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SAMPLE PAPER TEST 02 FOR ANNUAL EXAM 2025

(ANSWERS)

SUBJECT: MATHEMATICS **MAX. MARKS : 80**

CLASS : IX **DURATION : 3 HRS**

General Instruction:

1. This Question Paper has 5 Sections A-E.
2. **Section A** has 20 MCQs carrying 1 mark each.
3. **Section B** has 5 questions carrying 02 marks each.
4. **Section C** has 6 questions carrying 03 marks each.
5. **Section D** has 4 questions carrying 05 marks each.
6. **Section E** has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION – A

Questions 1 to 20 carry 1 mark each.

1. The value of $\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}$ is equal to

(a) $\sqrt{2}$ (b) 2 (c) 4 (d) 8

Ans: (b) 2

$$\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}=\frac{4\sqrt{2}+4\sqrt{3}}{2\sqrt{2}+2\sqrt{3}}=\frac{4(\sqrt{2}+\sqrt{3})}{2(\sqrt{2}+\sqrt{3})}=\frac{4}{2}=2$$

$\therefore$ Correct option is (b).

2. $\left(-\frac{1}{27}\right)^{\frac{-2}{3}}$ is equal to

(a) $8\left(\frac{1}{27}\right)^{\frac{-2}{3}}$ (b) 9 (c) $\frac{1}{9}$ (d) $27\sqrt{27}$

Ans: (b) 9

$$\left(\frac{-1}{27}\right)^{\frac{-2}{3}}=\left(\frac{-1}{3^3}\right)^{\frac{-2}{3}}=(-1)^{\frac{-2}{3}}\times(3^{-3})^{\frac{-2}{3}}$$

$$=\left\{(-1)^2\right\}^{\frac{-1}{3}}\times 3^2=1\times 9=9$$

$\therefore$ Correct option is (b).

3. The value of √10 times √15 is equal to

(a) 5√6 (b) √25 (c) 10√5 (d) √5

Ans: (a) 5√6

√10×√15 =(√2.√5)×(√3. √5) = (√5 × √5) (√2 × √3) = 5√6.

4. The simplified form of $13^{\frac{1}{5}}\div 13^{\frac{1}{3}}$ is

(a) $13^{\frac{2}{15}}$ (b) $13^{\frac{8}{15}}$ (c) $13^{\frac{-1}{15}}$ (d) $13^{\frac{-2}{15}}$

Ans: (d) $13^{\frac{-2}{15}}$

$$\frac{13^{\frac{1}{5}}}{13^{\frac{1}{3}}} = 13^{\frac{1}{5}}.13^{-\frac{1}{3}} = 13^{\frac{1}{5}-\frac{1}{3}} = 13^{-\frac{2}{15}}$$

$\therefore$ Correct option is (*d*).

5. Factors of $x^2 + 11x + 18$ are
(a) (x + 9) (x – 2) (b) (x – 9) (x – 2)
(c) (x – 9) (x + 2) (d) (x + 9) (x + 2)
Ans: (d) (x + 9) (x + 2)

6. If (2x + 5) is a factor of $2x^2 – k$, then value of k is
(a) 2 (b) – 1 (c) 25 (d) 25/2
Ans: (d) 25/2

7. The points (2, –1), (6, –5) and (–3, –2)
(a) lie in the I quadrant. (b) lie in the II quadrant.
(c) lie in the IV quadrant. (d) do not lie in the same quadrant.
Ans: (d) do not lie in the same quadrant.
Points (2, –1) and (6, –5) lie in the fourth quadrant. But the point (–3, –2) lie in the third quadrant. Thus, the given points do not lie in the same quadrant.

8. Perpendicular distance of the point P(–3, 8) from y-axis is
(a) –3 (b) 8 (c) 3 (d) –8
Ans: (c) 3

9. If point (3, 0) lies on the graph of the equation 2x + 3y = k, then the value of k is
(a) 6 (b) 3 (c) 2 (d) 5
Ans: (a) 6
On putting x = 3 and y = 0 in the equation 2x + 3y = k, we have
2 × 3 + 3 × 0 = k
⇒ 6 + 0 = k ⇒ k = 6

10. The graph of the linear equation 3x + 5y = 15 cuts the x-axis at the point
(a) (5, 0) (b) (3, 0) (c) (0, 5) (d) (0, 3)
Ans: (a) (5, 0)
At x-axis, y = 0
On putting y = 0 in 3x + 5y = 15, we have
⇒ 3x + 5 × 0 = 15 ⇒ 3x = 15 ⇒ x = 5

11. Any solution of the linear equation 2x + 0y = 9 in two variables, is of the form
(a) $\left(\frac{9}{2}, 0\right)$ (b) $\left(\frac{9}{2}, n\right)$, n is a real number
(c) $\left(n, \frac{9}{2}\right)$, n is a real number (d) $\left(0, \frac{9}{2}\right)$
Ans: (b) $\left(\frac{9}{2}, n\right)$, n is a real number

12. Aditya was given a riddle by Pragya who stated that an angle is 24° less than its complementary angle. The angle's measure is:
(a) 36° (b) 33° (c) 66° (d) 57°
Ans. (b) 33°
Let the angle be x. Its complementary angle = x + 24°
⇒ x + x + 24° = 90°
⇒ 2x = 90° – 24° ⇒ 2x = 66° ⇒ x = 33°

13. If the ratio of two co-interior angles on the same side of the transversal is 7 : 8, the bigger angle of the two angles is:

(a) 54° (b) 100° (c) 96° (d) 84°

Ans. (c) 96°

Let the angles be 7x and 8x

Sum of co-interior angles is 180°

$\Rightarrow 7x + 8x = 180°$

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

Bigger angle is $8x = 8 \times 12° = 96°$

14. If $\Delta ACB \cong \Delta EDF$, then which of the following equations is/are true?

(I) AC = ED

(II) $\angle C = \angle F$

(III) AB = EF

(a) Only (I) (b) (I) and (III) (c) (II) and (III) (d) All of these

Ans. (b) (I) and (III)

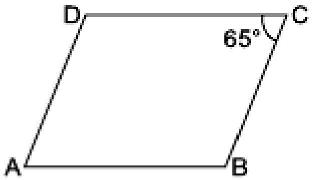
Since, $\Delta ACB \cong \Delta EDF$.

$\therefore$ AC = ED, CB = DF and AB = EF

And $\angle A = \angle E$, $\angle C = \angle D$ and $\angle B = \angle F$

Therefore, equations (I) and (III) are true.

15. In the given figure, ABCD is a parallelogram. If $\angle C = 65°$, then $(\angle B + \angle D)$ is equal to



(a) 180° (b) 115° (c) 155° (d) 230°

Ans. (d) 230°

Since ABCD is a parallelogram, so opposite angles are equal. Thus, $\angle B = \angle D$ and $\angle A = \angle C = 65°$.

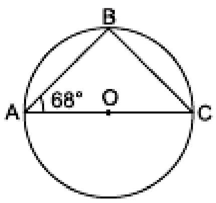
Using angle sum property of a quadrilateral, we have

$\angle A + \angle B + \angle C + \angle D = 360°$

$\Rightarrow 65° + \angle B + 65° + \angle D = 360°$

$\Rightarrow \angle B + \angle D = 360° - 130° = 230°$

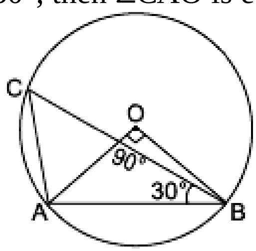
16. In the given figure, O is centre of the circle, $\angle BAO = 68°$, AC is diameter of the circle, then measure of $\angle BCO$ is



(a) 22° (b) 33° (c) 44° (d) 68°

Ans: (a) 22°

17. In figure, $\angle AOB = 90°$ and $\angle ABC = 30°$, then $\angle CAO$ is equal to



(a) 30° (b) 45° (c) 90° (d) 60°

Ans: We have ∠ACB = $\frac{1}{2}$∠AOB = $\frac{1}{2}$ × 90° = 45°

Using angle sum property of triangle in ΔCAB, we get

∠CAB = 105°

Since OA = OB (u2235 Radii of the circle)

⇒ ∠OBA = ∠OAB

Using angle sum property of triangle in u2206AOB, we get ∠OAB = 45°

Now, ∠CAO = ∠CAB – ∠OAB

= 105° – 45° = 60°

∴ Correct option is (d).

18. The length of each side of an equilateral triangle having an area of $9\sqrt{3}$ cm^2 is

(a) 8 cm (b) 36 cm (c) 4 cm (d) 6 cm

Ans: (d) 6 cm

$$\frac{\sqrt{3}}{4}a^2 = 9\sqrt{3} \Rightarrow a = 6cm$$

DIRECTION: In the question number 19 and 20, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**.

Choose the correct option

(a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

(c) Assertion (A) is true but Reason (R) is false.

(d) Assertion (A) is false but Reason (R) is true.

19. Assertion (A): 2 + √3 is an irrational number.

Reason (R): Sum of a rational number and an irrational numbers is always an irrational number.

Ans: (a) Both A and R are true and R is the correct explanation of A.

20. Assertion (A): If the diagonal of a parallelogram are equal, then it is a rectangle.

Reason (R): The diagonals of parallelogrom bisect each other at right angles.

Ans. (c) Assertion (A) is true but reason (R) is false.

A rectangle is a parallelogrom whose diogonals are equal and bisect each other. Here, only Assertian is true.

SECTION – B

Questions 21 to 25 carry 2 marks each.

21. Express $0.12\overline{3}$ in the form p/q where p and q are integers where q ≠ 0.

Ans: Let x = $0.12\overline{3}$ = 0.1233… … (i)

Multiplying both sides by 10, we get

10x = $0.12\overline{3}$ × 10 =1.233... ... (ii)

Multiplying both sides by 100, we get

100x = $0.12\overline{3}$ × 100 =12.333... … (iii)

Multiplying both sides by 1000, we get

1000x = $0.12\overline{3}$ × 1000 = 123.333..... (iv)

Subtract eq. (iii) from eq. (iv), we get

1000x – 100x = 123.333... – 12.333...

900x = 111

x = 111/900 = 37/300

OR

Find the value of x for which $\left(\frac{3}{4}\right)^6 \times \left(\frac{16}{9}\right)^5 = \left(\frac{4}{3}\right)^{x+2}$.

Ans:

Given $\left(\frac{3}{4}\right)^6 \times \left(\frac{16}{9}\right)^5 = \left(\frac{4}{3}\right)^{x+2}$

$\Rightarrow \left(\frac{4}{3}\right)^{-6} \times \left[\left(\frac{4}{3}\right)^2\right]^5 = \left(\frac{4}{3}\right)^{x+2}$

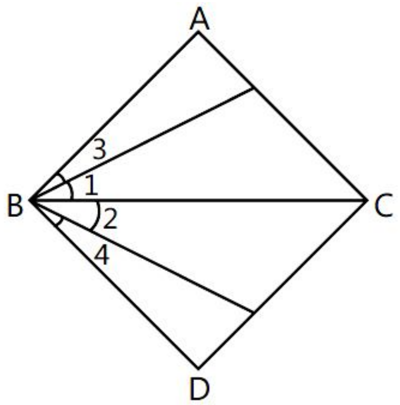
$\Rightarrow \left(\frac{4}{3}\right)^{-6} \times \left(\frac{4}{3}\right)^{10} = \left(\frac{4}{3}\right)^{x+2}$

$\Rightarrow \left(\frac{4}{3}\right)^{10-6} = \left(\frac{4}{3}\right)^{x+2}$

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

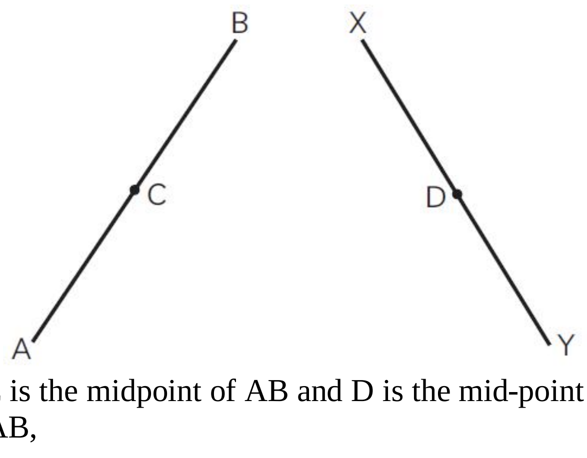
22. Find the distance of the following points from the *y*-axis: P(3, 0), Q(0, –3), R(22, –5), S(–3, –1).
Ans: Distance of the point from the *y*-axis is the *x*-coordinate of the given point. So, the distances of points P, Q, R and S from the *y*-axis are 3 units, 0 unit, 22 units and 3 units respectively.

23. In the given figure, we have ∠1 = ∠ 2, ∠ 3 = ∠ 4. Show that ∠ ABC = ∠ DBC. State the Euclid's axiom used.



Ans. Given, ∠ 1 = ∠ 2 and ∠ 3 = ∠4.
Using Euclid's second axiom, if equals are added to equals, then the wholes are equal.
Now, ∠ 1 + ∠ 3 = ∠ 2 + ∠4
⇒ ∠ABC = ∠DBC

24. In the figure, we have: AC = XD, C is the midpoint of AB and D is the mid-point of XY. Using an Euclid's axiom, show that AB = XY.



Ans. Given, AC = XD, C is the midpoint of AB and D is the mid-point of XY.
As C is the midpoint of AB,
∴ AB = 2AC

As D is the midpoint of XY,
∴ XY = 2XD
From Euclid's axiom, things that are double of same things are equal to one another
Hence, AB = XY

25. How many square metres of canvas is required for a conical tent whose height is 3.5 m and the radius of whose base is 12 m?
Ans: Given radius (r) of the base of the cone = 12 m and height (h) of the cone = 3.5 m
$\therefore$ Slant height (l) of the cone = $\sqrt{r^2+h^2} = \sqrt{(12)^2+(3.5)^2}$
$= \sqrt{144+12.25} = \sqrt{156.25} = 12.5m$ g
$\therefore$ Curved surface area of conical tent = πrl
$= \dfrac{22}{7} \times 12 \times 12.5 = 471.42$ m^2

OR

The diameters of two cones are equal. If their slant heights are in the ratio 7:4, find the ratio of their curved surface area.
Ans: Let diameter of both cones be *d*.
Let radius = $\dfrac{d}{2}$ = r (say)
$\therefore$ Let slant height of first cone be $7x$ and slant height of second cone be $4x$.
Let C_1 and C_2 be curved surface area of first and second cone respectively.
$\therefore \dfrac{C_1}{C_2} = \dfrac{\pi r\,(7x)}{\pi r\,(4x)} = \dfrac{7}{4}$
$\Rightarrow$ $C_1 : C_2 = 7 : 4$
$\therefore$ Ratio of their curved surface area = 7 : 4

SECTION – C

Questions 26 to 31 carry 3 marks each.

26. Find the value of $\dfrac{4}{(216)^{-\frac{2}{3}}} + \dfrac{1}{(256)^{-\frac{3}{4}}} + \dfrac{2}{(243)^{-\frac{1}{5}}}$
Ans:
$$\frac{4}{(216)^{-\frac{2}{3}}} + \frac{1}{(256)^{-\frac{3}{4}}} + \frac{2}{(243)^{-\frac{1}{5}}} = \frac{4}{(6^3)^{\frac{-2}{3}}} + \frac{1}{(2^8)^{-\frac{3}{4}}} + \frac{2}{(3^5)^{-\frac{1}{5}}}$$
$$= \frac{4}{6^{-3\times\frac{2}{3}}} + \frac{1}{2^{-8\times\frac{3}{4}}} + \frac{2}{3^{-5\times\frac{1}{5}}} = \frac{4}{6^{-2}} + \frac{1}{2^{-6}} + \frac{2}{3^{-1}}$$
$$= 4 \times 6^2 + 2^6 + 2 \times 3 = 4 \times 36 + 64 + 6$$
$$= 144 + 70 = 214$$

27. If $p(x) = x^2 - 4x + 3$, evaluate: $p(2) - p(-1) + p(½)$.
Ans: Given that, $p(x) = x^2 - 4x + 3$
$p(2) = (2)^2 - 4(2) + 3 = 4 - 8 + 3 = -4 + 3 = -1$
$p(-1) = (-1)^2 - 4(-1) + 3 = 1 + 4 + 3 = 8$
$p(½) = (½)^2 - 4(½) + 3 = ¼ - 2 + 3 = ¼ + 1 = 5/4$
Now, $p(2) - p(-1) + p(½) = -1 - 8 + (5/4)$
$= -9 + (5/4)$
$= (-36 + 5)/4 = -31/4$

28. For what value of p; $x = 2$, $y = 3$ is a solution of $(p + 1)x – (2p + 3)y – 1 = 0$?

(i) Write the equation.

(ii) Is this line passes through the point (–2, 3)? Give justification.

Ans: Given: $(p + 1)x – (2p + 3)y – 1 = 0$ ...(i)

Put $x = 2$ and $y = 3$ in (i), we get

$(p + 1)2 – (2p + 3)3 – 1 = 0$

$\Rightarrow 2p + 2 – 6p – 9 – 1 = 0$

$\Rightarrow –4p + 2 – 10 = 0$

$\Rightarrow –4p = 8$

$\Rightarrow p = –2$

(i) Substitute the value of p in (i), we get

$(–2 + 1)x – [2(–1) + 3]y – 1 = 0$

$\Rightarrow –x – y – 1 = 0$

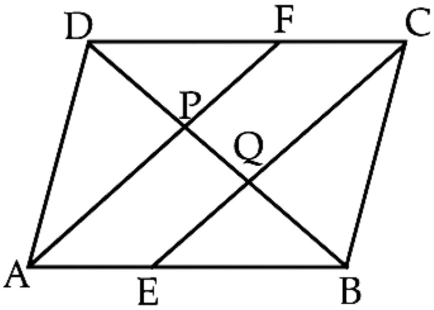
$\Rightarrow x + y + 1 = 0$ ...(ii)

(ii) Substitute $x = –2$ and $y = 3$ in L.H.S. of (ii), we have

L.H.S. $= –2 + 3 + 1 = 2 \neq$ R.H.S.

Hence, the line $x + y + 1 = 0$ will not pass through the point (–2, 3).

29. In the figure, ABCD is a parallelogram. E and F are the mid-points of sides AB and CD respectively. Show that the line segments AF and EC trisect the diagonal BD.



Ans. According to the question, E and F are the midpoints of sides AB and CD.

∴ AE = AB and CF = CD

In the parallelogram opposite sides are equal, so AB = CD

$\Rightarrow \frac{1}{2}AB = \frac{1}{2}CD$

∴ AE = CF

Again, AB || CD ⇒ AE || FC

Hence, AECF is a parallelogram.

In ΔABP, E is the mid-point of AB and EQ || AP.

∴ Q is the mid-point of BP. (By converse of mid-point theorem)

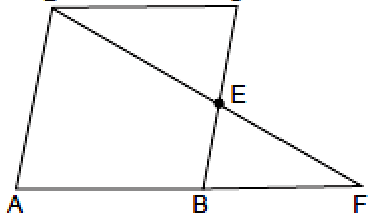
Similarly, P is the mid-point of DQ.

∴ DP = PQ = QB

∴ Line segments AF and EC trisect the diagonal BD.

OR

ABCD is a parallelogram and E is the mid-point of side BC. DE and AB on producing meet at F. Prove that AF = 2AB.



Ans: In ΔDCE and ΔBFE,

CE = EB (E is mid-point of BC)

∠DCE = ∠FBE (Alternate interior angles as CD | | AF)

∠DEC = ∠BEF (Vertically opposite angles)

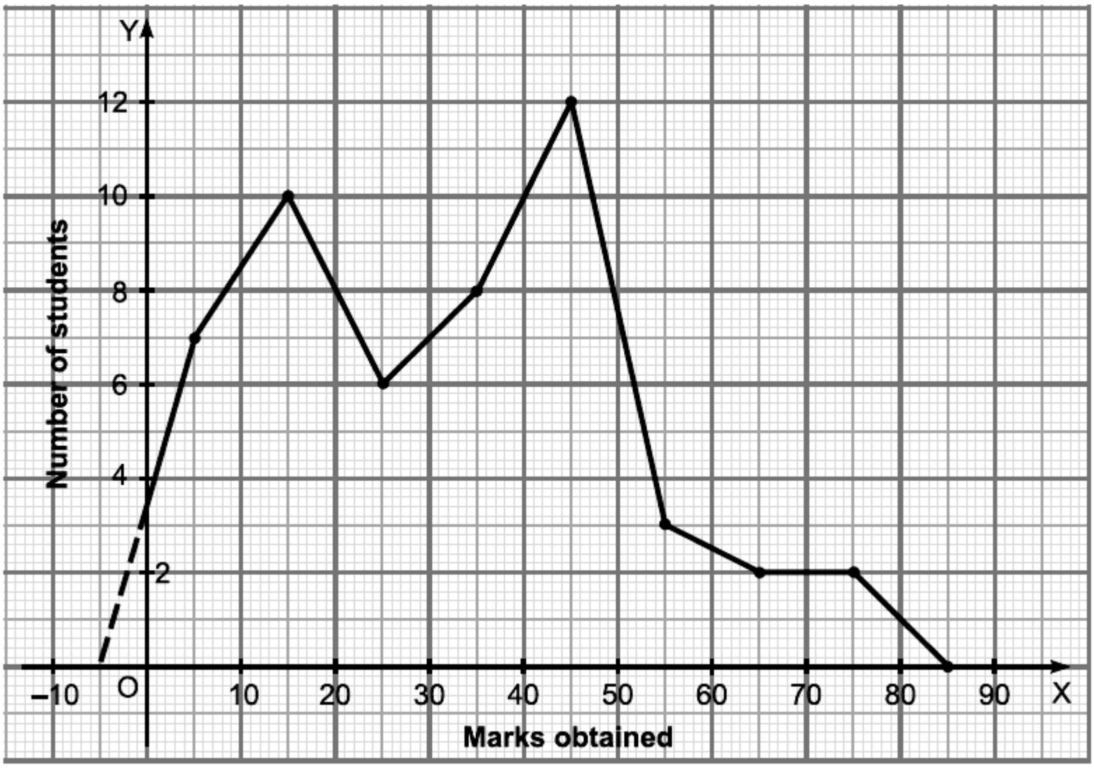
$\therefore$ ΔDCE $\cong$ ΔBFE (ASA congruence rule)
$\therefore$ DE = EF (CPCT)
$\Rightarrow$ E is mid-point of DF.
In ΔADF,
E is mid-point of DF. (Proved above)
and AD | | BE (As AD | | BC)
$\Rightarrow$ B is mid-point of AF. (By converse of mid-point theorem)
$\therefore$ AB = BF $\Rightarrow$ AF = 2AB

30. Draw a frequency polygon for the following distribution:

Marks	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
No. of marks	7	10	6	8	12	3	2	2

Ans.

x	***f***	***(x, f)***
5	7	(5, 7)
15	10	(15, 10)
25	6	(25, 6)
35	8	(35, 8)
45	12	(45, 12)
55	3	(55, 3)
65	2	(65, 2)
75	2	(75, 2)



31. The length of 40 leaves of a plant are measured correct to one millimetre, and the obtained data is represented in the following table:

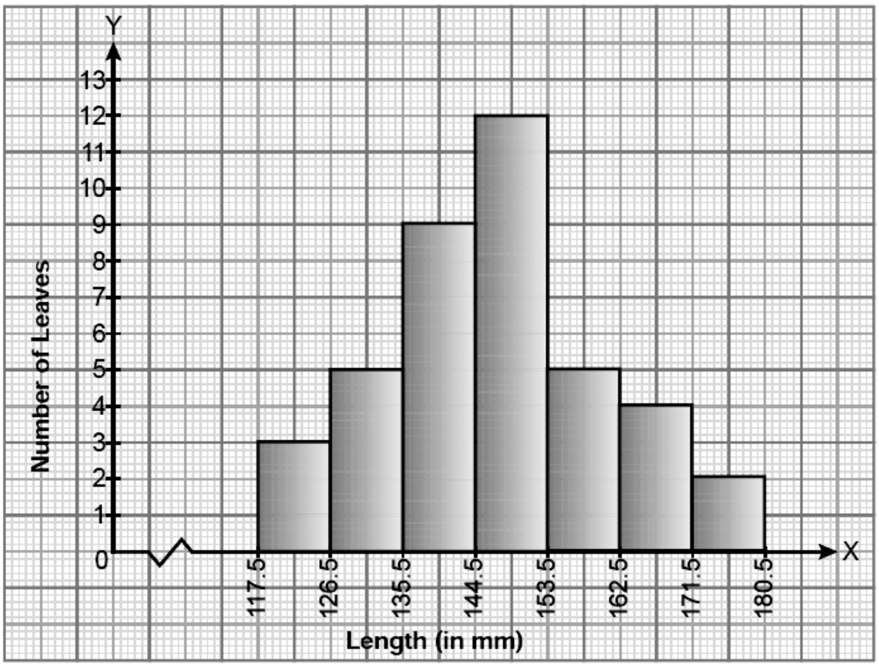
Length (in mm)	118–126	127–135	136–144	145–153	154–162	163–171	172–180
No. of leaves	7	10	6	8	12	3	2

Draw a histogram to represent the given data.
Ans.

Length (in mm)	**No. of leaves**
117.5 – 126.5	7
126.5 – 135.5	10
135.5 – 144.5	6
144.5 – 153.5	8

153.5 – 162.5	12
162.5 – 171.5	3
171.5 – 180.5	2

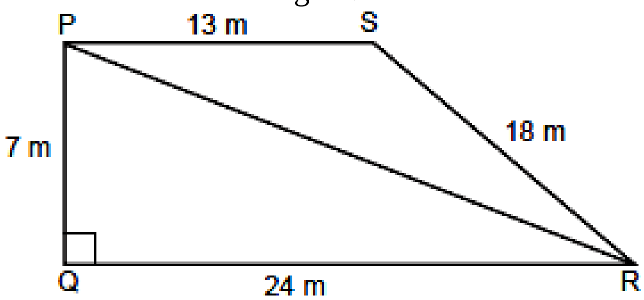
Consider the class 118 – 126 and 127 – 135
The lower limit of 127 – 135 = 127
The upper limit of 118 – 126 = 126
Half of the difference = (127 – 126)/2 = 0.5
So, the new class interval formed from 118 – 126 is
(118 – 0.5) – (126 + 0.5), i.e., 117.5 – 126.5
Continuing in the same manner, the continuous classes formed are:



SECTION – D

Questions 32 to 35 carry 5 marks each.

32. The students of a school staged a rally for cleanliness campaign. They walked through the lanes in two groups. One group walked through the lanes PQ, QR and RP; while the other group walked through PR, RS and SP as shown in figure:



These two groups cleaned the area enclosed within their lanes. If PQ = 7 m, QR = 24 m, RS = 18 m, SP = 13 m and $\angle Q = 90°$;
(i) Which group cleaned more area and by how much?
(ii) Find the total area cleaned by the students (neglecting the width of the lane).
Ans: (i) Given PQ = 7 m and QR = 24 m, $\angle Q = 90°$
Using Pythagoras theorem in right-angled ΔPQR,
we have $PR^2 = PQ^2 + QR^2$
$PR = \sqrt{7^2 + 24^2} = \sqrt{49 + 576} = \sqrt{625} = 25$ m

Therefore, first group has to clean the area of ΔPQR which is right-angled triangle.

∴ Area of ΔPQR = $\frac{1}{2}$ × base × height = $\frac{1}{2}$ × 24 × 7

= 84 m^2

The second group has to clean the area of ΔPRS, which is scalene having sides 25 m, 18 m and 13 m.

Its semi-perimeter, $s = \frac{25+18+13}{2} = \frac{56}{2} = 28m$

∴ By Heron's formula, $Area\ of\ \Delta PRS = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{28(28-25)(28-18)(28-13)} = \sqrt{28(3)(10)(15)}$

$= 30\sqrt{14}\, cm^2 = 30 \times 3.74 = 112.2 cm^2$

Clearly, the second group cleaned more area, i.e. 112.2 m^2 which is (112.2 – 84) = 28.2 m^2 more than the area cleaned by the first group.

(ii) Total area cleaned by all the students

= 84 + 11.2 = 196.2 m^2

OR

The perimeter of a triangle is 50 cm. One side of the triangle is 4 cm longer than the smallest side and the third side is 6 cm less than twice the smallest side. Find the area of the triangle.

Ans: Let *ABC* be any triangle with perimeter 50 cm.

Let the smallest side of the triangle be *x*.

Then the other sides be $x + 4$ and $2x - 6$.

Now, $x + x + 4 + 2x - 6 = 50$ (âˆµ perimeter is 50 cm)

$\Rightarrow 4x - 2 = 50 \Rightarrow 4x = 50 + 2$

$\Rightarrow 4x = 52 \Rightarrow x = 13$

∴ The sides of the triangle are of length 13 cm, 17 cm and 20 cm.

∴ Semi-perimeter of the triangle is $s = \frac{13+17+20}{2} = \frac{50}{2} = 25 cm$

∴ By Heron's formula, $Area\ of\ \Delta ABC = \sqrt{s(s-a)(s-b)(s-c)}$

$= \sqrt{25(25-13)(25-17)(25-20)} = \sqrt{25(12)(8)(5)} = 20\sqrt{30}\, cm^2$

Hence, the area of the triangle is $20\sqrt{30}\, cm^2$

33. Find the value of *m* and *n* so that the polynomial $f(x) = x^3 - 6x^2 + mx - n$ is exactly divisible by $(x - 1)$ as well as $(x - 2)$.

Ans: If $f(x)$ is exactly divisible by $(x - 1)$ and $(x - 2)$, then $(x - 1)$ and $(x - 2)$ are factors of $p(x)$.

By the given condition, we have

$f(1) = 0$ and $f(2) = 0$

When $f(1) = 0$,

$\Rightarrow 1^3 - 6(1)^2 + m(1) - n = 0$

$\Rightarrow 1 - 6 + m - n = 0$

$\Rightarrow m - n = 5$ ...(i)

When $f(2) = 0$,

$\Rightarrow 2^3 - 6(2)^2 + m(2) - n = 0$

$\Rightarrow 8 - 24 + 2m - n = 0$

$\Rightarrow 2m - n = 16$ ...(ii)

Subtracting (i) from (ii), we get

$m = 11$

and substitute in (i), we get $n = 6$

Hence, $m = 11$ and $n = 6$

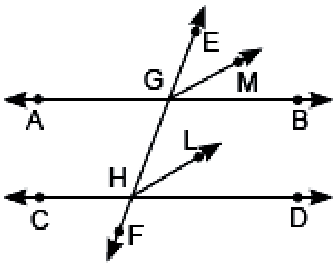
OR

Factorise the following: (i) $x^2 - \frac{y^2}{9}$ (ii) $2x^2 - 7x - 15$ (iii) $6x^2 + 5x - 6$

Ans: (i) $x^2 - \frac{y^2}{9} = x^2 - \left(\frac{y}{3}\right)^2 = \left(x + \frac{y}{3}\right)\left(x - \frac{y}{3}\right)$ $[x^2 - y^2 = (x + y)(x - y)]$
(ii) $2x^2 - 7x - 15 = 2x^2 - 10x + 3x - 15$
$= 2x(x - 5) + 3(x - 5)$
$= (x - 5)(2x + 3)$
(iii) $6x^2 + 5x - 6 = 6x^2 + 9x - 4x - 6$
$= 3x(2x + 3) - 2(2x + 3)$
$= (2x + 3)(3x - 2)$

34. (a) The circumference of the base of 10 m high conical tent is 44 m. Calculate the length of canvas used in making the tent, if width of canvas is 2 m. (3)
(b) Into a conical tent of radius 8.4 m and vertical height 3.5 m, how many full bags of wheat can be emptied, if space for the wheat in each bag is 1.96 m^3? (2)
Ans: (a) Let r m be the radius of the base of conical tent.
Circumference of base of conical tent = 44 m
$\Rightarrow 2\pi r = 44$
$\Rightarrow 2 \times \frac{22}{7} \times r = 44$
$\Rightarrow r = 7$ m
Height of conical tent = h = 10 m
$\therefore$ Slant height of conical tent = $l = \sqrt{r^2 + h^2}$
$\Rightarrow l = \sqrt{7^2 + 10^2} = \sqrt{49 + 100} = \sqrt{149}$ = 12.21 m
Let x be the length of canvas used in making the tent.
$\therefore$ Area of canvas used = $x \times 2$ m^2
Also, $x \times 2 = \pi rl$
$\Rightarrow 2x = \frac{22}{7} \times 7 \times 12.21$
$\Rightarrow x = 11 \times 12.21 = 134.31$ m
$\therefore$ Required length of canvas = 134.2 m.
(b) Radius of conical tent = 8.4 m
Height of conical tent = 3.5 m
$\therefore$ Capacity of the conical tent = $\frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times (8.4)^2 \times 3.5 = 258.72$ m^3
Space of occupied by each bag of wheat = 1.96 m^3
$\therefore$ Number of bags =
$\frac{\text{Capacity of the conical tent}}{\text{Space occupied by each bag of wheat}} = \frac{258.72}{1.96}$
= 132

35. In the given figure, EF is the transversal to two parallel lines AB and CD. GM and HL are the bisectors of the corresponding angles EGB and EHD. Prove that GM || HL.



Ans: Given: AB || CD and EF is transversal that intersects AB and CD at G and H respectively
$\therefore$ $\angle EGB = \angle GHD$ ...(i) (Corresponding angles)
Now, GM is the angle bisector of $\angle EGB$

$\Rightarrow$ $\angle EGM = \angle MGB = \frac{1}{2}\angle EGB$

$\Rightarrow$ $\angle EGB = 2\angle EGM$ ...(ii)

Similarly, HL is the angle bisector of $\angle GHD$

$\Rightarrow$ $\angle GHL = \angle LHD = \frac{1}{2}\angle GHD$

$\Rightarrow$ $\angle GHD = 2\angle GHL$ ...(iii)

Substituting from (ii) and (iii) in (i), we get

$2\angle EGM = 2\angle GHL$

$\Rightarrow$ $\angle EGM = \angle GHL$

But these are equal corresponding angles formed by transversal EF with GM and HL.

Hence, GM || HL ...(Converse of corresponding angles axiom)

SECTION – E(Case Study Based Questions)

Questions 36 to 38 carry 4 marks each.

36. Case Study – 1:

On his birthday, Manoj planned that this time he celebrates his birthday in a small orphanage centre. He bought apples to give to children and adults working there. Manoj donated 2 apples to each children and 3 apples to each adult working there along with Birthday cake. He distributed 60 total apples.

(a) Taking the number of children as ‘x’ and the number of adults as ‘y’. Represent the above situation in linear equation in two variables.

(b) If the number of children is 15, then find the number of adults.

(c) If the number of adults is 12, then find the number of children.

(d) If $x = -5$ and $y = 2$ is a solution of the equation $3x + 5y = b$, then find the value of ‘b’

Ans: (a) Let the number of children be x. Let the number of adult be y.

According to given condition 2x apples to each children + 3x apples to each adult

$2x + 3y = 60$

(b) Given linear equation is $2x + 3y = 60$ [From (a)]

Now, put $x = 15$

$\Rightarrow 2 \times 15 + 3y = 60$

$\Rightarrow 30 + 3y = 60 \Rightarrow 3y = 60 - 30 \Rightarrow 3y = 30 \Rightarrow y = 10$

Hence, number of adults is 10.

(c) Since, number of adults is 12.

Therefore, $y = 12$

Now, put $y = 12$ in given equation $2x + 3y = 60$ we get, $2x + 3 \times 12 = 60$

$\Rightarrow 2x + 36 = 60 \Rightarrow 2x = 60 - 36 \Rightarrow 2x = 24 \Rightarrow x = 12$

Hence, number of children is 12.

(d) Given equation is $3x + 5y = b$

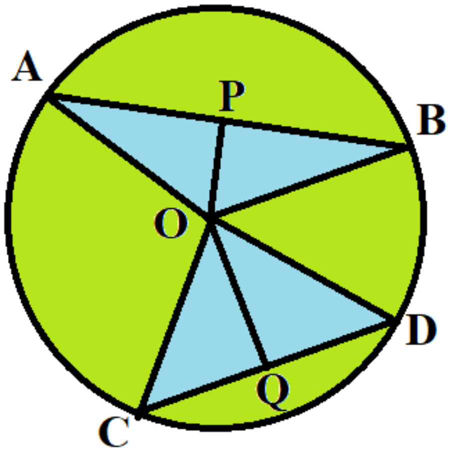
On putting the values of $x = -5$ and $y = 2$ in the equation, we get

$3(-5) + 5 \times 2 = b$

$\Rightarrow -15 + 10 = b \Rightarrow b = -5$

37. Case Study – 2:

Aditya seen one circular park in which two triangular ponds are there whose common vertex is the centre of the park. After coming back to home, he tried to draw the circular park on the paper. He draws a circle of radius 10 cm with the help of a compass and scale. He also draws two chords, AB and CD in such a way that the perpendicular distance from the center to AB and CD are 6 cm and 8 cm respectively. Now, he has some doubts that are given below.



(i) Show that the perpendicular drawn from the Centre of a circle to a chord bisects the chord using any one triangle. (2)
(ii) What is the length of CD? (2)

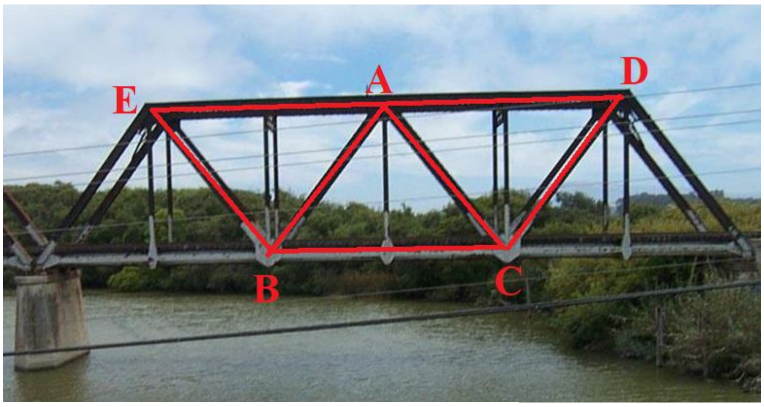
OR

(ii) What is the length of AB? (2)
Ans: (i) In ΔAOP and ΔBOP
$\angle APO = \angle BPO$ ($OP \perp AB$)
$OP = OP$ (Common)
$AO = OB$ (radius of circle)
$\Delta AOP \cong \Delta BOP$
$\therefore AP = BP$ (CPCT)
(ii) In right ΔCOQ
$CO^2 = OQ^2 + CQ^2$
$\Rightarrow 10^2 = 8^2 + CQ^2$
$\Rightarrow CQ^2 = 100 - 64 = 36$
$\Rightarrow CQ = 6$
$\Rightarrow CD = 2CQ = 12$ cm

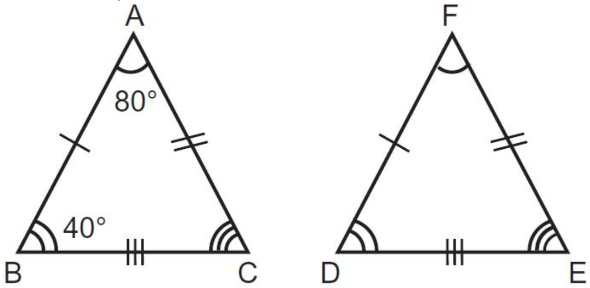
OR

(ii)In right ΔAOB
$AO^2 = OP^2 + AP^2$
$\Rightarrow 10^2 = 6^2 + AP^2$
$\Rightarrow AP^2 = 100 - 36 = 64$
$\Rightarrow AP = 8$
$\Rightarrow AB = 2AP$
$\Rightarrow AB = 16$cm

38. Case Study – 3:
Truss bridges are formed with a structure of connected elements that form triangular structures to make up the bridge. Trusses are the triangles that connect to the top and bottom cord and two end posts. You can see that there are some triangular shapes are shown in the picture given alongside and these are represented as ΔABC, ΔCAD, and ΔBEA.



(a) If AB = CD and AD = CB, then prove ΔABC ≅ ΔCDA
(b) If AB = 7.5 m, AC = 4.5 m and BC = 5 m. Find the perimeter of ΔACD, if ΔABC ≅ ΔCDA by SSS congruence rule.
(c) If ΔABC ≅ ΔFDE, AB = 5 cm, ∠B = 40° and ∠A = 80°. Then find the length of DF and ∠E.



Ans. Ans. (a) In ΔABC and ΔCDA,
AB = CD [Given]
AD = CB [Given]
AC = CA [common]
So by SSS congruence rule, ΔABC ≅ ΔCDA
(b) Given that ΔABC ≅ ΔCDA [By SSS congruence rule]
So, Perimeter of ΔABC = Perimeter of ΔCDA
(7.5 m + 4.5 m + 5 m) = Perimeter of ΔCDA
The required perimeter of ΔCDA = 17 m.
(c) Given, ΔABC ≅ ΔFDE and AB = 5cm,
∠B = 40°
∠A = 80°
Since, ΔFDE ≅ ΔABC
DF = AB [By CPCT]
DF = 5cm
and ∠E = ∠C
⇒ ∠E = ∠C = 180°– (∠A + ∠B) [By Angle Sum Property of a DABC]
⇒ ∠E = 180°– (80° + 40°) ⇒ ∠E = 60°
Hence, DF = 5cm, ∠E = 60°