HINTS & SOLUTION

1. *(b)* Median = $\frac{\text{5th Term} + \text{6th Term}}{2}$

$\Rightarrow 61.5 = \frac{x+x+3}{2}$

$\Rightarrow 123 = 2x+3$

$\Rightarrow x = 60$

2. *(a)*

X	f	fx
0	4	0
1	f	f
2	9	18
3	g	3g
4	4	16

$\sum fx = f+3g+34$, $N=25$, $\overline{X}=2$

$f+g+17=25 \quad \Rightarrow f+g=8$

$\Rightarrow \overline{X} = \frac{\sum fx}{N}$

$2 = \frac{f+3g+34}{25}$

$50 = (f+g)+2g+34$

$50 = 8+2g+34$

$g=4,\ f=4$

3. *(c)* Because there is a gap between two adjacent bars, so both the districts can be represented by bar chart.

4. *(a)* Let the frequency of class interval 21-30 be f

$9+22+f+20+12+8=100$

$\Rightarrow 71 + f = 100 \quad \Rightarrow f = 29$

Highest frequency = 29

∴Modal class = 20.5 – 30.5

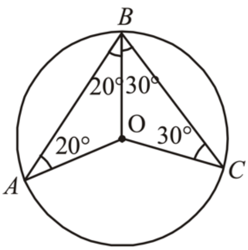
5. *(a)*

I. $HM = \frac{2\times 8\times 12}{8+12} = \frac{48}{5} = 9.6$

II. $HM = \frac{2\times 9\times 11}{9+11} = \frac{198}{20} = 9.9$

III. $HM = = \frac{2\times 6\times 24}{6+24} = \frac{288}{30} = 9.6$

6. *(d)* Join OB. $OA = OB = OC$



Then, $\angle OAB = \angle OBA = 20°$

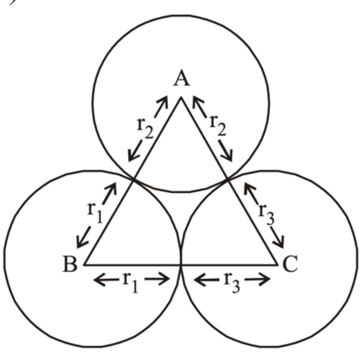
$\angle OCB = \angle OBC = 30°$

$\angle ABC = 50°$

We know that $\angle ABC = \frac{1}{2}\angle AOC$

$\angle AOC = 2\angle ABC = 2\times 50° = 100$

7. *(a)*



$r_1 + r_2 = 4,\ r_2 + r_3 = 6,\ r_3 + r_1 = 8$

$$(r_1 + r_2) + (r_2 + r_3) + (r_3 + r_1)$$
$$\Rightarrow 4 + 6 + 8$$
$$2(r_1 + r_2 + r_3) = 18$$
$$r_1 + r_2 + r_3 = \frac{18}{2} = 9$$

8. *(a)* We know that, the triangle of same segment of a circle makes an equal angles.

$\angle XBY = \angle XAY = 45°$

In ΔBXY, $\angle BXY + \angle XBY + \angle BYX = 180°$

$\Rightarrow 50° + 45° + \angle BYX = 180°$

$\Rightarrow \angle BYX = 180° - 95° = 85°$

9. *(a)*
$\angle BOD = 180° - 106° = 74°$

Since, $\angle BOD$ is an angle made by arc BD on centre.
Here, $\angle BCD$ is an angle made by arc BD on circumference

$$\angle BCD = \frac{1}{2}\angle BOD$$
$$= \frac{1}{2} \times 74° = 37°$$

10. *(a)* Only one circle passing through all the vertices of a given triangle.

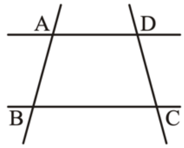
11. *(b)* Area of Parallelogram = 6 × Area of ΔNPR

$\text{NR} \times \text{PL} = 6 \times \frac{1}{2} \times \text{NR} \times \text{PR}$

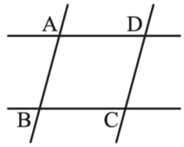
PL = 3 PR
PR + RL = 3PR
RL = 2PR = 2 × 6 = 12

12. *(d)* If two parallel lines are cut by two distinct transversals, the quadrilateral formed by the four lines is always a 'Trapezium'.

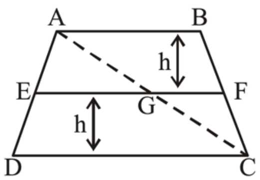
Case I If two distinct transversals (are not parallel), then always → (Trapezium)



Case II If two distinct transversals are parallel, then always (Trapezium + Parallelogram)



13. *(c)* Join AC
In ΔACD, $EG//DC$, E & G are mid points of AD and AC respectively



$$EG = \frac{1}{2}DC \quad \Rightarrow EG = \frac{3}{2}$$
$$GF = \frac{1}{2}AB \quad \Rightarrow GF = 1$$
$$EF = EG + GF = 1 + \frac{3}{2} = \frac{5}{2}$$
$$\text{Ratio} = \frac{\text{Area of } ABFE}{\text{Area of } EFCD}$$
$$= \frac{\frac{1}{2}\left(2 + \frac{5}{2}\right) \times h}{\frac{1}{2}\left(3 + \frac{5}{2}\right) \times h} = \frac{9}{11}$$

14. *(c)* Given, BC//EF//AD
$x° = z° = 50°$ (corresponding interior angle)
$\theta + z° = 180°$ (Linear pair)
$\theta = 180° - 50° = 130°$

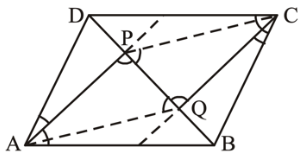
In Quadrilateral

AQFD, $x° + y° + 120° + \theta = 360°$

$50° + y° + 120° + 130° = 360°$

$y = 360° - 300° = 60°$

15. *(b)* Since, line segment AP , CQ bisect the $\angle A$, $\angle C$ respectively. Then, $AP//CQ$



In $\Delta\, APQ$ & ΔCPQ,

$AP//QC$

$\angle APQ = \angle PQC$

PQ is common

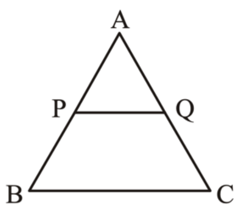
$PC//AQ$

Hence, $\angle CPQ = \angle PQA$ (Alternate angles)

$\Delta APQ \sim \Delta CQP$ (by ASA)

$\therefore\ \Delta APQ \sim \Delta PCQ$

16. *(d)*

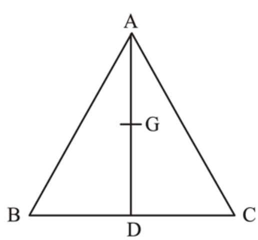


$AB = 3AP$

In ΔABC and ΔAPQ, $PQ//BC$ and $\angle A$ is common. Therefore, $\Delta ABC \sim \Delta APQ$

$$\Rightarrow \frac{Area\ of\ \ \Delta\ APQ}{Area\ of\ \ \Delta\ ABC} = \frac{AP^2}{AB^2} = \left(\frac{1}{3}\right)^2 = \frac{1}{9}$$

17. *(c)* G is a centroid of triangle



In ΔABC, AD is median of ΔABC

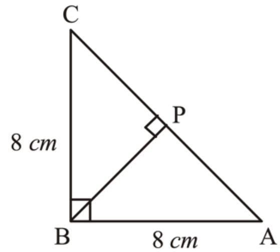
$AG : GD = 2:1$ (By property of triangle)

$\Rightarrow 8 : GD = 2:1$

$\Rightarrow GD = 4$ cm

Therefore, $AD = 8 + 4 = 12$

18. *(b)*



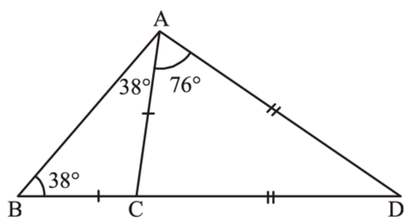
$AC^2 = AB^2 + BC^2$

$\Rightarrow AC^2 = 64 + 64$

$\Rightarrow AC^2 = 8\sqrt{2}$

ABC is isosceles right angle triangle

$$AP = PC = PB = \frac{AC}{2} = 4\sqrt{2}$$



19. *(b)*

In ΔABC, $\angle ABC = \angle CAB = 38°$

$\angle ACB = 180° - (\angle ABC + \angle CAB)$

$\Rightarrow 180° - (38° + 38°) = 104°$

In ΔACD, $\angle ACD = 180° - 104° = 76°$

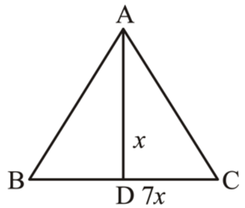
$CD = AD$, $\quad \therefore \angle ACD = \angle CAD = 76°$

$\angle ADC = 180° - (\angle ACD + \angle CAD)$

$\Rightarrow 180° - (76° + 76°) = 28°$

20. *(b)* Let the height of triangle be x, then $BC = 7x$

Area of $\Delta ABC = \frac{1}{2} \times 7x \times x = \frac{7}{2}x^2$



Cost of painting the wall at ₹350 per 100 sq m = ₹1225

Cost of painting 100 m^2 = ₹350

Cost of painting 1 m^2 = ₹3.5

Cost of painting $\frac{7}{2}x^2 = \frac{350}{100} \times \frac{7}{2}x^2$

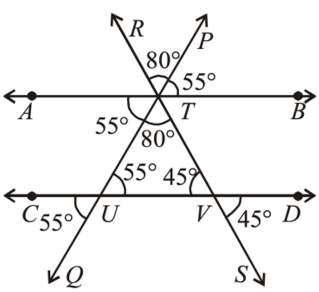
$\Rightarrow \frac{350}{100} \times \frac{7}{2}x^2 = 1225$

$\Rightarrow x^2 = \frac{1225 \times 100 \times 2}{350 \times 7} = \frac{35 \times 10 \times 2}{7}$

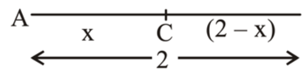
$\Rightarrow 5 \times 10 \times 2 = 100 = 10\ m$

Base $= BC = 7x = 70$

21. *(b)* $\angle PTB = \angle ATU = 55°$
(Vertically opposite angles)
Similarly, $\angle DVS = \angle BTV = 45°$
(Corresponding angles)
$\angle RTP = 180° - (45° + 55°) = 80°$
$\angle PTB = \angle TUV = 55°$
(Corresponding angles)
$\angle CUQ = \angle TUV = 55°$
(Vertically opposite angles)
Sum of angles = $\angle RTP + \angle CUQ = 135°$



22. *(b)* Given $AC^2 = AB \times CB$



$\Rightarrow x^2 = 2 \times (2 - x)$

$\Rightarrow x^2 = 4 - 2x$

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

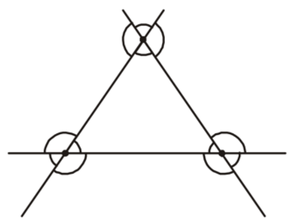
$x = \frac{-2 \pm \sqrt{4 + 16}}{2 \times 1}$

$x = -1 \pm \sqrt{5}$

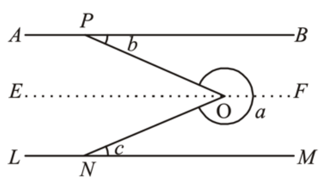
$BC = 2 - \left(-1 \pm \sqrt{5}\right)$

$= 3 - \sqrt{5}$

23. *(d)* We know that, when two lines intersect each other it makes 4 angles.
The total number of pairs = 3
Total number of angles =3×4=12



24. *(c)* Let us draw a line parallel to AB which is EF.



$\angle EOP = \angle OPB$

$\Rightarrow \angle EOP = b$

$\angle EON = \angle ONM$

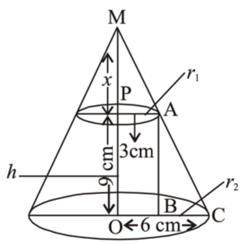
$\Rightarrow \angle EON = c$

$\angle PON = b + c$

$\angle PON + a = 2\pi$

$\Rightarrow a = 2\pi - (b + c)$

25. *(b)* Here $r_1 = 3cm, r_2 = 6cm, h = 9cm,$



Total surface area of the frustum

$\pi\left[(R+r)\, l^2+r^2+R^2\right]$

Where, $l=\sqrt{h^2+(R-r)^2}$

$\Rightarrow \pi\left[(6+3)\sqrt{81+9}+9+36\right]$

$\Rightarrow \pi\left[9\sqrt{90}+45\right] = 9\pi\left[3\sqrt{10}+5\right]$

26. *(d)* By using properties at similar triangle in ΔMPA, ΔMOC

$\frac{MP}{MO}=\frac{PA}{OC}$

$\Rightarrow \frac{x}{9+x}=\frac{3}{6} \quad \Rightarrow x=9$

Height of the cone = MO = $x + 9$

= $(9 + 9) = 18cm$

27. *(a)* In ΔABC

$AC^2 = AB^2 + BC^2$

$\Rightarrow AC^2 = 9^2 + (6-3)^2 = 90$

$\Rightarrow AC = 3\sqrt{10}$

28. *(b)* Given, $l = 30\ cm$, $b = 24cm, h = 18cm$

Maximum length of the rod can be placed in the cuboid is equal to diagonal of box

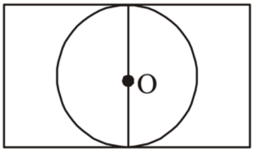
$\sqrt{30^2+24^2+18^2}=\sqrt{900+576+324}$

$\Rightarrow \sqrt{1800} = 30\sqrt{2}$

29. *(a)* Increase in the height of water level

$\frac{0.75}{2.5\times 1.5}=0.2m\ or\ 20\ cm$

30. *(a)* Here width of sheet is 20 cm, which is the maximum diameter of the circular sheet.



Remaining area of sheet = Area of rectangle sheet – Area of circular sheet

$= 25 \times 20 - \pi(10)^2 = 500 - 314 = 186$

31. *(a)* Circumference of circle = $2\pi \times 42$

$2\times \frac{22}{7}\times 42=264$

Perimeter of square = $4x$

$\Rightarrow 4x = 264. \quad x = 66$

32. *(b)* The above figure is symmetrical about BD

Area of shaded part

= $2 \times$ Area of BEDB

= $2 \times$ Area of BCDEB $-$ Area of ΔBCD

$\Rightarrow 2\left(\frac{\pi r^2}{4}-\frac{1}{2}\times BC\times CD\right)$

$\Rightarrow 2\left(\frac{22}{7}\times\frac{7^2}{4}-\frac{1}{2}\times 7\times 7\right)=28\ cm$

33. *(a)* Let sides of rectangle be $l\ and\ b$

Then $2(l+b) = 18$

$\Rightarrow l + b = 9$

Area of rectangle = $l \times b$

For maximum area, $l = b$

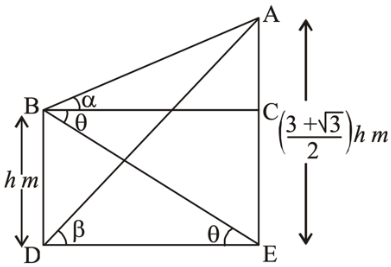
$2b = 9, b = 4.5$

Maximum area = $4.5^2 = 20.25$

34. *(b)* Given that $\beta = 30°$

In ΔAED, $tan\beta = tan30°$

$tan30^\circ = \frac{AE}{DE} = \frac{1}{\sqrt{3}}$



$$DE=\sqrt{3}AE=\sqrt{3}\left(\frac{3+\sqrt{3}}{2}\right)h$$

$$\Rightarrow BC=DE=\frac{3}{2}(1+\sqrt{3})h$$

Now, in ΔCB

$$\tan\alpha=\frac{AC}{BC}$$

$$\Rightarrow BC\tan\alpha=AE-CE=AE-BD$$

$$\Rightarrow BC\tan\alpha=\left(\frac{3+\sqrt{3}}{2}\right)h-h=h\left(\frac{3+\sqrt{3}-}{2}\right.$$

$$\Rightarrow \frac{3}{2}(1+\sqrt{3})h\tan\alpha=\left(\frac{1+\sqrt{3}}{2}\right)h$$

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

35. *(a)* Given that $\alpha = 30°$

In ΔACB, $\tan\alpha = \tan 30°$

$$\tan 30°=\frac{AC}{BC}=\frac{1}{\sqrt{3}}$$

$$\Rightarrow BC=\sqrt{3}AC=\sqrt{3}(AE-CE)$$

$$\Rightarrow \sqrt{3}(AE-BD)$$

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

Now, in ΔAED

$$\tan\beta=\frac{AE}{DE}=\frac{AE}{BC}$$

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

$$\tan\beta=1$$

36. *(c)* Given, $\alpha = 30°, h = 30m$

In ΔACB,

$$\tan\alpha=\tan 30°=\frac{AC}{BC}=\frac{1}{\sqrt{3}}$$

$$\Rightarrow \frac{BC}{\sqrt{3}}=(AE-CE)=(AE-BD)$$

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

$$\Rightarrow BC=\sqrt{3}\left(\frac{1+\sqrt{3}}{2}\right)\times 30$$

$$\Rightarrow DE=BC=\left(45+15\sqrt{3}\right)$$

37. *(a)* Given, $\beta = 30°$

In ΔADE,

$$\tan\beta=\frac{AE}{DE}$$

$$\Rightarrow \tan 30°=\left(\frac{\frac{3+\sqrt{3}}{2}}{DE}\right)$$

$$\Rightarrow \frac{1}{\sqrt{3}}=\frac{\sqrt{3}\left(\frac{1+\sqrt{3}}{2}\right)h}{DE}$$

$$\Rightarrow DE=\frac{3}{2}(1+\sqrt{3})h$$

In ΔBDE,

$$\tan\theta=\frac{BD}{DE}=\frac{h}{DE}$$

$$\Rightarrow \tan\theta = \frac{h}{\frac{3}{2}\left(1+\sqrt{3}\right)h}$$

$$\Rightarrow \frac{2}{3}\times\frac{1}{\left(1+\sqrt{3}\right)}$$

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

$$\Rightarrow \frac{\left(\sqrt{3}-1\right)}{3}\times\frac{\sqrt{3}}{\sqrt{3}} = \frac{\left(3-\sqrt{3}\right)}{3\sqrt{3}}$$

38. *(b)* Given that,

$$\frac{\tan x}{1+\sec x} - \frac{\tan x}{1-\sec x}$$

$$\Rightarrow \frac{\tan x\ (1-\sec x-1-\sec x)}{1-\sec^2 x}$$

$$\Rightarrow \frac{-2\tan x\sec x}{-\tan^2 x} = \frac{\frac{2}{\cos x}}{\frac{\sin x}{\cos x}} = 2\operatorname{cosec} x$$

39. *(b)*

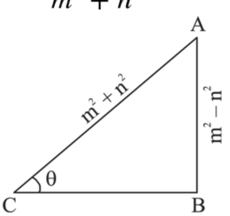
$$\sqrt{\cos x\operatorname{cosec} y - \cos x\sin y}$$

$$\sqrt{\cos x\operatorname{cosec}(90^\circ - x) - \cos x\sin(90^\circ - x)}$$

$$\Rightarrow \sqrt{\cos x\sec x - \cos^2 x}$$

$$\Rightarrow \sqrt{1-\cos^2 x} = \sqrt{\sin^2 x} = \sin x$$

40. *(c)* $\sin\theta = \frac{m^2-n^2}{m^2+n^2}$



In $\Delta ABC,\ BC = \sqrt{(AC)^2-(AB)^2}$

$$\sqrt{m^4+n^4+2m^2n^2-\left(m^4+n^4-2m^2n^2\right)}$$

$$\sqrt{4m^2n^2}\ 2mn$$

$$\tan\theta = \frac{m^2-n^2}{2mn}$$

41. *(b)* $1+\tan\theta = \sqrt{2}$

$$\Rightarrow \tan\theta = \sqrt{2} - 1$$

$$\cot\theta - 1 = \frac{1}{\sqrt{2}-1} - 1 = \frac{\sqrt{2}+1}{2-1} - 1$$

$$\Rightarrow \sqrt{2}$$

42. *(c)*

$$\sin x : \sin y = \sqrt{3} : 1$$

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

Hence, we can say $\sin x = \sin 60^\circ$

$\sin y = \sin 30^\circ$

$$\Rightarrow \frac{x}{y} = \frac{60}{30} = \frac{2}{1}$$

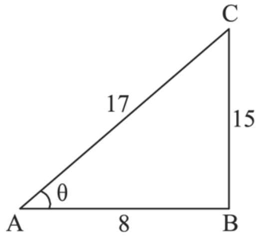
43. *(b)*

$$\frac{5\sin75^\circ\sin77^\circ + 2\cos13^\circ\cos15^\circ}{\cos15^\circ\sin77^\circ} - \frac{7\sin81^\circ}{\cos9^\circ}$$

$$\Rightarrow \frac{5\cos15^\circ\sin77^\circ + 2\sin77^\circ\cos15^\circ}{\cos15^\circ\sin77^\circ} - \frac{7\cos9^\circ}{\cos9^\circ}$$

$$\Rightarrow \frac{7\cos15\sin77}{\cos15\sin77} - \frac{7\cos9}{\cos9} = 7-7=0$$

44. *(c)*



$$cot\ \theta = \frac{8}{15}$$

$$AC = \sqrt{8^2 + 15^2} = 17$$

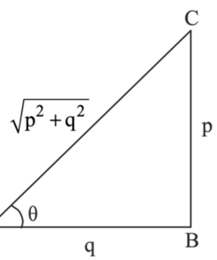
$$\Rightarrow \cos\theta = \frac{8}{17}$$

$$\Rightarrow \frac{\sqrt{1-\cos\theta}}{\sqrt{1+\cos\theta}} = \frac{\sqrt{1-\frac{8}{17}}}{\sqrt{1+\frac{8}{17}}} = \sqrt{\frac{9}{25}} = \frac{3}{5}$$

45. *(b)* As we know, sin x is increasing from 0 to 90°

$$\therefore siny > sinx$$

46. *(c)*



Given,

$$\tan\theta = \frac{p}{q}$$

$$\Rightarrow sec\theta = \frac{\sqrt{p^2+q^2}}{q}$$

$$\text{cosec}\theta = \frac{\sqrt{p^2+q^2}}{p}$$

$$\frac{p\ sec\theta - q\ \text{cosec}\theta}{p\ sec\theta + q\ \text{cosec}\theta}$$

$$\Rightarrow \frac{p\left(\frac{\sqrt{p^2+q^2}}{q}\right) - q\left(\frac{\sqrt{p^2+q^2}}{p}\right)}{p\left(\frac{\sqrt{p^2+q^2}}{q}\right) + q\left(\frac{\sqrt{p^2+q^2}}{p}\right)}$$

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

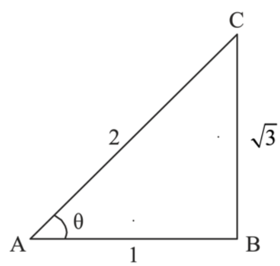
47. *(d)* We know that, the value of $\cos\theta$ is decreasing from 0 to 90°

$$\therefore cos1° > cos89°$$

$\Rightarrow p > q$

Also, cos 1° close to 1 and 89° is close to 0

48. *(d)*



$$\Rightarrow 7(1-\sin^2\theta) + 3(\sin^2\theta) = 4$$

$$\Rightarrow 7 - 4\sin^2\theta = 4$$

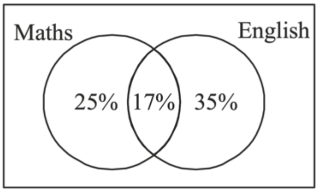
$$\Rightarrow 4\sin^2\theta = 3$$

$$\Rightarrow \sin\theta = \pm\frac{\sqrt{3}}{2}$$

For $0 < \theta < \frac{\pi}{2}$, $\sin\theta = \frac{\sqrt{3}}{2}$

$\Rightarrow \tan\theta = \frac{\sqrt{3}}{1} = \sqrt{3}$

49. *(a)* Percentage of candidates passed in both the subjects = {100 – (25 + 17 + 35)}
$\Rightarrow$ 23%



50. *(a)* Given: S = x ∈ N : { x + 3 = 3}
S={}. Thus, S is a null set.

51. *(b)* Given equation,

$$2x^2 - 3x - 4 = 0$$

For a reciprocal roots, we replace x by $1/x$

$\Rightarrow 2\left(\frac{1}{x}\right)^2 - 3\left(\frac{1}{x}\right) - 4 = 0$

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

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

52. *(c)* Given equation is
$kx^2 + (2k+6)x + 16 = 0$

For equal roots then D must be zero

$\Rightarrow (2k+6)^2 - 4k \times 16 = 0$

$\Rightarrow 4k^2 + 24k + 36 - 64k = 0$

$\Rightarrow 4k^2 - 40k + 36 = 0$

$\Rightarrow k^2 - 10k + 9 = 0$

$\Rightarrow k^2 - 9k - k + 9 = 0$

$(k-9)(k-1)$ Therefore, $k=1,\ k=9$

53. *(c)*

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

Let $3^x = y$

$\Rightarrow y + \frac{27}{y} = 12$

$\Rightarrow y^2 - 12y + 27 = 0$

$\Rightarrow y^2 - 9y - 3y + 27 = 0$

$\Rightarrow (y-3)(y-9) = 0,\ y=3,\ y=9$

54. *(c)* Let number of student in each row = x and number of rows = y
Hence total number of students = xy
According to the question,

$$xy = (x+1)(y-2)$$

$\Rightarrow xy = xy - 2x + y - 2$

$\Rightarrow 2x - y = -2$ & $xy = (x-1)(y+3)$

$\Rightarrow xy = xy + 3x - y - 3$

$\Rightarrow -3x + y = 3$ & $3x - y = 3$

Therefore, $x = 5,\ y = 12$ & $xy = 60$

55. *(d)* Let Pooja's initial salary is ₹ x
Fixed increment every year is ₹ y.
According to question $x + 3y = 4200$

$$x + 8y = 6800$$

On solving equations (i) and (ii), we get

$$x = ₹\,2640, \quad y = ₹\,520$$

56. *(c)* Let the two-digit number be 10y + x.
According to question, $x + y = 10$

$$10y + x - 18 = 10x + y$$

$$\Rightarrow 9x - 9y = -18$$

$$\Rightarrow x - y = -2$$

On solving equations, we get

$$x = 4, \quad y = 6$$

Required product = $xy = 4 \times 6 = 24.$

57. *(b)* Equations $kx - y = 2$, $6x - 2y = 3$ have a unique solution. Then,

$\frac{k}{6} \neq \frac{1}{2} \Rightarrow k \neq 3$

58. *(c)* Given system of equations are:

$x + 2y = 3$ & $3x + 6y = 9$
$\Rightarrow x + 2y = 3$
$$\Rightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} = \frac{1}{3}$$

So, it has infinitely many solutions

59. *(b)*
$$\frac{\log_{13}(10)}{\log_{169}(10)} = \frac{\log_{13}(10)}{\log_{13^2}(10)}$$
$$\Rightarrow \frac{\log_{13}10}{\frac{1}{2}\log_{13}10} = \frac{1}{\frac{1}{2}} = 2$$

60. *(b)*
$$\log_{10}\left[1 - \{1 - (1 - x^2)^{-1}\}^{-1}\right]^{-\frac{1}{2}} = 1$$
$$\log_{10}\left[1 - \left\{1 - \frac{1}{1 - x^2}\right\}^{-1}\right]^{-\frac{1}{2}} = 1$$
$$\log_{10}\left[1 - \left\{\frac{-x^2}{1 - x^2}\right\}^{-1}\right]^{-\frac{1}{2}} = 1$$
$$\log_{10}\left[1 - \left\{\frac{1 - x^2}{-x^2}\right\}\right]^{-\frac{1}{2}} = 1$$
$$\log_{10}\left[\frac{1}{x^2}\right]^{-\frac{1}{2}} = 1$$
$$\Rightarrow \log 10\, x = 1 \ \ or \ \log 10\, x = \log_{10}10$$
$$\Rightarrow x = 10$$

61. *(c)*

$$2^x - 2^{x-1} = 4$$
$$\Rightarrow 2^x\left(1 - \frac{1}{2}\right) = 4$$
$$\Rightarrow 2^x = 8 \ \Rightarrow 2^x = 2^3 \ \Rightarrow x = 3$$

Hence, $2^x + 2^{x-1} = 2^3 + 2^2 = 12$

62. *(b)* Given that,
$$1 + \frac{1}{\left(1 + \left\{\frac{1}{\left(1 + \frac{1}{x}\right)}\right\}\right)} = \frac{11}{7}$$
$$\Rightarrow 1 + \frac{2}{\left\{1 + \frac{x}{1 + x}\right\}} = \frac{11}{7}$$
$$\Rightarrow 1 + \frac{1 + x}{1 + 2x} = \frac{11}{7}$$
$$\Rightarrow 14 + 21x = 11 + 22x \quad \Rightarrow x = 3$$

63. *(b)*
$$9\sqrt{2} - \sqrt{8} - 4\sqrt{2}$$
$$\Rightarrow 9\sqrt{2} - 2\sqrt{2} - 4\sqrt{2} = 3\sqrt{2}$$

64. *(d)*

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

$p^6 - 8 - 6p^2(p^2 - 2)$

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

$p^6 - 8 - 6p^4 + 12p^2$

$\Rightarrow x^6 + \frac{1}{x^6} = p^6 - 6p^4 + 9p^2 - 2$

65. *(d)*

$$\frac{M_1D_1}{W_1} = \frac{M_2D_2}{W_2} = \frac{5\times\frac{1}{2}}{\frac{1}{48}} = \frac{6\times D_2}{\frac{1}{40}}$$

$$\Rightarrow D_2 = \frac{\frac{1}{2}\times 5\times 48}{40\times 6} = \frac{1}{2}$$

66. *(a)*

$M_1D_1 = M_2D_2$

$M_1 = n,\ D_1 = 20,$

$M_2 = (50 + n),\ D_2 = 16$

$\Rightarrow n\times 20 = (n + 50)\times 16$

$\Rightarrow 20n = 16n + 800$

$\Rightarrow 4n = 800 \Rightarrow n = 200$

67. *(c)* According to question.
$t_1 - t_2 = 12 - (-15) = 27$

$\Rightarrow \frac{x}{V_1} - \frac{x}{V_2} = \frac{27}{60}$

$\Rightarrow \frac{x}{2.5} - \frac{x}{4} = \frac{27}{60} \quad \Rightarrow \frac{2x}{5} - \frac{x}{4} = \frac{9}{20}$

$\Rightarrow \frac{3x}{20} = \frac{9}{20} \quad \Rightarrow 3x = 9 \quad \Rightarrow x = 3\ km$

68. *(d)* Let usual speed = v
Increase speed = $v + 5$

$$\frac{300}{v} - \frac{300}{v+5} = 2$$

Now, $\Rightarrow \frac{300(v+5) - 300v}{v(v+5)} = 2$

$\Rightarrow 2v^2 + 10v - 1500 = 0$

$\Rightarrow (v + 30)(2v - 50) = 0$

$\Rightarrow v = 25$

69. *(d)* Market price of machine = 18000
Discount of 20% = 3600
Selling Price = 18000 – 3600 = 14400
There was a loss of 4%

$\Rightarrow x - \frac{4}{100}\times x = 14400$

$\Rightarrow \frac{25x - x}{25} = 14400$

$\Rightarrow x = \frac{25}{24}x14400 = 15000$

70. *(c)* Cost price of milk = 28 × 8.5 = ₹238
He added x ltrs of water

$(28 + x)\times 8.5 \Rightarrow 238 + 8.5x$

Profit $= SP - CP$

$\Rightarrow 238 + 8.5x - (238) = 8.5x$

It is said that this $8.5x$ *is* 12.5%

$\Rightarrow \frac{8.5x}{238}\times 100 = 12.5 = 3.5\ ltrs$

71. *(d)* Cost of 2.5 kg rice = ₹125

9 kg rice $= \frac{125}{2.5}\times 9$

$\Rightarrow$ 9 kg rice = 4 kg pulses

$\Rightarrow$ 14 kg pulses $= \frac{125}{2.5}\times\frac{9}{4}\times 14$

$\Rightarrow$ 14 kg pulses $=$ 1.5 kg tea

$\Rightarrow$ 2 kg tea $= \dfrac{125\times 9\times 14\times 2}{2.5\times 4\times 1.5}$

$\Rightarrow$ 2 kg tea $=$ 5 kg nuts

$\Rightarrow$ 11 kg nuts $= \dfrac{125\times 9\times 14\times 2}{2.5\times 4\times 1.5}\times\dfrac{11}{5}$

$\Rightarrow$ ₹ 4620

72. *(b)* S.I = 2 × 10 = 20%

C.I = $x + y + \dfrac{xy}{100}$

$$\Rightarrow 10 + 10 + \frac{10\times 10}{100} = 21\%$$

Difference between interest = 21 – 20 = 1%

$$1\% \times \frac{P}{100} = 10$$

$$P = x = 1000$$

73. *(a)* Let Principal = P

Interest = 0.125 × P

$$\Rightarrow S.I = \frac{P\times R\times T}{100}$$

$$\Rightarrow 0.125P = \frac{P\times 10\times T}{100}$$

$$\Rightarrow 1.25 = T$$

$$T = \frac{5}{4} \; or \; 1\frac{1}{4} \; years$$

74. *(c)* P = ₹8400 R = 10% n=2

Let instalment = x

$$P = \frac{x}{\left(1+\dfrac{R}{100}\right)^1} + \frac{x}{\left(1+\dfrac{R}{100}\right)^2}$$

$$\Rightarrow 8400 = \frac{x}{\left(1+\dfrac{10}{100}\right)} + \frac{x}{\left(1+\dfrac{10}{100}\right)^2}$$

$$\Rightarrow 8400 = \frac{x}{\left(\dfrac{110}{100}\right)} + \frac{x}{\left(\dfrac{110}{100}\right)^2}$$

$$\Rightarrow 8400 = x\left[\frac{10}{11} + \left(\frac{10}{11}\right)^2\right]$$

$$\Rightarrow 8400 = x\left[\frac{110+100}{121}\right]$$

$$x = \frac{8400\times 121}{210} = 40\times 121 = 4840$$

75. *(c)* Let number of boys and girls in the class be $4x, 3x$

Average height of girl is h

$$\Rightarrow 7x\times 4.6 = 4x\times 4.8 + 3x\times h$$

$$\Rightarrow 32.2x = 19.2x + 3x\times h$$

$$\Rightarrow h = \frac{13}{3} = 4.33$$

76. *(a)* Radha's age = A. Rani's age = B

$$\frac{A-5}{B-5} = 3$$

$$\Rightarrow A - 5 = 3(B-5)$$

$$\frac{A-1}{B-1} = 2$$

$$\Rightarrow A - 1 = 2(B-1)$$

Solving the above two equations we get

$B = 9,\ A = 17$

$$\Rightarrow A - B = 8 \; yrs$$

77. *(b)* Sum of n consecutive natural numbers $= n(n+1)/2$

Average of n consecutive natural numbers $= (n+1)/2$

For first 50 average = 51/2 = x

Average of 54 continuous natural number = 55/2

$\Rightarrow \frac{51}{2} + \frac{4}{2} = x + 2$

78. *(a)*

$x:y = 1:3,\ y:z = 5:k,\ z:t = 2:5$

$t:x = 3:4$

$\Rightarrow \frac{x}{y} \times \frac{y}{z} \times \frac{z}{t} \times \frac{t}{x} = 1$

$\Rightarrow \frac{1}{3} \times \frac{5}{k} \times \frac{2}{5} \times \frac{3}{4} = 1$

$\Rightarrow \frac{1}{2} = k$

79. *(b)* Let quantities of milk and water are $5x, x$ litres

According to the question,

$\frac{5x}{x+5} = \frac{5}{2}$

$\Rightarrow 10x = 5x + 25$

$\Rightarrow 5x = 25 \quad \Rightarrow x = 5$

Quantity of milk in original mixture

= 25 l

80. *(d)* Let initial salary be ₹$22x$

Final salary be ₹$25x$

Let initial number of employees = $3y$

Final number of employees = $2y$

Present bill = Final salary × Final number of employees

$\Rightarrow 5000 = 25x \times 2y$

$\Rightarrow xy = 100$

Original bill = Initial salary × Initial number of employees

$22x \times 3y = 66xy$

$\Rightarrow 66 \times 100 =$ ₹6600

81. *(b)*

	X (20%)	Y (10%)
2010	5000	2000
2011	6000	2200
2012	7200	2420
2013	8640	2662

Year in which Difference in price is more than 5000 is 2013

⇒ 8640 – 2662 = 5978

82. *(c)* Let initial rent be ₹100 and initial rooms be 100

Initial collection = ₹10000

New rent of 20% increase = 120

New rooms = 120

New collection = 14400

Change in collection = 4400

Percentage change $= \frac{4400}{10000} \times 100 = 44\%$

83. *(a)* Let income be ₹100

Expenditure $= \frac{90}{100} \times 100 = 90$

Income increased by 20% $= 120$

New expenditure $= 120 - 10 = 110$

Change in expenditure $= 20$

Percentage change $= \frac{20}{90} \times 100$

$\Rightarrow \frac{200}{9}$ *or* $22\frac{2}{9}\%$

84. *(c)* $3^x = 4^y = 12^z = k$

$3 = k^{\frac{1}{x}},\ 4 = k^{\frac{1}{y}},\ 12 = k^{\frac{1}{z}}$

$\Rightarrow 3 \times 4 = 12$

$\Rightarrow k^{\frac{1}{x} + \frac{1}{y}} = k^{\frac{1}{z}}$

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

$\Rightarrow \frac{x+y}{xy} = \frac{1}{z} \quad \Rightarrow z = \frac{xy}{x+y}$

85. *(d)* Net effect in area = $200+200+\frac{200\times 200}{100}=800\%$

86. *(c)* $9^x 3^y = 2187,\ 2^{3x}2^{2y} - 4^{xy} = 0$
$2^{3x}2^{2y} = 4^{xy}$
Given, $3^{2x+y}=3^7$
$\Rightarrow 2x+y=7$
Given, $2^{3x+2y}=2^{2xy}$
$\Rightarrow 3x+2y=2xy$
Solving both equations we get
$\Rightarrow x = 2,\ y = 3$
Hence, $x + y = 5$

87. *(a)*
$=\sqrt[3]{\frac{512}{125}}=\sqrt[3]{\frac{8^3}{5^3}}=\frac{8}{5}$
$\Rightarrow 1\frac{3}{5}$

88. *(a)*
$\frac{26-2}{90}-\frac{19-1}{90}$
$\Rightarrow \frac{24}{90}-\frac{18}{90}=\frac{6}{90}$
$\Rightarrow 0.666666\ldots\ or\ 0.\bar{6}$

89. *(c)*
$\sqrt{\frac{289}{196}}=1+\frac{x}{14}\Rightarrow\frac{17}{14}=1+\frac{x}{14}$
$\Rightarrow\frac{x}{14}=\frac{17}{14}-1\quad\Rightarrow x=3$

90. *(d)*
$\frac{1}{1+\sqrt{2}}+\frac{1}{\sqrt{2}+\sqrt{3}}+..+\frac{1}{\sqrt{15}+\sqrt{16}}$
$\frac{1-\sqrt{2}}{1-2}+\frac{\sqrt{2}-\sqrt{3}}{2-3}+..+\frac{\sqrt{15}-\sqrt{16}}{15-16}$
$-1\left(1-\sqrt{2}+\sqrt{2}-\sqrt{3}+..\sqrt{15}-\sqrt{16}\right)$
$\Rightarrow -1\left(1-\sqrt{16}\right)\ =-1(1-4)\ =3$

91. *(a)*
$\frac{\left(\sqrt{5}-\sqrt{3}\right)^2-\left(\sqrt{5}+\sqrt{3}\right)^2}{\left(\sqrt{5}+\sqrt{3}\right)\left(\sqrt{5}-\sqrt{3}\right)}$
$\Rightarrow\frac{5+3-2\sqrt{15}-5-3-2\sqrt{15}}{5-3}$
$\Rightarrow\frac{-4\sqrt{15}}{2}=-2\sqrt{15}$

92. *(a)* Let number be x
According to the question
$x^2+x=20$
$\Rightarrow x^2+x-20=0$
Upon solving $x = 4, x = -5$

93. *(d)* We know that LCM is the multiple of HCF. So that 55 cannot be HCF because it is not divisor of 150.

94. *(a)* For same remainder
$486-392=94$
$627-486=141$
$627-392=235$
HCF of $(94,\ 141,\ 235)=47$

95. *(c)* Minimum number of rows
$\Rightarrow\frac{21}{7}+\frac{42}{7}+\frac{56}{7}=17$

96. *(a)* Let two digit of the numbers be x & y
$xy=8\Rightarrow y=\frac{8}{x}$
$\Rightarrow(10x+y)=4(10y+x)+9$

$\Rightarrow 10x + y = 40y + 4x + 9$

$\Rightarrow 6x = 39y + 9$

$\Rightarrow 2x = 13y + 3$

$2x = \frac{104}{x} + 3$

$\Rightarrow 2x^2 - 3x - 104 = 0$

$x = 8,\ y = 1$ Number $= 81$

97. *(c)* Quotient = 182,
Remainder = 182 – 175 = 7
N = 17 × 182 + 7 = 3101

98. *(b)* Let x & y be the number of apples and oranges brought by the person
$5x + 7y = 500$

$y = \frac{500 - 5x}{7} = \frac{5(100 - x)}{7}$

For x & y to be integers

$x =$ 2, 9, 16, 23, 30, 37, 46, 51, 58, 65, 72, 79, 86, 93

99. *(d)* Let the three prime numbers be $x, y, y + 36$

$x + y + (y + 36) = 100$

$x + 2y = 64$

$2y$ is an even number always as multiplied by 2
We know that even + even = even
Odd + odd = even
So, x has to be even to satisfy

$x + 2y = 64$

The only even prime number is 2

$x = 2, y = 31$

Numbers are 2, 31 and 67

100. *(c)* Dividend = Q × D + R
D = 5Q , D = 2R
R = 15, D = 30
5Q = 30, Q = 6
Dividend = DQ + R = 30 × 6 + 15 = 195