[Time Allowed: 3 Hours] [Maximum Marks: 80]

General Instructions:

1. This question paper contains two **parts A and B**.
2. Both Part A and Part B have internal choices.

Part – A:

1. It consists two sections I and II.
2. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
3. Section II has 6 questions on case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B:

1. Question No 23 to 28 are Very short answer Type questions of 2 mark each
2. Question No 29 to 34 are Short Answer Type questions of 3 marks each
3. Question No 35 and 36 are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

Part – A

SECTION – I

1. The exponent of 5 in the prime factorisation of 3750 is

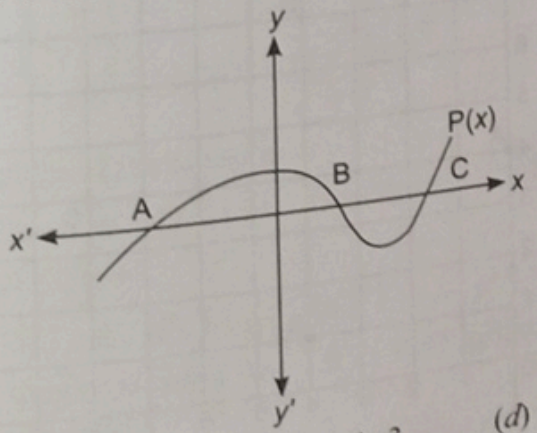
(*a*) 3 (*b*) 4 (*c*) 5 (*d*) 6

OR

The smallest number which when increased by 6 becomes divisible by 36, 63 and 108 is

(*a*) 756 (*b*) 750 (*c*) 6 (*d*) 762

2. In figure, the graph of a polynomial P(*x*) is shown. The number of zeroes of P(*x*) is



(*a*) 1 (*b*) 2 (*c*) 3 (*d*) 4

OR

The quadratic polynomial whose one zero is 6 and sum of zeroes is 0 is

(*a*) $x^2 + 36$ (*b*) $x^2 - 36$ (*c*) $36x^2$ (*d*) $x^2 + 6$

3. The pair of linear equations $2x - 3y = 1$ and $3x - 2y = 4$ have

(*a*) unique solution

(*b*) no solutions

(*c*) infinitely many solutions

(*d*) none of these

4. 5 chairs and 1 table cost ₹ 3500 and 8 chairs and 2 tables cost ₹ 6000. The linear equations representing the above situation is

(*a*) $5x + y = 3500$
$8x + 2y = 6000$

(*b*) $5x - y = 3500$
$8x + 2y = 6000$

(*c*) $5x + y = 6000$
$8x - 2y = 3500$

(*d*) $5x - y = 600$
$8x + 2y = 6000$

5. If the kth term of the arithmetic progression 25, 50, 75, 100, ... is 1000, then the value of k is

(*a*) 14 (*b*) 40 (*c*) – 40 (*d*) – 4

OR

If the common difference of an AP is 3, then $a_{20} - a_{15} =$

(*a*) 12 (*b*) – 12 (*c*) 15 (*d*) – 15

6. For what value of p, the equation $4x^2 + px + 9 = 0$ has equal roots then $p =$

(*a*) $p = 12$ (*b*) $p = -12$

(*c*) $p = \pm 12$ (*d*) $p = \pm 2$

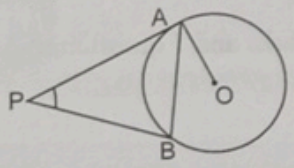
7. The roots of the quadratic equation $x^2 + 5x - (\alpha + 1)(\alpha + 6) = 0$, (where α is a constant) are

(*a*) $\alpha + 1$ and $\alpha - 6$ (*b*) $\alpha + 1$ and $\alpha + 6$

(*c*) $\alpha + 1$ and $-\alpha + 6$ (*d*) $\alpha + 1$ and $-\alpha - 6$

8. In the figure, PA and PB are tangents to the circle with centre O. If $\angle APB = 60°$, then $\angle OAB$ is

(*a*) 60° (*b*) 30° (*c*) 90° (*d*) 120°

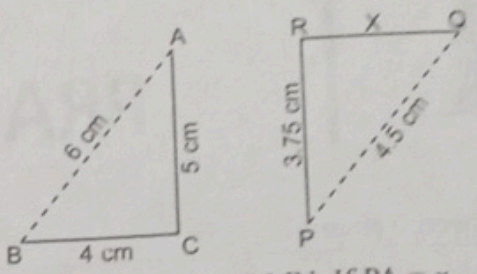


9. A tangent PQ at a point P to a circle of radius 6 cm meets a line through the centre O at a point Q so that OQ = 10 cm. Find the length of PQ.

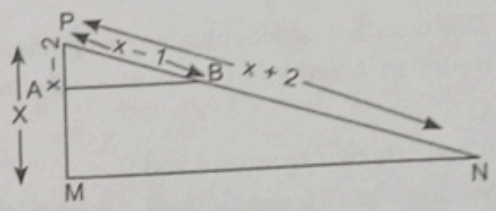
OR

If tangents PA and PB from a point P to a circle with centre O are inclined to each other at an angle of 60°, find $\angle POA$.

10. In the given figure, if $\Delta ABC \sim \Delta PQR$. Find the value of x.



11. In the given figure, AB || MN. If PA = $x - 2$, PM = x, PB = $x - 1$ and PN = $x + 2$, find the value of x.



12. Express tan A in terms of sin A

13. If sec A + tan A = x, then find tan A.

14. In a circle of diameter 84 cm, if an arc subtends an angle of 90° at the centre,then what will be the length of arc? (use $\pi = 22/7$)

15. The radii of the circular ends of a bucket of height 40 cm are 24 cm and 15 cm, find the slant height (in cm) of the bucket.

16. A box contains cards numbered 6 to 50. A card is drawn at random from the box. Find the probability that the drawn card has a number which is a perfect square.

OR

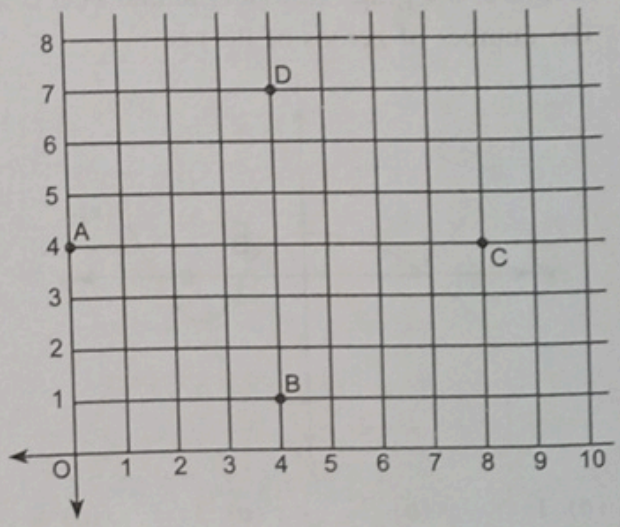
A die is thrown once. Find the probability of getting a prime number;

SECTION – II

17. **Case Study – 1**

MATHS PROJECT

Students of class X of a secondary school in Delhi have been allotted a rectangular plot of land for their maths integrated project. They made a rectangular grid on this plot as shown in the figure.



Four students take their positions at A, B, C and D as shown in the grid.

Refer to the sketch.

(*a*) The distance between B and D is

(*i*) 5 units (*ii*) 6 units (*iii*) 7 units (*iv*) 8 units

(*b*) Mid-point of AC is

(*i*) (4, 4) (*ii*) (4, 3) (*iii*) (5, 4) (*iv*) (4, 5)

(*c*) Distance of C from the *x*-axis is

(*i*) 1 unit (*ii*) 2 units (*iii*) 3 units (*iv*) 4 units

(*d*) Distance of D from the *y*-axis is

(*i*) 7 units (*ii*) 4 units (*iii*) 8 units (*iv*) 9 units

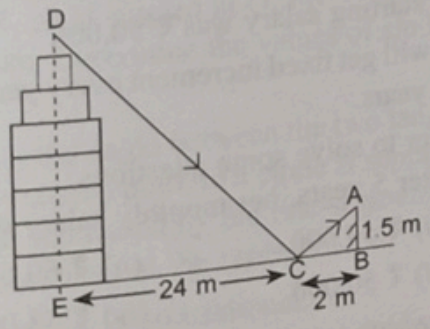
(*e*) The coordinates of the point which divides the line segment BD in the ratio 1 : 2 internally is

(*i*) (4, 2) (*ii*) (4, 3) (*iii*) (4, 4) (*iv*) (4, 5)

18. Case Study – 2

SIMILAR FIGURES

Two figures having the same shape (and not necessarily the same size are called similar figures. We may use principle of similarity of figures to find the heights of mountains or distances of long distant objects. when mathematics teacher introduce the concept of similarity in the classes. Sehaj was very much excited and decided to measure the height of a tower in his locality. He is 1.5 m tall. He place a mirror on the ground and moves until he can see the top of the tower. At the instant Sehaj is 2 m from the mirror and tower is 24 m from the mirror as shown in the figure.



(*a*) Height of the tower is

(*i*) 15 m (*ii*) 30 m (*iii*) 18 m (*iv*) 20 m

(*b*) AB : DE =

(*i*) 1 : 6 (*ii*) 12 : 1 (*iii*) 1 : 12 (*iv*) 12 : 6

(*c*) If height of Sehaj was 1.8 m, then height of the tower was

(*i*) 20 m (*ii*) 19 m (*iii*) 21.4 m (*iv*) 21.6 m

(*d*) Which similarity criterion is used to find the height of tower?

(*i*) AAA (*ii*) SSS

(*iii*) SAS (*iv*) None of these

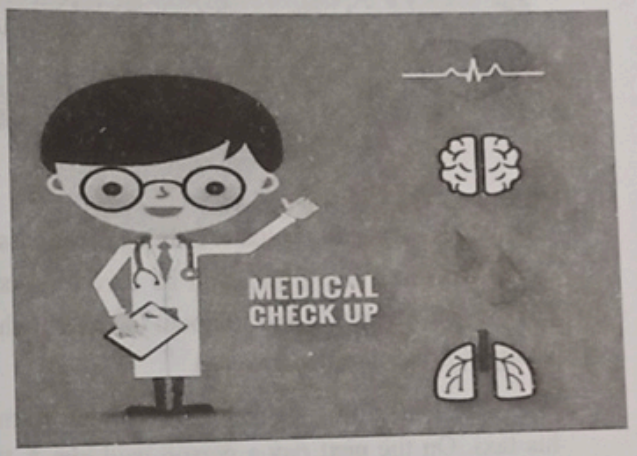
(*e*) AC × BC =

(*i*) 4 m (*ii*) 5 m (*iii*) 4.5 m (*iv*) 2.5 m

19. Case Study - 3

HEALTH CAMP

A health check up camp was organised for senior citizen of a locality. Many seniors citizens participated in this camp. In this camp each participant was given a card with the details of his/her weight, height, blood group, etc.



The following table shows the weight of participants.

Weight (in kg)	50-55	55-60	60-65	65-70	70-75	75-80
Number of persons	8	10	14	20	6	4

(*a*) What is the median class?

(*i*) 55 – 60 (*ii*) 60 – 65

(*iii*) 65 – 70 (*iv*) 70 – 75

(*b*) What is the modal class?

(*i*) 60 – 65 (*ii*) 65 – 70

(*iii*) 70 – 75 (*iv*) 75 – 80

(*c*) What is the class size of modal class?

(*i*) 20 (*ii*) 10 (*iii*) 5 (*iv*) 8

(*d*) Write the formula to determine the median for grouped data

(*i*) $l + \left(\frac{n/2}{cf}\right) \times h$ (*ii*) $l + \frac{\left(\frac{n}{2} + cf\right)}{f} \times h$

(*iii*) $l + \frac{\left(\frac{n}{2} - cf\right)}{f} \times h$ (*iv*) none of these

(e) How mode, median and mean are related?

(i) mode = 3 median – 2 mean

(ii) 2 mode = 3 median – 2 mean

(iii) Mean = 3 median – 2 mode

(iv) none of these

20. **Case Study - 4**

TOURS AND TRAVELS

Sumedh is a science graduate. Driving in his passion. After finishing his graduation he drives a taxi in Sikkim. He charges a fixed amount together with the charge for the distance covered.

A person paid him ₹ 1100 for travelling 50 km by his taxi. On the next day a person paid him ₹ 1900 for travelling 90 km by his taxi.

(a) What are the fixed charges for his taxi?

(i) ₹ 50 (ii) ₹ 90 (iii) ₹ 100 (iv) ₹ 110

(b) What is the rate per kilometre for travelling by his taxi?

(i) ₹ 50 (ii) ₹ 40 (iii) ₹ 30 (iv) ₹ 20

(c) If in peak tourist season sumedh increases the fixed charges by 60%, what will be the cost of travelling 50 km by his taxi?

(i) ₹ 1100 (ii) ₹ 1700 (iii) ₹ 1760 (iv) ₹ 1160

(d) If in lean tourist season he decreases the fixed charges by 50%, what will be the cost of travelling 60 km by his taxi?

(i) ₹ 1050 (ii) ₹ 1150 (iii) ₹ 1250 (iv) ₹ 1350

(e) If fixed charges are decreased by 20% and charge for per km is increased by 5%, what will be the cost of travelling 100 km by his taxi?

(i) ₹ 2100 (ii) ₹ 2150 (iii) ₹ 2180 (iv) ₹ 2190

21. **Case Study - 5**

AFZEL AND HIS FRIEND

Afzel shows a functions to this friend in his school.

$f(x) = ky^2 + 2y - 3k$

Afzel says this is a quadratic polynomial. It has at most two zeroes.

Afzel friends reply: yes, I know this is a quadratic polynomial, I am also familiar with zero and constant polynomials. Ask some questions related to this . I will answer

(a) If $p(x) = ax^2 + bx - c$, then $p(x)$ is a

(i) cubic polynomial

(ii) quadratic polynomial

(iii) linear polynomial

(iv) constant polynomial

(b) Which of the following is constant polynomial?

(i) $4x$ (ii) $2x^2$ (iii) 2 (iv) $-4x^2$

(c) Which of the following is a zero polynomial?

(i) $p(x) = 0$ (ii) $p(x) = x$

(iii) $p(x) = 3x^2$ (iv) $p(x) = 9x + 0$

(d) Zero of the polynomial $p(x) = 2x^3 - 5x^2 - 4x + 3$ is

(i) – 1 (ii) 1 (iii) 0 (iv) 3

(e) A quadratic polynomial has

(i) at most 2 zeroes (ii) at least 2 zeroes

(iii) one zeroes (iv) none of these

22. **Case Study - 6**

SALARY SLIP

After one year of working, Meenakshi was looking at her salary slip. She focused herself on two points

1. Her starting salary was ₹ 50,000

2. She will get fixed increment every year, i.e. ₹ 2,000 next 7 years.

Help her to solve some questions

(a) After 5 years, her monthly salary will be

(i) ₹ 54,000 (ii) ₹ 60,000

(iii) ₹ 50,000 (iv) ₹ 58,000

(b) In which year her income will reach to ₹ 56,000

(i) 2 (ii) 3 (iii) 4 (iv) 1

(c) Which formula of an AP series, is used here?

(i) sum of n terms of an AP

(ii) nth term of an AP

(iii) only constant increment is applied

(iv) none of these

(*d*) What will be her salary after 7 years?

(*i*) ₹ 62,000 (*ii*) ₹ 60,000

(*iii*) ₹ 56,000 (*iv*) ₹ 52,000

(*e*) What value is used for common difference(*d*)

(*i*) fixed salary (*ii*) fixed increment

(*iii*) salary after one year

(*iv*) none of these

Part – B

SECTION – III

23. Explain why $7 \times 11 \times 13 + 13$ and $7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 + 5$ are composite numbers.

OR

What is the HCF of smallest prime number and the smallest composite number?

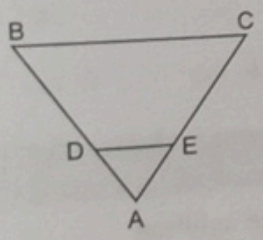
24. The centre of a circle is $c(2, -3)$ and one end of the diameter AB is A(3, 5). Find the coordinates of the other end B.

OR

The radius of a circle with centre (–2, 3) is 5 units The point (2, 5) lies inside the circle or outside the circle.

25. If the product of zeroes of the polynomial $ax^2 - 6x - 6$ is 4, find the value of a. Find the sum of zeroes of the polynomial.

26. In figure, DE || BC in ΔABC such that BC = 8 cm, AB = 6 cm and DA = 1.5 cm. Find DE. [All India]



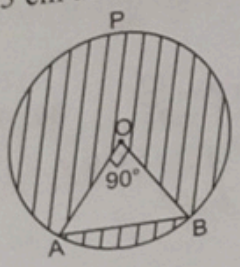
27. In ΔPQR, right–angled at Q, PR + QR = 25 cm and PQ = 5 cm. Determine the values of sin P, cos P and tan P.

28. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.

29. Prove that $\sqrt{5}$ is an irrational.

30. Find the area of the major segment APB in figure of a circle of radius 35 cm and $\angle AOB = 90°$.

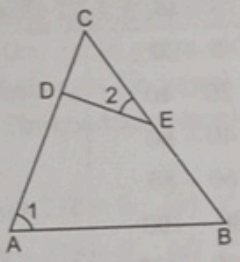
[Use $\pi = \frac{22}{7}$]



31. An aeroplane leaves an airport and flies due north at a speed of 1000 km per hour. At the same time, another aeroplane leaves the same airport and flies due west at a speed of 1200 km per hour .How far apart will be the two planes after $1\frac{1}{2}$ hours?

OR

In figure, if $\angle CAB = \angle CED$, then prove that $AB \times DC = ED \times BC$.



32. The distribution below shows the number of wickets taken by bowlers in one –day cricket matches .Find the mean number of wickets by choosing a suitable method .What does the mean signify?

Number of wickets	Number of bowlers
20 – 60	7
60 – 100	5
100 – 150	16
150 – 250	12
250 – 350	2
350 – 450	3

33. The angle of elevation of the top of a church from a point 20 metres away from its base is 45°. Find the height of the church.

34. The median of the following data is 525. Find the values of x and y, if the total frequency is 100.

Class interval	Frequency
0 – 100	2
100 – 200	5
200 – 300	x
300 – 400	12
400 – 500	17
500 – 600	20
600 – 700	y
700 – 800	9
800 – 900	7
900 – 1000	4

OR

Find the value of f_1 from the following data, if its mode is 65.

Class	Frequency
0 – 20	6
20 – 40	8
40 – 60	f_1
60 – 80	12
80 – 100	6
100 – 120	5

where frequency 6, 8, f_1 and 12 are in ascending order.

35. The angle of elevation of the top of a building from the foot of the tower is 30° and the angle of elevation of the top of the tower from the foot of the building is 60°. If the tower is 50 m high, find the height of the building.

OR

Two poles of equal heights are standing opposite each other on either side of the road, which is 80 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30°, respectively. Find the height of the poles and the distance of the point from the poles.

36. From a solid cylinder whose height is 15 cm and diameter 16 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid. [Use $\pi = 3.14$]

ANSWERS

1. (*b*) 4 OR (*b*) 750
2. (*c*) 3 OR (*b*) $x^2 - 36$
3. (*a*) Unique solution
4. (*a*) $5x + y = 3500$, $8x + 2y = 6000$, where x = cost of a chair, y = cost of a table
5. (*b*) $k = 40$ OR (*a*) 12
6. (*c*) $p = \pm 12$
7. (*d*) $1 + \alpha$; $-6 - \alpha$
8. (*b*) $\angle OAB = 30°$
9. PQ = 8 cm OR $\angle POA = 60°$
10. $x = 3$ cm
11. $x = 4$
12. $\tan A = \dfrac{\sin A}{\sqrt{1 - \sin^2 A}}$
13. $\tan A = \dfrac{x^2 - 1}{2x}$
14. 66 cm
15. 41 cm
16. $\dfrac{1}{9}$ OR $\dfrac{1}{2}$
17. (*a*) (*ii*), (*b*) (*i*), (*c*) (*iv*), (*d*) (*ii*), (*e*) (*ii*)
18. (*a*) (*iii*), (*b*) (*iii*), (*c*) (*iv*), (*d*) (*i*), (*e*) (*ii*)
19. (*a*) (*ii*), (*b*) (*ii*), (*c*) (*iii*), (*d*) (*iii*), (*e*) (*i*)
20. (*a*) (*iii*), (*b*) (*iv*), (*c*) (*iv*), (*d*) (*iii*), (*e*) (*iii*)
21. (*a*) (*ii*), (*b*) (*iii*), (*c*) (*i*), (*d*) (*iv*), (*e*) (*i*)
22. (*a*) (*iv*), (*b*) (*iii*), (*c*) (*ii*), (*d*) (*i*), (*e*) (*ii*)
23. OR 2
24. (1, –11) OR inside the circle
25. –4
26. 2 cm
27. $\sin P = \dfrac{12}{13}$; $\cos P = \dfrac{5}{13}$; $\tan P = \dfrac{12}{15}$
30. 3500 cm^2
31. $300\sqrt{61}$ km
32. 152.89;
33. 20 m
34. $x = 9$; $y = 15$ OR $f_1 = 10$
35. 16.67 m OR Height = $20\sqrt{3}$ m; 60 m; 20 m
36. 1381.6 cm^2