PRACTICE PAPER 3*

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

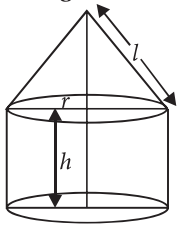
1. The discriminant of the quadratic equation $5x^2 + 5x + 6 = 0$ is $-a$. Find the value of a.

(a) –95 (b) 90
(c) 95 (d) –90

2. Find the common difference of the A.P. $\frac{1}{3b}, \frac{1-6b}{3b}, \frac{1-12b}{3b}, \ldots\ldots$.

(a) 2 (b) –2
(c) –3 (d) 3

3. Find the total surface area of the given solid figure.



(a) $2\pi r^2 + 2\pi rh + \pi rl$ (b) $\pi r^2 + \pi rh + \pi rl$
(c) $\pi r^2 + 2\pi rh + 2\pi rl$ (d) $\pi r^2 + 2\pi rh + \pi rl$

**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.*

4. Consider the following frequency distribution:

Class interval	10-15	15-20	20-25	25-30	30-35
Frequency	15	19	12	24	18

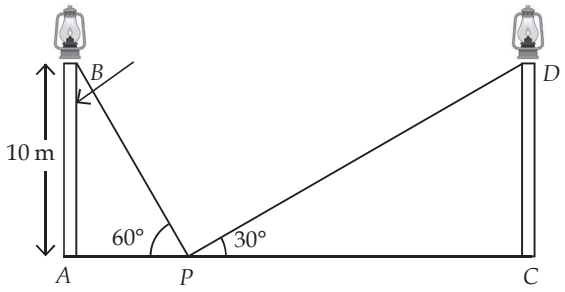
Find the modal class.

(a) 15-20 (b) 30-35 (c) 25-30 (d) 20-25

Section - II

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

5. **Street Vintage :** Two lamp posts of equal heights are standing on either side of the road. From a point between them on the road the angle of elevation of the top of poles are 60° and 30° respectively. Height of the lamp post is 10 m (Take $\sqrt{3} = 1.732$)



(i) Find the value of AP.

(a) 10 m (b) $10\sqrt{3}$ m (c) $\frac{10}{\sqrt{3}}$ m (d) None of these

(ii) Find the value of CP.

(a) 10 m (b) $10\sqrt{3}$ m (c) $\frac{10}{\sqrt{3}}$ m (d) None of these

(iii) The width of the road is

(a) 27.32 m (b) 29.32 m (c) 25.32 m (d) None of these

(iv) If the angle of elevation made by pole AB is 45°, then the value of AP =

(a) 10 m (b) $10\sqrt{3}$ m (c) $\frac{10}{\sqrt{3}}$ m (d) None of these

(v) Angle formed by the line of sight with the horizontal when the point being viewed is above the horizontal level is known as

(a) angle of depression (b) angle of elevation
(c) right Angle (d) reflex angle

PART - B

Section - III

6. To divide a line segment PQ in the ratio 3 : 2, we draw a ray PX such that $\angle QPX$ is an acute angle, then we draw a ray $QY \parallel PX$ such that X and Y are in opposite directions with respect to PQ and mark the points P_1, P_2, P_3 ... and Q_1, Q_2, Q_3, ... with $PP_1 = P_1P_2 = P_2P_3 = ... = QQ_1 = Q_1Q_2 = Q_2Q_3 = ...$ on the ray PX and QY respectively. Then P_3Q_2 is joined to intersect PQ at M. Find the value of $Q_2M : P_3M$.

7. Check whether the following statement is true or false. "While computing mean of grouped data, we assume that the frequencies are centred at the class marks of the classes."

8. Check, whether $y(3y + 12) = 2(y^2 + y + 6)$ is quadratic equation or not.

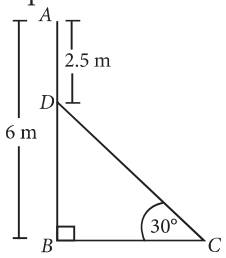
OR

If the roots of the quadratic equation $9x^2 + px + 1 = 0$ are equal, then find the value of p.

9. Write the median class of the following distribution:

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	4	8	10	12	8	4

10. In the given figure, AB is a 6 m high pole and CD is a ladder inclined at an angle of 30° to the horizontal and reaches up to a point D of pole. If AD = 2.5 m, find the length of the ladder.

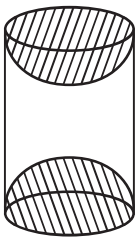


Section - IV

11. If $ad \neq bc$, then prove that the equation $(a^2 + b^2)x^2 + 2(ac + bd)\, x + (c^2 + d^2) = 0$ has no real roots.

12. A kite is flying at a height of $45\sqrt{2}$ m above the ground. The string attached to the kite is temporarily tied to a point on the ground. The inclination of the string with the ground is 45°. Find the length of the string assuming that there is no slack in the string.

13. A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in figure. If the height of the cylinder is 10 cm and its base is of radius 3.5 cm. Find the total surface area of the article.



OR

The dimensions of a metallic cuboid are 25 cm × 60 cm × 144 cm. It is melted and recast into a cube. Find the surface area of the cube.

14. Find the mean of the data, using an empirical formula, when it is given that mode = 50.5 and median = 45.5.

Section - V

15. Water is flowing at the rate of 15 km per hour through a pipe of diameter 14 cm into a rectangular tank which is 50 m long and 44 m wide. Find the time in which the level of water in the tank will rise by 21 cm.

16. Find the median of the following frequency distribution:

Weekly wages (in ₹)	59.5-69.5	69.5-79.5	79.5-89.5	89.5-99.5	99.5-109.5	109.5-119.5
Number of workers	5	15	20	30	20	8

17. Draw a line segment AB of length 18 cm. Taking A as centre, draw a circle of radius 7 cm and taking B as centre, draw another circle of radius 5 cm. Construct tangents to each circle from the centre of the other circle.

OR

Draw two concentric circles of radii 7 cm and 9 cm. Taking a point on outer circle construct the pair of tangents to the other.

Section - VI

18. The sum of four consecutive numbers in A.P. is 32 and the ratio of the product of the first and last terms to the product of two middle terms is 7 : 15. Find the numbers.

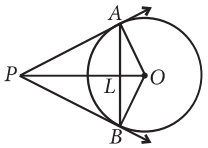
OR

Find the common difference of an A.P. whose first term is 5 and the sum of its first four terms is half the sum of the next four terms.

19. Draw a circle of radius 2 cm. Take two points P and Q on one of its extended diameter each at a distance of 4.5 cm from the centre. Draw tangents to the circle from the two points P and Q.

OR

In the given figure, AB is a chord of a circle, with centre O, such that AB = 16 cm and radius of circle is 10 cm. Tangents at A and B intersect each other at P. Find the length of PA.



ANSWERS

1. **(c) :** We have, $5x^2 + 5x + 6 = 0$

$\therefore$ $a = 5$, $b = 5$ and $c = 6$

$\therefore$ Discriminant, $D = b^2 - 4ac = 5^2 - 4(5)(6)$

$= 25 - 120 = -95 = -a$

Hence, $a = 95$

2. **(b) :** The common difference of the A.P.

$\frac{1}{3b}, \frac{1-6b}{3b}, \frac{1-12b}{3b}, \ldots\ldots$, is given by

$$\frac{1-6b}{3b} - \frac{1}{3b} = \frac{1-6b-1}{3b} = \frac{-6b}{3b} = -2$$

3. **(d) :** Total surface area for the cylindrical part $= \pi r^2 + 2\pi rh$

Curved surface area for the conical part = πrl

$\therefore$ Total surface area for the given solid

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

4. **(c) :** The maximum frequency is 24, which is corresponding to the interval 25 - 30. So, the modal class is 25-30.

5. **(i) (c) :** In ΔPAB, we have

$$\tan 60° = \frac{AB}{AP}$$

$\Rightarrow \sqrt{3} = \frac{10}{AP}$ [$\because$ AB = height of lamp past = 10 m]

$\Rightarrow AP = \frac{10}{\sqrt{3}}$ m

(ii) (b) : In ΔPCD, we have

$$\tan 30° = \frac{CD}{PC} \Rightarrow \frac{1}{\sqrt{3}} = \frac{10}{PC} \Rightarrow PC = 10\sqrt{3} \text{ m}$$

(iii) (d) : Clearly, width of the road = AC

$$= AP + PC = \left(\frac{10}{\sqrt{3}} + 10\sqrt{3}\right)\text{m} = 10\left(\frac{4}{\sqrt{3}}\right)\text{m} = \frac{40}{\sqrt{3}}\text{m} \approx 23 \text{ m}$$

(iv) (a) : In ΔPAB, if $\angle APB = 45°$, then

$$\tan 45° = \frac{AB}{AP} \Rightarrow 1 = \frac{10}{AP} \Rightarrow AP = 10\text{m}$$

(v) (b)

6. M divides PQ in the ratio 3 : 2

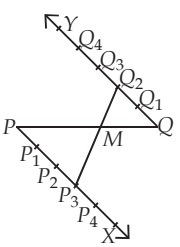
i.e., $\frac{PM}{MQ} = \frac{3}{2}$ ...(i)

Now, $\Delta PMP_3 \sim \Delta QMQ_2$

$\therefore$ $\frac{Q_2M}{P_3M} = \frac{MQ}{PM}$

$= \frac{2}{3}$ [Using (i)]

So, $Q_2M : P_3M = 2 : 3$



7. Given statement is true.

8. We have, $y(3y + 12) = 2(y^2 + y + 6)$
$\Rightarrow 3y^2 + 12y = 2y^2 + 2y + 12$
$\Rightarrow 3y^2 - 2y^2 + 12y - 2y - 12 = 0$
$\Rightarrow y^2 + 10y - 12 = 0$, which is a quadratic equation.

OR

Here, $a = 9$, $b = p$, $c = 1$
For equal roots, $D = b^2 - 4ac = 0 \Rightarrow b^2 = 4ac$
$\Rightarrow p^2 = 4(9)(1) = 36 \Rightarrow p = \pm 6$

9.

Class	Frequency	Cumulative frequency
0 - 10	4	4
10 - 20	4	8
20 - 30	8	16
30 - 40	10	26
40 - 50	12	38
50 - 60	8	46
60 - 70	4	50
Total	50	

Here, $\Sigma f_i = N = 50 \Rightarrow \frac{N}{2} = \frac{50}{2} = 25$

$\because$ Median class is that class whose cumulative frequency is just greater than or nearest to $\frac{N}{2}$.

$\therefore$ The median class is 30-40.

10. $AB = 6$ m, $AD = 2.54$ m (given)
$\therefore BD = AB - AD = 6 - 2.5 = 3.5$ m

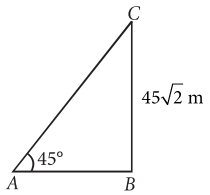
Hence, in ΔBDC, $\frac{BD}{CD} = \sin 30°$

$\Rightarrow \frac{3.5}{CD} = \frac{1}{2} \Rightarrow CD = 7$ m

11. We have, $(a^2 + b^2)x^2 + 2(ac + bd)x + (c^2 + d^2) = 0$
Discriminant, $D = 4(ac + bd)^2 - 4(a^2 + b^2)(c^2 + d^2)$
$= 4(a^2c^2 + b^2d^2 + 2acbd) - 4(a^2c^2 + a^2d^2 + b^2c^2 + b^2d^2)$
$= 4(a^2c^2 + b^2d^2 + 2abcd - a^2c^2 - a^2d^2 - b^2c^2 - b^2d^2)$
$= 4(2abcd - a^2d^2 - b^2c^2) = -4(ad - bc)^2 < 0$
$[\because ad \neq bc]$

Thus, given equation has no real roots.

12. Let C be the position of kite.
Now, in ΔABC,



$\sin 45° = \frac{BC}{AC} \Rightarrow \frac{1}{\sqrt{2}} = \frac{45\sqrt{2}}{AC}$

$\Rightarrow AC = 45\sqrt{2} \times \sqrt{2} = 90$ m

Thus, the length of the string is 90 m.

13. Radius of the cylinder (r) = 3.5 cm
Height of the cylinder (h) = 10 cm
$\therefore$ Curved surface area of cylinder = $2\pi rh$

$= 2 \times \frac{22}{7} \times \frac{35}{10} \times 10 \text{ cm}^2 = 220 \text{ cm}^2$

Curved surface area of a hemisphere = $2\pi r^2$
$\therefore$ Curved surface area of both hemispheres

$= 2 \times 2\pi r^2 = 4\pi r^2 = 4 \times \frac{22}{7} \times \frac{35}{10} \times \frac{35}{10} \text{ cm}^2 = 154 \text{ cm}^2$

Total surface area of the wooden article
= (220 + 154) cm^2 = 374 cm^2.

OR

Volume of given cuboid = 25 × 60 × 144
= 216000 cm^3
Now, cuboid is melted and recast into a cube.
Let side of the cube = a m
Also, volume of the cube = volume of the cuboid
$\Rightarrow a^3 = 216000 \Rightarrow a = 60$
Surface area of cube = $6a^2 = 6 \times (60)^2$
= 21600 cm^2

14. We have, Mode = 50.5 and Median = 45.5
Now, we know that,
3 Median = Mode + 2 Mean
$\Rightarrow$ 3 × 45.5 = 50.5 + 2 Mean

$\Rightarrow \text{Mean} = \frac{136.5 - 50.5}{2} = \frac{86}{2} = 43$

15. Length of the tank, $l = 50$ m and its width, $b = 44$ m

Depth required, $h = \frac{21}{100}$ m

Volume of water in the tank = $l \times b \times h$

$= \left(50 \times 44 \times \frac{21}{100}\right) \text{m}^3 = 462 \text{ m}^3$

Radius of the pipe, $r = \frac{7}{100}$ m

Speed of water flowing through the pipe
= (15 × 1000) m/hour = 15000 m/hour
Volume of water flown in 1 hour = $\pi R^2 H$

$= \left(\frac{22}{7} \times \left(\frac{7}{100}\right)^2 \times 15000\right) \text{m}^3 = 231 \text{ m}^3$

$\because$ Time taken by 231 m^3 of water falls in the tank = 1 hour
$\therefore$ Time taken by 462 m^3 of water falls in the tank

$= \left(\frac{1}{231} \times 462\right) \text{hrs} = 2 \text{ hrs}$

Hence, the required time is 2 hours.

16. The cumulative frequency distribution table for the given data is as follows:

Weekly wages (in ₹)	Number of workers (f_i)	Cumulative frequency (*c.f.*)
59.5-69.5	5	5
69.5-79.5	15	20
79.5-89.5	20	40
89.5-99.5	30	70
99.5-109.5	20	90
109.5-119.5	8	98

We have, $n = 98$

$\therefore \quad n/2 = 49$

The cumulative frequency just greater than $n/2$ is 70 and the corresponding class is 89.5-99.5. So, 89.5-99.5 is the median class.

$\therefore \quad l = 89.5$, $h = 10$, $f = 30$ and $c.f. = 40$

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

$$= 89.5 + \left(\frac{49 - 40}{30}\right) \times 10 = 92.5$$

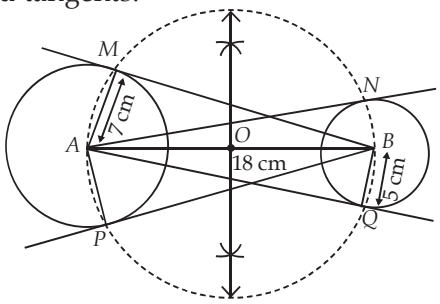
17. Steps of construction :

Step I : Draw line segment $AB = 18$ cm.

Step II : Draw a circle with centre A and radius 7 cm and another circle with center B and radius 5 cm.

Step III : Now, bisect AB. Let O be the mid-point of AB. Taking O as center and AO as radius, draw a circle which intersects the two circles at N, Q, M and P.

Step IV : Join AN, AQ, BM and BP. These are the required tangents.



OR

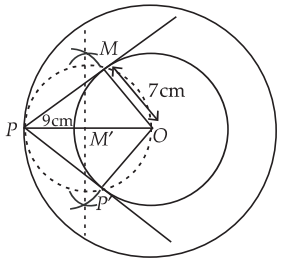
Steps of construction :

Step I : Draw two concentric circles with centre O and radii 7 cm and 9 cm.

Step II : Taking any point P on outer circle. Join OP.

Step III : Bisect OP, let M' be the mid-point of OP. Taking M' as centre and OM' as radius draw a circle dotted which cuts the inner circle at M and P'.

Step IV : Join PM and PP'. Thus, PM and PP' are the required tangents.



18. Let the four consecutive numbers be $(a-3d)$, $(a-d)$, $(a+d)$, $(a+3d)$.

Sum of four numbers = 32 [Given]

$\Rightarrow \quad (a-3d) + (a-d) + (a+d) + (a+3d) = 32$

$\Rightarrow \quad 4a = 32 \Rightarrow a = 8$

Also, $\dfrac{(a-3d)(a+3d)}{(a-d)(a+d)} = \dfrac{7}{15}$

$\Rightarrow \quad \dfrac{a^2 - 9d^2}{a^2 - d^2} = \dfrac{7}{15}$

$\Rightarrow \quad 15a^2 - 135d^2 = 7a^2 - 7d^2$

$\Rightarrow \quad 8a^2 = 128d^2 \Rightarrow d^2 = \dfrac{8a^2}{128} = \dfrac{8 \times 64}{128} = 4$

$\therefore \quad d = \pm 2$

If $d = 2$, then the numbers are (8 – 6), (8 – 2), (8 + 2) and (8 + 6) *i.e.*, 2, 6, 10, 14.

If $d = -2$, then the numbers are (8 + 6), (8 + 2), (8 – 2), (8 – 6) *i.e.*, 14, 10, 6, 2.

Hence, the numbers are 2, 6, 10, 14 or 14, 10, 6, 2.

OR

Let the common difference of the given A. P. be d.

First term $(a) = 5$ (Given)

$\because \quad$ Sum of the first n terms, $S_n = \dfrac{n}{2}[2a + (n-1)d]$

$\therefore \quad$ Sum of first four terms $(S_4) = \dfrac{4}{2}[2 \times 5 + (4-1)d]$

$= 2[10 + 3d] = 20 + 6d$

And, sum of next four terms $= S_8 - S_4$

$= \dfrac{8}{2}[2 \times 5 + (8-1)d] - (20 + 6d)$

$= 40 + 28d - 20 - 6d = 20 + 22d$

According to the given condition,

$$S_4 = \frac{1}{2}[S_8 - S_4] \Rightarrow 20 + 6d = \frac{1}{2}[20 + 22d]$$

$\Rightarrow$ $20 + 6d = 10 + 11d$
$\Rightarrow$ $11d - 6d = 20 - 10$
$\Rightarrow$ $5d = 10 \Rightarrow d = 2$

19. Steps of Construction

Step 1 : Draw a circle of radius 2 cm with centre O and draw a diameter.

Step 2 : Extend its diameter on both sides such that $OP = OQ = 4.5$ cm.

Step 3 : Bisect PO such that M be its mid-point.

Step 4 : Taking M as centre and MO as radius, draw a circle. Let it intersect the given circle at A and B.

Step 5 : Join PA and PB.

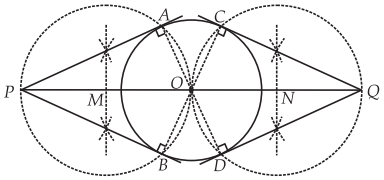
Thus, PA and PB are the two required tangents from P.

Step 6 : Now bisect OQ such that N is its mid-point.

Step 7 : Taking N as centre and NO as radius, draw a circle. Let it intersect the given circle at C and D.

Step 8 : Join QC and QD.

Thus, QC and QD are the required tangents from Q.



Justification :

Join OA to get $\angle OAP = 90°$ [Angle in a semi-circle]

$\Rightarrow$ $PA \perp OA \Rightarrow PA$ is a tangent.

Similarly, $PB \perp OB \Rightarrow PB$ is a tangent.

Now, join OC to get $\angle QCO = 90°$ [Angle in a semi-circle]

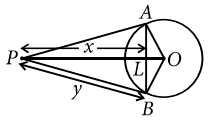
$\Rightarrow$ $QC \perp OC \Rightarrow QC$ is a tangent.

Similarly, $QD \perp OD \Rightarrow QD$ is a tangent.

OR

We have, $AB = 16$ cm

$\therefore$ $AL = BL = 8$ cm



In ΔOLB, we have

$OB^2 = OL^2 + LB^2$

$\Rightarrow$ $10^2 = OL^2 + 8^2 \Rightarrow OL^2 = 100 - 64 = 36$

$\Rightarrow$ $OL = 6$ cm

Let $PL = x$ cm and $PB = y$ cm

Then, $OP = (x + 6)$ cm

In ΔPLB, $PB^2 = PL^2 + BL^2 \Rightarrow y^2 = x^2 + 64$

Now, $OB \perp PB$.

In ΔOBP, $OP^2 = OB^2 + PB^2$

$\Rightarrow$ $(x + 6)^2 = 100 + y^2$

$\Rightarrow$ $x^2 + 36 + 12x = 100 + x^2 + 64$ [$\because y^2 = x^2 + 64$]

$\Rightarrow 12x = 128 \Rightarrow x = \frac{32}{3}$

$\therefore y^2 = \left(\frac{32}{3}\right)^2 + 64 = \frac{1600}{9} \Rightarrow y = \frac{40}{3}$

Hence, $PA = PB = \frac{40}{3}$ cm

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