $=\frac{\pi}{2}(81+9-36)=27\pi$ 94. Ans. C. $\angle BDC = \angle BAC = 30^{\circ}$ ATTEMPT NOW



(angles formed in same segment are equal) In $\triangle BDC$, $\angle BDC + \angle BCD + \angle CBD = 180$ $180^{\circ} = 30 + \angle BCD + 70$ $\angle BCD = 80^{\circ}$ 95. Ans. B. $\angle CEF = \angle ECD + \angle EDC$ (exterior angle supplementary) $\angle CEF = 32 + 32 = 64^{\circ}$ $\angle COF = 2 \angle CDF$ (degree measure theorem) $\angle COF = 2 \times 32 = 64^{\circ}$ 96. Ans. D. As $\triangle ABR \sim \triangle POR$ AB BR AR $\overline{PQ} =$ $= \overline{QR} = \overline{PR}$ $\frac{6}{3} = \frac{8.2}{QR_{\&}} \frac{6}{3} = \frac{AR}{5.2}$ QR = 4.1 & AR = 10.4 97. Ans. D. In $\triangle BCD \& \triangle ACB$ $\angle BCD = \angle ACB$ (common) $\angle BDC = \angle ABC$ (90 degree) $\Delta BCD \sim \Delta ACB$ BC CD $\overline{AC} = \overline{CB}$ $BC^2 = CD.AC$ $BC^{2} = 4 \times 13$ $BC^{2} = 52$ In $\triangle BCD$. $BC^2 = BD^2 + CD^2$ $52 = BD^2 + (4)^2$

 $BD^2 = 52 - 16 = 36$ BD = 6 cm98. Ans. C. CD = CO + OD54 = 0C + rOC = 54 - rIn $\triangle OCP$, $OC^{2} + (PC)^{2} = OP^{2}$ $(54 - r)^2 + (27)^2 = (27 + r)^2$ $= 2916 + r^{2} - 108r + (27)^{2} = (27)^{2} + r^{2} + 54r$ = 2916 = 162rR = 18Area of shaded region = area of bigger semicircle -area of 2 small semi circle area of small circle $\frac{\pi(54)^2}{2} - 2 \times \frac{\pi(27)^2}{2} - \pi(18)^2$ $=\pi(1458-1053)=405\pi$ 99. Ans. D. In the given figure, as XY || BC $\angle AXY = \angle ABC$ (corresponding angles) $_{\&} \angle AYX = \angle ACB$ (corresponding angles) △AXY is also an equilateral triangle XY + XP + YQ = 40AX + XB + YQ = 4030 + YQ = 40YQ = 10 = QCSimilarly, XP = 10 = BPBC = BP + PQ + QC30 = 10 + PQ + 10PQ = 10100. Ans. C. Area of shaded region = Area of square – area of circle - 4 x area of quadrant $= \operatorname{side}^{2} - \pi r^{2} - 4 \times \frac{1}{4} \pi r^{2}$ $= (4)^{2} - \pi (1)^{2} - \pi (1)^{2}$ $= 16 - \frac{44}{7} = 9\frac{5}{7}$ cm²



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