SELF PRACTICE PAPER SOLUTION

Maximum Time: 1 hour **Unit-I** **MM: 25**

1. a and b are two positive integers such that

the least prime factor of $a = 3$

and the least prime factor of $b = 5$

Then, least prime factor of $(a + b) = 2$. **1**

2.
$$\text{HCF} = 18$$
$$\text{Product} = 12960$$

Since,
$$\text{LCM} = \frac{\text{Product of two numbers}}{\text{HCF}}$$
$$= \frac{12960}{18} = 720$$ **1**

3.
$$p = p \times 1$$
$$p^2 = p \times p$$
$$p^3 = p \times p \times p$$
$$\text{Required LCM} = p \times p \times p = p^3.$$ **1**

4. $\frac{7}{150} = \frac{7}{2 \times 3 \times 5^2}$

Since, denominator of given rational number is not of the form $2^m \times 5^n$. Hence, it is non-terminating decimal expansion. **1**

5.
$$\frac{2\sqrt{125}+\sqrt{20}}{3\sqrt{5}} = \frac{2\sqrt{5\times5\times5}+\sqrt{2\times2\times5}}{3\sqrt{5}}$$
$$= \frac{2\times5\sqrt{5}+2\sqrt{5}}{3\sqrt{5}}$$
$$= \frac{10\sqrt{5}+2\sqrt{5}}{3\sqrt{5}}$$
$$= \frac{12\sqrt{5}}{3\sqrt{5}}$$
$$= 4.$$ **1**

Which is a rational number.

6. (i) Correct option: **(d)**.

Explanation: Prime factors of 420

$= 2 \times 2 \times 3 \times 5 \times 7$

$= 2^2 \times 3 \times 5 \times 7$

2	420
2	210
3	105
5	35
7	7
	1

(ii) Correct option: **(a).**

Explanation: Use Euclid's algorithm ,

$420 = 130 \times 3 + 30$

$130 = 30 \times 4 + 10$

$30 = 10 \times 3 + 0.$

So, the HCF of 420 and 130 is 10.

(iii) Correct option: **(b)**

Explanation:
$$\text{LCM} = \frac{\text{Product of numbers}}{\text{HCF}}$$
$$= \frac{420 \times 130}{10}$$
$$= 5460$$

(iv) Correct option: **(c).**

Explanation: Prime factors of 420

$= 2 \times 2 \times 3 \times 5 \times 7$

$= 2^2 \times 3^1 \times 5^1 \times 7^1$

$\therefore$ The sum of exponents of prime factors

$= 2 + 1 + 1 + 1 = 5.$

(v) Correct option: **(b).**

Explanation: Prime factors of $130 = 2 \times 5 \times 13$

$\therefore$ The sum of exponents of prime factors

$= 1 + 1 + 1 = 3.$

7. Required minimum distance will be LCM of 40, 42 and 45.

$$40 = 2 \times 2 \times 2 \times 5 = 2^3 \times 5$$
$$42 = 2 \times 3 \times 7$$
$$45 = 3 \times 3 \times 5 = 3^2 \times 5$$ **1**
$$\text{LCM}(40, 42, 45) = 2^3 \times 3^2 \times 5 \times 7$$
$$= 2520 \text{ cm.}$$ **1**

Hence, minimum distance each should walk = 25.20 m.

8.
$$\text{Denominator} = 500$$
$$= 2^2 \times 5^3$$ **1**
$$\text{Decimal expansion} = \frac{257}{500} = \frac{257\times2}{2\times2^2\times5^3} = \frac{514}{10^3}$$
$$= 0.514$$ **1**

9. Let p be a prime number and if possible, let $\sqrt{p}$ be rational

$\therefore \sqrt{p} = \frac{m}{n}$, where m and n are co-primes

and $n \neq 0$. **½**

Squaring on both sides, we get
$$\frac{(\sqrt{p})^2}{1} = \left(\frac{m}{n}\right)^2$$
or
$$p = \frac{m^2}{n^2}$$
or
$$pn^2 = m^2$$ ...(i) **1**

$\therefore p$ divides m^2 and p divides m. [$\because p$ divides pn^2]

Let $m = pq$ for some integer q

On putting $m = pq$ in eq. (i), we get

$$pn^2 = p^2q^2$$

or $n^2 = pq^2$

$\therefore$ p divides n^2 [$\because$ p divides pq^2] **1**

and p divides n.

[$\because p$ is prime and p divides $n^2 \Rightarrow p$ divides n]

Thus, p is a common factor of m and n but this contradicts the fact that m and n are co-primes.

The contradiction arises by assuming that $\sqrt{p}$ is rational.

Hence, $\sqrt{p}$ is irrational. ½

10. Since, the time to toll next together = LCM (9, 12, 15) **1**

$$9 = 3 \times 3 = 3^2$$

$$12 = 2 \times 2 \times 3 = 2^2 \times 3$$

and $15 = 3 \times 5$

$\therefore$ LCM (9, 12, 15) $= 3^2 \times 2^2 \times 5$

$= 180$ minutes **1**

Hence the bells will toll next together after 180 minutes. **1**

11. Let us assume that there is a positive integer n for which $\sqrt{n-1} + \sqrt{n+1}$ is rational and equal to $\frac{p}{q}$, where, p and q are positive integers and $(q \neq 0)$. **1**

$$\sqrt{n-1} + \sqrt{n+1} = \frac{p}{q} \quad \text{...(i)}$$

or $$\frac{q}{p} = \frac{1}{\sqrt{n-1}+\sqrt{n+1}}$$ ½

Rationalisation of denomination

$$= \frac{\sqrt{n-1}-\sqrt{n+1}}{(\sqrt{n-1}+\sqrt{n+1})(\sqrt{n-1}-\sqrt{n+1})}$$

$$= \frac{\sqrt{n-1}-\sqrt{n+1}}{(n-1)-(n+1)}$$ ½

$$= \frac{\sqrt{n-1}-\sqrt{n+1}}{-2}$$

or $$\sqrt{n+1} - \sqrt{n-1} = \frac{2q}{p} \quad \text{...(ii)}$$ **1**

Adding (i) and (ii), we get

$$2\sqrt{n+1} = \frac{p}{q} + \frac{2q}{p}$$

$$= \frac{p^2+2q^2}{pq} \quad \text{...(iii)}$$

From (i) and (ii),

$$\Rightarrow \sqrt{n-1} = \frac{p^2-2q^2}{2pq} \quad \text{...(iv)}$$ **1**

From (iii) and (iv), $\sqrt{n+1}$ and $\sqrt{n-1}$ both are rational because p and q both are rational. But it is possible only when $(n + 1)$ and $(n - 1)$ both are perfect squares. But they differ by 2 and two perfect squares never differ by 2. So, both $(n + 1)$ and $(n - 1)$ cannot be perfect squares, hence there is no positive integer n for which $\sqrt{n-1} + \sqrt{n+1}$ is rational. **1**

SELF PRACTICE PAPER SOLUTION

Maximum Time: 1 hour **Unit-II** **MM: 25**

1. $3x - y = -18$ ...(i)

$6x - ky = -16$ ...(ii)

For coincident lines,

$\Rightarrow \quad \dfrac{a_1}{a_2} = \dfrac{b_1}{b_2} = \dfrac{c_1}{c_2}$ ½

$\Rightarrow \quad \dfrac{3}{6} = \dfrac{-1}{-k} = \dfrac{-8}{-16}$

$\Rightarrow \quad \dfrac{1}{2} = \dfrac{1}{k} = \dfrac{1}{2}$

So, $k = 2$. ½

2. Let $f(x) = ax^3 + bx^2 + cx + d$

If α, β, γ are the zeroes of $f(x)$, then

$$\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a}$$

One root is zero (given) So, $\alpha = 0$. $\beta\gamma = \dfrac{c}{a}$ 1

3. Let $f(x) = x^2 + (a + 1)x + b$

As 2, and (– 3) are zeroes of polynomial $f(x) = x^2 + (a + 1)x + b$, then

$f(2) = 0$

$(2)^2 + (a + 1)(2) + b = 0$

$4 + 2a + 2 + b = 0$

$2a + b = -6$ ...(i) ½

And $f(-3) = 0$

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

$9 - 3a - 3 + b = 0$

$-3a + b = -6$

$3a - b = 6$ ...(ii)

$5a = 0$ [Adding (i) and (ii)]

$a = 0$. ½

4. Given: $x + 2y = 10$

$\Rightarrow \quad x + 2 \times 6 = 10$ [$\because$ Given $y = 6$]

$\Rightarrow \quad x = 10 - 12$

$\Rightarrow \quad x = -2$. 1

5. Since, $3x^2 - 5x + p = 0$ has equal roots;

Then, $D = 0$

i.e., $b^2 = 4ac$

$\Rightarrow \quad (-5)^2 = 4 \times 3 \times p$

$\Rightarrow \quad 25 = 12p$

$\Rightarrow \quad p = \dfrac{25}{12}$. 1

6. VISUAL CASE STUDY BASED QUESTIONS:

(i) Correct option: **(c)**.

Explanation: Since, they have 27 flags, then the middle most flag is 14th flag.

(ii) Correct option: **(b)**.

Explanation: We have, total no. of flags = 27 So, 13 flags to left of middle and 13 flags to right of middle most flag.

(iii) Correct option: **(c)**.

Explanation: The total distance travelled by Ruchi,

$S = 2(2 + 4 + 6 + 8 + \ldots$ upto 13 terms)

$= 2 \times 2\,(1 + 2 + 3 + 4 + \ldots$ upto 13 terms)

$= 4 \times \dfrac{13 \times 14}{2}$

$= 364$

Thus, Ruchi covered in completing this job and returning back to collect her books $= 2 \times 364 = 728$ m.

(iv) Correct option: **(d)**.

Explanation: The maximum distance travelled by her

$= 2 \times 13$ m

$= 26$ m.

(v) Correct option: **(a)**.

Explanation: The mathematical concept is related to this question as arithmetic progression.

7. Given: $f(x) = 2x^2 - 7x + 3$

Sum of roots $= p + q = -\dfrac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$

$= -\left(\dfrac{-7}{2}\right) = \dfrac{7}{2}$ ½

and Product of roots $= pq = \dfrac{\text{Constant term}}{\text{Coefficient of } x^2}$

$= \dfrac{3}{2}$ ½

Since, $(p + q)^2 = p^2 + q^2 + 2pq$

So, $p^2 + q^2 = (p + q)^2 - 2pq$ ½

$= \left(\dfrac{7}{2}\right)^2 - 3$

$= \dfrac{49}{4} - \dfrac{3}{1} = \dfrac{37}{4}$ ½

Hence, the value of $p^2 + q^2 = \dfrac{37}{4}$

8. The series as per question is 102, 108, 114, ..., 198 which is an A.P.

Given, $a = 102$, $d = 6$ and $l = 198$

Then $198 = 102 + (n - 1)6$ ½

or, $\dfrac{96}{6} = n - 1$

or, $n = 17$ ½

$S_n = \dfrac{n}{2}(a + l)$ ½

$\therefore \quad S_{17} = \dfrac{17}{2}[102 + 198]$

or, $S_{17} = \dfrac{17}{2} \times 300 = 17 \times 150 = 2550$. ½

[CBSE Marking Scheme, 2012]

9. The three digit numbers are divided by 7 and leave 3 as remainder are

101, 108, 115, ... 997 **1**

Since these are in A.P. $a = 101$, $d = 7$, $a_n = 997$

$$a_n = a + (n-1)d$$
$$997 = 101 + (n-1)7$$
$$997 - 101 = 896 = (n-1)7 \quad \tfrac{1}{2}$$
$$\frac{896}{7} = n - 1 \quad \tfrac{1}{2}$$
$$\therefore \quad n = 128 + 1 = 129$$

Hence, 129 three digit numbers are divided by 7 which leaves remainder is 3. **1**

[CBSE Marking Scheme, 2012]

10. Given: $(x^2 + y^2)(a^2 + b^2) = (ax + by)^2$

$$\Rightarrow \quad x^2a^2 + x^2b^2 + y^2a^2 + y^2b^2 = a^2x^2 + b^2y^2 + 2abxy$$ **1**

$$\Rightarrow \quad x^2b^2 + y^2a^2 - 2abxy = 0$$
$$\Rightarrow \quad (xb - ya)^2 = 0$$
$$[\because (a-b)^2 = a^2 + b^2 - 2ab]$$ **1**
$$\Rightarrow \quad xb = ya$$
$$\therefore \quad \frac{x}{a} = \frac{y}{b}$$ **1**

Hence proved

[CBSE Marking Scheme, 2014]

11. Let length of given rectangle be x and breadth be y

$\therefore$ Area of rectangle $= xy$ **1**

According to the first condition,

$$(x-5)(y+3) = xy - 9$$
$$\Rightarrow \quad 3x - 5y = 6 \quad \text{...(i)}$$ **1**

According to the second condition,

$$(x+3)(y+2) = xy + 67$$
$$\Rightarrow \quad 2x + 3y = 61 \quad \text{...(ii)}$$ **1**

Multiply eqn. (i) by 3 and eqn. (ii) by 5 and then adding,

$$9x - 15y = 18$$
$$10x + 15y = 305$$
$$\therefore \quad x = \frac{323}{19}$$
$$\Rightarrow \quad = 17$$ **1**

Substituting this value of x in eqn. (i),

$$3(17) - 5y = 6$$
$$\Rightarrow \quad 5y = 51 - 6$$
$$\therefore \quad y = 9$$ **1**

Hence, perimeter $= 2(x + y)$
$= 2(17 + 9)$
$= 52$ units.

SELF PRACTICE PAPER SOLUTION

Maximum Time: 1 hour **Unit-III** **MM: 25**

1.

Here, $BQ = \frac{5}{7}AB$

or, $\frac{BQ}{AB} = \frac{5}{7} \Rightarrow \frac{AB}{BQ} = \frac{7}{5}$

or, $\frac{AB}{BQ} - 1 = \frac{7}{5} - 1$

or, $\frac{AB - BQ}{BQ} = \frac{AQ}{BQ} = \frac{7-5}{5} = \frac{2}{5}$

$\therefore$ $AQ : BQ = 2 : 5$ **1**

2. Mid-point $= \left[\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right]$ ½

$= \left[\frac{-5+5}{2}, \frac{0+0}{2}\right]$

$= [0, 0]$. ½

3. Distance between two points (x_1, y_1) and (x_2, y_2) is given as,

$$d = \left|\sqrt{(x_2 + x_1)^2 + (y_2 + y_1)^2}\right| \quad ½$$

where, $(x_1, y_1) = (4, p)$

$(x_2, y_2) = (1, 0)$

And, $d = 5$

Put the values, we have

$5^2 = (1 - 4)^2 + (0 - p)^2$

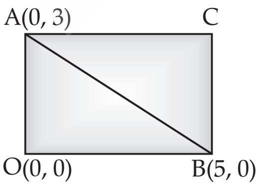
$25 = (-3)^2 + (-p)^2$

$25 - 9 = p^2$

$16 = p^2$

$+4, -4 = p \Rightarrow p =$ or $- 4$. ½

4. According to the question, a triangle can be represented as :



½

$\therefore$ Distance between the points A (0, 3) and B (5, 0) is

$AB = \left|\sqrt{(5-0)^2 + (0-3)^2}\right|$

$= \left|\sqrt{25+9}\right|$

$= \sqrt{34}$ unit

Hence, the required length of diagonal is $\sqrt{34}$. ½

5. Let the line segment joining the given points is divided by the X-axis in the ratio $k : 1$ at point P.

$\therefore$ The coordinates of P are $\left(\frac{k+6}{k+1}, \frac{-7k+4}{k+1}\right)$ ½

Since, Y-co-ordinates of every point on the X-axis is zero.

$\frac{-7k+4}{k+1} = 0$

$\Rightarrow$ $-7k + 4 = 0$

$\Rightarrow$ $k = \frac{4}{7}$

So, required ratio is 7 : 4. ½

6. VISUAL CASE STUDY BASED QUESTIONS:

(i) Correct Option: **(c)**

Explanation: Point A lies at $x = 3$, $y = 4$

$A = (3, 4)$

(ii) Correct Option: **(a)**

Explanation: Mid point of B and C:

$\left(\frac{6+9}{2}, \frac{7+4}{2}\right) = \left(\frac{15}{2}, \frac{11}{2}\right)$

[$\because$ Co-ordinates of $B = (6, 7)$ and $C = (9, 4)$]

(iii) Correct Option: **(c)**

Explanation: Point D lies at $x = 6$ and $y = 1$

$D = (6, 1)$

(iv) Correct Option: **(a)**

Explanation:

Since, $A = (3, 4)$ and $B = (6, 7)$

Using distance formula,

$AB = \left|\sqrt{(3-6)^2 + (4-7)^2}\right|$

$= \left|\sqrt{3^2 + 3^2}\right|$

$= \sqrt{18} = 3\sqrt{2}$ unit

(v) Correct Option: **(c)**

Explanation:

Since, $C = (9, 4)$, $D = (6, 1)$

Using distance formula

$CD = \left|\sqrt{(9-6)^2 (4-1)^2}\right|$

$CD = \left|\sqrt{9+9}\right|$

$CD = \sqrt{18}$

$= 3\sqrt{2}$ units.

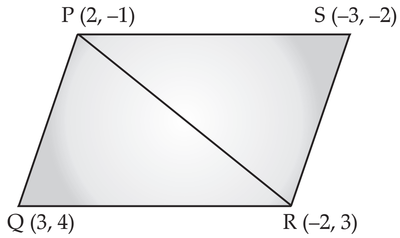
7. Given P (2, – 1), Q(3, 4), R(– 2, 3) and S(– 3, – 2).

$$PQ = \left|\sqrt{(3-2)^2+(4+1)^2}\right| = \sqrt{26} \text{ unit}$$

$$QR = \left|\sqrt{(-2-3)^2+(3-4)^2}\right| = \sqrt{26} \text{ unit}$$

$$RS = \left|\sqrt{(-3+2)^2+(-2-3)^2}\right| = \sqrt{26} \text{ unit}$$

$$PS = \left|\sqrt{(-3-2)^2+(-2+1)^2}\right| = \sqrt{26} \text{ unit}$$



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∴ All the four sides are equal.

or, PQRS is a rhombus.

Diagonal, $PR = \left|\sqrt{(-2-2)^2+(3+1)^2}\right| = \sqrt{32}$ unit

But, $PQ^2 + QR^2 = 26 + 26 = 52 \neq \left(\sqrt{32}\right)^2$

So, Δ*PQR* is not a right triangle.

Hence, *PQRS* is a rhombus but not a square. 1

8. P(*a*, *b*) is mid-point of AB, given A(10, – 6) and B(*k*, 4) ½

Then, $P(a, b) = \left(\frac{k+10}{2}, \frac{-6+4}{2}\right)$

$$a = \frac{k+10}{2}, b = -1$$

Now, $a - 2b = 18$ or, $a + 2 = 18$

[Putting $b = -1$]

or, $a = 16$

$$a = \frac{k+10}{2}$$

or, $\frac{k+10}{2} = 16$ or $k = 22$ 1

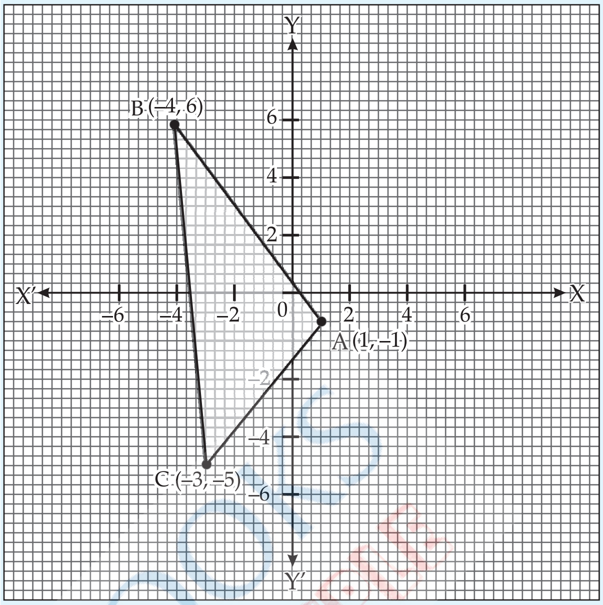
∴ $P(a, b) = (16, -1)$

$$AB = \left|\sqrt{(22-10)^2+(4+6)^2}\right|$$

$$= \left|\sqrt{244}\right|$$

$$= 2\sqrt{61} \text{ units.}$$ ½

9. The co-ordinates of the vertices of ΔABC are A(1, – 1), B(– 4, 6) and C(– 3, – 5) respectively.



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Then, $AB = \left|\sqrt{(1+4)^2+(-1-6)^2}\right|$

$$= \left|\sqrt{25+49}\right|$$

$$= \sqrt{74} \text{ unit}$$ ½

$$BC = \left|\sqrt{(-4+3)^2+(6+5)^2}\right|$$

$$= \left|\sqrt{1+121}\right|$$

$$= \sqrt{122} \text{ unit}$$ ½

$$AC = \left|\sqrt{(1+3)^2+(-1+5)^2}\right|$$

$$= \left|\sqrt{16+16}\right|$$

$$= 4\sqrt{2} \text{ unit}$$ ½

∵ $AB \neq BC \neq AC$

∴ ΔABC is scalene.

Now, area of ΔABC

$$= \frac{1}{2}\left|1(6+5) + (-4)(-5+1) + (-3)(-1-6)\right|$$

$$= \frac{1}{2}\left|11 + 16 + 21\right|$$

= 24 sq. units ½

[CBSE Marking Scheme, 2014]

10. *A*(3, 2) and *B*(– 3, 2)

∴ Mid-point of *AB* is lying on *Y*-axis

AB is equal distance from *X*-axis every where of

∴ $OD \perp AB$

Hence, 3rd vertex of Δ*ABC* is also lying on *Y*-axis.

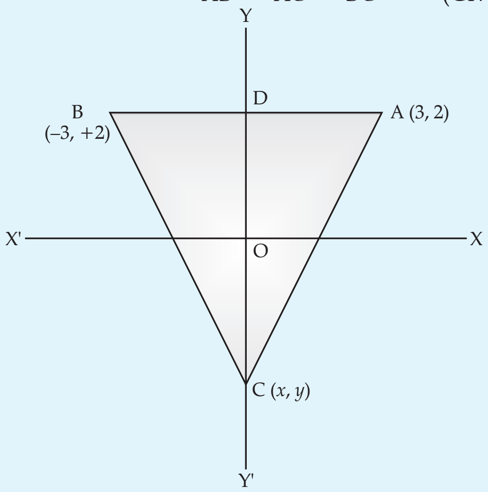
$$BC^2 = (x+3)^2 + (y-2)^2$$

$$AC^2 = (x-3)^2 + (y-2)^2$$

where coordinate of *C*(*x*, *y*)

$$AB^2 = (3+3)^2 + (2-2)^2 = 36$$

$$AB^2 = AC^2 = BC^2 \quad \text{(Given)} \; \mathbf{1}$$



$$(x+3)^2 + (y-2)^2 = (x-3)^2 + (y-2)^2 = 36$$

$$(x+3)^2 + (y-2)^2 = 36 \quad \because x = 0$$

$$(0+3)^2 + (y-2)^2 = 36$$

$$(y-2)^2 = 36 - 9 = 27$$

Taking square root on both sides, we get

$$y - 2 = \pm 3\sqrt{3}$$

$$y = 2 \pm 3\sqrt{3}$$

Since origin is inside the Δ.

∴ Coordinate of C are below the origin

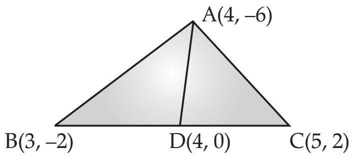
Hence, $y = 2 - 3\sqrt{3}$

Coordinates of $C = \left(0, 2-3\sqrt{3}\right)$ **1**

[CBSE Marking Scheme, 2012]

11. AD is the median of ΔABC from vertex A

$$D(x, y) = \left(\frac{3+5}{2}, \frac{-2+2}{2}\right) = (4, 0) \quad \mathbf{1}$$



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Area of ΔADB

$$= \frac{1}{2} \times |4(0+2) + 4(-2+6) + 3(-6-0)|$$

$$= \frac{1}{2} \times |8 + 16 - 18|$$

$$= \frac{1}{2} \times 6 = 3 \text{ sq.units} \quad \text{...(i)} \; \mathbf{1}$$

Area of ΔADC

$$= \frac{1}{2} \times |4(0-2) + 4(2+6) + 5(-6-0)|$$

$$= \frac{1}{2} \times |-8 + 32 - 30|$$

$$= \frac{1}{2} \times |-6| = 3 \text{ sq. units} \quad \mathbf{1}$$

Hence, area of ΔADC = 3 square units. ...(ii)

From (i) and (ii),

Area of ΔADB = Area of ΔADC

It is verified that median of ΔABC divides it into two triangles of equal areas. **Hence Proved. 1**

SELF PRACTICE PAPER SOLUTION

Maximum Time: 1 hour **Unit-IV** **MM: 25**

1. In the given figure, $\frac{PA}{PB} = \frac{6}{3} = 2$ and $\frac{PD}{PC} = \frac{5}{2.5} = 2$.

Thus $\frac{PA}{PB} = \frac{PD}{PC}$ and $\angle APB = \angle DPC$.

By SAS similarity, we get

$\angle APB \sim \Delta DPC$. ½

$\therefore$ $\angle A = \angle D = 30°$

Now, $\angle PBA = 180° - (50° + 30°)$

[Angle sum property of a triangle]

$= 100°$. ½

2. We know that the ratio of the areas of triangles will be equal to the square of the ratio of the corresponding sides of the triangles.

Thus, required ratio of the area of the two triangles

$$= \left(\frac{4}{9}\right)^2 = \frac{16}{81}.$$

3. We know that the radius is perpendicular to tangent

In ΔOPQ, we have

$\angle P = 90°$

By Pythagoras Theorem,

$OQ^2 = PQ^2 + OP^2$

$(12)^2 = PQ^2 + (5)^2$

$\Rightarrow$ $144 = PQ^2 + 25$

$\Rightarrow$ $PQ^2 = 144 - 25$

$= 119$

$\Rightarrow$ $PQ = \sqrt{119}$ cm. 1

4. Give that, TP and TQ are tangents.

We know that the radius drawn to the tangents will be perpendicular.

$\therefore$ $OP \perp TP$

and $OQ \perp TQ$

$\angle OPT = 90°$

$\angle OQT = 90°$ ½

In quadrilateral $POQT$,

Sum of all interior angles = 360°

$\angle OPT + \angle POQ + \angle OQT + \angle PTQ = 360°$

$90° + 110° + 90° + \angle PTQ = 360°$

$\angle PTQ = 70°$. ½

5. Here, $AB = 7, PB = 3$.

$AP = AB - PB = 7 - 3 = 4$

$\therefore$ $AP = PB = 4 : 3$. 1

6. VISUAL CASE BASED QUESTIONS

(i) Correct Option: **(c)**

Explanation: Distance travelled by the aeroplane towards North,

$OA = 1,000 \times \frac{3}{2}$

$= 1,500$ km 1

(ii) Correct Option: **(d)**

Explanation: Distance travelled by the aeroplane towards West,

$OB = 1,200 \times \frac{3}{2}$

$= 1,800$ km 1

(iii) Correct Option: **(c)**

Explanation: Angle between North and West direction is always 90°. 1

(iv) Correct Option: **(a)**

Explanation: Since ΔAOB is right triangle, by using Pythagoras Theorem, we have

$AB^2 = OA^2 + OB^2$

$= (1,500)^2 + (1,800)^2$

$= 22,50,000 + 32,40,000$

$= 54,90,000$

Thus, the two planes after $1\frac{1}{2}$ hours is at a distance of AB = $\sqrt{54,90,000}$ km = 2343 km (Approx.) 1

(v) Correct Option: **(a)**

7. EA and EC are tangents from point E to the circle with centre O_1.

$EA = EC$ ...(i) ½

EB and ED are tangents from point E to circle with centre O_2.

$EB = ED$ ...(ii) ½

Adding Eqns. (i) and (ii),

or, $EA + EB = EC + ED$

or, $AB = CD$ **Hence proved. 1**

8. In ΔPQR, $CA \,||\, PR$

$\therefore$ $\frac{PC}{CQ} = \frac{RA}{AQ}$ (By BPT)

or, $\frac{PC}{15} = \frac{20}{12}$

$\therefore$ $PC = \frac{15 \times 20}{12} = 25$ cm 1

In ΔPQR, $CB \,||\, QR$

$\therefore$ $\frac{PC}{CQ} = \frac{PB}{BR}$ (By BPT)

or, $\frac{25}{15} = \frac{15}{BR}$

$\therefore \quad BR = \dfrac{15 \times 15}{25}$

$= 9$ cm. **1**

9. Construction : Join A to B.

We have,

OP = diameter

$\Rightarrow \quad OQ + QP$ = diameter

$\Rightarrow \quad$ Radius $+ QP$ = diameter **1**

$\Rightarrow \quad OQ = PQ$ = radius

Thus, OP is the hypotenuse of right angled ΔAOP.

So, In ΔAOP, $\sin\theta = \dfrac{AO}{OP} = \dfrac{1}{2}$

$\theta = 30°$ **1**

Hence, $\angle APB = 60°$

Now, in ΔABP,

$AP = PB$

So, $\angle PAB = \angle PBA = 60°$

$\therefore$ ΔAPB is an equilateral triangle. **1**

[CBSE Marking Scheme, 2014]

10. Let, $BD = DE = EC$ be x

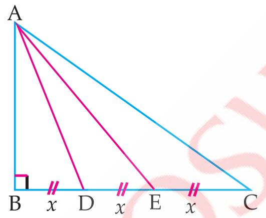
$BE = 2x$

and $BC = 3x$

Now, in ΔABE,

$AE^2 = AB^2 + BE^2$

$= AB^2 + 4x^2$, ...(i) ½



In ΔABC,

$AC^2 = AB^2 + BC^2 = AB^2 + 9x^2$

In ΔADB,

and $AD^2 = AB^2 + BD^2 = AB^2 + x^2$

...(ii) ½

$3AC^2 + 5AD^2 = 3(AB^2 + 9x^2) + 5(AB^2 + x^2)$

1

$= 3AB^2 + 27x^2 + 5AB^2 + 5x^2$

$= 3AB^2 + 27x^2 + 5AB^2 + 5x^2$

$= 8AB^2 + 32x^2$

$= 8(AB^2 + 4x^2)$

$\therefore \quad 3AC^2 + 5AD^2 = 8AE^2$. [From eqn. (i)]

Hence Proved. 1

11. We have to draw

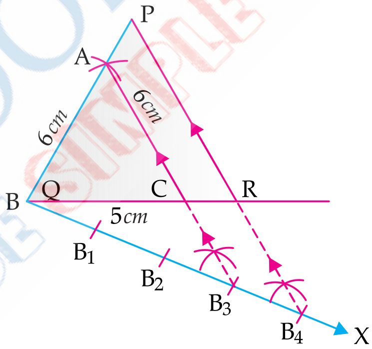
$\Delta PQR \sim \Delta ABC$

$PQ = 8$ cm

$\therefore \quad \dfrac{PQ}{AB} = \dfrac{8}{6} = \dfrac{4}{3}$ [$\because AB = 6$ cm] **1**

So, $PQ = QR = 8$ cm

So, we have to draw $\Delta PQR \sim \Delta ABC$ with scale factor $\dfrac{4}{3} > 1$ resulting ΔPQR will be larger than ΔABC.



2

Steps of Construction :

(i) Draw $BC = 5$ cm

(ii) Draw two arcs of 6 cm each from B and C in same direction let it be upside.

(iii) Join AB and AC.

(iv) Draw acute $\angle CBX$ and mark B, B_1, B_2, B_3, B_4 with compass.

(v) Join B_3C and draw $B_4R \parallel B_3C$, R is on BC produced.

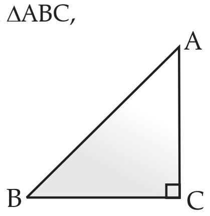
(vi) Again, draw $RP \parallel CA$. P is on BA produced.

Therefore, $\Delta PQR \sim \Delta ABC$ with $PQ = PR = 8$ cm. It's scale factor is $\dfrac{4}{3}$. **2**

SELF PRACTICE PAPER SOLUTION

Maximum Time: 1 hour **Unit-V** **MM: 25**

1. We know that, in ΔABC,



½

$$\text{Sum of three angles} = 180°$$
$$i.e., \quad \angle A + \angle B + \angle C = 180°$$
$$\angle C = 90° \quad \text{[Given]}$$
$$\angle A + \angle B + 90° = 180°$$
$$\Rightarrow \quad A + B = 90°$$
$$\therefore \quad \cos(A + B) = \cos 90° = 0 \quad ½$$

2.
$$\cos 9\alpha = \sin \alpha$$
$$\cos 9\alpha = \cos (90° - \alpha)$$

On comparing both sides, we have

$$9\alpha = 90° - \alpha$$
$$10\alpha = 90°$$
$$\alpha = 9°$$
$$\therefore \tan 5\alpha = \tan 5 \times 9° = \tan 45° = 1. \quad \mathbf{1}$$

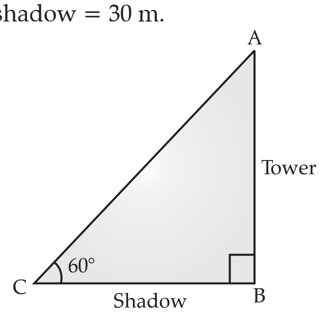
3. (sec A + tan A) (1 – sin A)

$$= \left(\frac{1}{\cos A} + \frac{\sin A}{\cos A}\right)(1 - \sin A)$$
$$= \left(\frac{1 + \sin A}{\cos A}\right)(1 - \sin A) \quad ½$$
$$= \left(\frac{1 - \sin^2 A}{\cos A}\right)$$
$$= \frac{\cos^2 A}{\cos A}$$
$$= \cos A. \quad ½$$

4.
$$9\sec^2 A - 9\tan^2 A = 9(\sec^2 A - \tan^2 A)$$
$$= 9(1) \quad [\because \sec^2 A - \tan^2 A = 1]$$
$$= 9 \quad \mathbf{1}$$

5. Let AB be the tower whose height be h m.

BC = shadow = 30 m.



½

From ΔABC,
$$\frac{AB}{BC} = \tan 60°$$
$$\Rightarrow \quad \frac{h}{30} = \sqrt{3}$$
$$h = 30\sqrt{3} \text{ m}$$

Hence, the height of tower = $30\sqrt{3}$ m. ½

6. VISUAL CASE BASED QUESTIONS

(i). Correct option: **(a)**.

Explanation: Clearly, distance covered by the artist is equal to the length of the rope AC. Let AB be the vertical pole of height 12 m.

It is given that $\angle ACB = 30°$

Thus, in right-angled triangle ABC,

$$\sin 30° = \frac{AB}{AC}$$
$$\Rightarrow \quad \frac{1}{2} = \frac{12}{AC}$$
$$\therefore \quad AC = 24 \text{ m.} \quad \mathbf{1}$$

(ii) Correct option: **(b)**.

Explanation: In ΔABC,

$$\tan 30° = \frac{AB}{BC}$$
$$\Rightarrow \quad \frac{1}{\sqrt{3}} = \frac{12}{BC}$$
$$\Rightarrow \quad BC = 12\sqrt{3} \text{ m.} \quad \mathbf{1}$$

(iii) Correct option: **(c)**.

Explanation:

We have,
$$\sin(A + B) = \frac{\sqrt{3}}{2}$$
$$\Rightarrow \quad \sin(A + B) = \sin 60°$$
$$\Rightarrow \quad A + B = 60°. \quad \mathbf{1}$$

(iv) Correct option: **(d)**.

Explanation: Given, sin A cos C + cos C sin A

Putting A = 60° and C = 30°, we get

$$= \sin 60° \cos 30° + \cos 30° \sin 60°$$
$$= \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2} + \frac{\sqrt{3}}{2} \times \frac{\sqrt{3}}{2}$$
$$= \frac{3}{4} + \frac{3}{4}$$
$$= \frac{6}{4}$$
$$= \frac{3}{2}. \quad \mathbf{1}$$

(v). Correct option: **(a)**.

Explanation: In this question, we used the basic formulae of trigonometry. **1**

7. Given : $4\cos\theta = 11\sin\theta$

or, $\cos\theta = \frac{11}{4}\sin\theta$

Now, $\frac{11\cos\theta - 7\sin\theta}{11\cos\theta + 7\sin\theta} = \frac{11\times\frac{11}{4}\sin\theta - 7\sin\theta}{11\times\frac{11}{4}\sin\theta + 7\sin\theta}$ **1**

$$= \frac{\sin\theta\left(\frac{121}{4} - 7\right)}{\sin\theta\left(\frac{121}{4} + 7\right)}$$

$$= \frac{121 - 28}{121 + 28} = \frac{93}{149}.$$ **1**

8. $\text{LHS} = -1 + \frac{\sin A \sin(90° - A)}{\cot(90° - A)}$

$[\because \sin(90° - \theta) = \cos\theta]$

$[\because \cot(90° - \theta) = \tan\theta]$

$= -1 + \frac{\sin A \cos A}{\tan A}$ ½

$= -1 + \sin A \cos A \times \cot A$ ½

$[\because \cot\theta = \frac{\cos\theta}{\sin\theta}]$

$= -1 + \sin A \cos A \times \frac{\cos A}{\sin A}$ ½

$[\because \sin^2\theta + \cos^2\theta = 1]$

$= -1 + \cos^2 A = -(1 - \cos^2 A)$ ½

$= -\sin^2 A = \text{RHS}$ **Hence proved.**

[CBSE Marking Scheme, 2012]

9. Given: $x\sin\theta = y\cos\theta$

or, $x = \frac{y\cos\theta}{\sin\theta}$ ...(i) **1**

and $x\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$ ...(ii)

Substituting x from eqn. (i) in eqn. (ii),

$\frac{y\cos\theta}{\sin\theta}\sin^3\theta + y\cos^3\theta = \sin\theta\cos\theta$

or, $y\cos\theta\sin^2\theta + y\cos^3\theta = \sin\theta\cos\theta$

or, $y\cos\theta[\sin^2\theta + \cos^2\theta] = \sin\theta\cos\theta$

or, $y\cos\theta \times 1 = \sin\theta\cos\theta$

or, $y = \sin\theta$ ...(iii) **1**

Substituting this value of y in eqn. (i),

$x = \cos\theta$ ...(iv)

$\therefore$ Squaring and adding eqn. (iii) and eqn. (iv), we get

$x^2 + y^2 = \cos^2\theta + \sin^2\theta = 1$ **1**

Hence proved.

10. $\because$ $\sec(90° - \theta) = \text{cosec}\,\theta$,

$\tan(90° - \theta) = \cot\theta$,

$\cot(90° - \theta) = \tan\theta$,

$\text{cosec}(90° - \theta) = \sec\theta$ **1**

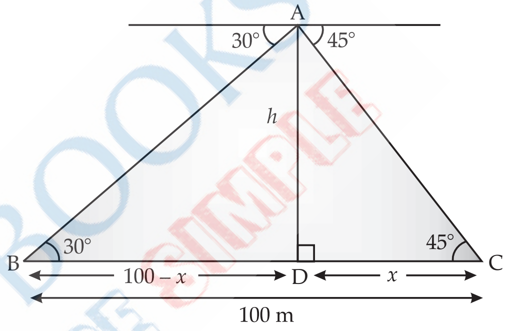
Hence,

$$\frac{\sin\theta\sec(90° - \theta)\tan\theta}{\text{cosec}(90° - \theta)\cos\theta\cot(90° - \theta)} - \frac{\tan(90° - \theta)}{\cot\theta}$$

$$= \frac{\sin\theta\,\text{cosec}\,\theta\tan\theta}{\sec\theta\cos\theta\tan\theta} - \frac{\cot\theta}{\cot\theta}$$ **1**

$$= \frac{\sin\theta \times \frac{1}{\sin\theta}\times\tan\theta}{\frac{1}{\cos\theta}\times\cos\theta\tan\theta} - 1 = 1 - 1 = 0$$ **1**

11. Let AD be the height (h) m of the light house and BC is the distance between two ships



1

Given, $BC = 100$ m

In ΔADC $\tan 45° = \frac{h}{DC}$

$\Rightarrow$ $x = h$ ...(i) **1**

In ΔABD, $\tan 30° = \frac{h}{100 - DC}$

$\Rightarrow$ $\frac{1}{\sqrt{3}} = \frac{h}{100 - x}$

$\therefore$ $100 - x = h\sqrt{3}$ **1**

$100 - h = h\sqrt{3}$ [By (i)]

$\Rightarrow$ $100 = h + h\sqrt{3}$

$\Rightarrow$ $100 = h(1 + \sqrt{3})$

$h = \frac{100}{1 + \sqrt{3}}$ **1**

$h = \frac{100}{(\sqrt{3} + 1)} \times \frac{(\sqrt{3} - 1)}{(\sqrt{3} - 1)}$

$\Rightarrow$ $h = \frac{100(\sqrt{3} - 1)}{3 - 1}$

$= 50(\sqrt{3} - 1)$

$= 50(1.732 - 1)$

$= 50 \times 0.732$

$\therefore$ Height of light house $= 36.60$ m. **1**

SELF PRACTICE PAPER SOLUTION

Maximum Time: 1 hour **Unit-VI** **MM: 25**

1. $\because$ Circumference of the outer circle, $2\pi r_1 = 88$ cm

$\therefore$ $r_1 = \frac{88 \times 7}{2 \times 22} = 14$ cm.

$\because$ Circumference of the inner circle, $2\pi r_2 = 66$ cm

$\therefore$ $r_2 = \frac{66 \times 7}{2 \times 22} = \frac{21}{2}$ cm

$= 10.5$ cm

$\therefore$ Width of the ring $= r_1 - r_2$

$= 14 - 10.5$ cm $= 3.5$ cm. 1

2. Let r be the radius of the circle.

Area of the circle= Sum of areas of two circles

$\pi r^2 = \pi \times (8)^2 + \pi(6)^2$

or, $\pi r^2 = \pi(64 + 36)$

or, $r^2 = 100$

or, $r = 10$ cm

$\therefore$ Diameter of the circle $= 2 \times 10 = 20$ cm. 1

[CBSE Marking Scheme, 2012]

3. Curved Surface area of cylinder $= 2\pi rh$

Volume of cylinder $= \pi r^2 h$

$\frac{\pi r^2 h}{2\pi rh} = \frac{924}{264} \Rightarrow \frac{r}{2} = \frac{7}{2}$

$\therefore$ $r = 7$ m

$2\pi rh = 264$

or, $2 \times \frac{22}{7} \times 7 \times h = 264$

or, $h = 6$ m

$\therefore$ $\frac{h}{2r} = \frac{6}{14} = \frac{3}{7}$ 1

Hence, $h : 2r = 3 : 7$

[CBSE Marking Scheme, 2014]

4. Perimeter of the circle = Perimeter of square

Let side of square be x cm.

$2\pi r = 4x$

or, $2 \times \frac{22}{7} \times 77 = 4x$

$\therefore$ $x = \frac{2 \times 22 \times 11}{4} = 121$

Side of the square $= 121$ cm.

5. Area of the circle = sum of areas of two circles

$\pi R^2 = \pi \times (40)^2 + \pi(9)^2$

or, $R^2 = 1600 + 81$

or, $R = \sqrt{1681} = 41$ cm.

$\therefore$ Diameter of given circle $= 41 \times 2 = 82$ cm.

6. CASE STUDY BASED QUESTIONS

(i) Correct option: **(c)**.

Explanation: Area of 9 circles

$= 9 \times \pi r^2$

$= 9 \times \frac{22}{7} \times 7 \times 7$

$= 1386$ sq cm. 1

(ii) Correct option: **(d)**.

Explanation: Side of square $= 6 \times 7 = 42$ cm

(side of square = Diameter of 3 circles) 1

(iii) Correct option: **(a)**.

Explanation:

Area of square $= (\text{side})^2$

$= (42)^2$

$= 1764$ sq cm. 1

(iv) Correct option: **(c)**.

Explanation: Area of remaining protion

$= (1764 - 1386)$ Sq cm.

$= 378$ sq cm. 1

(v) Correct option: **(a)**.

Explanation: The given problem is based on 'Areas Related ti Circles. 1

7. Angle subtended in 1 minute $= 6°$

θ = angle subtended in 35 minutes

$= 35 \times 6° = 210°$ ½

$\therefore$ Area swept by the minute hand

= Area of the sector ½

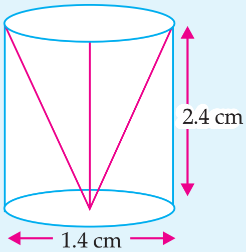
$= \frac{\pi r^2 \theta}{360°} = \frac{22}{7} \times \frac{14 \times 14 \times 210}{360}$ ½

$= \frac{1078}{3} = 359{\cdot}33$ cm^2. ½

(Approx)

[CBSE Marking Scheme, 2012]

8. Volume of remaining solid



= Volume of cylinder

– Volume of cone

$= \pi r^2 h - \frac{1}{3}\pi r^2 h$

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

$= \frac{2}{3} \times \frac{22}{7} \times 0.7 \times 0.7 \times 2.4$ ½

$= 44 \times 0.1 \times 0.7 \times 0.8$

$= 4.4 \times 0.56$

$= 2.464$ cm^3. ½

[CBSE Marking Scheme, 2012]

9. Let the radii of two cylinders be $2x$ and $3x$ and their heights be $5y$ and $4y$ respectively. ½

Again, ratio of their curved surface areas

$$= \frac{2\pi \times 2x \times 5y}{2\pi \times 3x \times 4y} = \frac{5}{6} \qquad \mathbf{1}$$

$\because$ Hence, their curved surface areas are in the ratio of 5 : 6.

$$\therefore \text{ Ratio of their volumes } = \frac{\pi \times (2x)^2 \times 5y}{\pi \times (3x)^2 \times 4y} \qquad \mathbf{1}$$

$$= \frac{5 \times 4}{4 \times 9}$$

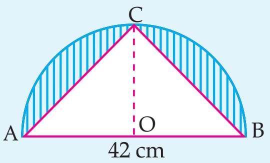
$$= \frac{5}{9} \qquad ½$$

Hence, their volumes are in the ratio of 5 : 9.

and their CSAs are in the ratio of 5 : 6

[CBSE Marking Scheme, 2012]

10.



½

Base of triangle = diameter of semicircle

= 42 cm

and its height = radius of semicircle

$$= \frac{42}{2} = 21 \text{ cm} \qquad ½$$

Area of shaded portion = Area of semicircle – area of ΔABC

$$= \frac{1}{2}\pi r^2 - \frac{1}{2} \times \text{base} \times \text{height} \qquad ½$$

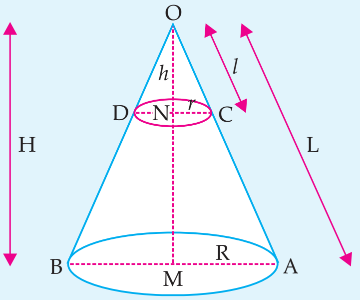
$$= \frac{1}{2} \times \frac{22}{7} \times 21 \times 21 - \frac{1}{2} \times 42 \times 21 \qquad \mathbf{1}$$

$$= 693 - 441 = 252$$

Hence, the area of shaded portion = 252 cm². ½

[CBSE Marking Scheme, 2014]

11.



Let the height of larger cone be H

Let height of smaller cone be h

and radius of larger & smaller cones are R and r

Now, $\Delta ONC \sim \Delta OMA$

$$\therefore \quad \frac{h}{H} = \frac{r}{R} = \frac{l}{L} \qquad \mathbf{1}$$

or CSA of the frustum $= \frac{15}{16}$ of (CSA of cone OAB)

and CSA of cone $OCD = 1 - \frac{15}{16} = \frac{1}{16}$ of (CSA of cone OAB)

$$\text{or, } \frac{\text{CSA of cone } OCD}{\text{CSA of cone } OAB} = \frac{1}{16}$$

$$\text{or, } \frac{\pi rl}{\pi RL} = \frac{1}{16} \qquad \mathbf{1}$$

$$\text{or, } \left(\frac{r}{R}\right)\left(\frac{l}{L}\right) = \frac{1}{16}$$

$$\text{or, } \left(\frac{h}{H}\right)\left(\frac{h}{H}\right) = \frac{1}{16} \qquad \left(\because \frac{l}{L} = \frac{h}{H}\right)$$

$$\text{or, } \frac{h}{H} = \frac{1}{4}$$

$$\text{or, } h = \frac{1}{4}H \qquad \mathbf{1}$$

$$\therefore \quad ON = \frac{1}{4}H$$

$$\text{and} \quad MN = \frac{3}{4}H$$

$$\text{or, } ON : MN = 1 : 3 \qquad \mathbf{1}$$

[CBSE Marking Scheme, 2014]

SELF PRACTICE PAPER SOLUTION

Maximum Time: 1 hour **Unit-VII** **MM: 25**

1.

Class	Frequency	Cumulative frequency
0 – 5	10	10
5 – 10	15	25
10 – 15	12	37
15 – 20	20	57
20 – 25	9	66

The modal class is the class having the maximum frequency. ½

The maximum frequency 20 belongs to class (15–20).

Here, $n = 66$

So, $\frac{n}{2} = \frac{66}{2} = 33$

33 lies in the class 10–15.

Therefore, 10–15 is the median class.

So, sum of lower limits of (15–20) and (10–15) is (15 + 10) = 25 ½

2. (i)

Class Interval	*c.f.*	*f*
0 – 10	63	5
10 – 20	58	3
20 – 30	55	4
30 – 40	51	3
40 – 50	48	6
50 – 60	42	42

½

So, frequency of the class 30 – 40 is 3.

(ii) Class mark of the class: 10 – 20 = $\frac{10+20}{2} = 15$ ½

3. Total outcomes = 10

$$\text{Mean} = \frac{3+5+5+7+7+7+9+9+9+9}{10} = \frac{70}{10} = 7$$

No. of favourable outcomes = 3

$$P(\text{mean}) = \frac{3}{10}$$ **1**

[CBSE Marking Scheme, 2012]

4. P(winning the game) = 0.08

P(losing the game) = 1 – 0.08 = 0.92 **1**

[CBSE Marking Scheme, 2012]

5. The numbers divisible by 2 and 3 both are 6, 12, 18, and 24.

No. of favourable outcomes = 4.

$\therefore$ P(number divisible by 2 and 3) = $\frac{4}{25}$ **1**

6. Visually Case Study Based Questions C + AE

(i) Correct option: **(a).**

Explanation:

Total no. of triangles = 8

Triangles with blue colour = 3

Triangles with red colour = 8 – 3 = 5

Total no. of squares = 10

Squares with blue colour = 6

Squares with red colour = 10 – 6 = 4. **1**

(ii) Correct option: **(a).**

Explanation:

Number of favourable outcomes for the event that lost figure is triangles, *i.e.*,

Total figures (squares and triangles) = 8 + 10 = 18

i.e., $T(E) = 18$

$\therefore$ P(getting a triangles)

$$= \frac{P(E)}{T(E)}$$

$$= \frac{8}{18} = \frac{4}{9}. \quad \mathbf{1}$$

(iii) Correct option: **(b)**.

Explanation: Number of favourable outcomes for the events that square is lost, *i.e.*,

$$F(E) = 10$$

and $T(E) = 8 + 10 = 18$

$\therefore P(\text{getting a square}) = P(E) = \frac{10}{18} = \frac{5}{9}.$ **1**

(iv) Correct option: **(c)**.

Explanation: Number of favourable outcomes for the events that lost figure is square of blue colour, *i.e.*,

$$F(E) = 6 \text{ and } T(E) = 18.$$

$\therefore P(\text{getting a blue square})$

$$= P(E) = \frac{F(E)}{T(E)}$$

$$= \frac{6}{18} = \frac{1}{3}. \quad \mathbf{1}$$

(v) Correct option: **(c)**.

Explanation: Number of favourable outcomes for the events that lost figure is triangle of red colour, *i.e.*,

$$F(E) = 15$$

and $T(E) = 18$

$\therefore P(\text{lost figure is red triangle}) = \frac{5}{18}.$ **1**

7. Let blue balls $= x$ and red balls $= 5$

$\therefore$ Total balls $= 5 + x$

$$P(\text{red ball}) = \frac{5}{5+x}$$

$$P(\text{blue ball}) = \frac{x}{5+x} \quad \mathbf{1}$$

$$\therefore \frac{x}{5+x} = 3\frac{5}{5+x}$$

$\Rightarrow x = 15.$ **1**

[CBSE Marking Scheme, 2012]

8. (i) Even numbers occur are

(2, 2) (2, 4) (2, 6) (4, 2) (4, 4) (4, 6) (6, 2) (6, 4) (6, 6)

$P(\text{number of each die is even}) = \frac{9}{36} = \frac{1}{4}$ **1**

(ii) Sum of numbers is 5 in (1, 4) (2, 3) (3, 2) (4, 1)

P(sum of numbers appearing on two dice is 5)

$$= \frac{4}{36} = \frac{1}{9}. \quad \mathbf{1}$$

9.

C. I.	f	$c.f.$
0 – 10	5	5
10 – 20	x	$x + 5$
20 – 30	20	$x + 25$
30 – 40	15	$x + 40$
40 – 50	y	$x + y + 40$
50 – 60	5	$x + y + 45$
	Σf = **60**	

From table $N = 60 = x + y + 45$

$\Rightarrow x + y = 60 - 45 = 15$ ...(i)

Since, Median $= 28.5$, which lies between 20 – 30. **1**

$\therefore$ Median class $= 20 - 30$

$$\text{Median} = l + \frac{\left(\frac{N}{2} - c.f.\right)}{f} \times h$$

$$\Rightarrow 28.5 = 20 + \frac{[30 - (x+5)]}{20} \times 10$$

$$\Rightarrow 8.5 = \frac{25 - x}{2} \quad \mathbf{1}$$

$\Rightarrow 25 - x = 17$

$\Rightarrow x = 25 - 17 = 8$

From (i), $y = 15 - 8 = 7$ **1**

Hence, $x = 8$ and $y = 7$.

10.

Class-Interval	Frequency
0 – 10	8
10 – 20	12
20 – 30	25
30 – 40	13
40 – 50	12
Total	**70**

Here, Modal class = 20 – 30 **1**

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$$ ½

and $l = 20,\ f_1 = 25,\ f_2 = 13$ and $f_0 = 12$ and $h = 10$ ½

$$\text{Mode} = 20 + \left(\frac{25-12}{50-12-13}\right) \times 10$$ ½

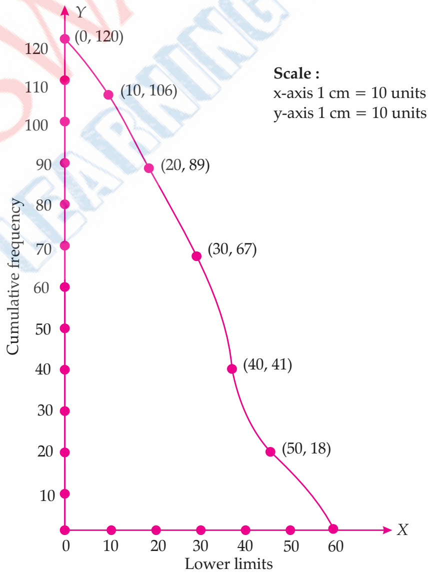
$$= 20 + \frac{13}{25} \times 10$$

$$= 20 + 5.2 = 25.2.$$ ½

11.

Weight (in kg)	Cumulative Frequency
More than 0	120
More than 10	106
More than 20	89
More than 30	67
More than 40	41
More than 50	18
More than 60	0

Plotting the points : 2½



2½