PRACTICE PAPER 2*

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 $2x^2 - 2\sqrt{6}x + 3 = 0$.

(a) $\frac{\sqrt{6}}{2}, \frac{-\sqrt{6}}{2}$ (b) $\frac{\sqrt{6}}{2}, \frac{\sqrt{6}}{2}$ (c) $\frac{\sqrt{6}}{3}, \frac{-\sqrt{6}}{3}$ (d) $\frac{\sqrt{6}}{3}, \frac{\sqrt{6}}{3}$

2. For the A.P. 2, 7, 12, 17, ..., find the value of $a_{30} - a_{20}$.

(a) 45 (b) 60 (c) 50 (d) 55

3. Find the next term of the A.P. $\sqrt{12}, \sqrt{27}, \sqrt{48}, ...$.

(a) $\sqrt{70}$ (b) $\sqrt{85}$ (c) $\sqrt{80}$ (d) $\sqrt{75}$

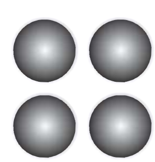
4. The angle of elevation of the top of a tower from a point on the ground, which is 40 m away from the foot of the tower is 45°. The height of the tower (in metres) is

(a) 20 (b) 40 (c) $40\sqrt{3}$ (d) $20\sqrt{3}$

Section - II

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

5. Recasting of Metal



Suraj took 4 small spherical balls of silver of surface area 887.04 sq.cm each from a blacksmith. He wanted them to be made into cylindrical coins of radius one-fourth of that of the silver ball and height 4 cm.

**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) What is the diameter of each spherical ball?
(a) 16.8 cm (b) 8.4 cm (c) 33.6 cm (d) None of these

(ii) The volume of each spherical ball is
(a) 2483.712 cu.cm (b) 19869.69 cu.cm (c) 3104.64 cu.cm (d) 1241.856 cu.cm

(iii) The curved surface area of each coin made is
(a) 105.6 sq.cm (b) 26.4 sq.cm (c) 422.4 sq.cm (d) 52.8 sq.cm

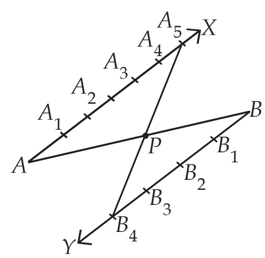
(iv) Volume of each coin is
(a) 221.76 cu.cm (b) 55.44 cu.cm (c) 110.88 cu.cm (d) 27.72 cu.cm

(v) Number of coins made out of the 5 spherical balls of silver is
(a) 56 (b) 224 (c) 112 (d) 336

PART - B

Section - III

6. In the given figure, $AX \parallel BY$ and P is a point on the line segment AB. Find the ratio in which P divides AB internally.



OR

To find a point P on a line segment AB of length 14 cm such that $AP : PB = 5 : 7$, we draw a ray AX such that $\angle BAX$ is acute. Then we mark points $A_1, A_2, A_3, \ldots$ on AX at equal intervals. Find the minimum number of marked points.

7. If x_i's are the mid points of the class intervals of grouped data, f_i's are the corresponding frequencies and $\bar{x}$ is the mean, then find the value of $\sum(f_i x_i - \bar{x})$.

8. The angle of elevation of a ladder leaning against a wall is 60° and the foot of the ladder is 11.5 metres away from the wall. Find the length of the ladder.

9. Consider the following frequency distribution,

Class-interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	3	10	15	45	48	12

Find the modal class.

10. If $d_i = x_i - 15$, $\sum f_i d_i = 30$ and $\sum f_i = 150$, then find the mean.

Section - IV

11. If a cube of side 6 cm is cut into a number of cubes each of side 2 cm, then find the number of cubes so formed.

12. Solve the following quadratic equation for x :
$4x^2 + 4bx - (a^2 - b^2) = 0$

OR

Find the value of k for which the roots of the quadratic equation $(k - 4)\, x^2 + 2(k - 4)\, x + 2 = 0$ are equal.

13. The tops of two towers of height x and y, standing on level ground, subtend angles of 30° and 60° respectively at the centre of the line joining their feet, then find $x : y$.

14. In a certain distribution, mean and median are 15.5 and 20 respectively. Find the mode of the distribution, using an empirical relation.

Section - V

15. Draw a circle of radius 9 cm. Draw two tangents to the circle inclined at an angle of 45° to each other.

16. An aeroplane flying at a height of 9000 m from the ground passes vertically above another aeroplane at an instant, when the angles of elevation of the two planes from the same point on the ground are 60° and 30° respectively. Find the vertical distance between the aeroplanes at that instant.

OR

From a window (h metres high above the ground) of a house in a street, the angles of elevation and depression of the top and the foot of another house on the opposite side of the street are θ and ϕ respectively. Show that the height of the opposite house is $h(1 + \tan\theta \cot\phi)$.

17. Find 'p' if the mean of the given data is 15.45.

Class interval	Frequency
0-6	6
6-12	p
12-18	10
18-24	9
24-30	7

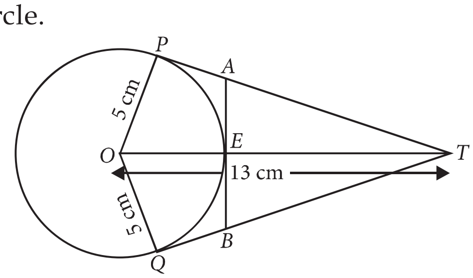
Section - VI

18. The 17th term of an A.P. is 17 more than twice its 8th term. If the 11th term of the A.P. is 43, then find its 5th term.

OR

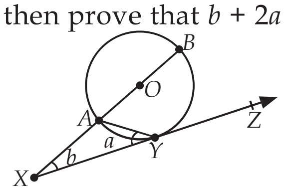
If the sum of first 4 terms of an A.P. is 40 and that of first 14 terms is 280, find the sum of its first 20 terms.

19. In the given figure, O is the centre of a circle of radius 5 cm. T is a point such that OT = 13 cm and OT intersects circle at E. If AB is a tangent to the circle at E, find the length of AB, where TP and TQ are two tangents to the circle.



OR

In the given figure, XZ touches the circle with centre O at Y. Diameter BA when produced meets XZ at X. If $\angle BXY = b$ and $\angle AYX = a$, then prove that $b + 2a = 90°$.



ANSWERS

1. **(b) :** Given quadratic equation is $2x^2 - 2\sqrt{6}x + 3 = 0$

Discriminant, $D = b^2 - 4ac$

$= (-2\sqrt{6})^2 - 4(2)(3) = 24 - 24 = 0$

Thus, real and equal roots will exist, which are given by the following

$$x = \frac{-b \pm \sqrt{D}}{2a} = \frac{-(-2\sqrt{6})}{2\times 2} = \frac{\sqrt{6}}{2}$$

2. **(c) :** Given, A.P. is 2, 7, 12, 17, ...

Here, $a = 2$ and $d = 7 - 2 = 5$

Since n^{th} term of an A.P. is $a_n = a + (n - 1)d$

$\therefore \quad a_{30} = a + 29d = 2 + 29(5) = 147$

and $a_{20} = a + 19d = 2 + 19(5) = 97$

Now, $a_{30} - a_{20} = 147 - 97 = 50$

3. **(d) :** Given, $a_1 = \sqrt{12} = \sqrt{4\times 3} = 2\sqrt{3}$,

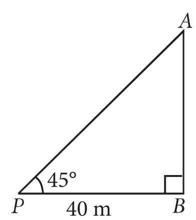
$a_2 = \sqrt{27} = \sqrt{9\times 3} = 3\sqrt{3}, a_3 = \sqrt{48} = \sqrt{16\times 3} = 4\sqrt{3}.$

On observing the pattern, we can say that

$a_4 = 5\sqrt{3} = \sqrt{25\times 3} = \sqrt{75}$

So, next term will be $\sqrt{75}$.

4. **(b) :** Let AB be the tower and P be the point on the ground.



In ΔABP, $\frac{AB}{BP} = \tan 45°$

$\Rightarrow \frac{AB}{40} = 1 \Rightarrow AB = 40$ m

5. **(i) (a) :** Let r be the radius of a small spherical ball.

Surface area of a spherical ball = 887.04 cm^2

$\Rightarrow \quad 4\pi r^2 = 887.04$

$\Rightarrow \quad r^2 = 887.04 \times \frac{7}{22}\times\frac{1}{4} = 70.56$

$\Rightarrow \quad r = 8.4$ cm

$\therefore$ Diameter of each spherical ball = 16.8 cm

(ii) (a) : Volume of each sphericall ball $= \frac{4}{3}\pi r^3$

$= \frac{4}{3}\times\frac{22}{7}\times 8.4\times 8.4\times 8.4 = 2483.712 \text{ cm}^3$

(iii) (d) : Radius of a cylindrical coin $= \frac{1}{4}\times 8.4 = 2.1$ cm

and height of a cylindrical coin = 4 cm

Now, curved surface area of a coin = $2\pi rh$

$= 2\times\frac{22}{7}\times 2.1\times 4 = 52.8 \text{ cm}^2$

(iv) (b) : Volume of coin = $\pi r^2 h$

$= \frac{22}{7}\times 2.1\times 2.1\times 4 = 55.44 \text{ cm}^3$

(v) (b) : Required number of coins

$= \frac{5\times \text{Volume of sphere ball}}{\text{Volume of coin}} = \frac{5\times 2483.712}{55.44} = 224$

6. From figure, it is clear that there are five points at equal distance on AX and four points at equal distance on BY. Here, P divides AB on joining A_5B_4. So, P divides AB in the ratio 5 : 4 internally.

OR

Here, $m = 5$, $n = 7$, $m + n = 12$

So, minimum number of points marked is 12.

7. We know, $\bar{x} = \frac{\Sigma f_i x_i}{N}$, where N is total frequency.

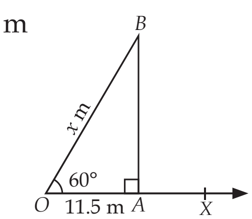
Consider, $\Sigma(f_i x_i - \bar{x}) = \Sigma f_i x_i - \Sigma\bar{x}$

$= N\bar{x} - N\bar{x} \quad [\because \Sigma\bar{x} = N\bar{x}]$

$= 0$

8. Let OX be the horizontal ground and $OB = x$ m be the ladder leaning against the wall AB.

Then, $\angle AOB = 60°$, $OA = 11.5$ m and $\angle OAB = 90°$.



In ΔOAB, $\frac{OB}{OA} = \sec 60°$

$\Rightarrow \frac{x}{11.5} = 2$

$\Rightarrow x = 2 \times 11.5 = 23$

Hence, the length of the ladder is 23 m.

9. The class 40-50 has maximum frequency. So, the modal class is 40-50.

10. Here, $d_i = x_i - 15 \Rightarrow a = 15 \quad [\because d_i = x_i - a]$

Also, $\sum f_i d_i = 30$ and $\sum f_i = 150$

$\therefore$ Mean, $\bar{x} = a + \frac{\Sigma f_i d_i}{\Sigma f_i} = 15 + \frac{30}{150} = 15.2$

11. Number of cubes so formed

$= \frac{\text{Volume of larger cube}}{\text{Volume of one small cube}} = \frac{10\times 10\times 10}{2\times 2\times 2} = 125$

12. We have, $4x^2 + 4bx - (a^2 - b^2) = 0$

$\Rightarrow 4x^2 + 4bx - a^2 + b^2 = 0$

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

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

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

$\Rightarrow 2x + b + a = 0$ or $2x + b - a = 0$

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

OR

For roots of equation

$(k-4)x^2 + 2(k-4)x + 2 = 0$ to be equal, Discriminant, $D = 0$

$\therefore \quad [2(k-4)]^2 - 4(k-4)(2) = 0$

$\Rightarrow \quad 4(k-4)^2 - 8(k-4) = 0$

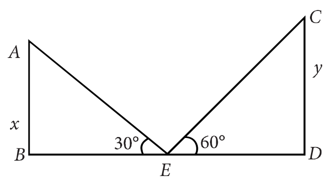
$\Rightarrow \quad 4(k-4)[(k-4)-2] = 0$

$\Rightarrow \quad 4(k-4)(k-6) = 0 \Rightarrow k = 6 \qquad [\because k \neq 4]$

13. $\because$ E is the midpoint of BD.

$\therefore \quad BE = ED$

Now, in ΔABE



$$\tan 30^\circ = \frac{AB}{BE}$$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{x}{BE}$$

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

And in ΔEDC, $\tan 60^\circ = \dfrac{CD}{ED}$

$$\Rightarrow \sqrt{3} = \frac{y}{ED} \Rightarrow y = \sqrt{3}BE \quad (\because BE = ED)$$

$$\therefore \frac{x}{y} = \frac{BE}{\sqrt{3}} \times \frac{1}{\sqrt{3}BE} = \frac{1}{3}$$

Thus, $x : y = 1 : 3$.

14. We know that, empirical relation between mean, median and mode is

Mode = 3 Median – 2 Mean ...(i)

We have,

Mean = 15.5, Median = 20

$\therefore$ Mode = 3(20) – 2(15.5) (Using (i))

$\Rightarrow$ Mode = 60 – 31 = 29

15. Steps of construction :

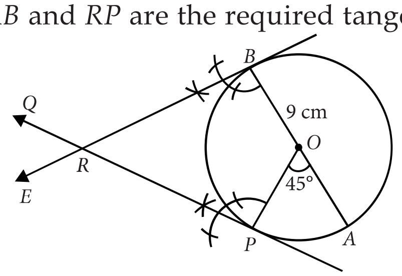
Step 1 : Draw a circle with centre O and radius 9 cm.

Step 2 : Draw any diameter AOB.

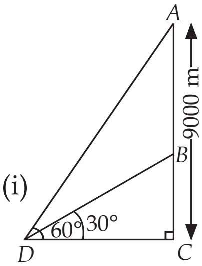
Step 3 : Take a point P on the circle such that $\angle AOP = 45°$.

Step 4 : Draw $PQ \perp OP$ and $BE \perp OB$. Let PQ and BE intersect at R.

Hence, RB and RP are the required tangents.



16. Let A and B be the positions of two aeroplanes when A is vertically above B and AC = 9000 m. Let D be the point of observation on the ground such that $\angle ADC = 60°$ and $\angle BDC = 30°$.



In ΔACD, $\tan 60^\circ = \dfrac{AC}{CD}$

$$\Rightarrow \sqrt{3} = \frac{9000}{CD}$$

$$\Rightarrow CD = \frac{9000}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = 3000\sqrt{3} \text{ m} \quad \ldots(i)$$

In ΔBCD, $\tan 30^\circ = \dfrac{BC}{CD}$

$$\Rightarrow \frac{1}{\sqrt{3}} = \frac{BC}{3000\sqrt{3}} \qquad \text{[From (i)]}$$

$\Rightarrow \quad BC = 3000$ m

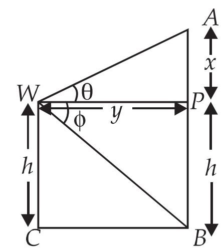
$\therefore$ Vertical distance between A and B, $AB = AC - BC$
= 9000 – 3000 = 6000 m

OR

Let W be the window and AB be the height of house on the opposite side. Also, let $WP = y$ meters be the width of the street and $AP = x$ metres.

Clearly, height of the window = h metres = BP

In ΔBPW, right angled at P, we have



$$\tan\phi = \frac{BP}{WP}$$

$$\Rightarrow \tan\phi = \frac{h}{y}$$

$$\Rightarrow y = \frac{h}{\tan\phi} = h\cot\phi$$

Similarly, in ΔAPW, we have

$$\tan\theta = \frac{AP}{WP} \Rightarrow \tan\theta = \frac{x}{y} \Rightarrow x = y\tan\theta$$

$\Rightarrow \quad x = h\cot\phi\tan\theta \qquad [\because y = h\cot\phi]$

Now, height of the opposite house = $AP + BP$

$= x + h = h\cot\phi\tan\theta + h = h(\cot\phi\tan\theta + 1)$

$= h(1 + \tan\theta\cot\phi)$.

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

Class interval	x_i	f_i	$f_i x_i$
0-6	3	6	18
6-12	9	p	$9p$
12-18	15	10	150
18-24	21	9	189
24-30	27	7	189
Total		$\sum f_i = 32 + p$	$\sum f_i x_i = 546 + 9p$

Mean, $\bar{x} = \frac{\Sigma f_i x_i}{\Sigma f_i} \Rightarrow 15.45 = \frac{546 + 9p}{32 + p}$ [Given]

$\Rightarrow$ $494.4 + 15.45p = 546 + 9p$

$\Rightarrow$ $6.45p = 51.6 \Rightarrow p = 8$

18. Let a be the first term and d be the common difference of the given A.P.

According to question, $a_{17} = 2a_8 + 17$

$\Rightarrow$ $a + 16d = 2[a + 7d] + 17$

$\Rightarrow$ $a + 16d = 2a + 14d + 17 \Rightarrow a = 2d - 17$ ...(i)

Also, $a_{11} = 43$

$\Rightarrow$ $a + 10d = 43$

$\Rightarrow$ $(2d - 17) + 10d = 43$ [Using (i)]

$\Rightarrow$ $12d = 60 \Rightarrow d = 5$

$\therefore$ $a = 2d - 17 = 2(5) - 17 = 10 - 17 = -7$

So, $a_5 = a + 4d = -7 + 4 \times 5 = 13$

OR

Let a and d be the first term and the common difference of the given A.P. respectively.

The sum of first four terms, $S_4 = 40$

$\Rightarrow \frac{4}{2}\{2a + (4-1)d\} = 40$

$\Rightarrow$ $2a + 3d = 20$ ...(i)

The sum of first 14 terms, $S_{14} = 280$

$\Rightarrow \frac{14}{2}\{2a + (14-1)d\} = 280$

$\Rightarrow$ $2a + 13d = 40$ ...(ii)

Subtracting (i) from (ii), we get $10d = 20 \Rightarrow d = 2$

Substituting $d = 2$ in (i), we get

$2a + 3 \times 2 = 20 \Rightarrow 2a = 20 - 6 = 14 \Rightarrow a = \frac{14}{2} = 7$

$\therefore$ Sum of first 20 terms, $S_{20} = \frac{20}{2}\{2a + (20 - 1)d\}$

$= 10\{2 \times 7 + 19 \times 2\} = 10[14 + 38]$

$= 10 \times 52 = 520$

19. We know, tangent to a circle is perpendicular to its radius at the point of contact.

So, $OP \perp PT$ and $OQ \perp QT$

In ΔOPT, $(OP)^2 + (PT)^2 = OT^2 \Rightarrow PT^2 = (OT)^2 - (OP)^2$

$\Rightarrow$ $(PT)^2 = 169 - 25 = 144 \Rightarrow PT = 12$ cm

$\Rightarrow$ $PT = QT = 12$ cm

($\because$ Tangents drawn from an external point are equal)

Let $PA = x$ cm $\Rightarrow AT = (12 - x)$cm

Hence, in right angled ΔAET

$(AE)^2 + (ET)^2 = (AT)^2$ ($\because OE \perp AB$)

$\Rightarrow$ $(x)^2 + (8)^2 = (12 - x)^2$

($\because PA = AE$ and $ET = OT - OE$)

$\Rightarrow$ $x^2 + 64 = 144 + x^2 - 24x$

$\Rightarrow x = \frac{80}{24} = 3.33$

In ΔAET and ΔBET

$\angle ETA = \angle ETB$

$ET = ET$ (Common)

$\angle AET = \angle BET$ (90° each, as $OE \perp AB$)

$\Rightarrow$ $\Delta AET \cong \Delta BET$ (By ASA congruence)

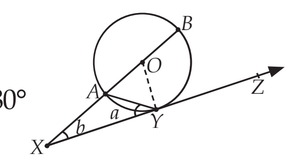
$\Rightarrow$ $AE = BE$ (By CPCT)

Now, $AB = AE + EB$

$\Rightarrow$ $AB = AE + AE$

$\Rightarrow$ $AB = 2AE = 2 \times 3.33 = 6.66$ cm

OR



Join OY.

In ΔOXY,

$\angle OXY + \angle XYO + \angle XOY = 180°$

[By angle sum property]

$\Rightarrow$ $b + 90° + \angle XOY = 180°$

$\Rightarrow$ $\angle XOY = 180° - 90° - b = 90° - b$ ...(i)

In ΔOAY

$OA = OY$ [Radii of same circle]

$\Rightarrow$ $\angle OYA = \angle OAY$...(ii) [$\because$ Angles opposite to equal sides are equal]

Now, $\angle AOY + \angle OAY + \angle OYA = 180°$

[By angle sum property]

$\Rightarrow$ $90° - b + \angle OAY + \angle OAY = 180°$ [Using (i) and (ii)]

$\Rightarrow$ $2\angle OAY = 90° + b$

$\Rightarrow$ $\angle OAY = \frac{90° + b}{2} = \angle OYA$ ...(iii)

Since tangent to a circle is perpendicular to the radius through the point of contact.

$\therefore$ $\angle OYX = 90°$

Now, $\angle OYA = \angle OYX - \angle AYX$

$\Rightarrow$ $\angle OYA = 90° - a$ ...(iv)

From (iii) and (iv), we get, $\frac{90° + b}{2} = 90° - a$

$\Rightarrow$ $90° + b = 180° - 2a$

$\Rightarrow b + 2a = 90°$

☺ ☺ ☺