Roll No. ☐☐☐☐☐☐☐

HALF YEARLY EXAMINATION 2026-2027

MATHEMATICS

CLASS X

Time Allowed: 3 Hours ***Maximum Marks : 80***

General Instructions:

1. *This question paper has 5 Sections A, B, C, D and E.*
2. *Section A has 20 MCQs carrying 1 mark each.*
3. *Section B has 5 questions carrying 02 marks each.*
4. *Section C has 6 questions carrying 03 marks each.*
5. *Section D has 4 questions carrying 05 marks each.*
6. *Section E has 3 case based integrated units of assessment (04 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.*
7. *All questions are compulsory. However, an internal choice in 2 Questions of 5 marks, 2 Questions of 3 marks and 2 Questions of 2 marks has been provided.*
8. *Draw neat figures wherever required.*

Section 'A'

Q.1 Two dice are rolled together. The probability of getting an outcome (x, y) where x > y, is

(A) $\frac{5}{12}$ (B) $\frac{5}{6}$ (C) $\frac{7}{12}$ (D) $\frac{1}{2}$

Q.2 The length of the shadow of a tower when the sun's altitude changes from 30^0 to 60^0 will:

(A) become shorter (B) become longer (C) remain same (D) be doubled

Q.3 If HCF of 66 and 99 is expressible in the form of $55m - 132$, then the value of 'm' is:

(A) 4 (B) 1 (C) 2 (D) 3

Q.4 At which of the following points, the quadratic polynomial $p(x) = -3x + 18x^2 - 1$ intersects the positive $x - axis$?

(A) $\left(\frac{1}{6}, 0\right)$ (B) $\left(\frac{1}{3}, 0\right)$ (C) $\left(-\frac{1}{6}, 0\right)$ (D) $\left(-\frac{1}{3}, 0\right)$

Q.5 Devansh proved that $\Delta ABC \sim \Delta PQR$ using SAS similarity criteria. If he found $\angle C = \angle R$, then which of the following was proved true?

(A) $\frac{AC}{AB} = \frac{PR}{PQ}$ (B) $\frac{BC}{AC} = \frac{PR}{QR}$ (C) $\frac{AC}{BC} = \frac{PR}{PQ}$ (D) $\frac{AC}{BC} = \frac{PR}{QR}$

Q.6 Which of the following cannot be the probability of an event?

(A) $\frac{39}{100}$ (B) $\frac{0.001}{20}$ (C) 10% (D) $\frac{10}{0.2}$

Q.7 The *sine* of an angle in a right triangle is $\frac{4}{5}$. Which of these could be the measures of the sid of the triangle?

(A) 4 cm, 5 cm and 9 cm (B) 4 cm, 5 cm and $\sqrt{41}$ cm

(C) 6 cm, 8 cm and 10 cm (D) 8 cm, 10 cm and $4\sqrt{41}$ cm

Q.8 If a pair of linear equations in two variables is represented by two coincident lines, then th pair of equations has:

(A) a unique solution (B) two solutions

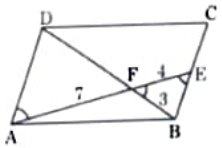
(C) no solution (D) an infinite number of solutions

Q.9 If the value of each observation of a statistical data is increased by 3, then the mean of the data:

(A) remains unchanged (B) increases by 3

(C) increases by 6 (D) increases by 3n

Q.10 ABCD is a parallelogram such that AF = 7 cm, FB = 3 cm and EF = 4 cm. FD measures:



(A) $\frac{21}{4}$ cm (B) $\frac{28}{3}$ cm (C) $\frac{12}{7}$ cm (D) 5.5 cm

Q.11 While calculating mean of a grouped frequency distribution using step deviation method $\left(u = \frac{x-a}{h}\right)$, it was found that $\bar{x} = 62$, $a = 47.5$, $h = 5$. The value of $\bar{u}$ is:

(A) 3 (B) 14.5 (C) 2.9 (D) 3.1

Q.12 The following table shows the marks scored by students of a class.

Marks Obtained	Below 20	Below 40	Below 60	Below 80	Below 100
Number of Students	3	12	22	39	45

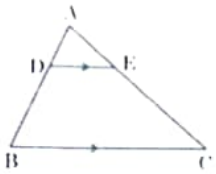
The lower limit of the modal class is:

(A) 20 (B) 40 (C) 60 (D) 80

Q.13 Equation of another line parallel to the line represented by $2x - 6y = 7$ is:

(A) $y = 3x - 7$ (B) $2x = 9 - 6y$ (C) $x - 3y = 7$ (D) $x = \frac{7}{2} - 3y$

Q.14 In the given figure, DE || BC. If $\frac{AD}{DB} = \frac{1}{3}$ and AC = 6 cm, then length AE is:



(A) 1.5 cm (B) 1 cm (C) 2 cm (D) 3 cm

Q.15 The value of $\left(\frac{1}{2}\tan^2 45^0 - \cos^2 60^0\right)$ is:

(A) 0 (B) $\frac{-1}{2}$ (C) $\frac{-1}{4}$ (D) $\frac{1}{4}$

Q.16 The product and sum of zeroes of a quadratic polynomial $p(x)$ are $\frac{-1}{2}$ and $\frac{7}{6}$ respectively. The polynomial $p(x)$ is:

(A) $6x^2 + 7 + 3x$ (B) $6x^2 - 3 - 7x$ (C) $12x^2 - 8x - 7$ (D) $6x^2 + 7x - 3$

Q.17 Meena calculates that the probability of her winning the first prize in a lottery is 0.08. If total 800 tickets were sold, the number of tickets bought by her, is

(A) 64 (B) 640 (C) 100 (D) 10

Q.18 If $\sin A = \frac{\sqrt{3}}{2}$ and $\cos B = \frac{\sqrt{3}}{2}$, then $\tan A \,.\, \tan B$ is:

(A) $\sqrt{3}$ (B) $\frac{1}{\sqrt{3}}$ (C) 1 (D) 0

Questions number 19 and 20 are Assertion and Reason based questions. Two statements are given, one labelled Assertion (A) and the other labelled Reason (R). Select the correct answer from the codes (A), (B), (C) and (D) as given below:

(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.19 **Assertion (A):** H.C.F. (36 m^2, 18 m) = 18 m, where m is a prime number.
Reason (R): H.C.F. of two numbers is always less than or equal to the smaller number.

Q.20 **Assertion (A):** The polynomial $p(x) = x^2 + 4x + 3$ has two zeroes -3 and -1.
Reason (R): The zeroes of a quadratic polynomial are the points of intersection of the graph with the x-axis.

Section 'B'

Q.21 (a) Find the value(s) of 'c' for which the following pair of linear equations has *infinitely* many solutions:

$$cx + 3y = c - 3$$
$$12x + cy = c$$

OR

(b) Solve for x and y:

$$3x + 2y = 65$$
$$2x + 3y = 60$$

Q.22 Find a quadratic polynomial one of whose zeroes is $(3+\sqrt{2})$ and the sum of its zeroes is 6.

Q.23 (a) If $tan(A + B) = \sqrt{3}$ and $tan(A - B) = \frac{1}{\sqrt{3}}$, $0 \leq A + B \leq 90°$ and $A > B$, then find A and B.

OR

(b) If $(\sec A + \tan A)(1 - \sin A) = k \cos A$, then find the value of k.

Q.24 A bag contains 100 cards numbered 1 to 100. A card is drawn at random from the bag. What is the probability that the number on the card is:

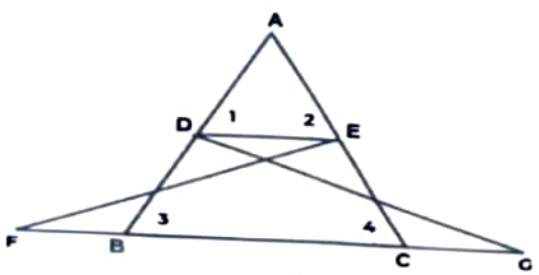
(i) a perfect cube

(ii) a multiple of 4 and 7 both.

Q.25 Evaluate: $\frac{5\cos^2 45° + 4\sec^2 30° - \operatorname{cosec}^2 60°}{\cos^2 80° + \sin^2 80°}$

Section 'C'

Q.26(a) In the given figure, $\Delta FEC \cong \Delta GDB$ and $\angle 1 = \angle 2$. Prove that $\Delta ADE \sim \Delta ABC$.



OR

Q.26(b) Sides AB and BC and median AD of a triangle ABC are respectively proportional to sides PQ and QR and median PM of Δ PQR. Show that Δ ABC ~ Δ PQR.

Q.27 Prove that $\frac{2+3\sqrt{5}}{7}$ is an irrational number, given that $\sqrt{5}$ is an irrational number.

Q.28 Prove that: $\frac{\tan A}{1-\cot A} + \frac{\cot A}{1-\tan A} = 1 + \sec A \, cosec \, A$

Q.29 A factory manager is analysing the daily wages of its workers to determine the daily wage level at which the largest concentration of workers is found. The following data was recorded. Using the given data, determine the most frequently occurring daily wage of the workers. If median of the data is ₹430, calculate the mean using the Empirical Formula.

Daily wages in ₹	300 - 350	350 - 400	400 - 450	450 - 500	500 - 550	550 - 600
Number of Workers	9	12	20	12	10	3

Q.30 (a) If one of the zeroes of the polynomial $3x^2 + 8x + 2k + 3$ is seven times the other, find the value of 'k'.

OR

(b) If the zeroes of the polynomial $x^2 + ax + b$ are in the ratio 3 : 4, then prove that $12a^2 = 49b$.

Q.31 A girl of height 1.2 m is walking away from the base of a lamp-post at a speed of 1.5 m/s. If the lamp is 4.8 m above the ground, find the length of her shadow after 6 seconds.

Section 'D'

Q.32 The median of the following frequency table is 55. But the frequencies 'x' and 'y' in the classes 20–40 and 60–80 are missing. Find the missing frequencies.

Age (in years)	0-20	20-40	40-60	60-80	80-100	Total
Number of People	15	x	24	y	17	100

OR

A school is preparing a statistical report on the heights of 100 students. The administration wants to replace the complete set of height data with one value such that, if this value were assigned equally to every student, the total of all the heights would remain unchanged. The recorded data is given below. **What is this representative value called?** Find it using an appropriate method.

Height (in cm)	135-139	140-144	145-149	150-154	155-159	160-164	165-169	170-174
Number of Students	4	9	18	28	24	10	5	2

Q.33 In $\triangle ABC$, points D and E lie on AB and AC, respectively, such that $DE \parallel BC$. A student observes that the parallel line appears to divide the two sides of the triangle proportionally. Prove mathematically that this observation is true for every triangle satisfying the given conditions.

Q.34 A designer is creating a triangular display panel for a school exhibition. Two straight edges of the panel are represented by the equations $4x - y - 8 = 0$ and $2x - 3y + 6 = 0$. The third edge of the panel lies along the x-axis. Using a graphical representation, determine the coordinates of the point where the two designed edges meet and hence determine the coordinates of the three vertices of the triangular display panel.

Q.35(a) A boy standing on a horizontal plane is flying a kite with a string of length 60 m, at an angle of elevation of 30°. Another boy standing on the roof of a 20 m high building, finds the angle of elevation of same kite to be 45°. If both the boys are on opposite sides of the kite, find the distance of the first boy from the base of the building. Also, find the height of the kite from the ground. (Use $\sqrt{3} = 1.73$)

OR

Q.35(b) The angle of elevation of a helicopter in air from a point A on the ground is 45°. After a flight of 25 seconds, the angle of elevation changes to 30°. If the helicopter is flying at a constant height of 2500 m, find the speed of the helicopter. (Use $\sqrt{3} = 1.73$)

Section 'E'

Q.36 A group of friends wanted to play cards with two identical packs together. While shuffling the cards, three cards are dropped. Rest of the cards are shuffled and one card is drawn at random. Assuming that the dropped cards were a queen of hearts, a ten of spades and an ace of clubs, answer the following questions:

(i) Find the probability that the drawn card is a face card. 1

(ii) Find the probability that the drawn card is either a king or a queen. 1

(iii) (a) Do you think that the probability of getting a queen was higher if none of the cards were dropped? Justify your answer. 2

OR

(iii) (b) Find the probability that the drawn card is a jack. Compare it with the probability when none of the cards were dropped. In which case is the probability of getting a jack higher? 2

Q.37 A test consists of 'True' or 'False' questions. One mark is awarded for every correct answer while $\frac{1}{4}$ mark is deducted for every wrong answer. A student attempted all 120 questions and obtained a total of 90 marks. Based on the above information, answer the following questions:

(i) Express the total number of questions by a linear equation in two variables $(x \& y)$. *1*

(ii) Express the total marks scored by the student by a linear equation in two variables $(x \& y)$. *1*

(iii) (a) Solve the pair of linear equations in two variables formed in (i) and (ii) to find the number of correct and incorrect answers attempted by the student. *2*

OR

(b) Ritu scored 75 marks in the same test. How many incorrect answers did she give, assuming that she also attempted all questions? *2*

Q.38 During the renovation of a school courtyard, a rectangular section measuring 156 cm × 216 cm is to be covered completely with identical square tiles. The school wants to use the largest possible square tiles so that the entire rectangular section is covered without cutting any tiles. Based on the information, answer the questions that follow:

(i) Which mathematical concept will help the students determine the greatest possible side length of the tile? *1*

(ii) (a) Find the greatest possible side length of each square tile. **2**

OR

(b) The architect suggests using square tiles of side 18cm. Determine whether the entire rectangular section can be covered exactly with these tiles. Give a reason for your answer. **2**

(iii) Find the total number of square tiles (of the greatest possible side) required to cover the rectangular section completely without cutting any tile. **1**