ICSE Board

Class IX Mathematics

Sample Paper 5

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.

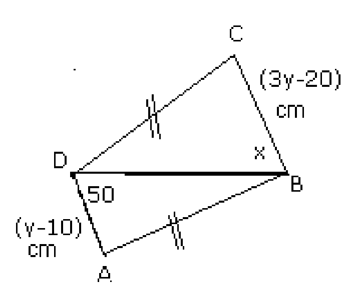
(a) The compound interest on a certain sum of money at 5% p.a. for 2 years is Rs. 287. Find the sum. [3]

(b) Show that $\sqrt{2}$ is an irrational number. [3]

(c) Evaluate: $\dfrac{\cos 37^\circ . \operatorname{cosec} 53^\circ}{\tan 5^\circ . \tan 25^\circ . \tan 45^\circ . \tan 65^\circ . \tan 85^\circ}$ [4]

Q. 2.

(a) Use congruency of triangles to find the value of x and y. [3]



(b) Express $2\log 3-\frac{1}{2}\log 16+\log 12$, as a single logarithm. [3]

(c) Draw parallelogram ABCD with AB = 6 cm, AD = 5 cm and $\angle DAB = 45^{o}$. [4]

Join diagonals AC and BD. Let them intersect at O.

Q. 3.

(a) Evaluate: $\left(\frac{8}{27}\right)^{-\frac{2}{3}}-\left(\frac{1}{3}\right)^{-2}-(7)^{0}$ [3]

(b) Find the value of 'a' and 'b' if (2a + b, a – 2b) = (7, 6) [3]

(c) Show that a quadrilateral with vertices (0, 0), (5, 0), (8, 4) and (3, 4) is a rhombus. Also find its area. [4]

Q. 4.

(a) Using Pythagoras theorem, prove that the area of an equilateral triangle of side 'a' is $\frac{\sqrt{3}}{4}\times a^{2}$. [3]

(b) The difference between the exterior angle of a regular polygon of n sides and a regular polygon of (n + 2) sides is 6. Find the number of sides. [4]

(c) Evaluate $\frac{4}{\tan^{2}60^\circ}+\frac{1}{\cos^{2}30^\circ}-\tan^{2}45^\circ$ [3]

SECTION – B (40 Marks)

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

Q. 5.

(a) Graphically solve the following equations: [4]

3x – 5y + 1 = 0; 2x – y + 3 = 0 [Use 1 cm = 1 unit on both the axes]

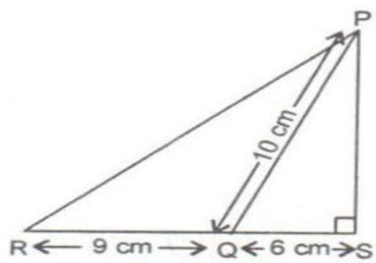
(b) A man starts his job with a certain monthly salary and earns a fixed increment every year. If his salary was Rs. 1500 after 4 years of service and Rs. 1800 after 10 years of his service, what was his starting salary and what is the annual increment? [3]

(c) If $x=\frac{1}{\sqrt{2}-1}$, then prove that $x^{2}-6+\frac{1}{x^{2}}=0$ [3]

Q. 6.

(a) What sum of money will amount to Rs. 3630 in two years at 10% p.a. compound interest? [3]

(b) In the given figure, m∠PSR = 90°, PQ = 10 cm, QS = 6 cm, RQ = 9 cm. Calculate the length of PR. [3]



(c) The lengths of two parallel chords of a circle are 6 cm and 8 cm. If the smaller chord is at a distance 4 cm from the centre, what is the distance of the other chord from the centre? [4]

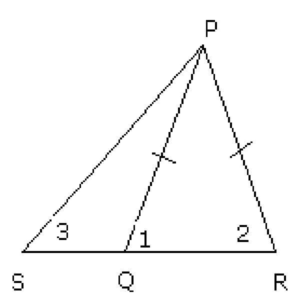
Q. 7.

(a) Calculate the mean and median of the following data: [3]

3, 1, 5, 6, 3, 4, 5, 3, 7, 2

(b) A room is 8 m long and 5 m broad. Find the cost of covering the floor of the room with 80 cm wide carpet at the rate of Rs. 22.50 per metre. [3]

(c) In the figure, Q is a point on side of ΔPSR such that PQ = PR. Prove that PS > PQ. [4]



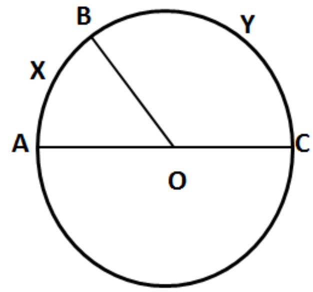
Q. 8.

(a) A small indoor greenhouse (herbarium) is made entirely of glass panes (including the base) held together with tape. It is 30 cm long, 25 cm wide and 25 cm high. [4]

i. What is the area of the glass?

ii. How much of tape is needed for all the 12 edges?

(b) In the given figure, AOC is the diameter of the circle, with centre O. If arc AXB is half of arc BYC, find ∠BOC. [3]



(c) The ages (in years) of 360 patients treated in a hospital on a particular day are given below. [3]

Age in years	10-20	20-30	30-40	40-50	50-60	60-70
Number of patients	90	40	60	20	120	30

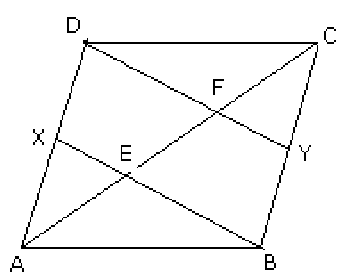
Draw a histogram and a frequency polygon on the same graph to represent the above data.

Q. 9.

(a) If $2\cos^2\theta \sin\theta - 2 = 0$ and $0° \leq \theta \leq 90°$; find the value of θ. [3]

(b) If $p^{\frac{1}{x}} = p^{\frac{1}{y}} = p^{\frac{1}{z}}$ and pqr = 1, prove that x + y + z = 0 [3]

(c) In the given figure, ABCD is a parallelogram in which X and Y are the midpoints of AD and BC respectively, Prove that: AE = EF = FC. [4]



Q. 10.

(a) If $\frac{2\sqrt{7}+3\sqrt{5}}{\sqrt{7}+\sqrt{5}} = P\sqrt{35}+Q$, then what is the value of 2P + Q? [3]

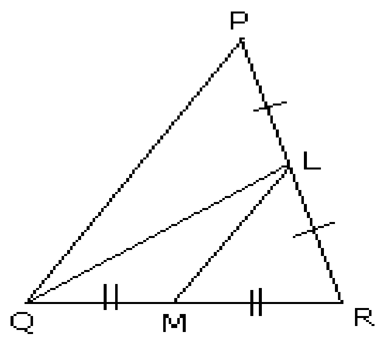
(b) Given 3 cos A – 4 sin A = 0; evaluate without using tables: $\frac{\sin A + 2\cos A}{3\cos A - \sin A}$ [4]

(c) If $a + \frac{1}{a} = 4$, find the value of i. $a^2 + \frac{1}{a^2}$ ii. $a^4 + \frac{1}{a^4}$ [3]

Q. 11.

(a) Show that a median divides a triangle into two triangles of equal areas. [4]

(b) In the given figure, area of $\Delta PQR = 44.8 \text{ cm}^2$, PL = LR and QM = MR. Find the area of ΔLMR. [3]



(c) Factorize: $x^3 - 3x^2 - x + 3$ [3]

Solution

SECTION – A (40 Marks)

Q. 1.

(a) Here,

$C.I. = Rs.\ 287,\ r = 5\%\ p.a.,\ n = 2$ years

$$C.I. = P\left[\left(1+\frac{r}{100}\right)^n - 1\right] = 287$$

$$\Rightarrow P\left[\left(1+\frac{5}{100}\right)^2 - 1\right] = 287$$

$$\Rightarrow P\left[\left(\frac{105}{100}\right)^2 - 1\right] = 287$$

$$\Rightarrow P\left[\left(\frac{21}{20}\right)^2 - 1\right] = 287$$

$$\Rightarrow P\left[\frac{441}{400} - 1\right] = 287$$

$$\Rightarrow P\left[\left(\frac{441-400}{400}\right)\right] = 287$$

$$\Rightarrow P\times\frac{41}{400} = 287$$

$$\Rightarrow P = \frac{287\times 400}{41} = 2800$$

Thus P = Rs. 2,800

(b) Let us assume that $\sqrt{2}$ is a rational number.

Then, $\sqrt{2} = \frac{p}{q}$ ....(1)

Where p and q are integers, co-prime to each other and $q \neq 0$.

On squaring both sides, we get

$2 = \frac{p^2}{q^2} \Rightarrow p^2 = 2q^2$ ....(2)

By equation (2), we can say that p^2 is an even integer.

$\therefore$ p is also an even integer ($\because$ the square of an even integer is always even)

Let p = 2k, where k is an integer.

From (2),

$p^2 = 2q^2$

$(2k)^2 = 2q^2$

$4k^2 = 2q^2$

$\Rightarrow q^2 = 2k^2$

q^2 is an even integer, q is also an even integer.

Thus, p and q have a common factor 2 which contradicts the hypothesis that p, q are co-prime to each other.

$\therefore \sqrt{2}$ is an irrational number.

(c)

$$\frac{\cos 37^o.\text{cosec}53^o}{\tan 5^o.\tan 25^o.\tan 45^o.\tan 65^o.\tan 85^o}$$

$$= \frac{\cos 37^o.\text{cosec}(90^o - 37^o)}{\tan 5^o.\tan 25^o.\tan 45^o.\tan(90^o - 25^o).\tan(90^o - 5^o)}$$

$$= \frac{\cos 37^o.\sec 37^o}{\tan 5^o.\tan 25^o.\tan 45^o.\cot 25^o.\cot 5^o} \quad \left[\begin{array}{l}\because \text{cosec}(90^o - \theta) = \sec\theta \\ \tan(90^o - \theta) = \cot\theta\end{array}\right]$$

$$= \frac{1}{\tan 5^o.\cot 5^o.\tan 25^o.\cot 25^o.1} \quad \left[\begin{array}{l}\because \sec\theta = \dfrac{1}{\cos\theta} \\ \tan 45^o = 1\end{array}\right]$$

$$= \frac{1}{1} \quad \left[\because \cot\theta = \frac{1}{\tan\theta}\right]$$

$$= 1$$

Q. 2

(a) In ΔABD and ΔBCD

$m\angle A = m\angle C = 90°$

AB = DC [Given]

BD = BD [Common]

$\Delta ABD \cong \Delta CDB$ [R.H.S.]

$\Rightarrow \angle CBD = \angle ADB$ [C.P.C.T.]

$\therefore \angle CBD = x° = 50°$

Also, BC = AD [C.P.C.T.]

$\Rightarrow 3y - 20 = y - 10$

$\Rightarrow 3y - y = 20 - 10$

$\Rightarrow 2y = 10$

$\Rightarrow y = 5$ cm

(b) $2\log 3 - \frac{1}{2}\log 16 + \log 12 = \log 3^2 - \log(16)^{\frac{1}{2}} + \log 12$

$= \log 9 - \log 4 + \log 12$

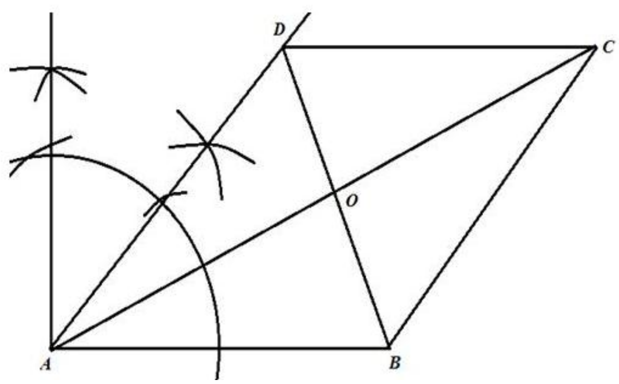
$= \log \frac{9 \times 12}{4}$

$= \log 27$

(c) Steps of construction for constructing parallelogram:

1) Draw a line AB of measure 6 cm.
2) Draw an angle of measure 45° at point A such that ∠DAB = 45° and AD = 5 cm.
3) Now draw a line CD parallel to line AB of measure 6 cm.
4) Join BC. Join diagonals AC and BD. Let them intersect at O.

Thus, ABCD is the required parallelogram.



Q. 3.

(a)

$$\left(\frac{8}{27}\right)^{-\frac{2}{3}} - \left(\frac{1}{3}\right)^{-2} - (7)^0 = \left[\left(\frac{2}{3}\right)^3\right]^{-\frac{2}{3}} - \left(\frac{1}{3}\right)^{-2} - 1 \qquad [\text{Since } a^\circ = 1]$$

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

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

$$= \frac{9}{4} - 9 - 1$$

$$= \frac{9}{4} - 10$$

$$= \frac{9 - 40}{4}$$

$$= \frac{-31}{4}$$

(b) Given, (2a + b, a − 2b) = (7, 6)

$\Rightarrow 2a + b = 7$ ....(1)

$a - 2b = 6$ ....(2)

Multiplying equation (1) by 2, we get

$4a + 2b = 14$ ....(3)

Adding equations (2) and (3), we get

$5a = 20$

$\Rightarrow a = 4$

Substituting $a = 4$ in equation (1), we get

$2(4) + b = 7$

$\Rightarrow b = -1$

$\therefore a = 4$ and $b = -1$

(c) Let $A \equiv (0, 0)$, $B \equiv (5, 0)$, $C \equiv (8, 4)$ and $D \equiv (3, 4)$

$AB = \sqrt{(5-0)^2 + (0-0)^2} = \sqrt{25+0} = 5$

$BC = \sqrt{(8-5)^2 + (4-0)^2} = \sqrt{9+16} = \sqrt{25} = 5$

$CD = \sqrt{(8-3)^2 + (4-4)^2} = \sqrt{25+0} = 5$

$DA = \sqrt{(0-3)^2 + (0-4)^2} = \sqrt{9+16} = \sqrt{25} = 5$

$AC = \sqrt{(8-0)^2 + (4-0)^2} = \sqrt{64+16} = \sqrt{80} = 4\sqrt{5}$

$BD = \sqrt{(3-5)^2 + (4-0)^2} = \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$

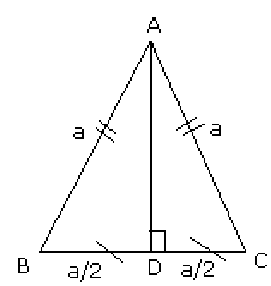
Now, AB = BC = CD = DA and AC $\neq$ BD.

Hence, ABCD is a rhombus.

$\therefore$ Area of rhombus $= \frac{1}{2} \times AC \times BD = \frac{1}{2} \times 4\sqrt{5} \times 2\sqrt{5} = 20$ sq. units

Q. 4.

(a) Given side of an equilateral triangle = a



Let, $AD \perp DC$ $\therefore BD = DC = \frac{a}{2}$

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

$$a^2 = AD^2 + \left(\frac{a}{2}\right)^2 \Rightarrow AD^2 = a^2 - \frac{a^2}{4} = \frac{3a^2}{4} \Rightarrow AD = \frac{a\sqrt{3}}{2}$$

Now, Area of $\Delta ABC = \frac{1}{2} \times \text{Base} \times \text{height} = \frac{1}{2} \times BC \times AD = \frac{1}{2} \times a \times \frac{a\sqrt{3}}{2} = \frac{\sqrt{3}}{4} a^2$

(b) We know, each exterior angle = $\frac{360^o}{n}$

$$\therefore \frac{360^o}{n} - \frac{360^o}{n+2} = 6$$

$$\Rightarrow 360^o\left[\frac{n+2-n}{n(n+2)}\right] = 6$$

$$\Rightarrow \frac{360^o \times 2}{n^2+2n} = 6$$

$$\Rightarrow n^2+2n = \frac{360^o \times 2}{6}$$

$$\Rightarrow n^2+2n = 120$$

$$\Rightarrow n^2+2n-120 = 0$$

$$\Rightarrow n^2+12n-10n-120 = 0$$

$$\Rightarrow n(n+12)-10(n+12) = 0$$

$$\Rightarrow (n+12)(n-10) = 0$$

$$\Rightarrow n = -12 \text{ or } n = 10$$

Neglecting n = −12 as number of sides cannot be negative.

$\therefore$ n = 10

Thus, number of sides are 10.

(c) $\frac{4}{\tan^2 60^o} + \frac{1}{\cos^2 30^o} - \tan^2 45^o$

$= \frac{4}{(\sqrt{3})^2} + \frac{1}{(\sqrt{3}/2)^2} - (1)^2$

$= \frac{4}{3} + \frac{4}{3} - 1$

$= \frac{5}{3}$

SECTION – B (40 Marks)

Q. 5

(a) $3x - 5y + 1 = 0$

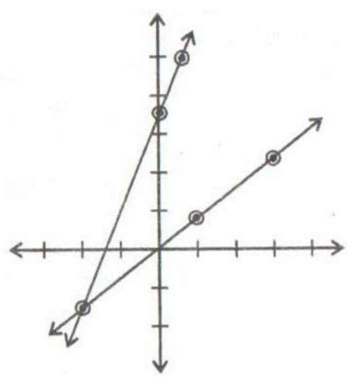
$\Rightarrow y = \frac{3x+1}{5}$

x	1	3	–2
y	0.8	2	–1

And $2x - y + 3 = 0$

$\Rightarrow y = 2x + 3$

x	0	1	-1
y	3	5	1



From the graph, we find that the two lines intersect at the point $(-2, -1)$

Therefore, the solution is $x = -2, y = -1$

(b) Let his starting salary be Rs. x and the fixed annual increment be Rs. y

Salary after 4 years = $x + 4y$

According to question,

$x + 4y = 1500$ ....(i)

And salary after 10 years = $x + 10y$

$\Rightarrow x + 10y = 1800$ ....(ii)

Subtracting (i) from (ii), we get

$6y = 300$

$\Rightarrow y = 50$

Substituting the value of y in (i), we get

$x + 4y = 1500$

$\Rightarrow x + 4 \times 50 = 1500$

$\Rightarrow x = 1300$

$\therefore$ Starting salary = Rs. 1300 and Annual increment = Rs. 50

(c)

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

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

Therefore,

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

$$=3+2\sqrt{2}-6+\frac{1}{3+2\sqrt{2}}$$

$$=3+2\sqrt{2}-6+3-2\sqrt{2}$$

$$=0$$

Q. 6.

(a) Let the sum be Rs. P, A = Rs. 3630, r = 10%, n = 2 years

We know that,

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

$$\Rightarrow 3630=P\left(1+\frac{10}{100}\right)^2$$

$$\Rightarrow 3630=P\left(\frac{110}{100}\right)^2$$

$$\Rightarrow P=\frac{3630\times 10\times 10}{11\times 11}$$

$$\Rightarrow P=\text{Rs. }3000$$

(b) In right ΔPQS,

$PS^2+QS^2=PQ^2$ [By Pythagoras theorem]

$$\Rightarrow PS^2=(10)^2-(6)^2=100-36=64$$

$$\Rightarrow PS=8\text{ cm}$$

$$\therefore RS = RQ + QS = 9 + 16 = 15\text{ cm}$$

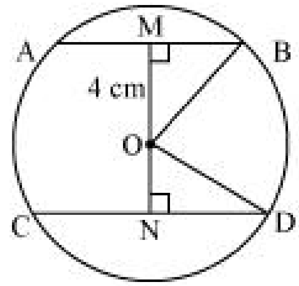
Now in ΔPSR,

$$\Rightarrow PR^2=PS^2+RS^2$$

$$\Rightarrow PR^2=(8)^2+(15)^2=64+225=289$$

$$\Rightarrow PR=17\text{cm}$$

(c) Consider the following figure:



Distance of smaller chord AB from centre of circle = 4 cm

i.e., OM = 4 cm

$MB = \frac{AB}{2} = \frac{6}{2} = 3$ cm

In ΔOMB,

$OM^2 + MB^2 = OB^2$

$\therefore 4^2 + 3^2 = OB^2$

$\therefore 16 + 9 = OB^2$

$\therefore OB^2 = 25$

$\therefore OB = \sqrt{25} = 5$ cm

In ΔOND,

$OD = OB = 5$ cm ....(radii of the same circle)

$ND = \frac{CD}{2} = \frac{8}{2} = 4$ cm

$ON^2 + ND^2 = OD^2$

$\therefore ON^2 = OD^2 - ND^2$

$\therefore ON^2 = 5^2 + 4^2 = 25 - 16 = 9$

$\therefore ON = \sqrt{9} = 3$ cm

Q. 7.

(a) Arranging the numbers in ascending order:

1, 2, 3, 3, 3, 4, 5, 5, 6, 7

Number of terms = n = 10 (even)

$\therefore$ Mean = $\frac{1 + 2 + 3 + 3 + 3 + 4 + 5 + 5 + 6 + 7}{10} = \frac{39}{10} = 3.9$

And median = $\frac{5^{th}\text{ term} + 6^{th}\text{ term}}{2} = \frac{3+4}{2} = \frac{7}{2} = 3.5$

(b) Area of room = (8×5) m^2 = 40 m^2

Let the length of carpet be ‘x’ m.

Area of carpet = $l \times b = \left(x \times \frac{80}{100}\right) = 0.80x$ m^2

Area of carpet = Area of floor

$\Rightarrow 0.80x = 40$

$\Rightarrow x = \frac{40}{80} \times 100 = 50$ m

$\therefore$ Cost of carpet = $50 \times$ Rs. 22.50 = Rs. 1125

(c) PR = PQ [Given]

$\Rightarrow \angle 1 = \angle 2$ [angles opposite to equal sides]

$\because$ Exterior angle of a triangle is greater than any one of the interior opposite angles.

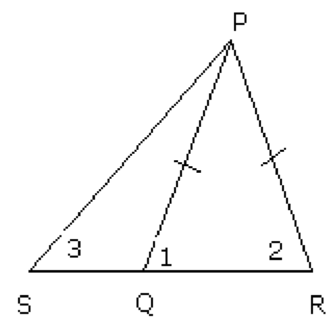
$\therefore \angle 1 > \angle 3$

$\Rightarrow \angle 2 > \angle 3$ [$\because \angle 1 = \angle 2$]

In ΔPSR, $\angle R > \angle S$

$\Rightarrow$ PS > PR [sides opposite to greater angle is longer]

$\Rightarrow$ PS > PQ [$\because$ PR = PQ]



Q. 8.

(a) Length (l) of the greenhouse = 30 cm

Breadth (b) of the greenhouse = 25 cm

Height (h) of the greenhouse = 25 cm

i. Total surface area of the greenhouse = 2[lb + lh + bh]

$= [2(30 \times 25 + 30 \times 25 + 25 \times 25)]$

$= [2(750 + 750 + 625)]$

$= (2 \times 2125)$

$= 4250$ cm^2

Thus, the area of the glass is 4250 cm^2.

ii. Total length of tape = 4(l + b + h)

$= [4(30 + 25 + 25)]$ cm

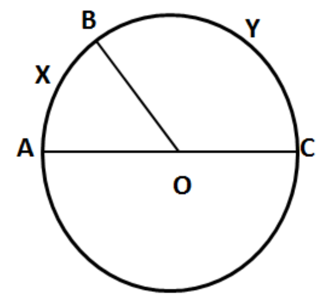
$= 320$ cm

Thus, 320 cm of tape is required for all the 12 edges.

(b) Given,

1. AOC is the diameter

2. Arc AXB = $\frac{1}{2}$ Arc BYC



From Arc AXB = $\frac{1}{2}$ Arc BYC we can see that

Arc AXB : Arc BYC = 1: 2

$\Rightarrow \angle BOA : \angle BOC = 1 : 2$

Since AOC is the diameter of the circle,

hence, $\angle AOC = 180^o$

Now,

Assume that $\angle BOA = x^o$ and $\angle BOC = 2x^o$

$\angle AOC = \angle BOA + \angle BOC = 180^o$

$\Rightarrow$ x + 2x = 180

$\Rightarrow 3x = 180$

$\Rightarrow$ x = 60

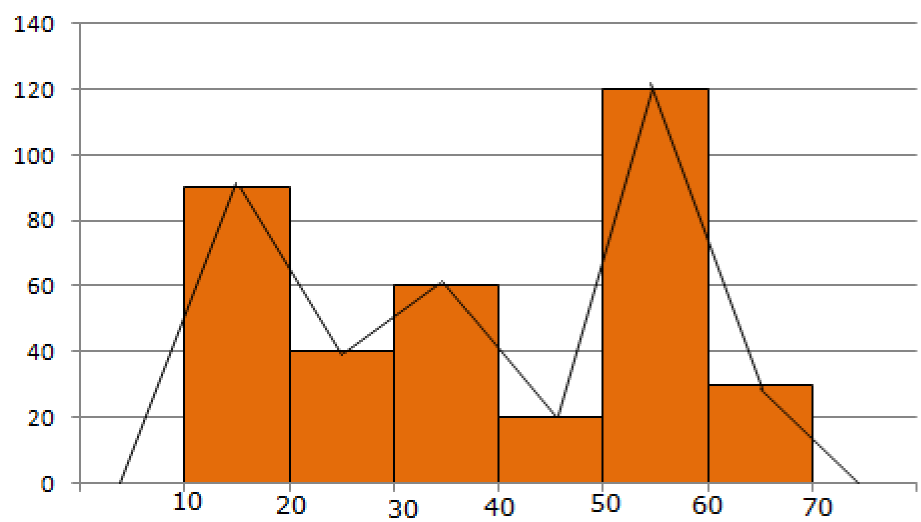
Hence $\angle BOA = 60^o$ and $\angle BOC = 120^o$

(c)

Age in years	10-20	20-30	30-40	40-50	50-60	60-70
Number of patients	90	40	60	20	120	30

Take class intervals i.e. age in years along x-axis and number of patients of width equal to the size of the class intervals and height equal to the corresponding frequencies to get the required histogram.

In order to draw frequency polygon, we take imaginary intervals 0-10 at the beginning and 70-80 at the end each with frequency zero and join the mid-points of top of the rectangles. Thus, we obtain a complete frequency polygon, shown below:



Q. 9.

(a)

$$2\cos^2\theta + \sin\theta - 2 = 0$$
$$\Rightarrow 2\cos^2\theta + \sin\theta = 2$$
$$\Rightarrow \sin\theta = 2 - 2\cos^2\theta$$
$$\Rightarrow \sin\theta = 2(1 - \cos^2\theta)$$
$$\Rightarrow \sin\theta = 2 \times \sin^2\theta$$
$$\Rightarrow \frac{\sin^2\theta}{\sin\theta} = \frac{1}{2}$$
$$\Rightarrow \sin\theta = \frac{1}{2}$$
$$\Rightarrow \sin\theta = \sin 30^\circ$$
$$\Rightarrow \theta = 30^\circ$$

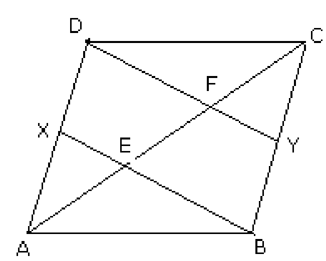
(b) Assume $p^{\frac{1}{x}} = p^{\frac{1}{y}} = p^{\frac{1}{z}} = k$

$$\Rightarrow p^{\frac{1}{x}} = k, p^{\frac{1}{y}} = k, p^{\frac{1}{z}} = k$$
$$\Rightarrow p = k^x, q = k^y, r = k^z$$

Also, $pqr = 1$

$$\Rightarrow k^x \times k^y \times k^z = 1$$
$$\Rightarrow k^{x+y+z} = k^0$$
$$\Rightarrow x + y + z = 0$$

(c) From the given figure,



$XD = \frac{1}{2}AD$ ($\because$ X is the midpoint of AD)

And $BY = \frac{1}{2}BC$ ($\because$ Y is the midpoint of BC)

$\therefore$ XD = BY (as AD = BC opposite sides of ||gm)

Also, XD || BY ($\because$ AD || BC opp. Sides of ||gm)

$\therefore$ XBYD is a parallelogram (Opposite sides are equal and parallel)

In ΔAFD, X is the midpoint of AD and XE || DF

$\therefore$ E is the midpoint of AF

$\therefore$ AE = EF ---- (i)

Now in ΔCEB, Y is the midpoint of BC and YF || BE.

$\therefore$ F is the midpoint of CE

$\therefore$ EF = FC ---- (ii)

From (i) and (ii)

AE = EF = FE [Hence proved]

Q. 10.

(a)

$$\frac{2\sqrt{7}+3\sqrt{5}}{\sqrt{7}+\sqrt{5}}$$

$$= \frac{2\sqrt{7}+3\sqrt{5}}{\sqrt{7}+\sqrt{5}} \times \frac{\sqrt{7}-\sqrt{5}}{\sqrt{7}-\sqrt{5}}$$

$$= \frac{14-2\sqrt{35}+3\sqrt{35}-15}{\left(\sqrt{7}\right)^2-\left(\sqrt{5}\right)^2} \qquad \left[\because (a+b)(a-b)=a^2-b^2\right]$$

$$= \frac{\sqrt{35}-1}{7-5}$$

$$= \frac{\sqrt{35}-1}{2}$$

$$= \frac{1}{2}\sqrt{35}-\frac{1}{2}$$

On comparing this with $P\sqrt{35}+Q$, $P=\frac{1}{2}$ and $Q=\frac{-1}{2}$

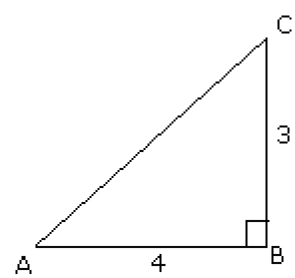
$$\therefore 2P+Q = 2\times\frac{1}{2}+\left(\frac{-1}{2}\right) = 1-\frac{1}{2} = \frac{1}{2}$$

(c) 3 cos A – 4 sin A = 0

$\Rightarrow 3\cos A = 4\sin A$

$\Rightarrow \frac{\sin A}{\cos A} = \frac{3}{4}$

$\Rightarrow \tan A = \frac{3}{4}$



By Pythagoras theorem,

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

$= 4^2 + 3^2$

$= 16 + 9 = 25$

$\Rightarrow AC = \sqrt{25} = 5$

$\sin A = \frac{BC}{AC} = \frac{3}{5}$

$\cos A = \frac{AB}{AC} = \frac{4}{5}$

$$\therefore \frac{\sin A+2\cos A}{3\cos A-\sin A} = \frac{\frac{3}{5}+2\times\frac{4}{5}}{3\times\frac{4}{5}-\frac{3}{5}} = \frac{\frac{3}{5}+\frac{8}{5}}{\frac{12}{5}-\frac{3}{5}} = \frac{\frac{11}{5}}{\frac{11}{9}} = \frac{9}{5}$$

(c) i. $a + \frac{1}{a} = 4$,

On squaring, we get

$a^2 + \frac{1}{a^2} + 2 = 16$

$\Rightarrow a^2 + \frac{1}{a^2} = 16 - 2 = 14$

ii. By part (i), we have $a^2 + \frac{1}{a^2} = 14$

On squaring, we get

$\Rightarrow a^4 + \frac{1}{a^4} + 2 = 196$

$\Rightarrow a^4 + \frac{1}{a^4} = 196 - 2 = 194$

Q. 11.

(a) Given: In ΔABC, AD is the median

To prove: Area of ΔABD = Area of ΔADC

Construction: We draw AE ⊥ BC

Proof:

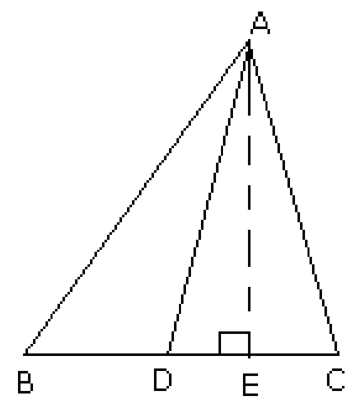
Area of ΔABD = $\frac{1}{2} \times BD \times AE$ [$\because$ Area $= \frac{1}{2} \times$ base $\times$ height]

Similarly, area of ΔADC = $\frac{1}{2} \times DC \times AE$

Here, we have BD = DC

$\therefore$ Area of ΔABD = Area of ΔADC

Hence proved.



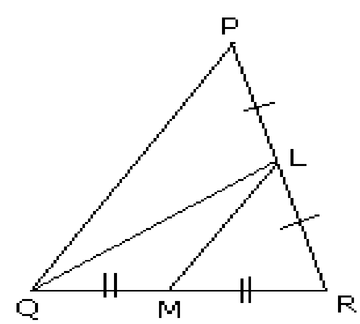
(b) Given, Area of ΔPQR = 44.8 cm^2

Since QL is the median and Median divides triangle into two triangles of equal areas

Area of ΔLQR = Area of ΔPQL = 22.4 cm^2

In ΔQLR, LM is the median,

Area of ΔLMR = $\frac{1}{2} \times 22.4 = 11.2 cm^2$



(c) $x^3 - 3x^2 - x + 3$

$= x^2 (x - 3) - 1(x - 3)$

$= (x - 3)(x^2 - 1)$

$= (x - 3)(x - 1)(x + 1)$