HINTS & SOLUTION

1. *(c)* 100 Soldiers have ration for 10 days
Total ration days = 1000
Ration left for soldiers after 2 days = 800
Soldiers added are 60, Total soldiers = 160
Remaining ration days = $\frac{800}{160} = 5$ Days

2. *(a)* 1 Men can do work in = $\frac{1}{50}$ Days
1 Women can do work in = $\frac{1}{180}$ Days
5 Men and 6 Women can do work in
$5\times\left(\frac{1}{50}\right)-6\times\left(\frac{1}{180}\right)$
$\Rightarrow \frac{1}{10}+\frac{1}{30}=\frac{4}{30}=\frac{2}{15}$
This will be $\frac{15}{2}$ Days or $7\frac{1}{2}$

3. *(a)* Distance between P & Q is 60 Km
Let speed of Q = x km/h
Speed of P = $(x-4)$ km/h
Distance travelled by Q till they meet P = 60+12 = 72 km
Time taken by Q till they meet = $\frac{72}{x}$
Distance travelled by P till they meet = 60 – 12 = 48 km
Time taken by P till they meet = $\frac{48}{x-4}$
Time taken by both are equal therefore,
$\frac{72}{x}=\frac{48}{x-4} \Rightarrow 72x-288=48x$
$\Rightarrow 24x = 288$
$\Rightarrow x = 12$
Speed of P = $x-4$
$\Rightarrow 12-4=8km/h$

4. *(d)* Time = $\frac{\text{Distance}}{\text{speed}} = \frac{92}{6.5+5}$
$= \frac{92}{11.5} = 8$

5. *(d)* Assuming cost of product is $100x$
If 25% discount is given then product is sold at $75x$
It is said that $75x$ is actually 25% profit
Hence, original price of product was $60x$
If the discount of 10% was given then product will be sold at $90x$ and profit would be $30x$, since original price is $60x$
Profit $= \frac{30x}{60x}\times 100 = 50\%$

6. *(b)*
$x+y+\frac{xy}{100}$
$\Rightarrow 20-20-\frac{20\times 20}{100} = -4\%$
Refrigerator and camera were sold together at 24000. Therefore, at 4% loss both are sold at 24000
$96x = 24000$
$\Rightarrow x = 25000$
Total loss amount = 1000

7. *(c)* Calculating interest from B
$\frac{25000\times 4\times 7}{100} = 7000$
Total interest = 11200
Interest received from C = 11200-7000=4200
Money lent to C = $\frac{4200\times 100}{7\times 4} = 15000$

8. *(b)* Given, $x+y+z = 17200$
Simple Interest will be

$\Rightarrow \frac{P \times R \times T}{100}$

For x, $\frac{x \times 5 \times 2}{100} = 0.1x$

For y, $\frac{y \times 6 \times 2}{100} = 0.12y$

For z, $\frac{z \times 9 \times 2}{100} = 0.18z$

Given, Interest is same for all three sums

Hence, $0.1x = 0.12y = 0.18z$

We know $x + y + z = 17200$

$1.8z + 1.5z + z = 17200$

$z = 4000$

9. *(c)* Total Sunday = 5

Other day = 25

Average number of visitors in a month

$\Rightarrow \frac{5 \times 510 + 25 \times 240}{30}$

$\Rightarrow \frac{2550 + 6000}{30} = \frac{8550}{30} = 285$

10. *(a)*

$x^2 + 9y^2 = 6xy$

$\Rightarrow 9\left(\frac{y}{x}\right)^2 - 6\left(\frac{y}{x}\right) + 1 = 0$

$\Rightarrow \left(3\frac{y}{x} - 1\right)^2 = 0$

$\Rightarrow \frac{y}{x} = \frac{1}{3}$

11. *(c)* Let Income be $4x, 3x$

Given, Expenditure for A = $4x - 600$

For B = $3x - 600$

$\frac{4x - 600}{3x - 600} = \frac{3}{2}$

$\Rightarrow 8x - 1200 = 9x - 1800$

$\Rightarrow x = 600$

$\Rightarrow$ A's Income = $4x = 2400$

12. *(d)* Let age of son and father be $x, 3x$ years respectively 6 years from now

Present age of son = $x - 6$

Present age of father = $3x - 6$

3 years ago age of father was $3x - 6 - 3$

3 years ago age of son was $x - 6 - 3$

Given, $3x - 9 = 9(x - 9)$

$\Rightarrow x = 12$

Hence, present age of father is 30 years

13. *(b)* Income of y = 100 a

Income of x = 120 a

Difference = 20 a

Income of y is less than x by $\frac{20}{120} \times 100$

$= 16\frac{2}{3}\%$

14. *(a)* Overall change in population

$x + y + \frac{xy}{100}$

$\Rightarrow 20 - 20 + \frac{20 \times (-20)}{100} = -4\%$

Let initial population be x

Given, $\frac{96x}{100} = 5184$

$x = 5400$

15. *(d)*

$5^{x+1} - 5^{x-1} = 600$

$\Rightarrow 5^{x-1}(25 - 1) = 600$

$\Rightarrow 5^{x-1} = 25$

$\Rightarrow 10^{2x} = 10^6 = 1000000$

16. *(b)* $x = 2^{\frac{1}{2}}$, $y = 3^{\frac{1}{3}}$, $z = 6^{\frac{1}{6}}$

Multiplying everything with power of 6

$x = 2^{\frac{1}{2}\times 6} = 8$

$y = 3^{\frac{1}{3}\times 6} = 9$

$z = 6^{\frac{1}{6}\times 6} = 6$

Hence, $y > x > z$

17. *(a)*

$(ab^{-1})^{2x-1} = (ba^{-1})^{x-2}$

$\Rightarrow \left(\frac{a}{b}\right)^{2x-1} = \left(\frac{b}{a}\right)^{x-2}$

$\Rightarrow \left(\frac{a}{b}\right)^{2x-1}\left(\frac{a}{b}\right)^{x-2} = 1$

$\Rightarrow \left(\frac{a}{b}\right)^{2x-1+x-2} = \left(\frac{a}{b}\right)^{0}$

$3x - 3 = 0, x = 1$

18. *(a)* Taking $x = 2$, we get 49

Square root of 49 is 7

Placing $x = 2$ in option (a) gives us 7

19. *(b)* $0.242424\ldots = 0.\overline{24} = \frac{24}{99} = \frac{8}{33}$

20. *(b)*

$0.00\bar{7} + 17.\overline{83} + 310.020\bar{2}$

$\Rightarrow \frac{7}{900} + \frac{1783-17}{99} + \frac{3100202-310020}{9000}$

$\Rightarrow \frac{7}{900} + \frac{1766}{99} + \frac{2790182}{9000}$

$\Rightarrow \frac{770+1766000+30692002}{99000} = \frac{32458772}{99000}$

Given, Option (b) is

$\frac{32786638-327866}{99000}$

21. *(c)* Let p = 16 a, q = 16b

$16a \times 16b = 7168$

$\Rightarrow ab = 28$

Possible pair are $(4,7)$ & $(7,4)$

Numbers are 64, 112

$p + q = 176$

22. *(a)* Area of a room = $2(6+4) \times 2.5 = 50$

Area of 5 rooms = 250

1 ltr paint can be used for 20 sq mtr

Total paint cans required = $\frac{250}{20} = 12.5$

Hence, 13 cans need to be purchased

23. *(a)* Taking value of $m = 1$

Equation 1,

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

$\Rightarrow (x+2)(x^2 - x + 1)$

Equation 2,

$x^2 + x - 2 \Rightarrow (x+2)(x-1)$

HCF is $(x+2)$ which is linear

24. *(c)*

Given, numbers are

$100x + 10y + z$

$100z + 10y + x$

Both are divisible by 7.

Hence, difference is divisible by 7

$99x - 99z$ is divisible by 7

$(x - z)$ is divisible by 7

x, z are one digit numbers and can be (1,8), (8,1), (9,2) (2,9)

25. *(a)* 1 is not a prime number

There are 15 prime between 0 to 50

10 prime between 50 to 100

$\Rightarrow 15 - 10 = 5$

26. *(b)* $3^{521} = 3^{130\times 4+1}$

We know, $3^1 = 3$

27. *(d)*
$\Rightarrow 17^{4\times 7} \times 17^1$

$\Rightarrow 1^7 \times 17 = 17$

(We know last digit of $7^4 = 1$)

$\Rightarrow 19^{4\times 7} \times 19^1$

$\Rightarrow 1^7 \times 19^1 = 19$

(We know last digit of 9^4 is 1)

17+19 = 36, 36 when divided by 18 leaves remainder 0

28. *(a)* For a number to be divisible by 10 it must contain powers of 10 or same powers or 2 and 5. Powers of 2 will be more naturally so we will identify power of 5

Powers of 5 are = $5^{(3+6+12+14+30)}$

$\Rightarrow 5^{65}$

29. *(b)* It takes 5 times for 5'o clock and 8 seconds

Hence, for 10 times for 10'o clock and

$8 \times 2 = 16$

30. *(c)* Given,

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

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

$11x + 11y = (k + m)(x + y)$

$11(x + y) = (k + m)(x + y)$

$k + m = 11 \Rightarrow m = 11 - k$

31. *(a)* Take n = 11 and divided by 4, remainder is 3,

when 2n or 22 is divided by 4, remainder is 2

32. *(b)* GP series is always $a, ar, ar^2, ar^3, ar^4 \ldots\ldots$

Given, $\Rightarrow ar^2 = a + 9$

$\Rightarrow ar = ar^3 + 18$

$\Rightarrow \dfrac{a(r^2 - 1)}{-ar(r^2 - 1)} = \dfrac{9}{18}$

$\Rightarrow r = -2$

$\Rightarrow a(4 - 1) = 9$

$a = 3$

33. *(d)* 331 is a prime number

34. *(b)* Therefore, sum of two irrational numbers may be rational or irrational

35. *(a)* Since, 589 is divisible by 19, then 589 is a composite number.

36. *(c)* Odd integers are $x, x + 2, x + 4$

Given, Alternate odd integers, hence we will take $x, x + 4$

$x(x + 4) = 3x + 12$

$\Rightarrow x^2 + 4x = 3x + 12$

$\Rightarrow x^2 + x - 12 = 0$

$\Rightarrow (x + 4)(x - 3) = 0$

$x = 3$

Numbers are 3 & 7

37. *(d)* From the given options, 451−154=297

Hence, option (d) is the answer

38. *(d)*

$2^{12n} - 6^{4n} = (2^{12})^n - (6^4)^n$

$\Rightarrow (4096)^n - (1296)^n$

$\Rightarrow 2800 \times k$

Hence, last digit will always be zero

39. *(c)* Upon simplification we can write

$\Rightarrow 3\times(9)^n+2\times(4)^n$

$\Rightarrow 3\times 9+2\times 4=35$

40. *(d)*

$\left[\log_{10}\left(5\log_{10}10^2\right)\right]$

$\Rightarrow\left[\log_{10}\left(10\log_{10}10\right)\right]^2$

$\Rightarrow\left[\log_{10}(10)\right]^2=1^2=1$

41. *(b) Given,* $a+b=3$

$(a+b)^3=3^3$

$\Rightarrow a^3+b^3+3ab(a+b)=27$

$\Rightarrow a^3+b^3+9ab=27$

42. *(b)* Taking $x=1$ in the given equation

$\left(5x^2+14x+2\right)^2-\left(4x^2-5x+7\right)^2$

We get 405

Taking $x=1$ in $\left(x^2+x+1\right)$, we get 3

Dividing 405 by 3 gives remainder 0

43. *(b)*

$(x+y)^{-1}\left(x^{-1}+y^{-1}\right)\left(xy^{-1}+x^{-1}y\right)^{-1}$

$\left(\frac{1}{x+y}\right)\left(\frac{1}{x}+\frac{1}{y}\right)\left(\frac{x}{y}+\frac{y}{x}\right)^{-1}$

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

$\Rightarrow\frac{1}{xy}\times\frac{xy}{x^2+y^2}=\frac{1}{x^2+y^2}$

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

44. *(b)* $\frac{1}{\frac{a^m}{a^n}-1}+\frac{1}{\frac{a^n}{a^m}-1}$

$\Rightarrow\frac{a^n}{a^m-a^n}+\frac{a^m}{a^n-a^m}$

$\Rightarrow\frac{a^n}{a^m-a^n}-\frac{a^m}{a^m-a^n}$

$\Rightarrow\frac{a^m-a^n}{a^m-a^n}=-1$

45. *(c)*

$x+\frac{1}{x}=\frac{x^2+1}{x}=\frac{26}{5}$

$\Rightarrow 5x^2-26x+5=0$

Upon solving, $x=5,1/5$

46. *(c)*

$x^8+\frac{1}{x^8}=47$

$\Rightarrow\left(x^4+\frac{1}{x^4}\right)^2=x^8+\frac{1}{x^8}+2$

$\Rightarrow\left(x^4+\frac{1}{x^4}\right)=\sqrt{47+2}=7$

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

$\Rightarrow\left(x^2+\frac{1}{x^2}\right)=\sqrt{7+2}=3$

$\Rightarrow\left(x^2+\frac{1}{x^2}\right)^3=x^6+\frac{1}{x^6}+3\left(x^2+\frac{1}{x^2}\right)$

$\Rightarrow x^6+\frac{1}{x^6}=3^3-3(3)=18$

47. *(a)* Given,

$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$

This represents parallel line and while parallel lines can be visualised graphically it cannot be solved graphically as one cannot find values or point of intersection. Option (a) is correct

48. *(d)* If three lines are parallel, then there are infinite solution. If all three lines are collinear, then there is only one solution. If all three lines are non-parallel and non-collinear, then there are only three solutions. Hence, the given system of equation have here exactly three solutions.

49. *(a)* Let the number of male employees be x and female employees be y
Total average age of male employees = 52x
Total average age of female employees = 42y
Mean age of all employees = $\frac{52x+42y}{x+y}$
Given,
$\frac{52x+42y}{x+y}=50$
$\Rightarrow 52x+42y=50x+50y$
$\Rightarrow 2x=8y$
$\Rightarrow \frac{x}{y}=\frac{4}{1}$
Percentage of male = $\frac{4}{5}\times 100=80\%$
Percentage of female = 20%

50. *(a)* Integers are numbers without decimal. Clearly, there are no integers to solve the equation

51. *(b)* Let age of first brother be x
Let age of second brother be y
Let age of third brother be z
According to the question,
$x+y=4 \Rightarrow y=4-x$
$y+z=6$
$z+x=8 \Rightarrow z=8-x$
$\Rightarrow 4-x+8-x=6$
$x=3,$
Therefore, $y=1,\ z=5$
$z-y=4$

52. *(b)* To intersect the equations should have only 1 solution
$\frac{a_1}{a_1}\neq\frac{b_1}{b_2}$
$\Rightarrow\left(\frac{k}{2}\neq\frac{3}{1}\right) \Rightarrow k\neq 6$

53. *(c)* $2x+4y=6$
$4x+8y=8$
$\frac{2}{4}=\frac{4}{8}\neq\frac{6}{8}$
$\frac{1}{2}=\frac{1}{2}\neq\frac{3}{4}$
This means lines are parallel and are inconsistent, independent and have no solution.

54. *(d)* Number of chairs in row are x
Number of rows = y
Total number of students = xy
Given,
$xy=(x+2)(y-3)$
$xy=(x+4)(y-5)$
Upon solving the equation we get
$x=8, y=15$

55. *(c)* Internal assessment changed 250 to 50, which means that marks were changed by 1/5th
$\frac{170-70}{5}=20$

56. *(c)* Upon solving the equation $x=\frac{28}{k}$
Using the value of x in the first equation we get,
$k^2=16 \Rightarrow k=\pm 4$

57. *(c)* Let the roots of equations be α, β

$\alpha\beta = \frac{c}{a}$

$\alpha\beta = 2k^2 - 1$

$\Rightarrow 2k^2 - 1 = 7$

$\Rightarrow 2k^2 = 8, \ \Rightarrow k^2 = 4 \Rightarrow k = \pm 2$

Equation will be $x^2 \pm 6x + 7$

$D = \sqrt{b^2 - 4ac} = \sqrt{36 - 28} = 2\sqrt{2}$

Hence, roots of equation are irrational

58. *(c)* Given,

$\frac{m}{100} \times m + \frac{n}{100} \times n = \frac{2}{100} \times mn$

$\Rightarrow m^2 + n^2 = 2mn$

$\Rightarrow (m - n)^2 = 0$

$\Rightarrow m = n$

59. *(c)* Taking $x = 1$ in the equation we get

$x^2 + \frac{1}{x^2} + 8\left(x + \frac{1}{x}\right) + 14$

$\Rightarrow 1 + 1 + 8(2) + 14$

$\Rightarrow 1 + 1 + 16 + 14 = 32$

Putting $x = 1$ in option (c), we get 8

32 is divisible by 8

60. *(c)* Shaded portion represent the students who opted for Mathematics, Physics and Electronics only

61. *(d)* Option (d) is correct

62. *(c)* $2sec^2\theta + sec\theta - 6 = 0$

Taking $sec\theta = x$

$\Rightarrow 2x^2 + 4x - 3x - 6 = 0$

$\Rightarrow 2x(x + 2) - 3(x + 2) = 0$

$\Rightarrow (2x - 3)(x + 2) = 0$

$\Rightarrow x = sec\theta = \frac{3}{2} \ \Rightarrow \cos\theta = \frac{2}{3}$

$\Rightarrow \sin\theta = \sqrt{1 - \cos^2\theta} = \sqrt{1 - \frac{4}{9}} = \frac{\sqrt{5}}{3}$

$\text{cosec}\theta = \frac{1}{\sin\theta} = \frac{3}{\sqrt{5}}$

63. *(a)*

$\frac{x \times 2^2 \times \left(\sqrt{2}\right)^2}{8 \times \left(\frac{1}{\sqrt{2}}\right)^2 \times \left(\frac{\sqrt{3}}{2}\right)^2} = \left(\sqrt{3}\right)^2 - \left(\frac{1}{\sqrt{3}}\right)^2$

$\Rightarrow \frac{x \times 4 \times 2 \times 4}{8 \times \frac{1}{2} \times 3} = 3 - \frac{1}{3}$

$\Rightarrow \frac{8x}{3} = \frac{8}{3} \ \Rightarrow x = 1$

64. *(b)* Given,

$\cos x + \cos^2 x = 1$

$\Rightarrow \cos x = 1 - \cos^2 x$

$\Rightarrow \cos x = \sin^2 x$

On squaring both sides we get

$\cos^2 x = \sin^4 x$

$1 - \sin^2 x = \sin^4 x$

$\Rightarrow \sin^4 x + \sin^2 x = 1$

65. *(b)* Given, $0^\circ < \theta < 90^\circ$

Taking angle 45°

$\left[\left(1 - \sin^2\theta\right) sec^2\theta + \tan^2\theta\right]\left(\cos^2\theta + 1\right)$

$\Rightarrow \left[\left(1 - \frac{1}{2}\right) \times 2 + 1\right]\left(\frac{1}{2} + 1\right)$

$\Rightarrow \left[\frac{1}{2} \times 2 + 1\right]\left(\frac{3}{2}\right) = 3$

3 is greater than 2

66. *(b)* Angle subtended = $\frac{\text{Arc}}{\text{Radius}}$

$\frac{4\pi}{8} = \frac{\pi}{2}$

67. *(c)* Given, $0 < \theta < \phi < 90°$

Taking, $\theta = 30°$, $\phi = 45°$

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

$\Rightarrow 0.75 < 2$

Option (c) is correct

68. *(a)* Taking angle as $\pi/3$ or 60°

We get $\frac{1}{2} + \sqrt{3} \times \frac{\sqrt{3}}{2} = \frac{1+3}{2} = 2$

69. *(b)* We know cos 90° is zero. Anything multiplied will give us 0

70. *(a)* We know value of cos decreases as it goes from 0 to 90

$cos60^\circ$ = 1/2

This means cos is lesser than 1/2 at any value of θ goes from $cos60^\circ$ *to* $cos90^\circ$

Therefore $\theta \leq \frac{\pi}{3}$

71. *(a)* Taking angle as 45° , we get

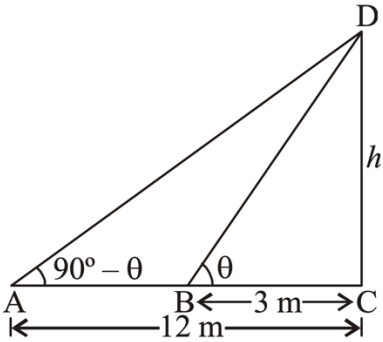
$\cot\theta\ (1 + \sin\theta) = 4m \Rightarrow \frac{\sqrt{2}+1}{4\sqrt{2}} = m$

$\cot\theta\ (1 - \sin\theta) = 4n \Rightarrow \frac{\sqrt{2}-1}{4\sqrt{2}} = n$

Upon solving option (b) satisfy the value

72. *(b)* Let the height of the tower be h and ∠CBD = θ then ∠DAC = 90° − θ

(Both angles are complementary)



In ΔBCD,

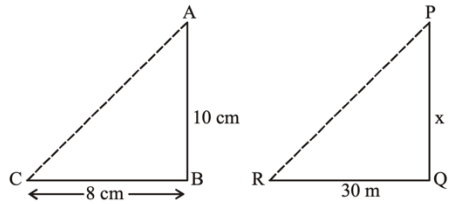
$\tan\theta = \frac{CD}{BC} \Rightarrow \tan\theta = \frac{h}{3}$

In Δ ACD, $\tan(90° - \theta) = \frac{CD}{AC}$

$\Rightarrow \cot\theta = \frac{h}{12}$, $\tan\theta = \frac{12}{h}$

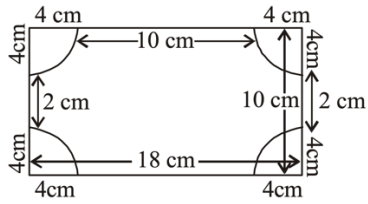
$\Rightarrow \frac{h}{3} = \frac{12}{h} \Rightarrow h^2 = 36 \Rightarrow h = 6$

73. *(a)*



Given, $\frac{10}{8} = \frac{x}{30} \Rightarrow x = 37.5$

74. *(b)*



$\left(\frac{2\pi r}{4}\right) \times 4 + 10 + 10 + 2 + 2 = 49.1$

75. *(a)* we know that, if the length of square and rhombus are same, then the area should be same.

$$x : y = 1 : 1$$

76. *(a)* 1m = 1000 mm

10 m = 10000 mm

Required number = $\frac{10000}{200} = 50$

77. *(b)* Distance covered by man diagonally is $\frac{3 \times 100}{60} = 50m$

$$\text{Area of field} = \frac{1}{2} d^2$$

$$= \frac{1}{2} \times (50)^2 = 1250$$

78. *(b)* Given sides are 9, 10, 11

$$s = \frac{9 + 10 + 11}{2} = 15$$

$$Area = \sqrt{s(s-a)(s-b)(s-c)}$$

$$\Rightarrow \sqrt{15(15-9)(15-10)(15-11)}$$

$$\Rightarrow \sqrt{15 \times 6 \times 5 \times 4} = 30\sqrt{2} = 42.3$$

79. *(d)* Area of pathway = $10 \times 4.5 = 45$

Area of each tile = $\frac{50 \times 50}{100 \times 100} = 0.25$

Required tiles = $\frac{45}{0.24} = 180$

Cost of 1 tile = $\frac{100}{20}$ = ₹5

Total cost = ₹900

80. *(c)* Area of rectangle = 72 feet

Given, width of border = 6 inch = 0.5 ft

Length of inner rectangle = $12 - 0.5 - 0.5$

Breadth of inner rectangle = $6 - 0.5 - 0.5$

Area of border = 72 – 55 = 17 feet

81. *(c)* Surface Area of cuboid

$2(l \times b + b \times h + l \times h)$

$\Rightarrow 2(12 \times 72 + 12 \times 12 + 72 \times 12)$

$\Rightarrow 2(864 + 144 + 864)$

$\Rightarrow 2 \times 1872 \Rightarrow 3744$

82. *(b)* According to question,

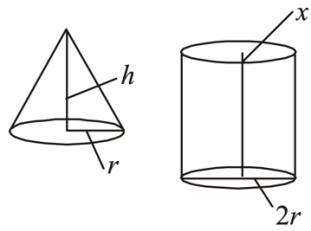
Volume of cylinder = Volume of bar

$\Rightarrow \pi r^2 h$ = base area of block × length

$$\Rightarrow \frac{22}{7} \times \left(\frac{1.5}{2}\right)^2 \times 3.5 = \frac{5}{100} \times \frac{5}{100} \times L$$

$\Rightarrow L = 2475$

83. *(d)* Volume of conical flask = $\frac{1}{3}\pi r^2 h$



Radius of cylindrical flask = $2r$

Height of cylindrical flask = x

Volume of cylindrical flask = $\pi(2r)^2 x$

According to the question,

$$\frac{1}{3}\pi r^2 h = 4\pi r^2 x \quad \Rightarrow x = \frac{h}{12}$$

84. *(d)* Let volume of cone be V_1, V_2

$$\frac{V_1}{V_2} = \frac{64}{1} = \frac{r^2 h}{R^2 H}$$

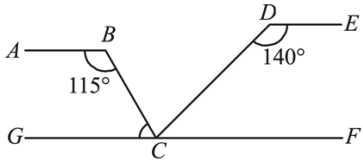
$\frac{r}{R} = \frac{h}{H}$, being similar Δ

$$\Rightarrow \frac{h^3}{H^3} = \sqrt[3]{\frac{64}{1}} \quad \Rightarrow \frac{h}{H} = \frac{4}{1}$$

$$\Rightarrow \frac{1}{4} \times 60 = 15\ cm$$

Height of smaller cone is 15 cm
Height from base to the cut will be 45 cm

85. *(d)* Draw a line GF through C parallel to AB and DE



$\angle BCG = 180° - \angle ABC$

$\Rightarrow 180° - 115° = 65°$ (Interior angles)

$\angle DCF = 180° - \angle CDE$

$\Rightarrow 180° - 140° = 40°$ (Interior angles)

$\angle BCG + \angle BCD + \angle DCF = 180°$

$65° + \angle BCD + 40° = 180°$

$\angle BCD = 180° - 105° = 75°$

86. *(c)* Option (c) is correct

87. *(c)* Given, $y = 6x,\ z = 5x$

$x + 5x + 6x = 180°$

$\Rightarrow 12x = 180° \quad \Rightarrow x = 15°$

88. *(a)* Area of all three sectors

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

Area of equilateral triangle $= \frac{\sqrt{3}}{4} \times 4^2 = 4\sqrt{3}$

Area of shaded portion $= 4\sqrt{3} - 2\pi$

89. *(a)* There can only be one circumcircle for a triangle

90. *(d)* XP+YQ+XY = 40

$\Rightarrow$ 2XP + XY = 40

Δ ABC is equilateral triangle

$\angle BXP = \angle BAC$ & $\angle BPX = \angle BCA$

Therefore, ΔXBP is an equilateral triangle

Similarly, ΔXAY is an equilateral triangle

XY = AX = y

Given, AX + AB = 30, we can say

XP + XY = 30

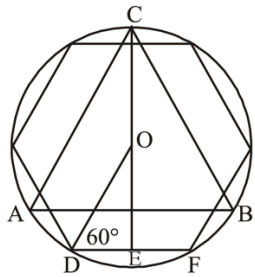
Also, 2XP + XY = 40

Upon solving XP = 10

PQ = BC – BP – QC

PQ = 30-10-10 = 10

91. *(d)* Altitude of $\Delta\ ABC = \frac{\sqrt{3}}{2}a$



In equilateral Δ, incentre, orthocentre, circumcentre, centroid all are coincident. and centroid divides the altitude in a ratio of 2:1

Therefore, OC is 2/3 of altitude

$OC = \frac{\sqrt{3}}{2}a \times \frac{2}{3} = \frac{a}{\sqrt{3}}$

$OC = OD =$ radius of circle

$DF = b,\ \Rightarrow DE = \frac{b}{2}$

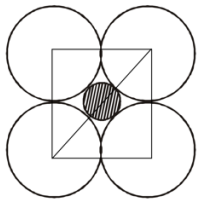
$In\ \Delta\ ODE,\ \cos 60° = \frac{DE}{OD} = \frac{\frac{b}{2}}{\frac{a}{\sqrt{3}}}$

$\Rightarrow \frac{1}{2} = \frac{\sqrt{3}b}{2a} \quad \Rightarrow a = \sqrt{3}b$

$\Rightarrow a^2 = 3b^2$

92. *(b)* We know that in a square diagonals are equal and bisect each other at 90°. Hence, the required quadrilateral is a square.

93. *(a)* D is the diameter of each outer circle
A square is drawn through the mid points of each outer circle. The diagonal of square will pass through the inner circle



Diagonal of square = $\sqrt{D^2+D^2} = D\sqrt{2}$

Diameter of shaded region = $D\sqrt{2} - D$

$\Rightarrow D\left(\sqrt{2}-1\right)$

94. *(d)* Given, side of equilateral triangle l

Inradius of circle $r = \dfrac{l}{2\sqrt{3}}$

Therefore , D = $\dfrac{l}{\sqrt{3}}$

When a square is inscribed in a circle, the diagonal of the square is equal to the diameter of the circle.

Let the side of square be x

$x\sqrt{2} = D$

$\Rightarrow x\sqrt{2} = \dfrac{l}{\sqrt{3}} = \dfrac{l}{\sqrt{6}}$

$\Rightarrow x^2 = \dfrac{l^2}{6}$

95. *(d)* Given, sides are 6, 8
$\therefore$ diagonal is 10. Hence, radius = 5

Area of circle = $\pi r^2 = 25\pi$

$\Rightarrow$ Area of rectangle $= a \times b = 6 \times 8$

Required area $= 25\pi - 48 = 30.5$

96. *(b)* Total expenditure = 24 lakhs

Angle of largest component = $\dfrac{7}{24} \times 360°$

= 105°

97. *(c)* Difference between expenditure of largest and smallest component

$7 - 1.5 = 5.5$

Required angle = $\dfrac{5.5}{24} \times 360° = 82.5°$

98. *(b)* Total number of bulbs = 100

$7 + x + 40 + y + 10 + 2 = 100$

$\Rightarrow x + y = 41$

Life of bulbs (in hours)	Number of bulbs	Cumulative Frequency
8–13	7	7
13–18	x	7 + x
18–23	40	47 + x
23–28	y	47 + x + y
28–33	10	57 + x + y
33–38	2	59 + x + y
	N = 100	

Median life is 20, Hence, median interval will be (18-23)

$l = 18,\ \dfrac{N}{2} = 50,\ c = 7 + x,\ f = 40$

$h = 5 \Rightarrow Median = l + \dfrac{\left(\dfrac{N}{2} - C\right)}{f} \times h$

$20 = 18 + \dfrac{(50 - 7 - x)}{40} \times 5 \Rightarrow x = 27$

99. *(d)* $x + y = 41 \Rightarrow y = 41 - 27 = 14$

100. *(d)* Density of Class Interval = $\dfrac{30}{15 - 10}$