



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 - 2

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 number of subsets of a set containing 4 elements is : 1
(A) 8
(B) 15
(C) 16
(D) 32
- Q.2 The set $\{x : x \in N, 1 < x < 2\}$ is : 1
(A) ϕ
(B) $\{1\}$
(C) $\{2\}$
(D) an infinite set
- Q.3 The solution set of the inequality $2x - 3 < 7, x \in R$, is : 1

- (A) $(-\infty, 5)$
 (B) $(5, \infty)$
 (C) $(-\infty, 2)$
 (D) $(2, \infty)$
- Q.4 If $n(A) = 2$ and $n(B) = 4$, then $n(A \times B)$ is : 1
 (A) 6
 (B) 8
 (C) 12
 (D) 16
- Q.5 The radian measure of 240° is : 1
 (A) $\frac{3\pi}{4}$
 (B) $\frac{4\pi}{3}$
 (C) $\frac{5\pi}{3}$
 (D) $\frac{2\pi}{3}$
- Q.6 The interval $(-2, 5]$ written in set-builder form is : 1
 (A) $\{x : x \in R, -2 \leq x \leq 5\}$
 (B) $\{x : x \in R, -2 < x < 5\}$
 (C) $\{x : x \in R, -2 < x \leq 5\}$
 (D) $\{x : x \in R, -2 \leq x < 5\}$
- Q.7 Ravi has ₹ 500 and wants to buy as many notebooks as possible, each costing ₹ 45. The greatest number of notebooks he can buy is : 1
 (A) 9
 (B) 10
 (C) 11
 (D) 12
- Q.8 The domain of the real function $f(x) = \frac{1}{x-3}$ is : 1
 (A) R
 (B) $R - \{3\}$
 (C) $R - \{-3\}$
 (D) $R - \{0\}$
- Q.9 If $A \subset B$, then $A \cup B$ is equal to : 1
 (A) A
 (B) B
 (C) ϕ
 (D) $A \cap B$
- Q.10 The degree measure of $\frac{5\pi}{4}$ radians is : 1
 (A) 135°
 (B) 200°
 (C) 225°
 (D) 240°
- Q.11 A courier company charges a fixed amount of ₹ 30 together with ₹ 8 per kg of weight. If $f(x)$ is the charge (in ₹) for a parcel of x kg, then $f(5)$ is : 1
 (A) ₹ 40
 (B) ₹ 62

(C) ₹ 70

(D) ₹ 78

Q.12 If $A = \{a, b\}$, then the number of elements in $P(A)$ is : 1

(A) 2

(B) 3

(C) 4

(D) 8

Q.13 If $x \in N$ and $4x - 3 < 13$, then the solution set of the inequality is : 1

(A) $\{1, 2\}$

(B) $\{1, 2, 3\}$

(C) $\{1, 2, 3, 4\}$

(D) $\{2, 3\}$

Q.14 If $(2x, y + 3) = (6, 5)$, then the values of x and y are : 1

(A) $x = 3, y = 2$

(B) $x = 2, y = 3$

(C) $x = 3, y = 8$

(D) $x = 6, y = 2$

Q.15 In a circle of radius 21 cm, the length of an arc which subtends an angle of 2 radians at the centre is : 1

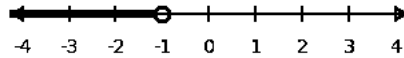
(A) 10.5 cm

(B) 21 cm

(C) 42 cm

(D) 84 cm

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



(A) $x + 1 < 0$

(B) $x + 1 \leq 0$

(C) $x + 1 > 0$

(D) $x - 1 > 0$

Q.17 The range of the function $f(x) = x^2 + 2, x \in R$, is : 1

(A) $[0, \infty)$

(B) $[2, \infty)$

(C) $(2, \infty)$

(D) R

Q.18 Ananya scored 55 and 70 marks in the first two unit tests. The minimum marks she must score in the third test so that her average is at least 65 marks is : 1

(A) 60

(B) 65

(C) 70

(D) 75

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) : If $A = \{1, 2\}$ and $B = \{a\}$, then the number of relations from A to B is 4.

Reason (R) : If $n(A) = m$ and $n(B) = n$, then the number of relations from A to B is 2^{mn} .

(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) : For any set A with universal set U , $A \cup A' = U$.

Reason (R) : A' is the set of all those elements of U which do not belong to A .

(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 $A = \{1, 2\}$ and $B = \{a, b\}$, write $A \times B$ and $B \times A$, and state whether $A \times B = B \times A$. 2

OR

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

Q.22 Find the domain and the range of the real function $f(x) = \sqrt{4 - x}$. 2

Q.23 Convert $-47^\circ 30'$ into radian measure. 2

Q.24 The wheel of a bicycle has a radius of 35 cm and makes 60 revolutions per minute. Through how many radians does the wheel turn in 5 seconds ? 2

Q.25 Solve the inequality $4x + 3 < 6x + 7$, $x \in R$, and represent the solution set on the number line. 2

OR

Solve $\frac{5-2x}{3} \leq \frac{x}{6} - 5$ and write the solution set in interval form.

SECTION C

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

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

Q.27 In a spelling activity a teacher writes A for the set of letters of the word SCHOOL and B for the set of letters of the word COLLEGE. Write A and B in roster form and hence find $A \cup B$, $A \cap B$ and $B - A$. 3

OR

If $A = \{2, 4, 6, 8\}$ and $B = \{6, 8, 10, 12\}$, 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 minute hand of a watch is 1.5 cm long. How far does its tip move in 40 minutes ? (take $\pi = 3.14$) 3

Q.29 An arc of a circle of radius 12 cm subtends an angle of 60° at the centre. Express this angle in radian measure and hence find the length of the arc. 3

Q.30 Solve the inequalities $2(x - 1) < x + 5$ and $3(x + 2) > 2 - x$ simultaneously, and represent the solution set on the number line. 3

Q.31 A chemical solution is to be kept between 68°F and 77°F . Using $F = \frac{9C}{5} + 32$, find the range of the temperature of the solution in degree Celsius. 3

OR

How many litres of water must be added to 1125 litres of a 45% acid solution so that the resulting mixture contains more than 25% but less than 30% of acid ?

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 $(A \cup B)' = A' \cap B'$. Verify this result for $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, $A = \{1, 3, 5, 7, 9\}$ and $B = \{2, 3, 5, 7\}$, and illustrate it by a Venn diagram. 5

Q.33 A stationery shop codes its items as $U = \{x : x \in N, x \leq 15\}$. The pens are given the codes that are multiples of 3, forming the set P , and the files are given the codes that are multiples of 5, forming the set Q . 5

- Write P and Q in roster form.
- Find $P \cup Q$ and $P \cap Q$, and state what each of these sets represents in this situation.
- Find P' and $Q - P$.
- Verify that $(P \cap Q)' = P' \cup Q'$.

OR

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

- $\{x : x \in R, -4 \leq x < 6\}$
- $\{x : x \in R, 0 < x \leq 9\}$

Hence find $[-4, 6) \cap (0, 9]$ and $[-4, 6) \cup (0, 9]$.

Q.34 Let $f = \{(0, 1), (1, 3), (2, 5), (3, 7)\}$ be a function defined by $f(x) = ax + b$, for some integers a and b . 5

- Determine the values of a and b .
- Write the domain and the range of the given function f .
- Find $f(10)$.
- Find the value of x for which $f(x) = 15$.

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

$$3x - 7 < 5 + x \quad \text{and} \quad 11 - 5x \leq 1$$

OR

The marks obtained by a student in the first two tests of a subject are 70 and 75. Find the range of marks he should obtain in the third test so that his average marks in the three tests are at least 70 but less than 80.

SECTION E

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

Q.36 Case Study – 1 : A school maintains its club registers as sets of roll numbers. For a class of 12 students, $U = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12\}$, the music club register is $M = \{1, 3, 4, 7, 9\}$ and the art club register is $A = \{3, 4, 8, 11\}$. Based on the above information, answer the following questions : 4

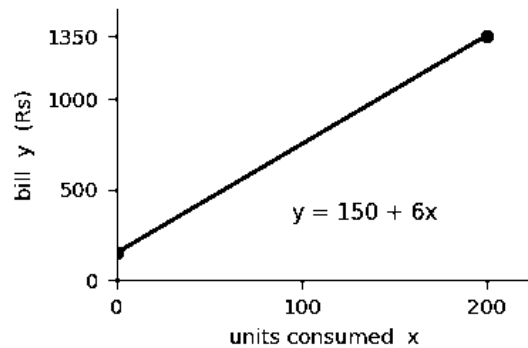
- Write the set of roll numbers of the students who have joined both the clubs.
- Write $M \cup A$ in roster form.
- Find A' and $M - A$, and state what each of them represents here.

OR

(iii) Verify that $(M \cap A)' = M' \cup A'$ for these two registers.

Q.37 Case Study – 2 : An electricity board charges a fixed monthly rental of ₹ 150 together with ₹ 6 for every unit of electricity consumed. A household consumes x units in a month and its total bill for that month is ₹ y . Based on the above information, answer the following questions :

4



(i) Express y as a function of x .

(ii) Find the bill for a month in which 40 units are consumed.

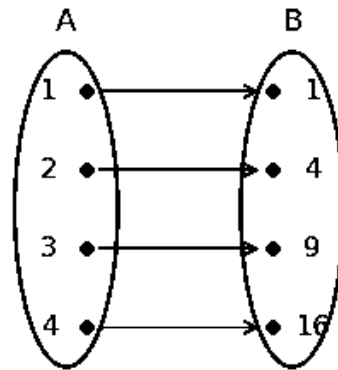
(iii) In a certain month the bill was ₹ 450. Find the number of units consumed in that month.

OR

(iii) If a household never consumes more than 200 units in a month, write the domain and the range of this function.

Q.38 Case Study – 3 : A teacher wrote two sets $A = \{1, 2, 3, 4\}$ and $B = \{1, 4, 9, 16\}$ on the blackboard and asked the class to consider the relation $R = \{(a, b) : a \in A, b \in B \text{ and } b = a^2\}$. 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.
