

Total number of printed pages : 7

NB-T/M-B/1

2024

**MATHEMATICS - B**

Total marks : 80

Time : 3 hours

**General Instructions:**

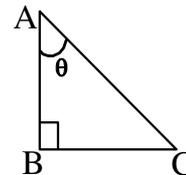
- i) Approximately 15 minutes is allotted to read the question paper and revise the answers.
- ii) The question paper consists of 23 questions.
- iii) All questions are compulsory.
- iv) Internal choice has been provided in some questions.
- v) Marks allocated to each question are indicated against it.
- vi) Write the correct question number in your answer sheet to indicate the option being attempted.

**N.B:** Check to ensure that all pages of the question paper is complete as indicated on the top left side.

**Section – A**

1. Choose the correct answer from the given alternatives.

- (a) A polynomial of degree 2 is called a 1  
 (i) quadratic polynomial. (ii) cubic polynomial.  
 (iii) linear polynomial. (iv) bi-quadratic polynomial.
- (b) If a pair of linear equations has no solution, then the lines are 1  
 (i) always intersecting. (ii) always coincident.  
 (iii) parallel. (iv) intersecting or coincident.
- (c) A quadratic equation  $ax^2 + bx + c = 0$ ,  $a \neq 0$  has two equal roots, then 1  
 (i)  $c^2 - 4ab = 0$  (ii)  $b^2 - 4ab = 0$   
 (iii)  $b^2 + 4ac = 0$  (iv)  $b^2 - 4ac = 0$
- (d) The common difference of the AP  $\frac{1}{3}, \frac{5}{3}, \frac{9}{3}, \frac{13}{3}, \dots$  is 1  
 (i)  $-\frac{4}{3}$  (ii)  $\frac{4}{3}$  (iii)  $-2$  (iv)  $2$
- (e) If  $\sin\theta = \frac{\sqrt{3}}{2}$ , then the value of  $\theta$  is 1  
 (i)  $90^\circ$  (ii)  $60^\circ$  (iii)  $45^\circ$  (iv)  $30^\circ$
- (f) In the adjoining figure, the value of  $\cos \theta$  is 1  
 (i)  $\frac{AB}{AC}$  (ii)  $\frac{BC}{AC}$   
 (iii)  $\frac{AB}{BC}$  (iv)  $\frac{AC}{AB}$



- (g) The mid-point of the line joining the points  $A(x_1, y_1)$  and  $B(x_2, y_2)$  is 1  
 (i)  $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$       (ii)  $\sqrt{(x_2 + x_1)^2 + (y_2 + y_1)^2}$   
 (iii)  $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$       (iv)  $\left(\frac{x_1 - x_2}{2}, \frac{y_1 - y_2}{2}\right)$
- (h) In the adjoining figure, if  $DE \parallel BC$ , then  $EC$  is equal to 1  
 (i) 4      (ii) 6  
 (iii) 9      (iv) 12
- (i) If  $\triangle ABC \sim \triangle PQR$ , then the value of  $\angle Q$  is 1  
 (i)  $80^\circ$       (ii)  $60^\circ$   
 (iii)  $40^\circ$       (iv)  $20^\circ$
- (j) The number of tangents that can be drawn from an external point to a circle is 1  
 (i) infinite      (ii) 0      (iii) 1      (iv) 2
- (k) In a circle, if the lengths of the major arc and the minor arc are 30 cm and 14 cm respectively, then the circumference of the circle is 1  
 (i) 44 cm      (ii) 30 cm      (iii) 16 cm      (iv) 14 cm
- (l) The radius of the sphere whose surface area is  $154 \text{ cm}^2$  is 1  
 (i) 3.5 cm      (ii) 7 cm      (iii) 14 cm      (iv) 49 cm
- (m) In the formula, Median =  $l + \frac{\frac{N}{2} - c.f.}{f} \times h$ ,  $h$  is 1  
 (i) highest frequency      (ii) height      (iii) class mark      (iv) class size
- (n) What is the probability of a sure event? 1  
 (i) 0      (ii)  $\frac{1}{2}$       (iii) 1      (iv) Less than 1
- (o) A die is thrown once. The probability of getting a number less than 3 is 1  
 (i)  $\frac{1}{6}$       (ii)  $\frac{1}{3}$       (iii)  $\frac{2}{3}$       (iv) 1

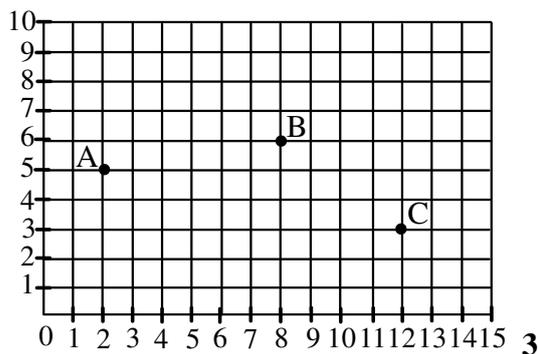
### Section – B

2. Given that  $\text{HCF}(26, 91) = 13$ . Find the  $\text{LCM}(26, 91)$  2
3. Find the roots of the quadratic equation  $x^2 - 3x - 10 = 0$  by factorisation. 2
4. State whether  $\sin(A + B) = \sin A + \sin B$  is True or False. Justify your answer. 2
5. A tower is  $100\sqrt{3}$  m high. Find the angle of elevation of its top from a point 100 m away from its foot. 2

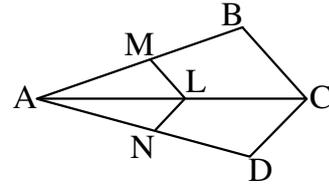
6. Find the distance between the points (1, -2) and (-3, 4) 2
7. E and F are points on the sides PQ and PR respectively of a  $\Delta PQR$ . PE = 4 cm, QE = 4.5 cm, PF = 8 cm and RF = 9 cm. Check whether  $EF \parallel QR$  or not. 2
8. Find the area of a sector of a circle with radius 21 cm if the angle of the sector is  $60^\circ$  [Take  $\pi = \frac{22}{7}$ ] 2

**Section – C**

9. (a) If  $-\frac{1}{3}$  and  $\frac{3}{2}$  are the zeroes of a quadratic polynomial, find the polynomial and hence verify the relationship between the zeroes and the coefficients. 3
- Or**
- (b) Find the value of  $k$  for which the quadratic equation,  $kx(x - 2) + 6 = 0$  has equal roots. 3
10. Solve the following pair of linear equations by substitution method: 3  
 $2x + 3y = 11, \quad 2x - 4y = -24$
11. Find the 31<sup>st</sup> term of an AP whose 11<sup>th</sup> term is 38 and 16<sup>th</sup> term is 73. 3
12. a. If  $\cot \theta = \frac{7}{8}$ , find  $\cot^2 \theta$  with the help of a right triangle. 3
- Or**
- b. Prove that :  $\sqrt{\frac{1 + \sin A}{1 - \sin A}} = \sec A + \tan A$ , where  $\angle A$  is acute. 3
13. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower fixed at the top of a 20 m high building are  $45^\circ$  and  $60^\circ$  respectively. Find the height of the tower. [Use  $\sqrt{3} = 1.732$ ] 3
14. Three friends from Dimapur, namely Reema, Jyoti and Deepa living in different locations are represented by the points A, B and C respectively. They all go to the same school which is located at the origin O. Reema comes to school by foot, Jyoti comes by bus and Deepa comes by car. Using this information, answer the following: 3
- (i) Write the coordinates of the points A, B & C.
- (ii) How far is the school from Jyoti's location?



15. a. In the adjoining figure, if  $LM \parallel CB$  and  $LN \parallel CD$ , prove that  $\frac{AM}{AB} = \frac{AN}{AD}$



Or

- b. E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that  $\triangle ABE \sim \triangle CFB$ .

3

16. a. Prove that the lengths of tangents drawn from an external point to a circle are equal.

Or

- b. The length of a tangent from a point A at distance 5 cm from the centre of the circle is 4 cm. Find the radius of the circle.

3

17. a. A chord of a circle of radius 10 cm subtends a right angle at the centre. Find the areas of the corresponding minor and major segments of the circle. [Take  $\pi = 3.14$ ]

Or

- b. A vessel is in the form of a hollow hemisphere mounted by a hollow cylinder. The diameter of the hemisphere is 14 cm and total height of the vessel is 13 cm. Find the inner surface area of the vessel. [Take  $\pi = \frac{22}{7}$ ]

3

18. The table below shows the daily expenditure on food of 25 households in a locality. Find the mean daily expenditure on food by a suitable method.

3

Daily expenditure (in `)	100-150	150-200	200-250	250-300	300-350
Number of households	4	5	12	2	2

19. a. A student noted the number of cars passing through a spot on a road for 100 periods each of 3 minutes and summarised it in the table given below. Find the mode of the data.

Number of cars	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	10	14	13	12	20	8	15	8

Or

- b. The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. Find the median monthly consumption of the data.

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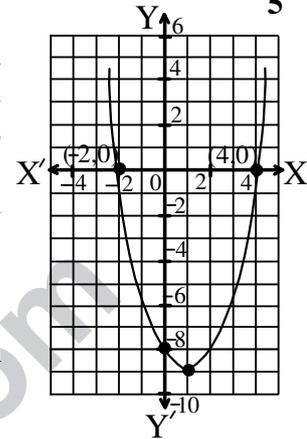
Monthly consumption (in units)	68-85	85-105	105-125	125-145	145-165	165-185	185-205
Number of consumers	4	5	13	20	14	8	4

20. A box contains 5 red marbles, 8 white marbles and 4 green marbles. One marble is taken out of the box at random. What is the probability that the marble taken out will be: (i) red, (ii) white, (iii) not green? 3

**Section – D**

21. Answer any one from the following questions (a) to (c): 5

- a. Nina saw a creeper on the boundary of her aunt’s house which was in the shape as shown in the figure. Answer the following questions by considering that the creeper has the same mathematical shape as shown in the figure:
- (i) How many zeroes does the polynomial (shape of the creeper) have?
  - (ii) Find the sum of the zeroes.
  - (iii) Find the product of the zeroes.
  - (iv) Write the expression of the polynomial represented by the graph.



**Or**

- b. Rana usually go to a dry fruit shop with his mother. He observes the following two situations:

**On 1<sup>st</sup> day:** The cost of 2 kg of almonds and 1 kg of cashew was ` 1600.

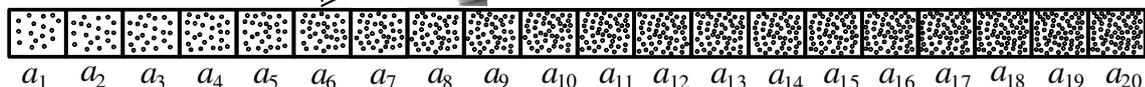
**On 2<sup>nd</sup> day:** The cost of 4 kg of almonds and 2 kg of cashew was ` 3000.

Denoting the cost of 1 kg almonds by `  $x$  and cost of 1 kg cashew by `  $y$ , answer the following questions:

- (i) Represent algebraically the situations of the 1<sup>st</sup> day and the 2<sup>nd</sup> day.
- (ii) What is the coordinate of the point, which the equation represented by the 1<sup>st</sup> day intersect the  $x$ -axis?
- (iii) What is the coordinate of the point, which the equation represented by the 2<sup>nd</sup> day intersect the  $y$ -axis?

**Or**

- c. In a board game, the number of sea shells in various cells forms an AP. If the number of sea shells in the 3<sup>rd</sup> and 11<sup>th</sup> cell together is 68 and the number of shells in the 11<sup>th</sup> cell is 24 more than that of the 3<sup>rd</sup> cell, then answer the following questions based on this data:



$a_1$   $a_2$   $a_3$   $a_4$   $a_5$   $a_6$   $a_7$   $a_8$   $a_9$   $a_{10}$   $a_{11}$   $a_{12}$   $a_{13}$   $a_{14}$   $a_{15}$   $a_{16}$   $a_{17}$   $a_{18}$   $a_{19}$   $a_{20}$

- (i) What is the difference between the number of sea shells in the 19<sup>th</sup> and 20<sup>th</sup> cells?
- (ii) How many sea shells are there in the first cell?
- (iii) How many total sea shells are there in the first 13 cells?

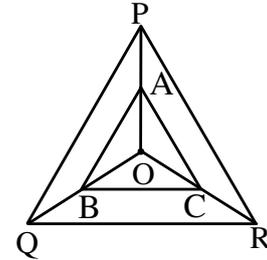
22. Answer any one from the following questions (a) to (c):

5

a. State and prove Thales Theorem.

Or

b. In the adjoining figure, A, B and C are points on OP, OQ and OR respectively such that  $AB \parallel PQ$  and  $AC \parallel PR$ . Show that  $BC \parallel QR$ .



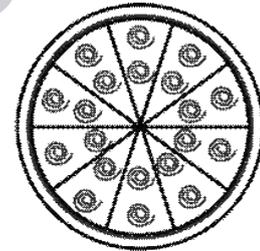
Or

c. Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

23. Answer any one from the following questions (a) to (c):

5

a. A brooch is made with silver wire in the form of a circle with diameter 35 mm. The wire is also used in making 5 diameters which divide the circle into 10 equal sectors as shown in the figure. Find the:



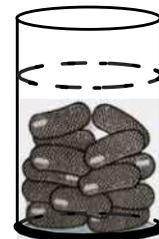
- (i) total length of the silver wire required.
- (ii) area of each sector of the brooch. [Take  $\pi = \frac{22}{7}$ ]

Or

b. A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 m and 4 m respectively, and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of the canvas of the tent at the rate of ₹ 500 per m<sup>2</sup>. [Take  $\pi = \frac{22}{7}$ ]

Or

c. A *gulab jamun*, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 *gulab jamuns*, each shaped like a cylinder with two hemispherical ends with length 5 cm and diameter 2.8 cm. [Take  $\pi = \frac{22}{7}$ ]



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