



B.K. BIRLA CENTRE FOR EDUCATION

SARALA BIRLA GROUP OF SCHOOLS
A CBSE DAY-CUM-BOYS' RESIDENTIAL SCHOOL



FIRST TERM EXAMINATION (2026-27)
MATHEMATICS — CLASS XI — Subject Code: 041
SET - A

Time allowed : 3 hours
Date : 07-09-2026

Maximum Marks : 80
Roll No :

General Instructions :

Read the following instructions carefully and follow them :

- (i) This question paper contains 38 questions. All questions are compulsory.
- (ii) This question paper is divided into FIVE Sections — A, B, C, D and E.
- (iii) In Section A, Questions no. 1 to 18 are multiple choice questions (MCQs) and questions no. 19 and 20 are Assertion-Reason based questions of 1 mark each.
- (iv) In Section B, Questions no. 21 to 25 are very short answer (VSA) type questions, carrying 2 marks each.
- (v) In Section C, Questions no. 26 to 31 are short answer (SA) type questions, carrying 3 marks each.
- (vi) In Section D, Questions no. 32 to 35 are long answer (LA) type questions carrying 5 marks each.
- (vii) In Section E, Questions no. 36 to 38 are case study based questions carrying 4 marks each. Internal choice is provided in 2 marks questions in each case study.
- (viii) There is no overall choice. However, an internal choice has been provided in 2 questions in Section B, 2 questions in Section C, 2 questions in Section D and 3 questions in Section E.
- (ix) Draw neat Venn diagrams and number lines wherever required.
- (x) Use of calculator is NOT allowed.

SECTION A

This section comprises multiple choice questions (MCQs) of 1 mark each.

- Q.1 The set $A = \{x : x \in \mathbb{Z}, x^2 = 9\}$, written in roster form, is : 1
- (A) $\{3\}$
 - (B) $\{-3\}$
 - (C) $\{-3, 3\}$
 - (D) ϕ
- Q.2 If $A = \{1, 2, 3\}$, then the number of elements in the power set $P(A)$ is : 1
- (A) 3
 - (B) 6

- (C) 8
(D) 9
- Q.3 The interval $[-3, 5)$ written in set-builder form is : 1
 (A) $\{x : x \in R, -3 < x < 5\}$
 (B) $\{x : x \in R, -3 \leq x < 5\}$
 (C) $\{x : x \in R, -3 < x \leq 5\}$
 (D) $\{x : x \in R, -3 \leq x \leq 5\}$
- Q.4 If $A \subset B$, then $A \cap B$ is equal to : 1
 (A) A
 (B) B
 (C) ϕ
 (D) $A \cup B$
- Q.5 A shopkeeper labels a shelf with the set $S = \{x : x \text{ is a two-digit natural number and a multiple of } 25\}$. Then S in roster form is : 1
 (A) $\{25, 50, 75\}$
 (B) $\{0, 25, 50, 75\}$
 (C) $\{25, 50, 75, 100\}$
 (D) $\{50, 75\}$
- Q.6 If $n(A) = 3$ and $n(B) = 2$, then the number of relations from A to B is : 1
 (A) 6
 (B) 12
 (C) 32
 (D) 64
- Q.7 If $(x + 1, y - 2) = (3, 1)$, then the values of x and y are : 1
 (A) $x = 2, y = 3$
 (B) $x = 4, y = -1$
 (C) $x = 2, y = -1$
 (D) $x = 3, y = 2$
- Q.8 The domain of the real function $f(x) = \frac{1}{x^2 - 4}$ is : 1
 (A) R
 (B) $R - \{2\}$
 (C) $R - \{-2, 2\}$
 (D) $R - \{0\}$
- Q.9 The range of the function $f(x) = |x - 3|$, $x \in R$, is : 1
 (A) $[0, \infty)$
 (B) $(0, \infty)$
 (C) R
 (D) $[3, \infty)$
- Q.10 A cab charges a fixed amount of ₹ 50 together with ₹ 12 per km. If $f(x)$ is the fare (in ₹) for a journey of x km, then $f(6)$ is : 1
 (A) ₹ 62
 (B) ₹ 72
 (C) ₹ 112
 (D) ₹ 122
- Q.11 The radian measure of 45° is : 1

- (A) $\frac{\pi}{2}$
- (B) $\frac{\pi}{3}$
- (C) $\frac{\pi}{4}$
- (D) $\frac{\pi}{6}$

Q.12 The degree measure of $\frac{7\pi}{6}$ radians is : 1

- (A) 210°
- (B) 150°
- (C) 240°
- (D) 105°

Q.13 The minute hand of a clock is 7 cm long. The distance moved by its tip in 15 minutes is (take $\pi = \frac{22}{7}$) : 1

- (A) 11 cm
- (B) 22 cm
- (C) 7 cm
- (D) 14 cm

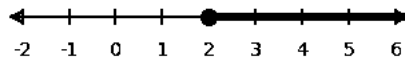
Q.14 The solution set of the inequality $3x - 7 > 5x - 1$, $x \in R$, is : 1

- (A) $(-3, \infty)$
- (B) $(-\infty, -3)$
- (C) $(3, \infty)$
- (D) $(-\infty, 3)$

Q.15 If $x \in N$ and $5x - 3 < 12$, then the solution set of the inequality is : 1

- (A) $\{1, 2\}$
- (B) $\{1, 2, 3\}$
- (C) $\{0, 1, 2\}$
- (D) $\{2, 3\}$

Q.16 The solution set represented on the number line given below is the solution set of the inequality : 1



- (A) $2x - 1 > 3$
- (B) $2x - 1 \geq 3$
- (C) $2x + 1 \leq 5$
- (D) $x - 2 < 0$

Q.17 Ishaan scored 62 and 48 marks in the first two unit tests. The minimum marks he must score in the third test so that his average is at least 60 marks is : 1

- (A) 70
- (B) 68
- (C) 72
- (D) 60

Q.18 If $-3 \leq 2x + 1 < 5$, $x \in R$, then x belongs to : 1

- (A) $[-2, 2)$
- (B) $(-2, 2]$

(C) $[-1, 3)$

(D) $(-1, 3]$

Q.19 Directions : In the question below, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option. 1

Assertion (A) : The set $\{x : x \in R, x^2 + 1 = 0\}$ is an empty set.

Reason (R) : The square of every real number is non-negative.

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

Q.20 Directions : In the question below, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option. 1

Assertion (A) : The relation $R = \{(1, 2), (2, 4), (3, 6)\}$ from $A = \{1, 2, 3\}$ to $B = \{2, 4, 6\}$ is a function.

Reason (R) : A relation from A to B is a function if every element of A has exactly one image in B .

(A) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).

(B) Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of Assertion (A).

(C) Assertion (A) is true, but Reason (R) is false.

(D) Assertion (A) is false, but Reason (R) is true.

SECTION B

This section comprises very short answer (VSA) type questions of 2 marks each.

Q.21 If $A = \{1, 2, 3\}$ and $B = \{3, 4\}$, write $A \times B$ and hence state the number of relations from A to B . 2

OR

If $(\frac{x}{3} + 1, y - \frac{2}{3}) = (\frac{5}{3}, \frac{1}{3})$, find the values of x and y .

Q.22 Find the domain and the range of the real function $f(x) = \sqrt{x - 1}$. 2

Q.23 Convert 520° into radian measure. 2

Q.24 A circular running track has a radius of 100 m. A runner covers an arc of length 22 m along this track. Find the angle, in degrees, subtended by this arc at the centre of the track. (take $\pi = \frac{22}{7}$) 2

Q.25 Solve the inequality $5x - 3 < 3x + 1$ when (i) x is an integer, (ii) x is a real number. 2

OR

Solve $3(x - 1) \leq 2(x - 3)$ and represent the solution set on the number line.

SECTION C

This section comprises short answer (SA) type questions of 3 marks each.

Q.26 If $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{2, 4, 6, 8\}$ and $B = \{2, 3, 5, 7\}$, verify that $(A \cup B)' = A' \cap B'$. 3

Q.27 A school library codes its two reading sections as follows : A is the set of even natural numbers not exceeding 10, and B is the set of multiples of 3 not exceeding 10. Write A and B in roster form and hence find $A \cup B$, $A \cap B$ and $A - B$. 3

OR

If $A = \{1, 2, 3, 4\}$ and $B = \{3, 4, 5, 6\}$, verify that the sets $A - B$, $B - A$ and $A \cap B$ are pairwise disjoint and that their union is $A \cup B$.

Q.28 The tip of a pendulum of length 75 cm describes an arc of length 21 cm. Find the angle, in radians, through which the pendulum swings. Also find the length of the arc described when it swings through an angle of 1.2 radians. 3

Q.29 A wheel of a moving cart makes 360 revolutions in one minute. Through how many radians does it turn in one second ? 3

Q.30 Solve the inequalities $5(2x - 7) - 3(2x + 3) \leq 0$ and $2x + 19 \leq 6x + 47$ simultaneously, and represent the solution set on the number line. 3

Q.31 A manufacturer has 600 litres of a 12% solution of acid. How many litres of a 30% acid solution must be added to it so that the acid content in the resulting mixture will be more than 15% but less than 18% ? 3

OR

The longest side of a triangle is 3 times the shortest side and the third side is 2 cm shorter than the longest side. If the perimeter of the triangle is at least 61 cm, find the minimum length of the shortest side.

SECTION D

This section comprises long answer (LA) type questions of 5 marks each.

Q.32 For any two sets A and B , prove that $(A \cap B)' = A' \cup B'$. Verify this result for $U = \{1, 2, 3, 4, 5, 6, 7, 8\}$, $A = \{2, 4, 6, 8\}$ and $B = \{1, 2, 3, 4\}$, and illustrate it by a Venn diagram. 5

Q.33 A class teacher writes the roll numbers of her class as $U = \{x : x \in N, x \leq 12\}$. She forms two teams : M , the students whose roll number is a multiple of 2, and S , those whose roll number is a multiple of 3. 5

(a) Write M and S in roster form.

(b) Find $M \cup S$ and $M \cap S$, and state what each of these sets represents in this situation.

(c) Find M' and $S - M$.

(d) Verify that $(M \cup S)' = M' \cap S'$.

OR

Write each of the following as an interval and represent it on the number line :

(a) $\{x : x \in R, -5 < x \leq 3\}$ (b) $\{x : x \in R, 2 \leq x < 7\}$

Hence find $(-5, 3] \cap [2, 7)$ and $(-5, 3] \cup [2, 7)$.

Q.34 Let $f = \{(1, 1), (2, 3), (0, -1), (-1, -3)\}$ be a function from Z to Z defined by $f(x) = ax + b$, for some integers a and b . 5

(a) Determine the values of a and b .

(b) Write the domain and the range of the given function f .

(c) Find $f(5)$.

(d) Find the value of x for which $f(x) = 9$.

Q.35 Solve the following system of inequalities and represent the solution set of each inequality on the number line ; hence write the common solution : 5

$$2(2x + 3) - 10 < 6(x - 2) \text{ and } \frac{2x - 3}{4} + 6 \geq 2 + \frac{4x}{3}$$

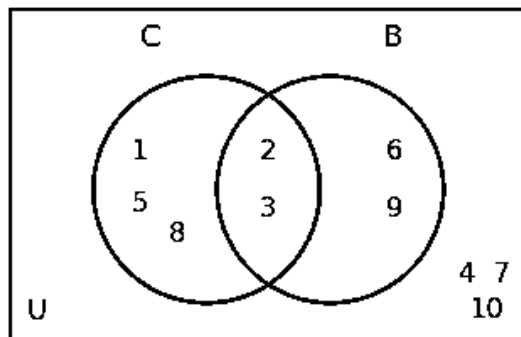
OR

The acidity of the water in a swimming pool is taken to be normal when the average of three daily pH readings lies between 8.2 and 8.5. If the first two readings are 8.48 and 8.35, find the range of the pH value of the third reading for which the acidity of the water will be normal.

SECTION E

This section comprises 3 case study based questions of 4 marks each.

Q.36 Case Study – 1 : A school sports club maintains its registers as sets of roll numbers. For a class of 10 students, $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, the cricket register is $C = \{1, 2, 3, 5, 8\}$ and the badminton register is $B = \{2, 3, 6, 9\}$. Based on the above information, answer the following questions :

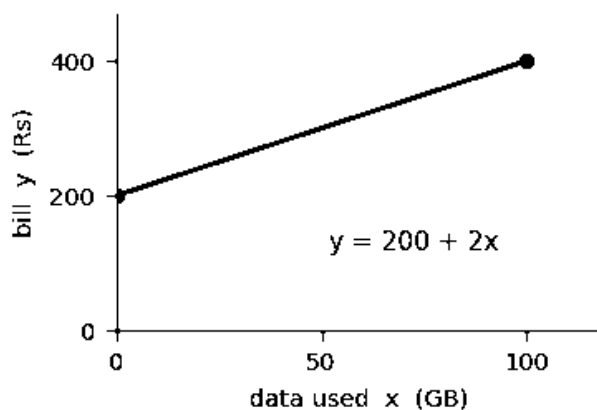


- (i) Write the set of roll numbers of the students who play both the games.
- (ii) Write $C \cup B$ in roster form.
- (iii) Find C' and $B - C$, and state what each of them represents here.

OR

- (iii) Verify that $(C \cup B)' = C' \cap B'$ for these two registers.

Q.37 Case Study – 2 : A mobile network offers a monthly plan with a fixed rental of ₹ 200 together with a charge of ₹ 2 for every GB of data consumed. Rehan uses x GB of data in a month and his total bill for that month is ₹ y . Based on the above information, answer the following questions :



- (i) Express y as a function of x .
- (ii) Find his bill for a month in which he consumes 30 GB of data.

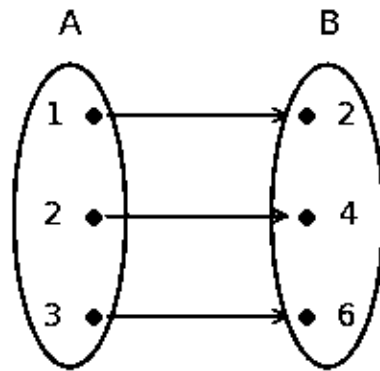
(iii) In a certain month his bill was ₹ 350. Find the data consumed by him in that month.

OR

(iii) If the plan allows a maximum of 100 GB of data in a month, write the domain and the range of this function.

Q.38 Case Study – 3 : A teacher wrote two sets $A = \{1, 2, 3\}$ and $B = \{2, 4, 6\}$ on the blackboard and asked the class to consider the relation $R = \{(a, b) : a \in A, b \in B \text{ and } b = 2a\}$. Based on the above information, answer the following questions :

4



- (i) Write the relation R in roster form.
- (ii) Write the domain and the range of R .
- (iii) Is R a function from A to B ? Justify your answer. Also write the total number of relations from A to B .

OR

(iii) Write the number of elements in $A \times B$ and hence the number of relations from A to B which contain exactly one ordered pair.
