# SAMPLE QUESTION PAPER

## SESSION 2025-2026

**Class 10th** | **SET-01**

# MATHEMATICS

## Hints & Solutions

### SECTION-A

**1.** **(A)**

We know that for any two positive integers a and b,
HCF(a, b) × LCM (a, b) = a × b.
Let the two numbers be a and b. We are given:
HCF = 23
LCM = 1449
One number (a) = 161
We need to find the other number (b)
$23 \times 1449 = 161 \times b$

$= \dfrac{23\times1449}{161}$

$= \dfrac{23\times1449}{7\times23} = \dfrac{1449}{7} = 207.$

So, the other number is 207.

**2.** **(B)**

For the polynomial $f(x) = x^2 - x - 4$, we have
$a = 1, b = -1, c = -4$.

Sum of zeroes, $\alpha+\beta = -\dfrac{b}{a} = -\dfrac{(-1)}{1} = 1.$

Product of zeroes, $\alpha\beta = \dfrac{c}{a} = -\dfrac{4}{1} = -4$

We need to find the value of

$\dfrac{1}{\alpha}+\dfrac{1}{\beta}-\alpha\beta\cdot$

$\dfrac{1}{\alpha}+\dfrac{1}{\beta} = \dfrac{\alpha+\beta}{\alpha\beta} = \dfrac{1}{-4} = -\dfrac{1}{4}.$

So, $\dfrac{1}{\alpha}+\dfrac{1}{\beta}-\alpha\beta = -\dfrac{1}{4}-(-4)$

$= -\dfrac{1}{4}+4 = \dfrac{-1+16}{4} = \dfrac{15}{4}.$

**3.** **(A)**

For a system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + C_2 = 0$ to have no solution, we must have $\dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} \neq \dfrac{c_1}{c_2}$.

The given equations are: $x + 2y = 3 = 0$

$\Rightarrow \quad a_1 = 1, b_2 = 2, c_1 = -35x + ky + 7 = 0$

$\Rightarrow \quad a_2 = 5, b_2 = k, c_2 = 7$

For no solution: $\dfrac{1}{5} = \dfrac{2}{k} \neq \dfrac{-3}{7}$

From the first part, $\dfrac{1}{5} = \dfrac{2}{k} \Rightarrow k = 10.$

Now we check the second part: $\dfrac{2}{10} = \dfrac{1}{5},$

and $\dfrac{-3}{7}$ is not equal to $\dfrac{1}{5}$.

So, for k = 10, the equations have no solution.

**4.** **(A)**

Let the roots be a and $\dfrac{1}{\alpha}$.

For the quadratic equation $ax^2 + bx + c = 0$, the product of roots is $\dfrac{c}{\alpha}$.

In the given equation, $2x^2 - 10x + k = 0$,
we have $a = 2, b = -10, c = k$.

Product of roots = $\alpha \times \frac{1}{\alpha} = 1$.

Also, product of roots = $\frac{c}{a} = \frac{k}{2}$.

So, $\frac{k}{2} = 1 \Rightarrow k = 2$.

**5. (B)**

The first term, $a_1 = S_1 = 2(1)^2 + 3(1) = 2 + 3 = 5$.
The sum of the first two terms, $S_2 = 2(2)^2 + 3(2)$
$= 2(4) + 6 = 8 + 6 = 14$.
The second term, $a_2 = S_2 - S_1 = 14 - 5 = 9$.
The common difference,
$d = a_2 - a_1 = 9 - 5 = 4$.

**6. (B)** Let the point on the-y-axis be P(0,y). Let the point divide the lines segment joining A(5, –6) and B(–1, –4) in the ration k: 1.
Using the section formula for the x-coordinate : $x = \frac{kx_2 + 1x_1}{k+1}$

$$0 = \frac{k(-1) + 1(5)}{k+1}$$

$= 0 = -k + 5 \Rightarrow k = 5$. So the ratio is 5: 1

**7. (B)** By the basic proportionality theorem (Thales' Theorem), if DE||BC, then

$$\frac{AD}{DB} = \frac{AE}{EC}.$$

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

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

**8. (C)** Let the height of the tower be h. Let the two points be A and B, at distance 4m and 9m from the base of the tower.

Let the angles of elevation from A and B be $\theta$ and $90^\circ - \theta$
In the right triangle with the point 4m : $\tan\theta = \frac{h}{4}$.
In the right triangle with the point at 9m : $\tan(90^\circ - \theta) = \frac{h}{9} \Rightarrow \cot\theta = \frac{h}{9}$.
We know that $\tan\theta \times \cot\theta = 1$.
So, $\frac{h}{4} \times \frac{h}{9} \Rightarrow h^2 = 36 \Rightarrow h = 6\,m$
(since height cannot be negative).

**9. (B)** The volume of the cone $\frac{1}{3}\pi R^2 H$.

The volume of the sphere = $= \frac{4}{3}\pi r^3$.

Since the cone is melted and recast into a sphere, their volumes are equal

$$\frac{1}{3}\pi R^2 H = \frac{4}{3}\pi r^3 = R^2 H = 4r^2$$

**10. (B)** The sum of the first n natural numbers is Sn

$$S_n = \frac{n(n+1)}{2}.$$

The means is $\bar{x} = \frac{S_n}{n} = \frac{n(n+1)/2}{n} = \frac{n+1}{2}$.
We are given that the mean is 21.

$$\frac{n+1}{2} = 21$$
$$n + 1 = 42 \Rightarrow n = 41$$

**11. (A)** Total number of letter in the word " is 11.
The vowels are A, E, A, I.
Number of vowels = 4.
The vowels are M-A-T-H-E-M-A-T-I-C-S. So, A, E, A, I. The number of vowels is 4. Total number of letters is 11. The probability of choosing a vowel is

$$\frac{\text{Number of vowels}}{\text{Total number of letters}} = \frac{4}{11}.$$

**12. (A)** Let the zeroes be $\alpha, \beta, \gamma$.
Product of the zeroes,

$\alpha\beta\gamma = -\frac{d}{a} = -\frac{80}{1} = -80.$

We are given the product of two zeroes, say $\alpha\beta = 8$.

So, $8 \times \gamma = -80$.

$\gamma = -10$.

**13. (A)** From the given equation $x^2 + pr + q = 0$:

$\alpha + \beta + -P$

$\alpha\beta = q$

We need to find the equation with roots $\alpha^2$ and $\beta^2$.

Sum of new root

$= \alpha^2 + \beta^2 = (\alpha+\beta)^2 - 2\alpha\beta =$

$(-p)^2 - 2q = p^2 - 2q$

Product of new roots $\alpha^2\beta^2 = (\alpha\beta)^2 = q^2$

The new question equation is $x^2$ – (sum of roots) x + (product of roots) = 0.

$x^2 - (p^2 - 2q)x + q^2 = 0.$

**14. (A)** The coordinates of the midpoint of a line segment joining $(x_1, y_1)$ and $(x_2, y_2)$ are $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$.

Given the midpoint is (0, 0) for the points A(2,p) and B(–2,4)

Midpoint x -coordinate : $\frac{2+(-2)}{2} = \frac{0}{2} = 0$.

This is correct.

Midpoint y-coordinate :

$\frac{p+4}{2} = 0 \Rightarrow p + 4 = 0 \Rightarrow p = -4.$

**15. (A)** The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides or medians.

$$\frac{\text{Area}_1}{\text{Area}_2} = \left(\frac{\text{median}_1}{\text{median}_2}\right)^2$$

$$\frac{121}{64} = \left(\frac{12.1}{\text{median}_2}\right)^2$$

Taking the square root of both sides:

$$\sqrt{\frac{121}{64}} = \frac{12.1}{\text{median}_2}$$

$$\frac{11}{8} = \frac{12.1}{\text{median}_2}$$

$$\text{Median}_2 = \frac{12.1 \times 8}{11} = 1.1 \times 8 = 8.8\,\text{cm}$$

**16. (B)** Let the height of the tree be h and the width of the river be x.

From the first observation, tan

$60^\circ = \frac{h}{x} \Rightarrow \sqrt{3} = \frac{h}{x} \Rightarrow h = x\sqrt{3}.$ (1)

From the second observation,

$\tan 30^\circ = \frac{h}{x+40} \Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{x+40}$

$\Rightarrow h\sqrt{3} = x + 40$ (2)

Substitute $h = x\sqrt{3}$ from (1) into (2).

$(x\sqrt{3})\sqrt{3} = x + 40$

$3x = x + 40$

$2x = 40 \Rightarrow x = 20$ m.

Now, find the height h:

$h = x\sqrt{3} = 20\sqrt{3}$ m.

**17. (C)** Let the first term be common difference be d.

Sum of first 4 term,

$S_4 = \frac{4}{2}(2a + (4-1)d) = 2(2a + 3d)$

$= 28 \Rightarrow 2a + 3d = 14$ ..(1)

Sum of first 8 terms, $S_8 = \frac{8}{2}(2a + (8-1)d)$

$= 4(2a + 7d) = 88 \Rightarrow 2a + 7d = 22$ …(2)

Subtracting equation (1) from (2):

$(2a + 7d) - (2a + 3d) = 22 - 14$

$\Rightarrow 4d = 8 \Rightarrow d = 2.$

Substitute d = 2 into equation (1):

$2a + 3(2) = 14 \Rightarrow 2a + 6 = 14$

$\Rightarrow 2a = 8 \Rightarrow a = 4.$

The first term is 4.

**18. (A)** Total number of discs in the box is 90. The numbers on the discs are 1, 2, 3, ..., 90. We need to find the number of perfect square numbers between 1 and Perfect square numbers are:

$1^2 = 1$
$2^2 = 4$
$3^2 = 9$
$4^2 = 16$
$5^2 = 25$
$6^2 = 36$
$7^2 = 49$
$8^2 = 64$
$9^2 = 81$
$10^2 = 100$ which is greater than 90, so we stop at 9.

The perfect square numbers are 1, 4, 9, 16, 25, 36, 49, 64, 81. The number of perfect square numbers is 9. The probability of drawing a perfect square number is:

P(perfect square)

$$= \frac{\text{Number of perfect squares}}{\text{Total number of discs}} = \frac{9}{90} = \frac{1}{10}.$$

**19.** **(A)** For the polynomial $f(x) = 2x^2 + 5x - 3$ the corresponding quadratic equation is $2x^2 + 5x - 3 = 0$

Here, a = 2, b = 5, c = - 3 Discriminant

$D = b^2 - 4ac = 5^2 - 4(2)(-3) = 25 + 24 = 49$

Since 49 is a perfect square ($7^2$) the roots of the equation are rational. Therefore, the zeroes of the polynomial are rational. So, Assertion (A) is true. The reason for this is exactly what is stated in the Reason (R). The condition for rational roots is that the discriminant must be a perfect square.

Thus, both A and R are true, and R is the correct explanation of A.

**20.** **(A)** The given quadratic equation is $x^2 - 4x + k = 0$

Here, a = 1, b = - 4, c = k

For two distinct real roots, the discriminant $D = b^2 - 4ac$ must be greater than 0.

$(-4)^2 - 4(1)(k) > 0$
$16 - 4k > 0$
$16 > 4k$
$4 > k$
$k < 4$

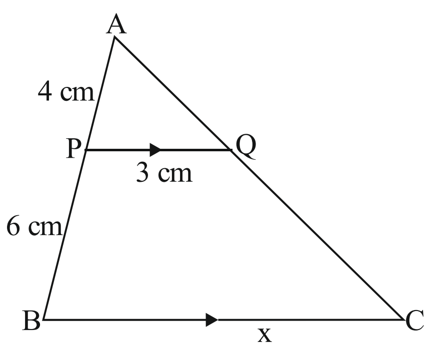
This matches the condition in Assertion (A). So, Assertion (A) is true. The condition stated in Reason (R) is the definition of the discriminant for a quadratic equation to have two distinct real roots. Thus, both A and R are true, and R is the correct explanation of A.

## SECTION-B

**21.** LCM of 12, 16, 24 = 48

Required number is 48 + 7 = 55.

**22.** Let BC = x cm




In Δ's APQ and ABC, we have,

$\angle A = \angle A$

$\angle APQ = \angle ABC$

Therefore, by AA criteria of similar Δ's, we have,

$\because PQ \parallel BC$

$\therefore \Delta APQ \sim \Delta ABC$

$$\therefore \frac{AP}{AB} = \frac{AQ}{AC} = \frac{PQ}{BC}$$

$$\Rightarrow \frac{AP}{AP + PB} = \frac{PQ}{BC}$$

$$\Rightarrow \frac{4}{4+6} = \frac{3}{x} \Rightarrow \frac{4}{10} = \frac{3}{x}$$

$$\Rightarrow x = \frac{10 \times 3}{4} = \frac{15}{2}$$

$$\therefore BC = \frac{15}{2}\text{cm} = 7.5\,\text{cm}$$

**23.** $AQ = \frac{1}{2}(2AQ)$

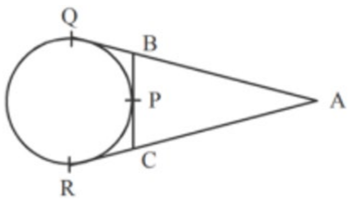
$= \frac{1}{2}(AQ + AQ)$

$= \frac{1}{2}(AQ + AR)$

$= \frac{1}{2}(AB + BQ + AC + CR)$

$= \frac{1}{2}(AB + BC + CA) = RHS$

$\because [BQ = BP, CR = CP]$




**24.** $L.H.S. = \sin(A - B) = \sin\left(60^o - 60^o\right)$

$= \sin 0^o = 0$

$R.H.S. = \sin A \cos B - \cos A \sin B$

$= \sin 60^o \cos 60^o - \cos 60^o \sin 60^o$

$= \frac{\sqrt{3}}{2} \times \frac{1}{2} - \frac{1}{2} \times \frac{\sqrt{3}}{2}$

$= \frac{\sqrt{3}}{4} - \frac{\sqrt{3}}{4} = 0$

$\therefore$ L.H.S. = R.H.S

**OR**

$LHS = \tan^2 A \sec^2 B - \sec^2 A \tan^2 B$

$= \tan^2 A\left(1 + \tan^2 B\right) - \left(1 + \tan^2 A\right)\tan^2 B$

$\left[\because 1 + \tan^2\theta = \sec^2\theta\right]$

$= \tan^2 A + \tan^2 A \tan^2 B - \tan^2 B - \tan^2 A \tan^2 B$

$= \tan^2 A - \tan^2 B$

= RHS

Hence proved.

**25.** Let $A_1$ and $A_2$ be the areas of the given sector and the corresponding major sector respectively.

Given, $\theta = 120^o$ and it's radius is 21 cm. So, r = 21 cm.

$\therefore A_1 = \frac{\theta}{360} \times \pi r^2 = \frac{120}{360} \times \pi \times (21)^2 = 147\pi\,cm^2$

and, $A_2$ = Area of the circle $- A_1$

$\Rightarrow A_2 = \left\{\pi \times (21)^2 - 147\pi\right\} cm^2 = \pi(441 - 147) cm^2$

$= 294\pi\,cm^2$

Required differences = $A_2 - A_1$

$= (294\pi - 147\pi) cm^2 = 147\pi\,cm^2 = \left(147 \times \frac{22}{7}\right) cm^2$

= 462 $cm^2$

**OR**

**i.** $r = 10\,cm, \theta = 90^o$

Area of minor sector = $= \frac{\theta}{360} \times \pi r^2$

$= \frac{90}{360} \times 3.14 \times 10 \times 10 = 78.5\,cm^2$

Area of $\Delta OAB = \frac{OA \times OB}{2}$

$= \frac{10 \times 10}{2} = 50\,cm^2$

$\therefore$ Area of the minor segment

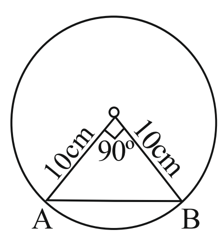
= Area of minor sector -Area of $\Delta OAB$

= $78.5 cm^2 - 50 cm^2 = 28.5 cm^2$

**ii.** Area of major sector = $\pi r^2$ – area of minor sector

$= 3.14 \times 10 \times 10 - 78.5$

$= 314 - 28.5 = 285.5\,cm^2$



# SECTION-C

**26.** This problem can be solved using H.C.F. because we are cutting or "dividing" the strips of cloth into smaller pieces of 36 and 24 and we are looking for the widest possible strips.

So,

H.C.F. of 36 and 24 is 12

So we can say that

Maya should cut each piece to be 12 inches wide.

**27.** Let the given polynomial is $p(x) = 4x^2 + 4x + 1$

Since, $\alpha$, $\beta$ are zeroes of p(x),

$\therefore \alpha+\beta =$ sum of zeroes $= \frac{-4}{4}$

Also, $\alpha\cdot\beta =$ Product of zeroes $= \alpha\cdot\beta = \frac{1}{4}$

Now, a quadratic polynomial whose zeroes are $2\alpha$ and $2\beta$

$X^2$ – (sum of zeroes) x + product of zeroes

$= x^2 - (2\alpha + 2\beta)x + 2\alpha \times 2\beta$

$= x^2 - 2(\alpha+\beta)x + 4(\alpha\beta)$

$= x^2 - 2\times(-1)x + 4\times\frac{1}{4}$

$= x^2 + 2x + 1$

The quadratic polynomial whose zeroes are $2\alpha$ and $2\beta$ is $x^2 + 2x + 1$

**28.** Let the greater number be 'x' and the smaller number 'y'

It is said that half the difference between the two number is 2. So, we can write it as:

$\frac{1}{2}\times(x-y) = 2$

$\Rightarrow (x-y) = 4$ ….(i)

It is also said that the sum of greater number and twice the smaller number is 13. So, we can write it as;

$x + 2y = 13$ …(ii)

Subtracting (ii) from (i), we get;

$(x-y)-(x+2y) = 4-13$

$\Rightarrow x - y - x - 2y = -9$

$\Rightarrow -3y = -9$

$\Rightarrow y = \frac{9}{3}$

$\Rightarrow y = 3$

Putting $y = 3$ in (1), we get;

$x - y = 4$

$\Rightarrow x - 3 = 4$

$\Rightarrow x = 4 + 3$

$\Rightarrow x = 7$

Hence, the greater number is 7. The smaller number is 3.

**OR**

$31x + 29y = 33$ ….(1)

$29x + 31y = 27$ ….(2)

Multiply (1) by 29 and (2) by 31 (Since 29, 31 are primes and L cm is $29 \times 31$)

(i) Become $31 \times 29 + 29 + 29y = 33$ …(3)

(ii) Becomes $29x \times 31 + 31 \times 31y = 27 \times 31$ ..(4)

Subtracting (3) from (4),

$(312 - 292)y = 27\times31 - 33\times29 = -120$

$(31-29)(31+29)y = -120$

$120y = -120$

$y = -1$

Substituting in (1)

$31x - 29 = 33$

$31x = 62$

Hence,

$x = 2$ and $y = -1$

**29.** Given : A circle with centre O and an external point T and two tangents TP and TQ to the circle, where P, Q are the points of contact.

To prove: $\angle PTQ = 2\angle OPQ$

Proof : $\angle PTQ = \theta$

Since, TP, TQ are tangents drawn from point T to the circle.

TP = TQ

$\therefore$ TPQ is an isosceles triangle

$$\therefore \angle TPQ = \angle TQP = \frac{1}{2}(180^\circ - \theta) = 90^\circ - \frac{\theta}{2}$$

Since, TP is a tangent to the circle at point of contact P

$\therefore \angle OPT = 90^\circ$

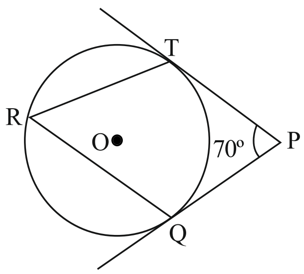
$\therefore \angle OPQ = \angle OPT - \angle TPQ = 90^\circ$

$$\left(90^\circ - \frac{1}{2}\theta\right) = \frac{\theta}{2} = \frac{1}{2}\angle PTQ$$

Thus, $\angle PTQ = 2\angle OPQ$

**OR**

In the given figure, O is centre of a circle, PT and PQ are tangents to the circle from an external point P. If $\angle TPQ = 70^\circ$, then we have to find $\angle TRQ$.




We know that the radius and tangent are perpendicular at the their point of contact.

$\angle OTP = \angle OQP = 90^\circ$

Now, In quadrilateral OQPT

$\angle QOT + \angle OTP + \angle OQP + \angle TPQ = 360^\circ$

$\angle QOT + 90^\circ + 90^\circ + 70^\circ = 360^\circ$

$250^\circ + \angle QOT = 360^\circ$

$\angle QOT = 110^\circ$

We know that the angle subtended by an arc at the centre is double of the angles subtended by the arc at any point on the circumference of the circle.

$$\angle TRQ = \frac{1}{2}\angle QOT \Rightarrow \angle TRQ = \frac{1}{2} \times 110^\circ = 55^\circ$$

**30.** We have,

$$\Rightarrow \frac{1}{\operatorname{cosec} A - \cot A} - \frac{1}{\sin A} = \frac{1}{\sin A} - \frac{1}{\operatorname{cosec} A + \cot A}$$

$$\Rightarrow \frac{1}{\operatorname{cosec} A - \cot A} + \frac{1}{\operatorname{cosec} A + \cot A} = \frac{1}{\sin A} + \frac{1}{\sin A}$$

$$\Rightarrow \frac{1}{\operatorname{cosec} A - \cot A} + \frac{1}{\operatorname{cosec} A + \cot A} = \frac{2}{\sin A}$$

$$\text{LHS } = \frac{1}{\operatorname{cosec} A - \cot A} + \frac{1}{\operatorname{cosec} A + \cot A}$$

$$\Rightarrow \frac{\operatorname{cosec} A + \cot A + \operatorname{cosec} A - \cot A}{(\operatorname{cosec} A - \cot A)(\operatorname{cosec} A + \cot A)}$$

$$\Rightarrow \frac{2\operatorname{cosec} A}{\operatorname{cosec}^2 A - \cot^2 A}$$

$$\Rightarrow \frac{2}{\sin A} = \frac{2}{\sin A} = \text{ RHS.}$$

Hence Proved.

**31.** We are given the cumulative frequency distribution. So, we first construct a frequency table from the given cumulative frequency distribution and then will make necessary computations to computer median

| Class intervals | Frequency (f) | Cumulative frequency (c.f.) |
|---|---|---|
| 20–30 | 4 | 4 |
| 30–40 | 12 | 16 |
| 40–50 | 14 | 30 |
| 50-60 | 16 | 46 |
| 60-70 | 20 | 66 |
| 70–80 | 16 | 82 |
| 80–90 | 10 | 92 |
| 90–10 | 8 | 100 |
| | | $N = \Sigma f_i = 100$ |

Here, $N=\Sigma f_i = 100 \therefore \frac{\mu}{2} = 50$

We observe that the cumulative frequency just greater than $\frac{N}{2} = 50$ is 66 and the corresponding class is 60–70.

So, 60–70, f = 20, F = 46 and h = 10

Now, Median $= 1 + \frac{\frac{N}{2} - F}{f} \times h$

$\Rightarrow$ Median $= 60 + \frac{50-46}{20} \times 10 = 62$

## SECTION-D

**32.** (i) $\frac{1}{a+b+x} = \frac{1}{a} + \frac{1}{b} + \frac{1}{x}$

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

$\Rightarrow \frac{-(a+b)}{x^2+(a+b)x} = \frac{b+a}{ab}$

$\Rightarrow x^2 + (a+b)x + ab = 0$

$\Rightarrow (x+a)(x+b) = 0$

$\Rightarrow x = -a, x = -b$

Hence, x = – a, b.

**OR**

x = – 4 is the root of the equation $x^2 + 2x + 4p = 0$

$(-4)^2 + (2 \times -4) + 4p = 0$

Or, p = –2

Equation $x^2 - 2(1 + 3k)x + 7(3x + 2k) = 0$ has equal roots.

$\therefore 4(1+3x)^2 - 28(3+2k) = 0$

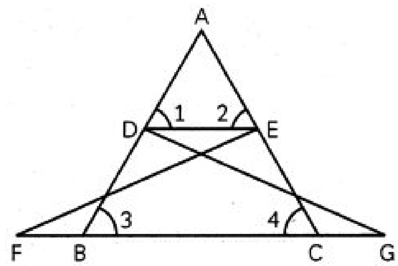
or, $9k^2 - 8k - 20 = 0$

or, $(9k+10)(k-2) = 0$

or, $k = \frac{-10}{9}, 2$

Hence, the value of $k = -\frac{10}{9}, 2$

**33.**




$\because \Delta FEC \sim \Delta GBD$

Or, EC = BD ..(i)

It is given that $\angle 1 = \angle 2$

Or, AE = AD ($\because$ Isosceles triangle property) …(ii)

From, eqns. (i) and (ii).

$\frac{AE}{EC} = \frac{AD}{DB}$

Or, DE|| BC, ($\because$ Corresponding angles)

Thus, in $\Delta ADE$ and $\Delta ABC$.

$\angle A = \angle A$

$\angle 1 = \angle 3$

$\angle 2 = \angle 4$

$\Delta ADE \sim \Delta ABC$ ($\because$ converse of B.PT)

$\Delta ADE \sim \Delta ABC$ Hence proved

**34.**

| Cylinder |
| --- |
| $r = \frac{6}{2} = 3$ cm |
| H = 12 cm |

For cone:

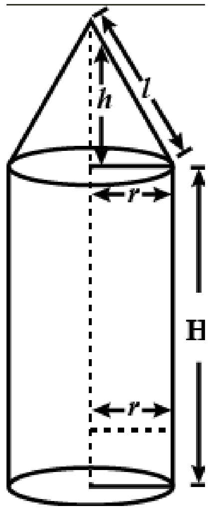
r = 3 cm

1 = 5cm

$\therefore 1^2 = 1^2 + h^2 +$ or $h^2 = 1^2 - r^2$

$h^2 = 5^2 - 3^2 = 25 - 9 = 16$

$\Rightarrow h = \sqrt{16} = 4\,cm$




Now, volume of rocket = volume of cylinder + volume of cone

$= \pi r^2 H + \frac{1}{3}\pi r^2 h = \pi r^2 \left[H + \frac{1}{3}h\right]$

$= 3.14 \times 3 \times 3\left[12 + \frac{1}{3} \times 4\right]$

$= 3.14 \times 9\left[\frac{40}{3}\right] = 3.14 \times 3 \times 40 = 376.8\,cm^3$

$\therefore$ Volume of Rocket = 376.8 $cm^3$

Total surface area of rocker = Curved surface area of cylinder + Curved surface area of cone + Area of base of cylinder [As it is closed (Given)]

$= 2\pi rH + \pi rl + \pi r^2 = \pi r[2H + 1 + r]$

$= 3.14 \times 3[2 \times 12 + 5 + 3]$

$= 3.14 \times 3 \times 32$

$= 301.44\,cm^2$

Hence, the surface area of hemisphere + curved surface area of cone

Diameter of hemisphere = 3.5cm

So radius of hemispherical portion of the lattu $= r = \frac{3.5}{2} cm = 1.75$

r = Radius of the conical portion $= \frac{3.5}{2} = 1.75$

Height of the conical portion = height of top- radius of hemisphere = 5 – 1.75 = 3.25 cm

Let I be the slant height of the conical part. Then,

$l^2 = h^2 + r^2$

$l^2 = (3.25)^2 + (1.75)^2$

$\Rightarrow l^2 = 10.5625 + 3.0625$

$\Rightarrow l^2 = 13.625$

Let the S be the total surface area of the top, Then,

$S = 2\pi r^2 + \pi rl$

$\Rightarrow \quad S = \pi r(2r + l)$

$\Rightarrow S = \frac{22}{7} \times 1.75(2 \times 1.75 + 3.7)$

$= 5.5(3.5 + 3.7)$

$= 5.5(7.2)$

$= 39.6\,cm^2$

**35.**

| **Marks** | **X** | **F** | $u = \frac{x-35}{10}$ | **Fu** | **cf** |
|---|---|---|---|---|---|
| 0–10 | 5 | 3 | –3 | –9 | 3 |
| 10–20 | 15 | 5 | –2 | –10 | 8 |
| 20–30 | 25 | 16 | –1 | –16 | 24 |
| 30–40 | 35 | 12 | 0 | 0 | 36 |
| 40–50 | 45 | 13 | 1 | 13 | 49 |
| 60–70 | 65 | 6 | 3 | 18 | 75 |
| 70–80 | 75 | 5 | 4 | 20 | 80 |
| | | 80 | | 56 | |

Mean $= 35 + \left(10 \times \frac{56}{80}\right) = 42$

Median class: 40–50

Median $= 40 + \frac{10}{13}(40 - 36) = 43$

## SECTION-E

**36.** Deepa has to buy a scooty. She can buy scooty either making cashdown payment of ₹25,000 or by making 15 monthly instalments as below.
I[st] month-₹3425, II[nd] month-₹3225, III[rd] month-₹3025, IV[th] month-2825 and so on


(i) Ist instalment = ₹3425
2nd instalment =₹3225
3rd instalment =3025
And os on
Now, 3425, 3225, 3025, are in AP, with
d = 3225 - 3425 = - 200 a = 3425 Now 6th installment = $a_n = a + 5d = 3425 + 5(-200) =$ ₹2425

(ii) Total amount paid $= \frac{15}{2}(2a + 14d)$

$= \frac{15}{2}[2(3425) + 14(-200)]$

$= \frac{15}{2}(6850 - 2800)$

$= \frac{15}{2}(4050) =$ ₹30375

**OR**

$a_n = a + (n-1)d$ given $a_n = 2625$

$2625 = 3425 + (n-1) \times -200$

$\Rightarrow -800 = (n-1) \times -200$

$\Rightarrow 4 = n - 1$

$\Rightarrow n = 5$

So, in 5[th] installment, she pays ₹2625.

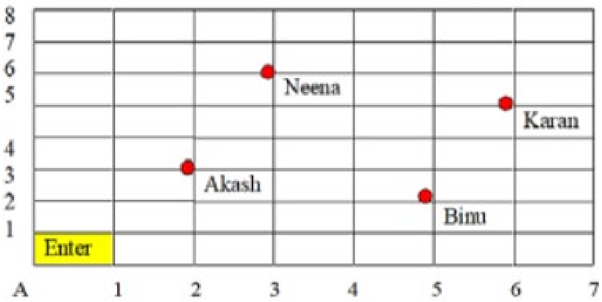
(iii) $a_n = a + (n-1)d$

$\Rightarrow a_{10} = 3425 + 9 \times (-200) = 1625$

$\Rightarrow a_{11} = 3425 + 10 \times (-200) = 1425$

$a_{10} + a_{11} = 1625 + 1425 = 3050$

**37.**




(i) Position of Neena = (3, 6)
Position of Karan = (6, 5)
Distance between Neena and Karan

$= \sqrt{(6-3)^2 + (5-6)^2}$

$= \sqrt{9 + (-1)^2}$

$= \sqrt{10}$

(ii) Co-ordinate of seat of Akash = 2, 3

**OR**

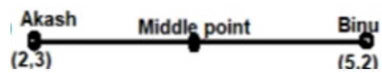
Binu = (5,5); Karan = (6,5)

Distance $= \sqrt{(6-5)^2 + (5-2)^2}$

$= \sqrt{1+9}$

$= \sqrt{10}$

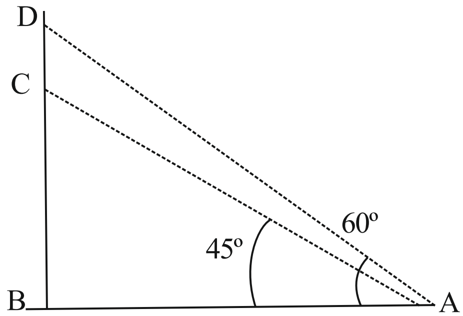
(iii)




Co-ordinate of middle point $= \left(\frac{2+5}{2}, \frac{3+2}{2}\right)$

$= 3.5, 2.5$

**38.** Let the height of the building be BC and the height of the flagpole be CD. The total height of the building and the flagpole is BD. Let the observation point on the ground be A. The distance of the observation point from the base of the building is AB.




(a) In the right-angled triangle $\Delta ABC$, we have

$$\tan 45^\circ = \frac{BC}{AB}$$

$$1 = \frac{20}{AB}$$

$$AB = 20\,m$$

(b) From the previous question, we know AB = 20m.

In the right-angle triangle $\Delta ABD$, we have:

$$\tan 60^\circ = \frac{BD}{AB}$$

$$\sqrt{3} = \frac{BC + CD}{AB}$$

$$\sqrt{3} = \frac{20 + CD}{20}$$

$$20\sqrt{3} = 20 + CD$$

$$CD = 20\sqrt{3} - 20 = 20(\sqrt{3} - 1)\,m.$$

So, the height of the flagpole is $20(\sqrt{3} - 1)$ meters.

(c) We need to find the length of AD.

In the right-angle triangle $\Delta ADB$, we have:

$$\sin 60^\circ = \frac{BD}{AD}$$

$$\frac{\sqrt{3}}{2} = \frac{BC + CD}{AD}$$

From the previous question, BD = 20 + CD = 20 + 20 $(\sqrt{3} - 1) = 20 + 20\sqrt{3} - 20 = 20\sqrt{3}\,m$.

$$\frac{\sqrt{3}}{2} = \frac{20\sqrt{3}}{AD}$$

$$AD = \frac{20\sqrt{3} \times 2}{\sqrt{3}} = 40\,m$$

**OR**

We need to find the length AC.

In the right-angle triangle $\Delta ABC$, we have:

$$\sin 45^\circ = \frac{BC}{AC}$$

$$\frac{1}{\sqrt{2}} = \frac{20}{AC}$$

$$AC = 20\sqrt{2}\,m.$$

Alternatively, we can use the cosine function or Pythagoras theorem:

$$\cos 45^\circ = \frac{AB}{AC} \Rightarrow \frac{1}{\sqrt{2}} = \frac{20}{AC} \Rightarrow AC = 20\sqrt{2}\,m.$$

By Pythagoras theorem:

$$AC^2 = AB^2 + BC^2 = 20^2 + 20^2$$

$$= 400 + 400 = 800.$$

$$AC = \sqrt{800} = \sqrt{400 \times 2} = 20\sqrt{2}\,m.$$

■■■