PRACTICE PAPER 1*

Time allowed : 2 hours | *Maximum marks : 40*

General Instructions :

1. *This question paper contains two parts A and B. Each part is compulsory. Part-A carries 8 marks and Part-B carries 32 marks.*
2. *Part-A has Objective Type Questions and Part-B has Descriptive Type Questions.*
3. *Both Part-A and Part-B have internal choices.*

Part - A :

1. *It consists of two Sections-I and II.*
2. *Section-I comprises of 4 MCQs.*
3. *Section-II contains 1 case study-based questions.*

Part - B :

1. *It consists of four Sections-III, IV, V and VI.*
2. *Section-III comprises of 5 questions of 1 mark each.*
3. *Section-IV comprises of 4 questions of 2 marks each.*
4. *Section-V comprises of 3 questions of 3 marks each.*
5. *Section-VI comprises of 2 questions of 5 marks each.*
6. *Internal choice is provided in 1 question of Section-III, 1 question of Section-IV, 1 question of Section-V and 2 questions of section-VI. You have to attempt only one of the alternatives in all such questions.*

PART - A

Section - I

1. Find the roots of the quadratic equation $4(x - 2)^2 = 16$.

(a) 2, 4 (b) 0, 4 (c) –2, 4 (d) 0, 2

2. A hollow cylinder of height 20 cm is melted and cast into a solid cylinder of height 4 cm. If the internal and external radii of the hollow cylinder are 2 cm and 3 cm respectively, then find the radius of the solid cylinder.

(a) 5 cm (b) 6 cm (c) 7 cm (d) 8 cm

3. If the mean and mode of a frequency distribution are 28 and 19 respectively, then find the median.

(a) 15 (b) 18 (c) 20 (d) 25

4. If 1/4 is a root of the quadratic equation $x^2 + kx - 7/16 = 0$, then find the value of k.

(a) $\frac{-3}{2}$ (b) $\frac{3}{2}$ (c) $\frac{2}{3}$ (d) $\frac{-2}{3}$

Section - II

Case study-based question is compulsory. Attempt any 4 sub parts. Each question carries 1 mark.

5. Application of A.P. in Day to Day life.

Do you know, we can find A.P. in many situations in our day-to-day life. One such example is a tissue paper roll, in which the first term is the diameter of the core of the roll and twice the thickness of the paper is the common difference. If the sum of first n rolls of tissue on a roll is $S_n = 0.1\ n^2 + 7.9n$, then answer the following questions.

**The paper is for practice purpose. CBSE has yet not released the official sample paper. So, the pattern is suggestive only. For latest information visit www.cbse.gov.in.*

(i) Find S_{n-1}.
(a) $0.1n^2 - 0.2n - 7.8$
(b) $0.1n^2 - 7.9n$
(c) $0.1n^2 + 7.7n - 7.8$
(d) None of these

(ii) Find the radius of the core.
(a) 8 cm (b) 4 cm (c) 16 cm (d) Can't be determined

(iii) $S_2 =$
(a) 16.2 (b) 8.2 (c) 2.8 (d) 4.8

(iv) What is the diameter of roll when one tissue sheet is rolled over it?
(a) 7.6 cm (b) 7.9 cm (c) 8.1 cm (d) 8.2 cm

(v) Find the thickness of each tissue sheet.
(a) 2 cm (b) 1 cm (c) 1 mm (d) 2 mm

PART - B
Section - III

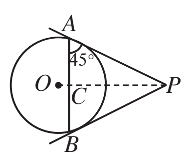
6. If $\alpha = \frac{-b+\sqrt{b^2-12c}}{k}$ and $\beta = \frac{-b-\sqrt{b^2-12c}}{k}$ are two roots of the quadratic equation $3x^2 + bx + c = 0$, then find the value of k.

7. Find the least positive value of k for which the equation $x^2 + kx + 4 = 0$ has real roots.

8. If angle between two tangents drawn from a point P to a circle of radius a units and centre O is 90°, then prove that $OP = a\sqrt{2}$ units.

OR

In the given figure, PA and PB are tangents from an external point P and $\angle PAB = 45°$. Then, find the value of $\angle APB$.



9. Find the upper limit of the modal class of the data is given below :

Classes	Frequency
0-100	10
100-200	12
200-300	14
300-400	20
400-500	14
500-600	7

10. Find the mean of first twelve odd natural numbers.

Section - IV

11. Find the value of p, for which one root of the quadratic equation $px^2 - 14x + 8 = 0$ is 6 times the other.

12. A solid is in the shape of a cone mounted on a hemisphere of same base radius. If the curved surface areas of the hemispherical part and the conical part are equal, then find the ratio of the square of radius and the square of height of the conical part.

OR

A cone of height 32 cm and radius of base 8 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the diameter of the sphere.

13. Data of 'missed catches' for the 40 matches played by a player is as follows :

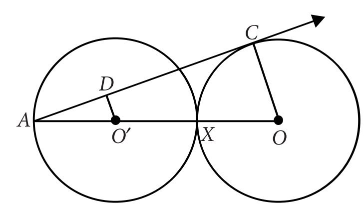
Number of missed catches in a match	0-3	3-6	6-9	9-12	12-15
Number of matches	15	16	3	4	2

Calculate the mean number of catches missed by him.

14. A pole casts a shadow of length $2\sqrt{3}\,\text{m}$ on the ground, when the sun's elevation is 60°. Find the height of the pole.

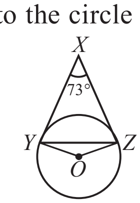
Section - V

15. In the given figure, two equal circles, with centres O and O' touch each other at X. OO' produced meets the circle with centre O' at A. AC is tangent to the circle with centre O, at the point C. $O'D$ is perpendicular to AC. Find the value of $\frac{DO'}{CO}$.



OR

In the given figure, XY and XZ are tangents to the circle with centre O such that $\angle YXZ = 73°$. Find $\angle YZO$.



16. A hemispherical bowl of internal radius 9 cm is full of water. Its contents are emptied in a cylindrical vessel of internal radius 6 cm. Find the height of water in the cylindrical vessel.

17. Find the median of the following data :

Marks	20-30	30-40	40-50	50-60	60-70	70-80	80-90
Number of students	5	15	25	20	7	8	10

Section - VI

18. There is a small island in the middle of a 100 m wide river and a tall tree stands on the island. P and Q are points directly opposite to each other on two banks and in line with the tree. If the angles of elevation of the top of the tree from P and Q are respectively 30° and 45°, then find the height of the tree. (Use $\sqrt{3} = 1.732$)

OR

A 1.2 m tall girl spots a balloon moving with the wind in a horizontal line at a height of 88.2 m from the ground. The angle of elevation of the balloon from the eyes of the girl at that instant is 60°. After some time, the angle of elevation reduces to 30°. Find the distance travelled by the balloon during the interval.

19. Draw a circle of radius 3.5 cm. Draw two tangents to the circle which are perpendicular to each other.

OR

Draw a line segment of length 6 cm. Using compasses and ruler, find a point P on it which divides it in the ratio 3 : 4.

ANSWERS

1. **(b) :** We have, $4(x-2)^2 = 16$

$\Rightarrow (x-2)^2 = 4 \Rightarrow x - 2 = \pm 2$

$\Rightarrow x - 2 = 2$ or $x - 2 = -2 \Rightarrow x = 4$ or $x = 0$

2. **(a) :** Let r be the radius of solid cylinder.

$\therefore \pi r^2(4) = \pi(3^2 - 2^2)20 \Rightarrow r^2 = 5 \times 5 \Rightarrow r = 5$ cm

3. **(d) :** We know that, Mode = 3 Median – 2 Mean

$\Rightarrow$ 3 Median = Mode + 2 Mean

$\Rightarrow$ 3 Median = 19 + 2 × 28 $\Rightarrow$ Median = 75/3 = 25

4. **(b) :** Since, $\frac{1}{4}$ is the zero of the quadratic equation,

$$x^2 + kx - \frac{7}{16} = 0$$

$$\therefore \left(\frac{1}{4}\right)^2 + k\left(\frac{1}{4}\right) - \frac{7}{16} = 0$$

$$\Rightarrow \frac{1}{4}k = \frac{7}{16} - \frac{1}{16} = \frac{6}{16} \Rightarrow k = \frac{6}{16} \times 4 = \frac{3}{2}$$

5. Here $S_n = 0.1n^2 + 7.9n$

(i) **(c) :** $S_{n-1} = 0.1(n-1)^2 + 7.9(n-1)$
$= 0.1n^2 + 7.7n - 7.8$

(ii) **(b) :** $S_1 = t_1 = 0.1(1)^2 + 7.9(1) = 8$ cm
= Diameter of core

So, radius of the core = 4 cm

(iii) **(a):** $S_2 = 0.1(2)^2 + 7.9(2) = 16.2$

(iv) **(d) :** Required diameter $= t_2 = S_2 - S_1$
$= 16.2 - 8 = 8.2$ cm

(v) **(c) :** As common difference, $d = t_2 - t_1 = 8.2 - 8 = 0.2$ cm

So, thickness of tissue = 0.2 ÷ 2 = 0.1 cm = 1 mm

6. The roots of the equation $3x^2 + bx + c = 0$ are given by $x = \frac{-b \pm \sqrt{b^2 - 12c}}{6}$

Now, on comparing it with given roots, we get $k = 6$

7. Given, $x^2 + kx + 4 = 0$ has real roots.

$\therefore D \geq 0 \Rightarrow k^2 - 4\cdot4\cdot1 \geq 0 \Rightarrow k^2 - 16 \geq 0$

Clearly, the least positive value of k satisfying this is 4.

8. Given, from point P, two tangents are drawn.

Also, it is given that $OT = a$ units

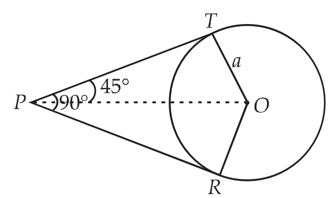
Clearly line OP bisects the $\angle RPT$.

$\therefore \angle TPO = \angle RPO = 45°$

Also, $OT \perp TP$

$\Rightarrow \angle OTP = 90°$

In right angled ΔOTP,



$$\sin 45° = \frac{OT}{OP}$$

$$\Rightarrow \frac{1}{\sqrt{2}} = \frac{a}{OP} \Rightarrow OP = a\sqrt{2} \text{ units}$$

OR

In ΔPBA, we have

$PA = PB$

[∵ Tangents from an external point to a circle are equal]

$\therefore \Delta APB$ is an isosceles triangle.

$\therefore \angle PBA = \angle PAB = 45°$

(∵ Angle opposite to equal sides of an isosceles triangle are equal)

In ΔAPB, $\angle APB + \angle PAB + \angle PBA = 180°$

$\Rightarrow \angle APB + 45° + 45° = 180°$

$\Rightarrow \angle APB = 90°$

9. In the given table frequency of the class 300 - 400 is the greatest.

$\therefore$ Modal class is 300 - 400

Thus, upper limit of the modal class is 400.

10. First ten odd natural numbers are 1, 3, 5, 7, 9, 11, 13, 15, 17, 19 21 and 23.

$\therefore$ Mean $=\frac{1+3+5+7+9+11+13+15+17+19+21+23}{10}$

$=\frac{144}{12}=12$

11. Given equation is, $px^2 - 14x + 8 = 0$.
Let roots of equation be α and β such that
$\beta = 6\alpha \Rightarrow 6\alpha - \beta = 0$ ...(i)

Now, sum of roots $= \alpha + \beta = -\left(\frac{-14}{p}\right)=\frac{14}{p}$ ...(ii)

and product of roots $= \alpha\beta = \frac{8}{p}$ ...(iii)

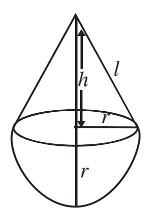
Solving (i) and (ii), we get $\alpha = \frac{2}{p}$ and $\beta = \frac{12}{p}$

Putting these values in (iii) we get

$\left(\frac{2}{p}\right)\times\left(\frac{12}{p}\right)=\frac{8}{p} \Rightarrow 8p = 24 \Rightarrow p = 3$ $(\because p \neq 0)$

12. Let r be the radius of cone or hemispherical part and h be the height of cone.
According to question,
$2\pi r^2 = \pi rl$ (where l is slant height of cone)
$\Rightarrow 2r = l \Rightarrow 4r^2 = l^2$
$\Rightarrow 4r^2 = r^2 + h^2$
$\Rightarrow 3r^2 = h^2$

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



OR

Let the radius of the sphere be r and R, h are the radius, height of cone respectively.
Radius of the cone = 8 cm
Height of the cone = 32 cm
Now, Volume of sphere = Volume of cone

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

$\Rightarrow \frac{4}{3}\pi r^3=\frac{1}{3}\pi(8)^2\times(32)$

$\Rightarrow r^3 = 8^3 \Rightarrow r = 8$ cm
$\therefore$ Diameter of the sphere $= 2r = 16$ cm

13. The frequency distribution table from the given data can be drawn as :

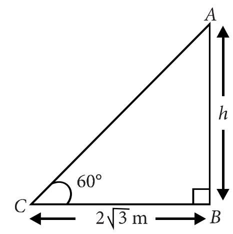
Missed catches	Class marks (x_i)	Frequency (f_i)	$f_i x_i$
0-3	1.5	15	22.5
3-6	4.5	16	72
6-9	7.5	3	22.5
9-12	10.5	4	42
12-15	13.5	2	27
		$\Sigma f_i = 40$	$\Sigma f_i x_i = 186$

$\therefore$ Mean $=\frac{\sum f_i x_i}{\sum f_i}=\frac{186}{40}=4.65$

14. Let AB is the pole of height h m and its shadow be BC.
$BC = 2\sqrt{3}$ m, $\angle ACB = 60°$
In ΔABC,

$\frac{h}{BC}=\tan 60° \Rightarrow \frac{h}{2\sqrt{3}}=\sqrt{3}$

$\Rightarrow h = 2 \times 3 = 6$
$\therefore$ Height of the pole is 6 m.



15. Given : Two equal circles O and O' touching each other at X. AC is tangent to the circle with centre O. $\angle ADO' = 90°$

To find : $\frac{DO'}{CO}$

Solution : Let $AO' = O'X = XO = r$
$\because$ Tangent to a circle is always perpendicular to its radius at the point of contact.
$\therefore \angle ACO = 90°$
In $\Delta ADO'$ and ΔACO
$\angle DAO' = \angle CAO$ [Common]
$\angle ADO' = \angle ACO$ [Each 90°]
$\therefore \Delta ADO' \sim \Delta ACO$ (AA similarity criteria)

$\Rightarrow \frac{DO'}{CO}=\frac{AO'}{AO}=\frac{r}{3r}=\frac{1}{3}$

OR

We have, $XY \perp OY$ and $XZ \perp OZ$
[$\because$ Tangent at any point of a circle is perpendicular to the radius through the point of contact]
$\therefore \angle XYO = 90°$ and $\angle OZX = 90°$ ...(i)
In quadrilateral $XYOZ$,
$\angle X + \angle XYO + \angle YOZ + \angle OZX = 360°$ [By angle sum property of a quadrilateral]
$\Rightarrow 73° + 90° + \angle YOZ + 90° = 360°$ [Using (i)]
$\Rightarrow \angle YOZ = 360° - 253° = 107°$ ...(ii)
Now, in ΔYOZ, $OY = OZ$ [Radii of same circle]
$\therefore \angle OYZ = \angle YZO$ [$\because$ Angles opposite to equal sides in a triangle are equal] ...(iii)
In ΔYOZ, $\angle YOZ + \angle OYZ + \angle YZO = 180°$
[By angle sum property]
$\Rightarrow 107° + \angle YZO + \angle YZO = 180°$ [Using (ii) and (iii)]
$\Rightarrow 2\angle YZO = 180° - 107° = 73°$

$\Rightarrow \angle YZO = \frac{73°}{2} = 36.5°$

16. Radius of the hemispherical bowl, r = 9 cm

$\therefore$ Volume of the water in hemispherical bowl

$$= \frac{2}{3}\pi r^3 = \frac{2}{3}\pi(9)^3 \text{ cm}^3$$

Let height of water in the cylindrical vessel be h cm.
Also, Radius of the cylinder (R) = 6 cm

$\therefore$ Volume of water in the cylindrical vessel = $\pi R^2 h$

$$= \pi(6)^2 h \text{ cm}^3$$

Volume of water in cylindrical vessel = Volume of the water in hemispherical bowl

$$\Rightarrow \pi(6)^2 h = \frac{2}{3}\pi(9)^3 \Rightarrow h = \frac{2\times(9)^3}{3\times(6)^2} \Rightarrow h = \frac{27}{2}$$

$\Rightarrow$ h = 13.5

Thus, the height of water in the cylindrical vessel is 13.5 cm.

17. The frequency distribution table for the given data can be drawn as :

Marks	Frequency (f_i)	Cumulative frequency ($c.f.$)
20-30	5	5
30-40	15	20
40-50	25	45
50-60	20	65
60-70	7	72
70-80	8	80
80-90	10	90
Total	90	

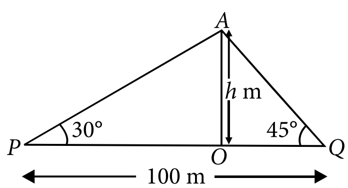
Here, $N = 90 \Rightarrow \frac{N}{2} = 45$

Class interval corresponding to 45 is 40-50.

$$\text{Median} = 40 + \left[\frac{45-20}{25}\right]\times 10$$

$$= 40 + \left[\frac{25}{25}\right]\times 10 = 40 + 10 = 50$$

18. Let OA be the tree of height h m.



Given, PQ = 100 m

In ΔPOA, we have, $\tan 30° = \frac{OA}{OP}$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{h}{OP} \Rightarrow OP = \sqrt{3}h \quad \text{...(i)}$$

Now, in ΔQOA,

$$\tan 45° = \frac{OA}{OQ} \Rightarrow 1 = \frac{h}{OQ} \Rightarrow OQ = h \quad \text{...(ii)}$$

On adding (i) and (ii), we get

$$OP + OQ = \sqrt{3}h + h \Rightarrow PQ = (\sqrt{3}+1)h$$

$$\Rightarrow 100 = (\sqrt{3}+1)h \quad (\because PQ = 100 \text{ m})$$

$$\Rightarrow h = \frac{100}{\sqrt{3}+1}\times\frac{\sqrt{3}-1}{\sqrt{3}-1} \quad \text{(By rationalisation)}$$

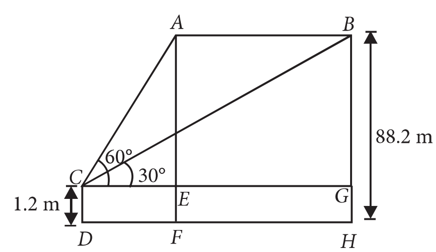
$$\Rightarrow h = \frac{100(\sqrt{3}-1)}{2}$$

$$\Rightarrow h = 50(\sqrt{3}-1) = 50(1.732-1) \Rightarrow h = 36.6$$

Hence, height of the tree is 36.6 m.

OR

Let the initial position A of the balloon changes to B during the given interval.
Let CD be the height of the girl. Then, the given situation can be represented as follows :



Here, $\angle ACG = 60°$ and $\angle BCG = 30°$.
Also, $AF = BH$ = 88.2 m

$\therefore$ $AE = BG$ = 88.2 m − 1.2 m = 87 m

In ΔACE, we have

$$\frac{AE}{CE} = \tan 60° \Rightarrow \frac{87}{CE} = \sqrt{3}$$

$$\Rightarrow CE = \frac{87}{\sqrt{3}} = \frac{87\sqrt{3}}{3} = 29\sqrt{3} \text{ m}$$

In ΔBCG, we have

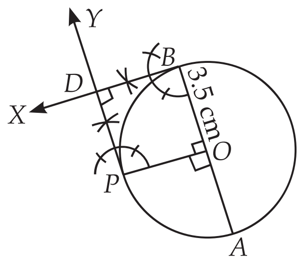
$$\frac{BG}{CG} = \tan 30° \Rightarrow \frac{87}{CG} = \frac{1}{\sqrt{3}} \Rightarrow CG = 87\sqrt{3} \text{ m}$$

Thus, distance travelled by the balloon
= $AB = EG = CG - CE$
$= (87\sqrt{3} - 29\sqrt{3})$ m $= 58\sqrt{3}$ m

19. Steps of construction :

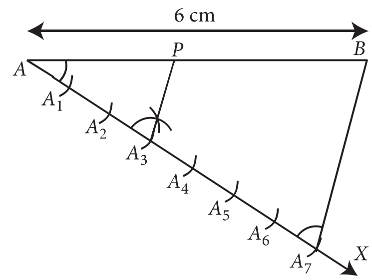
Step 1 : Draw a circle of radius 3.5 cm with centre O.
Step 2 : Draw a diameter AB.
Step 3 : Construct $\angle AOP = 90°$.

Step 4 : At P and B, draw $PY \perp OP$ and $BX \perp OB$.
Step 5 : Let PY and BX intersect at D.
Hence, DB and DP are required tangents to the circle perpendicular to each other.



OR

Steps of construction :
Step 1 : Draw a line segment AB of length 6 cm and draw a ray AX making an acute angle with this line segment AB.
Step 2 : Locate 7 points, A_1, A_2, A_3, A_4, A_5, A_6, A_7 on AX such that $AA_1 = A_1A_2 = A_2A_3$ and so on.
Step 3 : Join BA_7.
Step 4 : Through the point A_3, draw a line parallel to BA_7 intersecting AB at point P.
Thus, P is the point that divides line segment AB of length 6 cm in the ratio 3 : 4.



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