# MATHEMATICS SAMPLE PAPER # 1

## ANSWER AND SOLUTIONS

### SECTION-A

**1.** $x^2 - 4x - 8 = 0$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4 \times 1 \times (-8)}}{2}$$

$$= \frac{4 \pm \sqrt{16+32}}{2}$$

$$= \frac{4 \pm \sqrt{48}}{2}$$

$$= \frac{4 \pm 4\sqrt{3}}{2}$$

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

OR

Given $eq^n$ $x^2 - 4x + 1 = 0$

Here a = 1, b = – 4, c = 1

Discriminant $D = b^2 - 4ac$

$= (-4)^2 - 4 \times 1 \times 1$

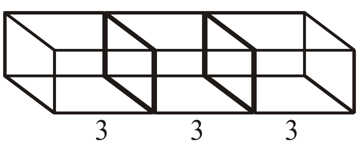
$= 16 - 4$

$= 12$

**2.** Volume of cube = 27

$a^3 = 27$

$a = 3$




Length of cuboid formed = 3+3+3 = 9

breadth of cuboid formed = 3

height of cuboid formed = 3

surface area of cuboid = $2\,(9 \times 3 + 3 \times 3 + 3 \times 9)$

$= 2\,(27 + 9 + 27)$

$= 2 \times 63 = 126\ cm^2$

**3.**

| Classes | Frequency |
|---|---|
| 0 – 6 | 7 |
| 6 – 12 | 5 |
| 12 – 18 | 10 |
| 18 – 24 | 12 |
| 24 – 30 | 6 |

Since, highest frequency is 12

Hence, modal class is 18 – 24

$l = 18,\ f_1 = 12,\ f_0 = 10,\ f_2 = 6,\ h = 6$

$$\text{Mode} = \ell + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$$

$$= 18 + \frac{12-10}{24-10-6} \times 6$$

$$= 18 + \frac{2}{8} \times 6$$

$$= 18 + \frac{3}{2}$$

$= 18 + 1.5$

$= 19.5$

**4.** Two APs are 63, 65, 67, ..., (1)

and 3, 10, 17, .... (2)

From (1), First term = 63 and common difference = 2.

Its nth term = $63 + (n-1) \times 2 = 2n + 61$.

From (2), First term = 3 and common difference = 7

Its nth term = $3 + (n-1) \times 7 = 7n - 4$

Putting $7n - 4 = 2n + 61$

$\Rightarrow\ 7n - 2n = 61 + 4 \Rightarrow 5n = 65 \Rightarrow n = 13$

**5.**

| Class | Frequency | cf |
|---|---|---|
| 12.5-17.5 | 2 | 2 |
| 17.5-22.5 | 22 | 24 |
| 22.5-27.5 | 19 | 43 |
| 27.5-32.5 | 14 | 57 |
| 32.5-37.5 | 13 | 70 |

$\frac{N}{2} = \frac{70}{2} = 35$

Median class = 22.5 – 27.5

Median = $\ell + \frac{\frac{N}{2} - cf}{f} \times h$

$= 22.5 + \frac{35-24}{19} \times 5$

$= 22.5 + \frac{11 \times 5}{19}$

$= 22.5 + \frac{55}{19}$

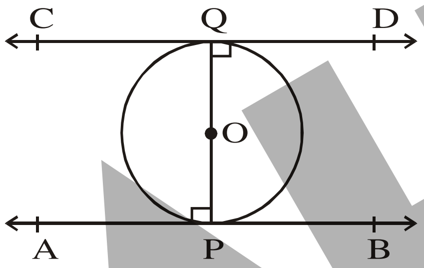
= 22.5 + 2.89

= 25.39

**6.** In the figure, PQ is diameter of the given circle and O is its centre.

Let tangents AB and CD be drawn at the end points of the diameter PQ.

Since, the tangents at a point to a circle is perpendicular to the radius through the point.




$\therefore$ PQ $\perp$ AB

$\Rightarrow$ $\angle APQ = 90°$

and PQ $\perp$ CD

$\Rightarrow$ $\angle PQD = 90°$

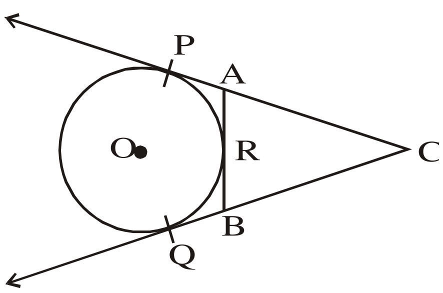
$\Rightarrow$ $\angle APQ = \angle PQD$

But they form a pair of alternate angles.

$\therefore$ AB || CD.

Hence, the two tangents are parallel.

**OR**




CP = CQ = 11 cm

(Tangents from external point)

CQ = CB + BQ

But BQ = BR

(Tangents from external point)

$\therefore$ 11 = 7 + BR

or BR = 4 cm

## SECTION-B

**7.** $a_n = 7 - 3n$

n = 1

$\Rightarrow a_1 = 4$

n = 2

$\Rightarrow a_2 = 1$

$d = a_2 - a_1$

d = – 3

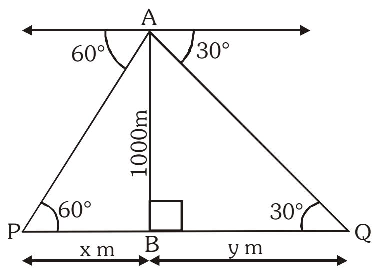
$S_n = \frac{n}{2}[2a + (n - 1)d]$

$S_{25} = \frac{25}{2}[2(4) + 24(-3)]$

$= \frac{25}{2}[8 - 72]$

$S_{25} = \frac{25}{2} \times -64 = -800$

**8.**




Let A be the position of the captain of an aeroplane flying at the altitude of 1000 metres from the ground.

AB = The altitude of the aeroplane from the ground = 1000 m

P and Q be the position of two ships.

Let PB = x metres, and BQ = y metres.

Required : PQ = Distance between the ships = (x + y) metres.

ABP is rt. $\Delta$ at B

$$\frac{AB}{PB} = \tan 60°$$

$$\frac{1000}{x} = \sqrt{3} \Rightarrow x = \frac{1000}{\sqrt{3}}$$

$$x = \frac{1000(1.732)}{3} = 577.3 \text{ m}$$

ABQ is rt. $\Delta$ at B

$$\frac{AB}{BQ} = \tan 30°$$

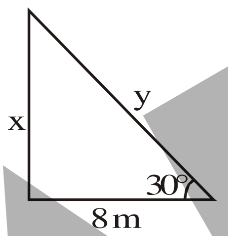
$$\frac{1000}{y} = \frac{1}{\sqrt{3}} \Rightarrow y = 1000\sqrt{3}$$

$y = 1000\ (1.732) = 1732$ m

Required distance between the ships = (x + y) metres

= (577.3 + 1732) m = 2309.3 m

**OR**




Height of tree = (x + y)m

$$\tan 30° = \frac{x}{8}$$

$$\Rightarrow x = \frac{8}{\sqrt{3}} m$$

$$\cos 30° = \frac{8}{y}$$

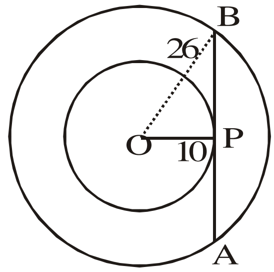
$$\frac{\sqrt{3}}{2} = \frac{8}{y}$$

$$y = \frac{16}{\sqrt{3}}$$

$$x + y = \frac{8}{\sqrt{3}} + \frac{16}{\sqrt{3}} = \frac{24}{\sqrt{3}} m$$

$$\Rightarrow \frac{24}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 8\sqrt{3} m$$

**9.**




In $\Delta$OPB

$OP^2 + PB^2 = OB^2$ [by pythagoras theroem]

$(10)^2 + PB^2 = (26)^2$

$PB^2 = (26)^2 - (10)^2$

$PB^2 = 676 - 100 = 576$

PB = 24 cm

$\therefore$ AB = AP + PB = 24 + 24 = 48cm

**10.** Let the number be x and x + 1

ATQ

$x^2 + (x + 1)^2 = 421$

$x^2 + x^2 + 1 + 2x = 421$

$2x^2 + 2x - 420 = 0$

$x^2 + x - 210 = 0$

$x^2 + 15x - 14x - 210 = 0$

$x(x + 15) - 14(x + 15) = 0$

$(x + 15)(x - 14) = 0$

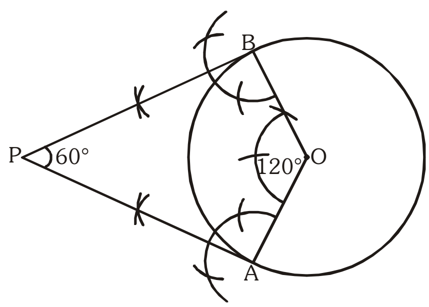
$x = -15$ (Rejected) ; $x = 14$

$x + 1 = 14 + 1 = 15$

Thus, numbers are 14 and 15.

## SECTION-C

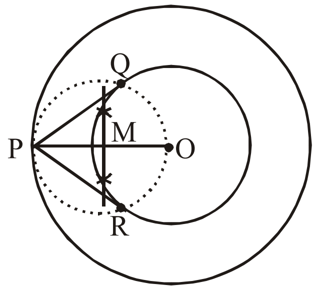
**11.**




Steps of construction

1. Draw circle with centre at O and radius 3 cm.
2. Construct radii OA and OB such that $\angle AOB = 120°$.
3. Draw perpendiculars to OA and OB at A and B respectively and let they intersect at P.
4. Now, PA and PB is a pair of tangents inclined to each other at an angle of 60°.

**OR**




**Steps of construction**

1. Two concentric circles of radius 4cm & 6cm are drawn.
2. Taking P a point on circumference of outer circle & OP is joined.
3. Perpendicular bisector of OP is drawn intersecting it at M.
4. Taking M as centre & MP as radius, a circle is drawn intersecting smaller circle at Q & R.
5. PQ & PR are required tangents.

**12.**

| Class Interval | $x_i$ | Frequency | $f_ix_i$ |
|---|---|---|---|
| 0-20 | 10 | 5 | 50 |
| 20-40 | 30 | $f_1$ | $30f_1$ |
| 40-60 | 50 | 10 | 500 |
| 60-80 | 70 | $f_2$ | $70f_2$ |
| 80-100 | 90 | 7 | 630 |
| 100-120 | 110 | 8 | 880 |
| Total | | 50 | $2060+30f_1+70f_2$ |

$30 + f_1 + f_2 = 50$

$f_1 + f_2 = 20$ ......(1)

Mean $= \frac{\Sigma f_i x_i}{\Sigma f_i}$

$62.8 = \frac{2060 + 30f_1 + 70f_2}{50}$

$3140 = 2060 + 30f_1 + 70f_2$

$30f_1 + 70f_2 = 1080$

$3f_1 + 7f_2 = 108$ ..(2)

Multiplying equation (1) by 3 and subtracting from (1)

$3f_1 + 7f_2 = 108$

$\underset{-}{3f_1} \underset{-}{+} 3f_2 = \underset{-}{} 60$

$4f_2 = 48$

$f_2 = 12$

from (1)

$f_1 = 8$

**13.** (i) In $\Delta ABD$

$\tan 45° = \frac{AB}{BD}$

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

$BD = AB$

$BD = 20m$

(ii) In $\Delta CBD$

$\tan 60° = \frac{CB}{BD}$

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

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

$CA = 20\sqrt{3} - 20$

$= 20\left(\sqrt{3} - 1\right)$

$= 20(1.73 - 1)$

$= 20 \times 0.73$

$= 14.6$ m

**14.** (i) slant height $= \sqrt{r^2 + h^2}$

$= \sqrt{7^2 + 24^2}$

$= \sqrt{49 + 576}$

$= \sqrt{625}$

$= 25$cm

(ii) Total surface area

= curved surface area of cylinder + curved surface area of hemisphere + curved surface area of cone

$= 2\pi \times 7 \times 40 + 2\pi \times 7^2 + \pi \times 7 \times 25$

$= \pi\ (560 + 98 + 175)$

$= 833 \times \frac{22}{7}$

$= 22 \times 119$

$= 2618\ cm^2$