HINTS & SOLUTION

1. *(c)* One day work of 1st son = $\frac{1}{6}$

One day work of second son = $\frac{1}{12}$

One day work of them working together

$\Rightarrow \frac{1}{6}+\frac{1}{12}=\frac{2+1}{12}=\frac{1}{4}$

Father will finish the work in 4 days

2. *(c)*

$$\frac{M_1D_1}{W_1}=\frac{M_2D_2}{W_2}$$

$$\Rightarrow \frac{18\times 5}{1440}=\frac{M_2\times 8}{1920}$$

$$\Rightarrow M_2=\frac{1920\times 18\times 5}{8\times 1440}=15$$

3. *(c)* One day work of Ram = $\frac{1}{6}$

One day work of Shyam = $\frac{1}{12}$

One day work of them working together

$\Rightarrow \frac{1}{6}+\frac{1}{12}=\frac{2+1}{12}=\frac{1}{4}$

Two days work together = $\frac{1}{2}$

(half of the work)

4. *(c)* $\log_{10}0.0001=a$

$$a=\log_{10}\frac{1}{(10)^4}$$

$$\Rightarrow \log_{10}1-\log_{10}(10)^4$$

$$=0-4=-4$$

5. *(c)*

$$\frac{1}{3}\log_{10}125-2\log_{10}4+\log_{10}32+\log_{10}1$$

$$\frac{1}{3}\log_{10}(5)^3-2\log_{10}(2)^2+\log_{10}(2)^5+0$$

$$\log_{10}5+\log_{10}2=\log_{10}5\times 2$$

$$\Rightarrow \log_{10}10=1$$

6. *(b)* It can be written as

$$\frac{x^8+4+4x^4-4x^4}{x^4+2x^2+2}$$

$$\Rightarrow \frac{x^8+4x^4+4-4x^4}{x^4+2x^2+2}$$

$$\Rightarrow \frac{(x^4+2)^2-(2x^2)^2}{x^4+2x^2+2}$$

$$\Rightarrow \frac{(x^4+2x^2+2)(x^4-2x^2+2)}{x^4+2x^2+2}$$

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

7. *(c)*

$$x^2(y-z)+y^2(z-x)-z(xy-yz-zx)$$

$$x^2y-x^2z+y^2z-y^2x-zxy+z^2y+z^2x$$

$$xy(x-y-z)-z(x^2-y^2)+z^2(x+y)$$

$$xy(x-y-z)-z(x+y)(x-y-z)$$

$$(x-y-z)(xy-yz-zx)$$

8. *(a)* Remainder

$$3(2y)^3-2(2y)^2y-13(2y)y^2+10y^3$$

$$\Rightarrow 24y^3-8y^3-26y^3+10y^3$$

$$\Rightarrow 34y^3-34y^3=0$$

9. *(c)* Upon dividing Quotient by x^2+2

We get remainder $-2x+10k-10$

It is given $-2x$

$-2x = -2x + 10k - 10$

$\Rightarrow k = 1$

10. *(d)* 1 Quintal = 100 kg

$\frac{3}{2}\text{quintal} = \frac{3}{2} \times 100 = 150\ kg$

Given, $\frac{15}{4}\text{kg} = 1$ unit

$\Rightarrow 1\text{ kg} = \frac{4}{15}\text{unit}$

$\Rightarrow 150\text{ kg} = \frac{4}{15} \times 150 = 40$

11. *(b)* Let full fare = ₹ x

Reservation charges = ₹ y

$x + y = 362$

$1\frac{1}{2}x + 2y = 554$

$\Rightarrow 3x + 4y = 1108$

Upon solving both equations

$x = 340,\ y = 22$

Reservation charge $= 22$

12. *(d)* Let greater number be x and smaller number be y

$x - y = 45$

$\Rightarrow x = 4y$

$4y - y = 45 \ \Rightarrow y = 15$

$\Rightarrow x = 4 \times 15 = 60$

Required sum $= x + y = 75$

13. *(b)* Fare from P to Q = ₹ x

Fare from P to R = ₹ y

According to question $x + y = 42$

$5x + 10y = 350$

Upon solving we get, $x = 14, y = 28$

14. *(b)* Let smaller number be x

Larger number be $80 - x$

According to question, $80 - x = 4x + 5$

$\Rightarrow 5x = 75 \ \Rightarrow x = 15$

15. *(a)* Given equations are

$5x - 2y = 10$

$2x + 6y = 21$

Upon solving, $x = 3,\ y = \frac{5}{2}$

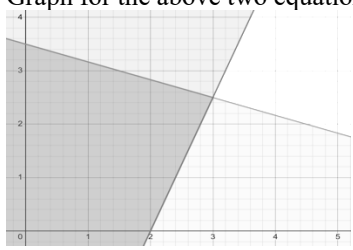
Their interaction point is (3, 5/2)

The shaded region in the question graph is below the original region

Hence, solution set is

$2x + 6y \leq 21, \quad 5x - 2y \leq 10$

Graph for the above two equation is



16. *(d)* Since α, β are the roots of the equation

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

Therefore, $\alpha + \beta = 3, \ \alpha\beta = 2$

$\alpha + 1 + \beta + 1 = \alpha + \beta + 2$

$\Rightarrow 3 + 2 = 5$

$\Rightarrow (\alpha + 1)(\beta + 1) = \alpha\beta + \alpha + \beta + 1$

$2 + 3 + 1 = 6$

Required equation is

$x^2 - (\alpha + 1 + \beta + 1)x +$

$(\alpha + 1)(\beta + 1) = 0$

$\Rightarrow x^2 - 5x + 6 = 0$

17. *(d)* α & β are roots of the equation

$7x^2+12x+18=0$

$\alpha+\beta=-\frac{12}{7},\ \alpha\beta=\frac{18}{7}$

$\alpha^2+\beta^2+2\alpha\beta=\frac{144}{49}$

$\Rightarrow\alpha^2+\beta^2=\frac{144}{49}-\frac{36}{7}=-\frac{108}{49}$

$\Rightarrow\frac{\alpha^2+\beta^2}{\alpha\beta}=\frac{\frac{-108}{49}}{\frac{18}{7}}=-\frac{6}{7}$

18. *(d)* $\frac{x(x-1)-m(m+1)}{(x-1)(m-1)}=\frac{x}{m}$

$m\left(x^2-x-m-1\right)=x(mx-x-m+1)$

$\Rightarrow mx^2-mx-m(m+1)$

$\Rightarrow mx^2-x^2-mx+x$

$\Rightarrow x^2-x-m(m+1)=0$

Given, roots are α & α

$\alpha+\alpha=1,\ \alpha\times\alpha=-m(m+1)$

$\alpha=\frac{1}{2}\ \Rightarrow\left(\frac{1}{2}\right)^2=-m(m+1)$

$\Rightarrow 4m^2+4m+1=0$

$\Rightarrow(2m+1)^2=0\quad\Rightarrow m=-\frac{1}{2}$

19. *(a)* $\sqrt{\frac{x}{x+3}}-\sqrt{\frac{x+3}{x}}=-\frac{3}{2}$

Let $y=\sqrt{\frac{x}{x+3}}$

$y-\frac{1}{y}=-\frac{3}{2}$

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

Upon solving, $y=\frac{1}{2}$

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

Squaring both sides

$\Rightarrow\frac{x}{x+3}=\frac{1}{4}$

$\Rightarrow 4x=x+3\quad\Rightarrow x=1$

20. *(c)* -1.5 is a root of $ax^2+x-3=0$

Then, $a(-1.5)^2+(-1.5)-3=0$

$\Rightarrow 2.25a-4.5=0$

$a=\frac{4.5}{2.25}\quad\Rightarrow a=2$

21. *(c)*

$n(A\cap B)=2n$

$\Rightarrow n(A\cup B)=n(A)+n(B)-n(A\cap B)$

$\Rightarrow 2n+4n-2n=4n$

Minimum number of elements is 4n

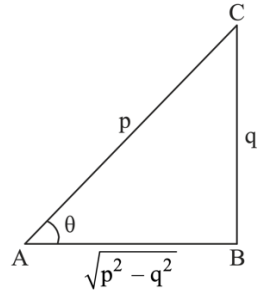
22. *(c)* Given, A = {1,2,3,4}

So, required subsets are {1,2,3}, {1,2,4}, {1,3,4}, {2,3,4} and {1,2,3,4}

23. *(b)* Percent of candidates who failed in either Hindi or English = $(50+40-15)$ = 75

Percent of candidates who passed in both subject = $100-75=25\%$

24. *(b)*



$\text{cosec}\theta = \frac{p}{q}$

$b = \sqrt{p^2 - q^2}$

$In\ \Delta ABC,\ \tan\theta = \frac{q}{\sqrt{p^2 - q^2}}$

$\Rightarrow \sqrt{p^2 - q^2} \times \tan\theta = q$

25. *(c)* We know that sin θ is increasing from 0° to 90°

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

$\sin 32^\circ > \frac{1}{2}$

26. *(d)* $sinx - cosx = 0$

$sinx = cosx$

$\Rightarrow x = 45^\circ = \frac{\pi}{4}$

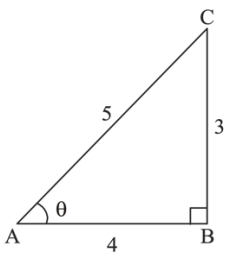
$\Rightarrow \sin^4 x + \cos^4 x = \sin^4\frac{\pi}{4} + \cos^4\frac{\pi}{4}$

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

27. *(d)* $\tan\theta = \frac{3}{4} = \frac{P}{B}$

$H = \sqrt{P^2 + B^2} = \sqrt{9 + 16} = \sqrt{25} = 5$

Let hypotenuse $= x$



$\sin\theta = \frac{2}{x} = \frac{3}{5} \Rightarrow x = \frac{2 \times 5}{3} = \frac{10}{3}$

28. *(c)* Given, $\sin(x - y) = \frac{1}{2}$

$\cos(x + y) = \frac{1}{2}$

$\Rightarrow \sin(x - y) = \sin 30^\circ$

$\cos(x + y) = \cos 60^\circ$

$\Rightarrow x - y = 30^\circ\ ,\ x + y = 60^\circ$

$x = 45^\circ\ ,\ y = 15^\circ$

29. *(b)* In 60 min h hand gains = 5min

In 1 min h hand gains = $\frac{5}{60} min.$

In 10 min, h hand gains = $\frac{5}{60} \times 10 = \frac{5}{6} min$

There is 15 min gap between hours and minutes hands but in 10 min h hand gains $\frac{5}{6} min$ more

Actual gap = $15 + \frac{5}{6} = \frac{95}{6}$

In 1 min, there are 6°

In $\frac{95}{6} min$, there are $\frac{95}{6} \times 6^\circ$

$\Rightarrow \frac{95}{6} \times 6 \times \frac{\pi}{180} = \frac{19\pi}{36}$ radian

30. *(c)* Given, $sinx\ cosx = \frac{1}{2}$

$(\sin x - \cos x)^2 = (\sin^2 x + \cos^2 x) - 2\sin x \cos x$

$\Rightarrow 1 - 2\left(\frac{1}{2}\right) = 0$

31. *(b)*

$\cot^2\theta - \frac{1}{\sin^2\theta} = \frac{\cos^2\theta}{\sin^2\theta} - \frac{1}{\sin^2\theta}$

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

32. *(c)* $sinx = cosy$
$\angle x$ & $\angle y$ are acute angles, then

$$x = y = 45^\circ = \frac{\pi}{4}$$

Hence, $x + y = \frac{\pi}{2}$

33. *(a)* $\frac{\cos x}{\cos y} = n$, $\frac{\sin x}{\sin y} = m$

$$\left(m^2 - n^2\right)\sin^2 y = \left(\frac{\sin^2 x}{\sin^2 y} - \frac{\cos^2 x}{\cos^2 y}\right)\sin^2 y$$

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

$$\Rightarrow \frac{\cos^2 y - \cos^2 x}{\cos^2 y} = 1 - n^2$$

34. *(b)* Given equation can be written as

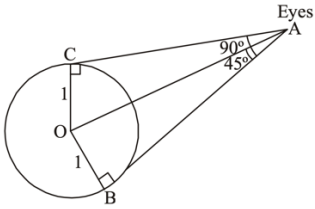
$$\cos^2(3x - 9^\circ) = 1 - \sin^2 60^\circ$$

$$\Rightarrow \cos^2(3x - 9^\circ) = \cos^2 60^\circ$$

$$\Rightarrow 3x - 9^\circ = 60^\circ$$

$$\Rightarrow 3x = 69^\circ \quad \Rightarrow x = 23^\circ$$

35. *(b)* Let O = Centre of the balloon
OB = OC = Radii of the balloon



In ΔOBA, $\sin 45^\circ = \frac{OB}{OA} = \frac{1}{\sqrt{2}} = \frac{1}{OA}$

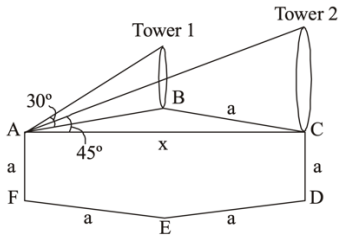
$$\Rightarrow OA = \sqrt{2}$$

36. *(b)* Let the side of a regular hexagon be 'a'
Let height of tower 1 = h1 and tower 2 be h2

Height of tower 1 = h1

$$\Rightarrow \tan 30^\circ = \frac{h1}{a}$$

$$\Rightarrow a \times \frac{1}{\sqrt{3}} = h1$$



$$\tan 45^\circ = \frac{h2}{\sqrt{3a}}$$

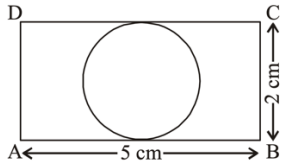
$$\Rightarrow h2 = \sqrt{3}a$$

Ratio of h1 & h2 $\Rightarrow \frac{a}{\frac{\sqrt{3}}{\sqrt{3a}}} = \frac{1}{3}$

37. *(b)* The angle of elevation and angle of depression are measured with the horizontal line only.

38. *(a)* It will be a centroid

39. *(b)* A circle of radius 1cm can be cut off



Area of rectangular sheet = 10 cm
Area of circle = $\pi \times 1^2 = \pi$
Required area = $10 - \pi$

40. *(b)*

$$\text{Distance in 1 revolution} = \frac{400}{1000}m$$

$$\Rightarrow Circumf erence = \pi \times d = \frac{44000}{1000}$$

$$d = \frac{44000 \times 7}{1000 \times 22} = 14 \text{ cm}$$

41. *(a)* BC $= \sqrt{x^2 + y^2}$

Area of Δ ABC $= \frac{1}{2} \times xy$

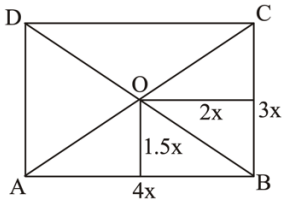
Area of semi circle BACB $= \frac{\pi(x^2 + y^2)}{4}$

Area of shaded portion = Semi circle ABDA + Semi circle AECA − (Semi circle BACB − Area of Δ ABC)

$$\Rightarrow \frac{\pi x^2}{4} + \frac{\pi y^2}{4} - \pi\left(\frac{x^2 + y^2}{4}\right) + \Delta ABC$$

$\Rightarrow$ Area of Δ ABC

42. *(d)* Let length and breadth of a rectangle is $4x$ and $3x$



Area of $\Delta BOC = \frac{1}{2} \times 3x \times 2x = 3x^2$

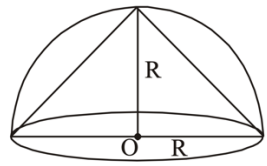
Area of $\Delta AOB = \frac{1}{2} \times 4x \times 1.5x = 3x^2$

Ratio = 1:1

43. *(a)* Volume of cone. C $= \frac{1}{3}\pi R^2 H$

Since, H = R, C $= \frac{1}{3}\pi R^3$

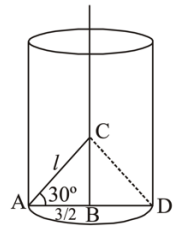
Volume of hemisphere, H $= \frac{2}{3}\pi R^3$



$C:H = 1:2$

44. *(b)* In ΔABC,

$$\cos 30^\circ = \frac{\frac{3}{2}}{l} \Rightarrow l = \frac{\frac{3}{2}}{\sqrt{\frac{3}{2}}} = \sqrt{3}$$



Area of cone ACD = πrl

$$\Rightarrow \pi \times \frac{3}{2} \times \sqrt{3}$$

$$= \frac{3\sqrt{3}\pi}{2}$$

45. *(d)* Volume of semi circular disc

$$\Rightarrow \frac{1}{2}\pi \times 4 \times 4 \times 2$$

Volume of spherical ball

$$\Rightarrow \frac{4}{3}\pi\left(\frac{2.5}{10}\right)^3$$

$$\text{Number of balls} = \frac{\frac{1}{2}\pi \times 4 \times 4 \times 2}{\frac{4}{3}\pi \times \left(\frac{2.5}{10}\right)^3} = 768$$

46. *(b)* Surface area of sphere = 3 (Volume of sphere)

$4\pi r^2 = 3 \times \frac{4}{3} \times \pi r^3 \Rightarrow r = 1$

Diameter = 2r = 2cm

47. *(c)* Volume of wood = Volume of lead pencil – Volume of lead

$\pi(0.4)^2 \times 21 - \pi \times (0.1)^2 \times 21$

$\Rightarrow 21 \times \frac{22}{7} \times (0.16 - 0.01)$

$\Rightarrow 66(0.15) = 9.9$ cu cm

48. *(d)* Since the outer edges of cubical box is 5 cm

Surface area of outer cubical box

$= 5\ (edge)^2$

$5 \times 5^2 = 125$

Surface area of inner cubical box

$\Rightarrow 5 \times 4^2 = 80$

Total surface area = 125 + 80 = 205

49. *(c)* Volume of bigger cone

$\frac{1}{3}\pi(6)^2 \times 8 = 96\pi$

Volume of smaller cone

$\frac{1}{3}\pi \times (1)^2 \times 2 = \frac{2\pi}{3}$

Number of cones $= \frac{96\pi}{\frac{2\pi}{3}} = 144$

50. *(a)* R = 2*r*

According to the question,

Volume of cylinder = volume of cone

$\Rightarrow \pi r^2 h = \frac{1}{3}\pi R^2 H$

$\Rightarrow r^2 h = \frac{1}{3}(2r)^2 H$

$H = \frac{3h}{4}$

51. *(b)* Radius cone $= \frac{126}{2} = 63$

Height of cone $= 21 - 5 = 16$

Slant height $= \sqrt{63^2 + 16^2}$

$\Rightarrow \sqrt{3969 + 256} = \sqrt{4225} = 65$

52. *(a)* Radius of cylinder = 63

Height = 5

Curved surface area = $2\pi rh$

$\Rightarrow 2 \times \frac{22}{7} \times 63 \times 5 = 1980$

53. *(d)* Canvas = Curved surface area of cylinder + curved surface area of cone

$\Rightarrow 2\pi rh + \pi rl$

$\Rightarrow 1980 + \frac{22}{7} \times 63 \times 65 = 14850$

54. *(d)*

Given, $\frac{\text{Volume of small cone}}{\text{Volume of large cone}} = \left(\frac{r}{R}\right)^3$

$\Rightarrow 1 - \frac{\text{Volume of small cone}}{\text{Volume of large cone}} = 1 - \left(\frac{1}{2}\right)^3$

$\Rightarrow \frac{\text{Vol large cone} - \text{Vol small cone}}{\text{Vol of large cone}} = \frac{7}{8}$

$\Rightarrow \frac{\text{Vol of frustum}}{\text{Vol of large cone}} = \frac{7}{8}$

55. *(c)*

$2\pi rh = 1$ litre. Paint required $=$

$\frac{2\pi rh + 2\pi(r+1)h + 2\pi[(r+1) + r]}{2\pi rh}$

$\Rightarrow \frac{rh + (r+1)h + 2r + 1}{rh} = \frac{21 + 28 + 7}{3 \times 7}$

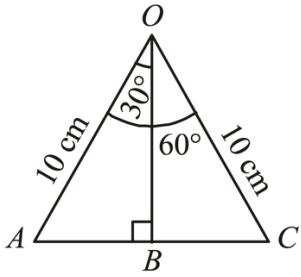
$= \frac{8}{3}$

56. *(b)* In ΔAOB,

$$\sin 30^\circ = \frac{AB}{OA} \Rightarrow \frac{1}{2} = \frac{AB}{10}$$

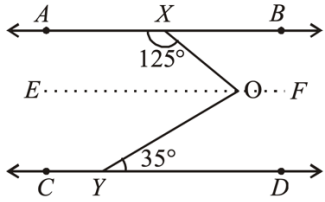
$$\Rightarrow AB = 5cm$$

$$Now,\ AC = 2AB = 2\times 5 = 10\ cm$$



57. *(a)* The locus of P is a straight line which is the right bisector of AB.

58. *(b)* Draw a line EF such that $EF||AB||CD$



Now, $AB//EF$

$$\angle AXO + \angle XOE = 180^\circ \text{ (Interior } \angle \text{les)}$$

$$\Rightarrow \angle XOE = 180^\circ - 125^\circ = 55^\circ$$

$$EF \parallel CD$$

$$\Rightarrow \angle EOY = \angle OYD = 35^\circ$$

$$\Rightarrow \angle XOY = \angle XOE + \angle EOY$$

$$\Rightarrow 55^\circ + 35^\circ = 90^\circ$$

59. *(b)* A circle is the lows of any point that sum of square of its distance from any two fixed point is always constant

60. *(d)* Hour hand moves by 30° in 1 hour
In one hour movement of hour hand = 30°

$$\text{In } \left(5+\frac{10}{60}\right) \text{ hour movement is}$$

$$30\left(5+\frac{10}{60}\right)$$

$$\Rightarrow 30 = \left(5+\frac{1}{6}\right)$$

$$\Rightarrow 30\times \frac{31}{6} = 155^\circ$$

61. *(b)* Hour hand moves by 30° in 1 hour
Hence, In 10 min hour hand will move by 5°

62. *(c)* of the circle = θ

$$\text{Then, } \frac{\theta}{360}\times 2\pi R = 33$$

$$\Rightarrow \theta = \frac{33\times 360\times 7}{2\times 22\times 14} = 3\times 45$$

$$= 135^\circ$$

63. *(b)* Let other angle of each triangle be a, b, c, d

$$\Rightarrow (1+2+a)+(3+4+b)+(5+6+c)$$

$$+(7+8+d) = 180^\circ \times 4$$

$$\Rightarrow 1+2+3+4+5+6+7+8 = 720^\circ -$$

$$(a+b+c+d)$$

$$\Rightarrow 1+2+3+4+5+6+7+8 =$$

$$720^\circ - 360^\circ = 360^\circ$$

64. *(d)* Given, DE:BE = 3:5

$$\frac{Area\ of\ \Delta ABC}{Area\ of\ \Delta DAE} = \left(\frac{BC}{DE}\right)^2 = \frac{25}{9}$$

65. *(b)* $\angle DAB + \angle ABD + \angle BDA = 180^\circ$

$$(30^\circ + x) + 45^\circ + 90^\circ = 180^\circ$$

$$x = 15^\circ$$

In ΔACB,

$\angle CAB + \angle ABC + \angle BCA = 180°$

$\Rightarrow 30° + (45° + y) + 90° = 180°$

$y = 15°$

$2x - y = 2 \times 15° - 15° = 15°$

66. *(c)* Suppose the smaller and larger sides of a right triangle be x & y, respectively. By given condition,

$x^2 + y^2 = \left(3\sqrt{10}\right)^2$

$\Rightarrow x^2 + y^2 = 90$

$9x^2 + 4y^2 = 405$

On solving equation, $x = 3.\ y = 9$

67. *(c)*

$\angle AMC + \angle CMD = \angle BMD$

$+ \angle CMD \Rightarrow \angle AMD = \angle BMC$

$\Rightarrow \angle DAM = \angle CBM$

$AM = BM$

By ASA, $\Delta ADM \cong \Delta BCM$

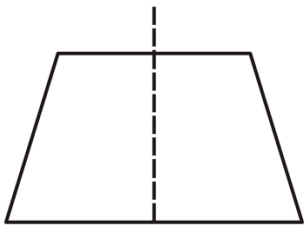
68. *(c)* Here we see $(50)^2 = (30)^2 + (40)^2$

$\Rightarrow 2500 = 900 + 1600$

It means given scores are sides of a rectangle

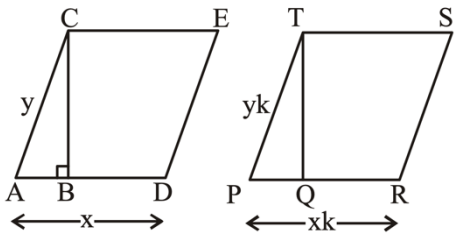
So, other diagonal should be 50 runs

69. *(c)* Isosceles trapezium has only line of symmetry.



70. *(c)* Let the sides of parallelogram be x, y, xk, yk

Sides of parallelogram are in ratio 1: k



$\Delta ABC \sim \Delta PQT$

$\Rightarrow \frac{AC}{PT} = \frac{BC}{QT}$

$\Rightarrow \frac{BC}{QT} = \frac{y}{yk} = \frac{1}{k}$

Let $BC = z,\ QT = zk$

Ratio of parallelogram

$= \frac{xz}{zk \times zk} = \frac{1}{k^2}$

71. *(a)*

In $\Delta ABE,\ \angle EAB = \angle ABE = 60°$

$\angle AEB = 60°$

ΔABE is an equilateral triangle

$AB = BE = EA$

Perimeter of $\Delta ABE = 6$

$AB + BE + EA = 6,\ AB = 2$

In $\Delta ADE,\ AE^2 = AD^2 + ED^2$

$4 = AD^2 + 1$

E is mid point of CD, $AD = \sqrt{3}$

Area $= AB \times AD = 2 \times \sqrt{3}$

72. *(d)* In parallelogram,

$d_1^2 + d_2^2 = 2\left(l^2 + b^2\right)$

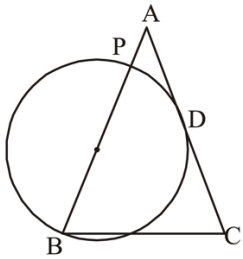
$d^2 + (10)^2 = 2(64 + 144)$

$d^2 = 2 \times 208 - 100$

$d^2 = 416 - 100 = 316$

$d = \sqrt{316} = 17.76 \Rightarrow d > 12$

73. *(c)*



$AB \times AP = AD^2 = \left(\frac{AC}{2}\right)^2 = \frac{1}{4}(AC)^2$

$AB \times AP = \frac{1}{4}(AB)^2$

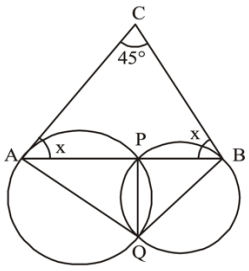
74. *(b)* By using theorem,

$(PT)^2 = PA \times PB$

$\Rightarrow (6)^2 = 4 \times (4 + AB)$

$\Rightarrow \frac{36}{4} = 4 + AB \quad \Rightarrow AB = 5\ cm$

75. *(d)* The tangents drawn from an outer point on a circle are always equal = $\angle CBA$



$\angle CAB = \angle CBA \quad \Rightarrow 45° + x + x = 180°$

$2x = 180° - 45°$

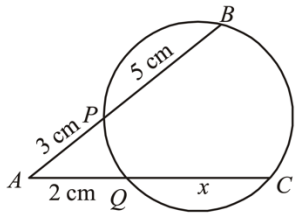
$\Rightarrow x = 67\frac{1}{2}° = \angle AQP = \angle BQP$

(Alternate interior segments properties)

$\angle AQB = \angle AQP + \angle BQP$

$= 67\frac{1}{2}° + 67\frac{1}{2}° = 135°$

76. *(c)*



$AP \times AB = AC \times AQ$

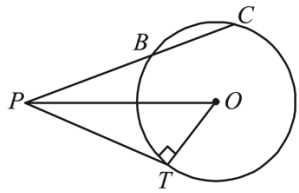
$\Rightarrow 8 \times 3 = (2 + x) \times 2$

$\Rightarrow \frac{8 \times 3}{2} = 2 + x \quad \Rightarrow x = 10\ cm$

77. *(a)* Given, $PO = 10cm,\ OT = 6cm$

$PB = 5cm$

In $\Delta\ OTP$,



$\Rightarrow (OP)^2 = (PT)^2 + (OT)^2$

$\Rightarrow (10)^2 = (PT)^2 + 6^2 \quad \Rightarrow PT = 8cm$

From properties of circle,

$\Rightarrow (PT)^2 = PB \times PC$

$\Rightarrow 64 = 5 \times (BC + 5) \quad \Rightarrow 5BC = 39$

$\Rightarrow BC = 7.8$ cm

78. *(c)* Mean age of minor children = 5 years

79. *(b)* Median age of minor children = 5 years

80. *(d)* $1,3,5,7,9,x,15,17$

Total number of terms = 8

Median =

$$\Rightarrow \frac{\frac{8}{2}th\ term + \left(\frac{8}{2}+1\right)th\ term}{2}$$

$$\Rightarrow \frac{4th\ term\ +\ 5th\ term}{2} = \frac{7+9}{2} = 8$$

Distribution is arranged in ascending order

So, $9 \le x \le 15$

81. *(d)* Pie chart

82. *(a)* For an ogive, the cumulative frequencies are plotted as a upper limit of class intervals.

83. *(b)* Let speed of train and car are x, y respectively

$$\frac{120}{x} + \frac{480}{y} = 11$$

$$\Rightarrow \frac{200}{x} + \frac{400}{y} = \frac{35}{3}$$

$\Rightarrow$ Upon solving $x = 40,\ y = 60$

$\Rightarrow x : y\ =\ 2:3$

84. *(d)* Let CP be ₹$100x$

$106x - 94x = 6. \Rightarrow 12x = 6$

$x = 0.5,\ 100x = ₹50$

85. *(d)*

$$1\% = \frac{24}{2} = 12$$

Hence, Principal $= 1200$

86. *(d)*

$$\frac{x+x+x+x}{\frac{x}{100}+\frac{x}{200}+\frac{x}{300}+\frac{x}{400}}$$

$$\frac{4x}{\frac{12x+6x+4x+3x}{1200}} = \frac{4x \times 1200}{25x} = 192$$

87. *(b)* Milk content in 1st vessel $= \frac{1}{4}$

water content $= \frac{3}{4}$

Milk content in 2nd vessel $= \frac{3}{8}$

water content $= \frac{5}{8}$

Milk content in mixture drawn from both

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

Water content $= 3 \times \frac{3}{4} + 2 \times \frac{5}{8} = \frac{7}{2}$

Ratio $= \frac{3}{2} : \frac{7}{2} = 3:7$

88. *(b)* Given, 50 % $(x-y)$ = 40 % $(x+y)$,

$$\Rightarrow \frac{50}{100} \times (x-y) = \frac{40}{100} \times (x+y)$$

$$\Rightarrow 5x - 5y = 4x + 4y$$

$$\Rightarrow x = 9y$$

Let $a\%$ of $x = y$

$$\Rightarrow \frac{a}{100} \times 9y = y \quad \Rightarrow r = \frac{100}{9} = 11\frac{1}{9}\%$$

89. *(c)* After 1st hit ball height will be $\frac{1}{2} \times 64$

After 2nd hit ball height will be $\left(\frac{1}{2}\right)^2 \times 64$

After 16th hit ball height will be $\left(\frac{1}{2}\right)^{16}(64) = \frac{1}{2^{16}} \times 2^6 = 2^{-10}$

90. *(d)*
$\left(\sqrt{7}-\sqrt{2}\right)^2 = 7+2-2\times\sqrt{7\times 2}$
$\Rightarrow 9-2\sqrt{14}$

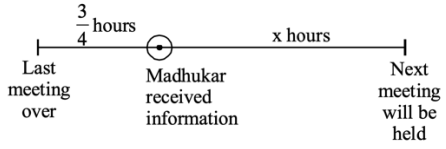
91. *(b)* 3.292929... = 3.29 is a non-terminating repeating decimal. Then, it is a rational number.

92. *(b)* Using $k=-1$
$(-k)^2-5k+6=(-k)^2-8k+15$
$\Rightarrow 3k=9,\ k=3$

93. *(d)* X completes a round in inch 252 sec.
Y completes a round in inch 308 sec.
Z completes a round in inch 198 sec.
L.C.M of 252, 308 and 198 = 2×2×3×3×7×11 = 2772 sec.
= 46 min. 12 sec.

94. *(a)* Let two numbers are 12a and 12b. Such that H.C.F = 12. then L.C.M = 12ab
Here, L.C.M of these two number must be divisible by 12.
'80' is not divisible by 12, so can not be L.C.M

95. *(b)* Let Madhukar received the information x hour before 2p.m.



$\Rightarrow \frac{3}{4}+x=\frac{13}{4}$

$\Rightarrow x=\frac{13}{4}-\frac{3}{4}=\frac{5}{2}=2\frac{1}{2}$

Hence Madhukar received information $2\frac{1}{2}$ hours before 2 p.m. i.e 11 : 30 a.m.

96. *(b)* Let original number be x
$8x-\frac{x}{8}=2016$

$\Rightarrow\left(\frac{63x}{8}\right)=2016 \ \Rightarrow x=256$

97. *(c)* As per divisibility rule of 9, 4444 when divided by 9 will leave remainder 7
4^{4444} can be written as 7^{4444}
We know that for 7, If number is x^{4k}, Last Digit is 1
Hence, we can write 7^{4444} as 7^1
7 when divided by 9 will leave the remainder 7

98. *(c)* We know that for 7, If number is x^{4k+1}, Last Digit is 7

99. *(d)* Given number is 222222.
Sum of digits = 2 + 2 + 2 + 2 + 2 + 2 = 12 which is divisible by 3.
So, number is also divisible by 3.
Sum of odd terms of digits – Sum of even terms of digits = 6 – 6 = 0, it is divisible by 11.
In a number a digit repeated six times, then this number is divisible by 7
Hence, the given number is divisible by 3, 7 and 11

100. *(b)* $x = 14a + 7 = 15b + 5$. For smallest value of x , two number a & b should be minimum and when $a = 2 = b$
Then, $x = 14 \times 2 + 7 = 35$