ICSE Board
Class IX Mathematics
Sample Paper 4

Time: 2½ hrs **Total Marks: 80**

General Instructions:

1. Answers to this paper must be written on the paper provided separately.
2. You will **NOT** be allowed to write during the first 15 minutes. This time is to be spent in reading the question paper.
3. The time given at the head of this paper is the time allowed for writing the answers.
4. This question paper is divided into two Sections. Attempt **all** questions from **Section A** and any **four** questions from **Section B**.
5. Intended marks for questions or parts of questions are given in brackets along the questions.
6. All working, including rough work, must be clearly shown and should be done on the same sheet as the rest of the answer. Omission of essential working will result in loss of marks
7. Mathematical tables are provided.

SECTION – A (40 Marks)

*(Answer **all questions** from this Section)*

Q. 1.

(a) If $\frac{3\sqrt{2}+2\sqrt{3}}{5\sqrt{2}-4\sqrt{3}}=x-y\sqrt{6}$, find x. [3]

(b) How many bricks having dimensions 20 cm × 5 cm × 5 cm are required to make a wall 2.5 m long, 0.5 m broad and 5 m in height? [3]

(c) In two successive years interest on a certain sum at C.I. payable annually is Rs. 350 and Rs.420. Find the rate of interest. [4]

Q. 2.

(a) If $a^2 - 3a + 1 = 0$, find [4]

(i) $a^2+\frac{1}{a^2}$ (ii) $a^3+\frac{1}{a^3}$

(b) Factories: $20-45(m+n)^2$ [3]

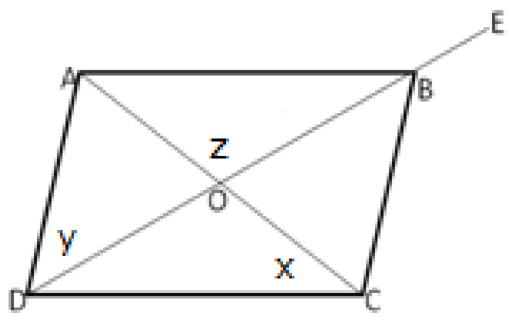
(c) Without using tables evaluate: [3]

$$\frac{5\sin 62^\circ}{\cos 28^\circ}-\frac{2\sec 34^\circ}{\operatorname{cosec} 56^\circ}$$

Q. 3.

(a) The perimeter of a square is 4(p + 3q). Find its area. [3]

(b) In figure below, ABCD is a rhombus in which the diagonal DB is produced to E. If $m\angle ABE = 160^\circ$ then find x, y and z. [4]



(c) If $x = 2^{\frac{1}{3}} + 2^{\frac{-1}{3}}$, prove that $2x^3 = 6x + 5$ [3]

Q. 4.

(a) Solve for a and b: [3]

$$\frac{\log(a-b)}{\log 5}=\frac{\log 4}{\log \frac{1}{2}}=\frac{\log(a+b)}{\log 2}$$

(b) AD is perpendicular to the side BC of an equilateral ΔABC. [4]
Prove that $4AD^2 = 3AB^2$.

(c) Sum of the external angles of a regular polygon is $\frac{1}{6}^{\text{th}}$ of the sum of interior angles. Find the number of sides. [3]

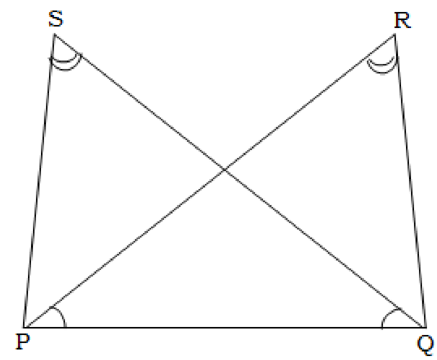
SECTION – B (40 Marks)

*(Answer **any four questions** from this Section)*

Q. 5.

(a) Solve: $3x-7=\frac{1}{y}, x+\frac{1}{y}=1$ [3]

(b) In the fig., ∠R = ∠S and ∠RPQ = ∠PQS. Prove that PS = QR. [3]



(c) In an equilateral triangle with side a, prove that [4]

(i) $\text{Altitude}=\frac{a\sqrt{3}}{2}$ (ii) $\text{Area}=\frac{\sqrt{3}}{4}a^2$

Q. 6.

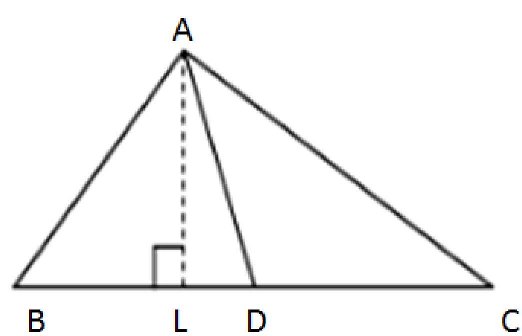
(a) The points A(4, −1), B(6, 0), C(7, 2) and D(5, 1) are the vertices of a rhombus. Is ABCD also a square? [3]

(b) Factories: $(e-y)^3+(y-g)^3+(g-e)^3$ [3]

(c) If $\sin\theta=\frac{5}{13}$ where θ < 90°, find the value of $\tan\theta+\frac{1}{\cos\theta}$ [4]

Q. 7.

(a) Show that the median of a triangle divides it into two triangles of equal area. [3]

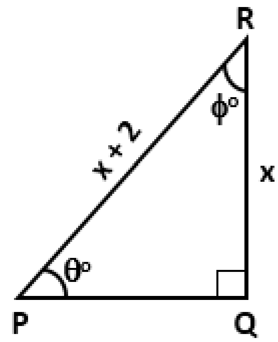


(b) In the figure of ΔPQR, $\angle P = \theta°$ and $\angle R = \phi°$ [3]

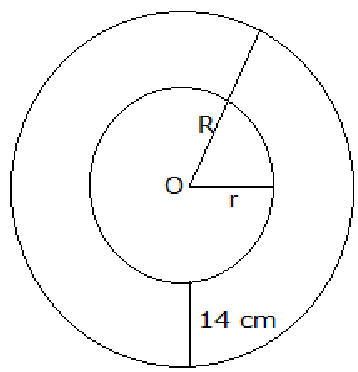
Find (i) $\left(\sqrt{x+1}\right)\cot\phi$

(ii) $\left(\sqrt{x^3+x^2}\right)\tan\,\theta$

(iii) $\cos\theta$

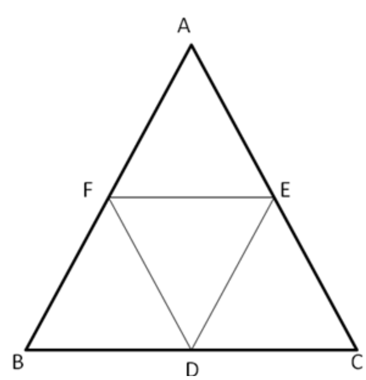


(c) A road, 14 m wide surrounds a circular ground whose circumference is 704 m Find the surface area of the road. Also, find the cost of paving the road at Rs. 100 per m^2. [4]



Q. 8.

(a) In the ΔABC, D, E, F are the mid-points of BC, CA and AB respectively. Given AB = 5.8 cm EF = 6 cm and DF = 5 cm. Calculate BC and CA. [4]

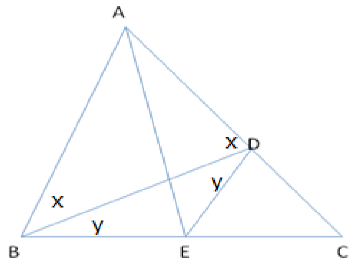


(b) Factorise: $x^3 + y^3 + z^3 - 3xyz$ [3]

(c) Padma invested Rs. 30,000 in a finance company and received Rs. 39,930 after $1\frac{1}{2}$ years. Find the rate of interest per annum compound semi-annually. [3]

Q. 9.

(a) In the given fig., AD = AB and AE bisects $\angle$A. Prove that: BE = ED. [3]



(b) Find x, $\frac{x-b-c}{a}+\frac{x-c-a}{b}+\frac{x-a-b}{c}=3$, if $\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\neq 0$. [3]

(c) If two intersecting chords of a circle make equal angles with the diameter passing through their point of intersection, prove that the chords are equal. [4]

Q. 10.

(a) The distribution of weight (in kg) of 40 students in a class is as given below: [6]

Weight (kg)	36-40	41-45	46-50	51-55	56-60	61-65
No.of students	3	6	5	10	9	7

i. Draw a histogram for the distribution

ii. Draw a frequency polygon for the distribution

(b) If the numerator of a fraction is increased by 2 and the denominator by 1, it becomes $\frac{5}{8}$ and if the numerator and denominator of the same fraction are each increased by 1, the fraction becomes $\frac{1}{2}$. Find the fraction. [4]

Q. 11.

(a) Construct a rectangle ABCD in which AB = CD = 5.2 cm and AC = BD = 5.7 cm and angle B measures 90 degrees. [3]

(b) Using a scale of 1 cm = 1 unit on both axes, draw the graphs of the following equation: $4x - y = 13$, $5x + y = 14$ [4]

From the graph find,

i. The co-ordinates of the point where two lines intersect

ii. The area of the triangle between the lines and the x-axis.

(c) A rope is wound round the outside of a circular drum whose diameter is 70 cm and a bucket is tied to the other end of the rope. Find the number of revolutions made by the drum, if the bucket is raised by 11 m. [3]

Solution

SECTION – A (40 Marks)

Q. 1.

(a) Consider

$$\frac{3\sqrt{2}+2\sqrt{3}}{5\sqrt{2}-4\sqrt{3}}=x-y\sqrt{6}$$

$$\Rightarrow \frac{3\sqrt{2}+2\sqrt{3}}{5\sqrt{2}-4\sqrt{3}}\times\frac{5\sqrt{2}+4\sqrt{3}}{5\sqrt{2}+4\sqrt{3}}=x-y\sqrt{6}$$

$$\Rightarrow \frac{30+12\sqrt{6}+10\sqrt{6}+24}{50-48}=x-y\sqrt{6}$$

$$\Rightarrow \frac{54+22\sqrt{6}}{2}=\frac{2\left(27+11\sqrt{6}\right)}{2}=x-y\sqrt{6}$$

$$\Rightarrow 27+11\sqrt{6}=x-y\sqrt{6}$$

$$\Rightarrow x=27, y=-11$$

(b) Dimensions of the brick:

Length (l) = 20 cm, breadth (b) = 5 cm and height (h) = 5 cm

Volume of brick (V) = lbh = 500 cm^3

Dimensions of the wall:

Length (l) = 2.5 m = 250 cm, breadth (b) = 0.5 m = 50 cm and

height (h) = 5 m = 500 cm

Volume of the wall (V_1) = LBH= 6250000 cm^3

Let N be the number of bricks required to make the wall.

Then, N × V = V_1

$$\Rightarrow N=\frac{6250000}{500}=12500$$

Thus, 12500 bricks are required to make the wall.

(c) Let P = Rs. x, rate = r%

Then, $\frac{x \times r \times 1}{100} = 350 \Rightarrow rx = 35000$ ....(1)

Now, principal for second year = Rs. (x + 350)

$\Rightarrow$ rx + 350r = 42000

$\Rightarrow$ 35000 + 350r = 42000 [From (1)]

$\Rightarrow$ 350r = 42000 – 35000

$\Rightarrow 350r = 7000$

$\Rightarrow r = \frac{7000}{350} = 20\%$

Q. 2.

(a) $a^2 - 3a + 1 = 0$ ....(1)

On dividing equation (1) by a, we get, $a - 3 + \frac{1}{a} = 0$

(i) $a + \frac{1}{a} = 3$ ....(2)

On squaring equation (2), we have

$$\left(a + \frac{1}{a}\right)^2 = 3^2$$

$$a^2 + \frac{1}{a^2} + 2 \times a \times \frac{1}{a} = 9$$

$$a^2 + \frac{1}{a^2} + 2 = 9$$

$$a^2 + \frac{1}{a^2} = 9 - 2 = 7$$

(ii) Cubing equation (2), we have

$$\left(a + \frac{1}{a}\right)^3 = 3^3$$

$$a^3 + \frac{1}{a^3} + 3 \times a \times \frac{1}{a}\left(a + \frac{1}{a}\right) = 27$$

$$a^3 + \frac{1}{a^3} + 3(3) = 27$$

$$a^3 + \frac{1}{a^3} = 27 - 9 = 18$$

(b)

$$20-45(m+n)^2=5\left[4-9(m+n)^2\right]$$
$$=5\left[(2)^2-\{3(m+n)\}^2\right]$$
$$=5\left[2+3(m+n)\right]\left[2-3(m+n)\right]$$
$$=5(2+3m+3n)(2-3m-3n)$$

(c) Here

$$\frac{5\sin 62°}{\cos 28°}=\frac{5\sin(90°-28°)}{\cos 28°}=\frac{5\cos 28°}{\cos 28°}=5$$

And $\frac{2\sec 34°}{\operatorname{cosec} 56°}=\frac{2\sec(90°-56°)}{\operatorname{cosec} 56°}=\frac{2\operatorname{cosec} 56°}{\operatorname{cosec} 56°}=2$

$$\therefore \frac{5\sin 62°}{\cos 28°}-\frac{2\sec 34°}{\operatorname{cosec} 56°}=5-2=3$$

Q. 3

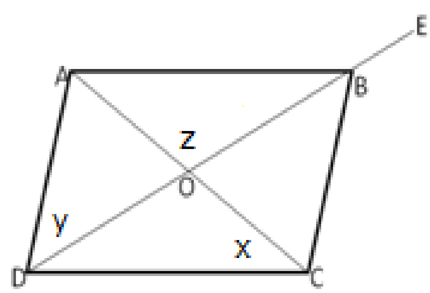
(a) Let the side of square be x cm

$\therefore$ Its perimeter is 4x cm

Given, $4x = 4(p + 3q)$

$$\Rightarrow x=\frac{4(p+3q)}{4}=(p+3q)\text{cm}$$
$$\therefore \text{Area}=(\text{side})^2=(p+3q)^2$$
$$=(p^2+9q^2+6pq)\text{cm}^2$$

(b) $m\angle AOB = z = 90°$ [Diagonals of a rhombus bisect each other at right angle]



$m\angle ABO = 180 - 160 = 20°$

In ΔAOB, $m\angle BAO + m\angle AOB + m\angle ABO = 180°$

$m\angle BAO + 90° + 20° = 180°$

$m\angle BAO = 70°$

Also, $x = m\angle BAO = 70°$ [Alternate interior angles are equal as AB || DC]

In ΔADB, AD = AB

$\angle ABD = \angle ADB$ (Angles opposites to equal sides are equal)

Therefore, $y = 20°$

(c) $x = 2^{\frac{1}{3}} + 2^{\frac{-1}{3}}$

On cubing both sides

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

[By using $(a+b)^3 = a^3 + b^3 + 3ab(a+b)$]

$$\Rightarrow x^3 = 2 + 2^{-1} + 3 \times 2^{\circ} \times x$$

$$x^3 = 2 + \frac{1}{2} + 3x$$

$$\Rightarrow 2x^3 = 5 + 6x \text{ or } 2x^3 = 6x + 5$$

Q. 4.

(a) We have $\dfrac{\log 4}{\log \frac{1}{2}} = \dfrac{\log 2^2}{\log 2^{-1}} = \dfrac{2\log 2}{-1\log 2} = -2$

Now $\dfrac{\log(a-b)}{\log 5} = -2$

$$\Rightarrow \log(a-b) = -2\log 5$$

$$\Rightarrow \log(a-b) = \log 5^{-2}$$

$$\Rightarrow a - b = \frac{1}{5^2}$$

$$\Rightarrow a - b = \frac{1}{25} \quad ....(1)$$

Again, $\dfrac{\log(a+b)}{\log 2} = -2$

$$\Rightarrow \log(a+b) = -2\log 2$$

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

$$\Rightarrow a + b = \frac{1}{4} \quad ....(2)$$

From (1) and (2), we get

$$a = \frac{29}{200},\ b = \frac{21}{200}$$

(b) Given: In the equilateral ΔABC, AD is perpendicular to BC.

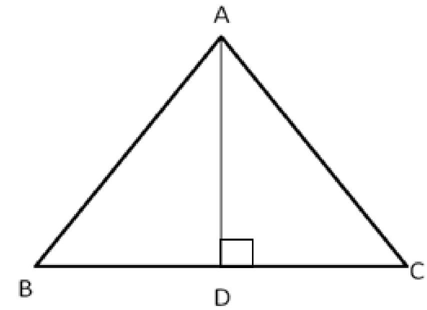
To prove: $4AD^2 = 3AB^2$

Proof: $AD \perp BC$ [Given]

BD = DC

[In an equilateral triangle $\perp$ from the vertex bisects the base]

In right ΔADB, $AD^2 + BD^2 = AB^2$ [Pythagoras theorem]



$$\Rightarrow AD^2 + \left[\frac{1}{2}BC\right]^2 = AB^2 \quad \left[\because BD = \frac{1}{2}BC\right]$$

$$\Rightarrow AD^2 + \frac{BC^2}{4} = AB^2$$

$$\Rightarrow AD^2 + \frac{AB^2}{4} = AB^2 \left[\because AB = BC\right]$$

$$\Rightarrow 4AD^2 + AB^2 = 4AB^2$$

$$\Rightarrow 4AD^2 = 3AB^2$$

(c)

Sum of exterior angles = $\frac{1}{6}^{\text{th}}$ of the sum of interior angles

$$360 = \frac{1}{6} \times (2n-4) \times 90$$

$$\Rightarrow 4 \times 6 = 2n - 4$$

$$\Rightarrow 24 = 2n - 4$$

$$\Rightarrow 2n = 28 \Rightarrow n = 14$$

SECTION - B

Q. 5.

(a)

$$3x - 7 = \frac{1}{y} \qquad ....(1)$$

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

Substituting $\frac{1}{y} = a$

3x – a = 7 ....(3)

x + a = 1 ....(4)

Applying 1(3) – 3(4), we get

−4a = 4

$$\Rightarrow \ a = \frac{-4}{4} = -1$$

$$\therefore \frac{1}{y} = -1$$

$$\Rightarrow y = -1$$

Substituting value of y in equation (2) we get

x = 2

Hence, x = 2 and y = −1.

(b) Given: ∠R = ∠S and ∠RPQ = ∠PQS

To prove: PS = QR

Proof: In ΔPQS and ΔPQR, we have

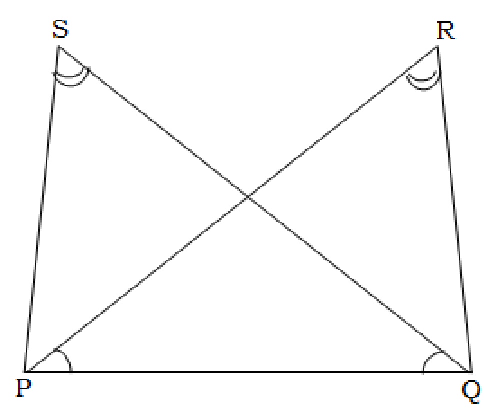
PQ = PQ [Common]

∠PSQ = ∠PRQ [Given]

∠RPQ = ∠PQS [Given]

Hence, $\Delta PQS \cong \Delta PQR$ [AAS]

$\therefore$ PS = PR [CPCT]



(c) Let ABC be an equilateral triangle whose sides measure 'a' units each. Draw AD $\perp$ BC. Then, D is the mid-point of BC.

$\Rightarrow \quad AB = a,\ BD = \frac{1}{2}BC = \frac{a}{2}$

Since ΔABD is a right triangle right – angled at D.

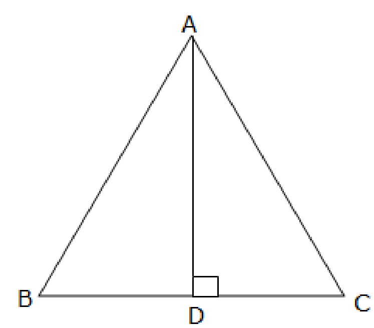
$\therefore\ AB^2 = AD^2 + BD^2$

$\Rightarrow a^2 = AD^2 + \left(\frac{a}{2}\right)^2$

$\Rightarrow AD^2 = a^2 - \frac{a^2}{4} = \frac{3a^2}{4}$

$\Rightarrow AD = \frac{\sqrt{3}a}{2}$

$\therefore\ \text{Altitude} = \frac{\sqrt{3}}{2}a$



Now,

Area of $\Delta ABC = \frac{1}{2}(\text{Base} \times \text{Height})$

Area of $\Delta ABC = \frac{1}{2}(BC \times AD)$

$\Rightarrow$ Area of $\Delta ABC = \frac{1}{2} \times a \times \frac{\sqrt{3}}{2}a = \frac{\sqrt{3}}{4}a^2$

Q. 6.

(a) The given points are A(4, −1), B(6, 0), C(7, 2) and D(5, 1).

Using distance formula,

Diagonal AC = $\sqrt{(4-7)^2 + (-1-2)^2} = \sqrt{9+9} = \sqrt{18}$

Diagonal BD = $\sqrt{(6-5)^2 + (0-1)^2} = \sqrt{1+1} = \sqrt{2}$

Since, AC ≠ BD, ABCD is not a square.

(b)

$(e - y)^3 + (y - g)^3 + (g - e)^3$

Here, $e - y + y - g + g - e = 0$

Here, by the result, if $a + b + c = 0$, then, $a^3 + b^3 + c^3 = 3abc$

$(e - y)^3 + (y - g)^3 + (g - e)^3 = 3 \times (e - y)(y - g)(g - e)$

(c)

$$(\text{Per.})^2+(\text{Base})^2=(\text{Hyp.})^2 \qquad \text{[By Pythagoras theorem]}$$

$$\Rightarrow 5^2+(\text{Base})^2=13^2$$

$$\Rightarrow (\text{Base})^2=13^2-5^2$$

$$\Rightarrow \text{Base}=\sqrt{169-25}=\sqrt{144}=12$$

$$\therefore \tan\theta=\frac{5}{12},\frac{1}{\cos\theta}=\sec\theta=\frac{13}{12}$$

$$\Rightarrow \tan\theta+\frac{1}{\cos\theta}=\frac{5}{12}+\frac{13}{12}=\frac{5+13}{12}=\frac{18}{12}=\frac{3}{2}$$

Q. 7.

(a) Given: ΔABC in which AD is the median.

To prove: $ar(\Delta ABC)=ar(\Delta ADC)$

Construction: Draw $AL \perp BC$.

Proof: Since D is the mid-point of BC, we have $BD=DC$

$$\Rightarrow \frac{1}{2}BD\times AL=\frac{1}{2}DC\times AL$$

$$\Rightarrow ar(\Delta ABD)=ar(\Delta ADC)$$

Hence, a median of a triangle divides in into two triangles of equal area.

(b) Let the width of concrete wall be x m

In ΔPQR, $\angle Q=90^\circ$, $\angle P=\theta^\circ$ and $\angle R=\phi^\circ$

By Pythagoras theorem, we have

$$PQ^2=PR^2-QR^2$$

$$\Rightarrow PQ^2=(x+2)^2-x^2$$

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

$$\Rightarrow PQ^2=4(x+1)$$

$$\Rightarrow PQ=2\sqrt{x+1}$$

Now, $\cot\phi=\dfrac{QR}{PQ}=\dfrac{x}{2\sqrt{x+1}}$ and $\tan\theta=\dfrac{QR}{PQ}=\dfrac{x}{2\sqrt{x+1}}$

(i) $\left(\sqrt{x+1}\right)\cot\phi=\left(\sqrt{x+1}\right)\times\dfrac{x}{2\sqrt{x+1}}=\dfrac{x}{2}$

(ii) $\left(\sqrt{x^3+x^2}\right)\tan\theta=\left(\sqrt{x^2(x+1)}\right)\tan\theta=x\left(\sqrt{x+1}\right)\times\dfrac{x}{2\sqrt{x+1}}=\dfrac{x^2}{2}$

(iii) $\cos\theta=\dfrac{PQ}{PR}=\dfrac{2\sqrt{x+1}}{x+2}$

(c) Given, circumference = 704 m

$\therefore\ 2\pi r = 704$

$\Rightarrow\ 2 \times \frac{22}{7} \times r = 704$

$\Rightarrow r = \frac{7 \times 704}{2 \times 22} = 112 \text{ m}$

and $R = 112 + 14 = 126$ m

$\therefore$ Surface area of road $= \pi R^2 - \pi r^2$

$$= \pi(R + r)(R - r)$$

$$= \frac{22}{7}(126 + 112)(126 - 112)$$

$$= \frac{22}{7} \times 238 \times 14 = 10472 \text{ m}^2$$

Given Rate of paving = Rs. 100 per m^2

$\therefore$ Total cost = 10472×100 = Rs. 1047200

Q. 8.

(a) Given: A ΔABC and D, E, F are the mid-points of BC, CA and DF

AB = 5.8 cm, EF = 6 cm and DF = 5 cm

To find: BC and CA

EF || BC [As E and F are mid-points of AC and AB]

Also, $EF = \frac{1}{2} BC$

BC = 2 × EF = 2 × 6 = 12 cm

Thus, BC = 12 cm

DF || AC [As D and F are mid-points of AB and BC respectively]

And $DF = \frac{1}{2} AC \Rightarrow 5 = \frac{1}{2} AC \Rightarrow AC = 10 \text{cm}$

(b)

$$x^3 + y^3 + z^3 - 3xyz$$

$$= (x + y)^3 - 3xy(x + y) + z^3 - 3xyz$$

$$= (x + y)^3 + z^3 - 3xy(x + y) - 3xyz$$

$$= (x + y + z)\left[(x + y)^2 - (x + y)z + z^2\right] - 3xy(x + y + z)$$

$$= (x + y + z)(x^2 + 2xy + y^2 - xz - yz + z^2 - 3xy)$$

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

(c) P = Rs. 30,000, A = Rs. 39,930, T = 3 half years $\Rightarrow$ n = 3

$$A = P\left(1+\frac{r}{100}\right)^n$$

$$39{,}930 = 30{,}000\left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \frac{39930}{30000} = \left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \frac{1331}{1000} = \left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \left(\frac{11}{10}\right)^3 = \left(1+\frac{r}{100}\right)^3$$

$$\Rightarrow \frac{r}{100} = \frac{11}{10} - 1 = \frac{1}{10}$$

$$\Rightarrow \quad r = 10\%$$

So, rate of interest per annum $= 20\%$

Q. 9.

(a) Given: AD = AB, AE bisects $\angle A$

Construction: Join DE

To prove: BE = ED

Proof: In ΔABE and ΔADE

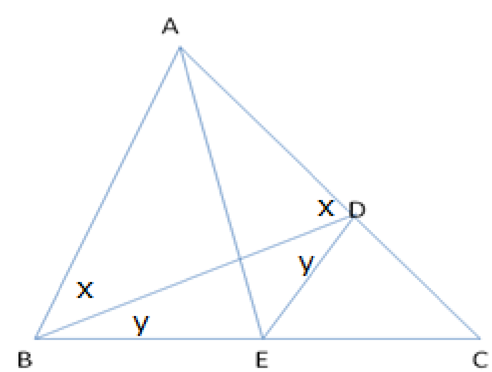
AE = AE [Common]

AD = AB [Given]

And $\angle BAE = \angle DAE$ [AE bisects $\angle A$]

$\Rightarrow \Delta ABE \cong \Delta ADE$ [S.A.S. Congruency]

So, BE = ED [CPCT]



(b)

$$\text{Given: } \frac{x-b-c}{a} + \frac{x-c-a}{b} + \frac{x-a-b}{c} = 3$$

$$\Rightarrow \frac{x-b-c}{a} - 1 + \frac{x-c-a}{b} - 1 + \frac{x-a-b}{c} - 1 = 3 - 3$$

$$\Rightarrow \frac{x-a-b-c}{a} + \frac{x-c-a-b}{b} + \frac{x-a-b-c}{c} = 0$$

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

$$\Rightarrow x-a-b-c = 0 \qquad \left(\text{as } \frac{1}{a}+\frac{1}{b}+\frac{1}{c} \neq 0\right)$$

$$\Rightarrow x = a+b+c$$

(c) Given that AB and CD are two chords of a circle with centre O, intersecting at a point E. PQ is the diameter through E, such that $\angle AEQ = \angle DEQ$.

To prove that AB = CD.

Draw perpendiculars OL and OM on chords AB and CD respectively.

Now, $m\angle LOE = 180° - 90° - m\angle LEO$ ... [Angle sum property of a triangle]

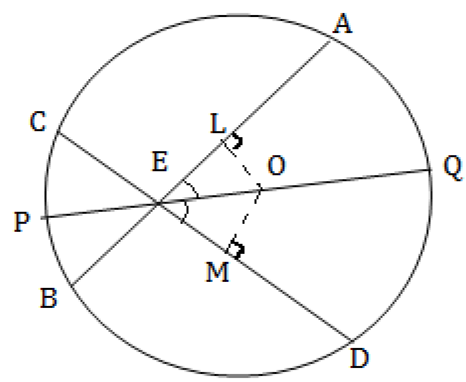
$= 90° - m\angle LEO$

$\Rightarrow m\angle LOE = 90° - m\angle AEQ$

$\Rightarrow m\angle LOE = 90° - m\angle DEQ$

$\Rightarrow m\angle LOE = 90° - m\angle MEQ$

$\Rightarrow \angle LOE = \angle MOE$



In ΔOLE and ΔOME,

$\angle LEO = \angle MEO$

$\angle LOE = \angle MOE$

EO = EO

$\Delta OLE \cong \Delta OME$

OL = OM

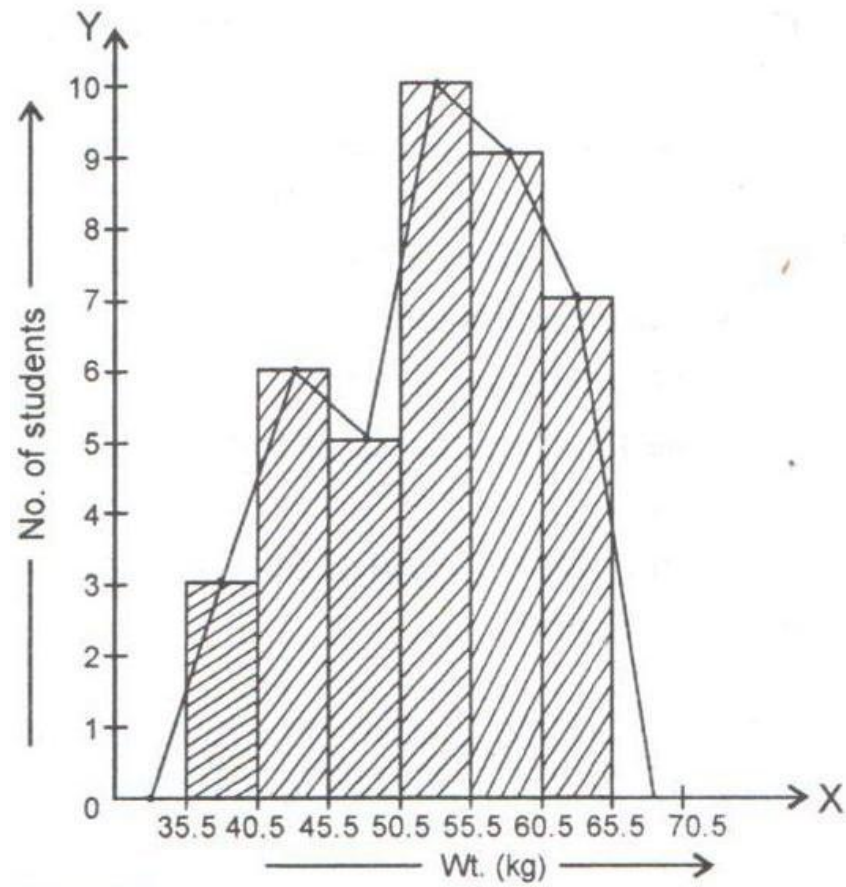
Therefore, cords AB and CD are equidistant from the centre.

Hence AB = CD

Q. 10.

(a) Adjustment factor $=\frac{41-40}{2}=0.5$

C.I	C.I after Adjustment	Frequency
36-40	35.5 – 40.5	3
41-45	40.5 – 45.5	6
46-50	45.5 – 50.5	5
51-55	50.5 – 55.5	10
56-60	55.5 – 60.5	9
61-65	60.5 – 65.5	7



(b) Let the numerator be x and denominator be y

Then, the required fraction is $\frac{x}{y}$

According to the given conditions

$\frac{x+2}{y+1} = \frac{5}{8}$

$\Rightarrow 8x + 16 = 5y + 5$

$\Rightarrow 8x - 5y = -11$ ....(1)

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

$\Rightarrow 2x + 2 = y + 1$

$\Rightarrow 2x - y = -1$ ....(2)

On Solving (1) and (2), we get

y = 7 and x = 3

Hence, the required fraction is $\frac{3}{7}$

Q. 11.

(a)

(i) Draw AB = 5.2 cm

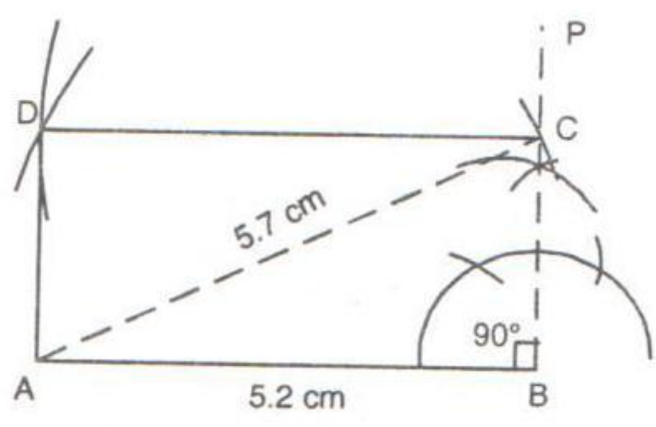
(ii) At B construct $m\angle ABP = 90^\circ$

(iii) With A as the centre and radius 5.7 cm, draw an arc to cut BP at C.

(iv) With C as centre and radius equal to 5.2 cm draw an arc.

(v) With B as centre and radius equal to 5.7 cm, cut the previous arc at D

(vi) Join AD and DC



(b) $4x - y = 13 \Rightarrow 4x = 13 + y \Rightarrow x = \frac{13+y}{4}$

Taking convenient values of y, we get

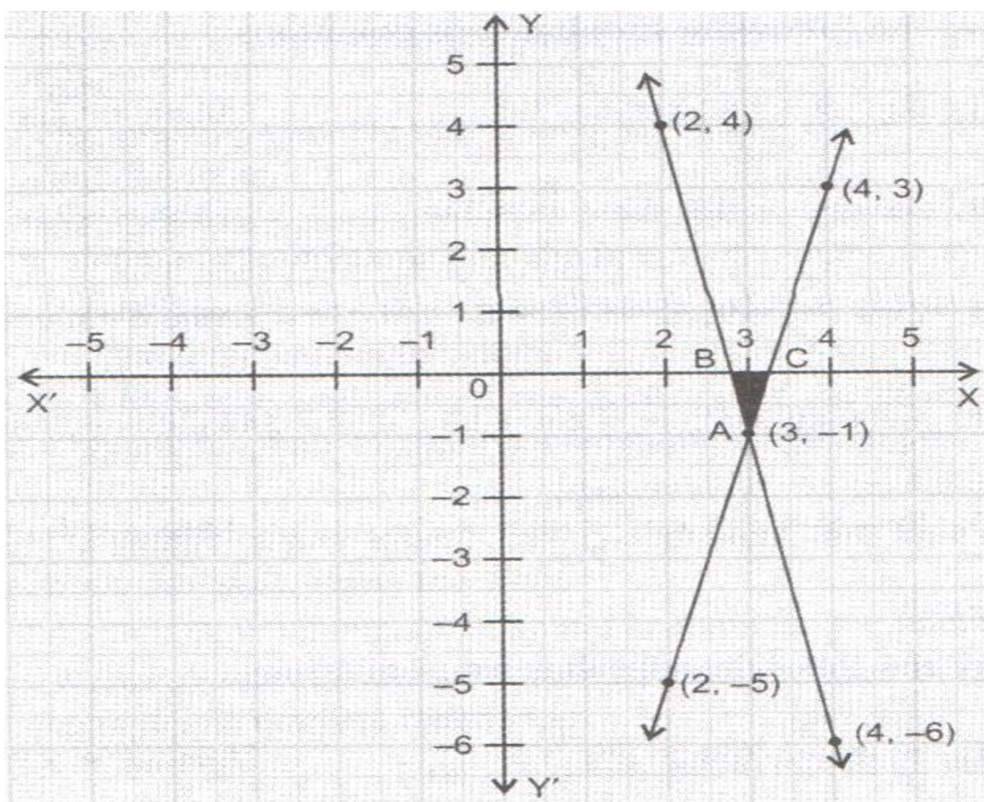
x	3	4	2
y	-1	3	−5

And $5x + y = 14 \Rightarrow 5x = 14 - y \Rightarrow x = \frac{14-y}{5}$

Taking convenient values of y, we get

x	3	2	4
y	−1	4	−6

Now plot these points on the graph paper,



i. From graph, the coordinates of the point of intersection of two lines are (3, −1).

ii. In ΔABC, BC = 0.6 cm, AD = 1 cm

$\therefore$ Area $(\Delta ABC) = \frac{1}{2} \times BC \times AD = \frac{1}{2} \times 0.6 \times 1 = 0.3 \text{ cm}^2$

(c) Radius of the drum $= \frac{70}{2} = 35\text{cm}$

$\therefore$ No. of revolution = $\frac{\text{Distance by which the bucket is raised}}{\text{Circumference of the drum}}$

$$= \frac{11 \times 100}{2\pi \times 35} = \frac{11 \times 100 \times 7}{2 \times 35 \times 22} = 5$$

No. of revolutions = 5