MATHEMATICS-A (IX & X)

DESIGN OF THE QUESTION PAPER

Weightage to different forms of questions:

Section	Forms of questions	Marks for each question	No. of questions	Total Marks
A	MCQ	1	15	15
B	SA-I	2	7	14
C	SA-II	3	12	36
D	LA	5	3	15
Total :			**37**	**80**

Weightage level of questions:

Sl.No.	Level	Percentage	Marks
1.	Easy	20	16
2.	Average	60	48
3.	Difficult	20	16
Total :		**100**	**80**

Scheme of options:

1. Internal choice shall be provided in *any* 6 (six) questions of 3 marks in Section C.

2. General choice shall be provided in *all* 3 (three) questions of 5 marks in Section D.

3. The internal choice and general choice questions shall be set from the same unit with the same difficulty level.

4. Minimum 10% of the marks will be of Higher Order Thinking Skills (HOTS)/ Competency Based Questions.

Sample Question Paper 2023
MATHEMATICS A (X)

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 and General choice have been provided in some questions.
v) Marks allocated to every question are indicated against it.

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) How many zeroes are there in the polynomial $14x + x^2 + 49$? **1**
(i) 0 (ii) 2 (iii) 4 (iv) 7

(b) The graph of the pair of equations $x - 2y = 0$ and $3x + 4y - 2 = 0$ represents **1**
(i) intersecting lines. (ii) coincident lines.
(iii) parallel lines. (iv) cannot be determined from the graph.

(c) The nature of the roots of the quadratic equation $2x^2 - 4x + 3 = 0$ is **1**
(i) real and distinct. (ii) real.
(iii) unreal . (iv) equal.

(d) If the n^{th} term of an AP is given by $2n+11$, then what is the common difference? **1**
(i) –2 (ii) –1 (iii) 1 (iv) 2

(e) As θ increases from 0° to 90°, how does tan θ vary? **1**
(i) Increases from 0 to not defined.
(ii) Decreases from not defined to 0.
(iii) Increases from 0 to 1.
(iv) Decreases from 1 to 0.

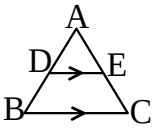
(f) If the length of the shadow of a pole on a level ground is equal to the length of the pole, the angle of elevation of the sun is **1**
(i) 30° (ii) 45° (iii) 60° (iv) 90°

(g) Y is a point on *y*-axis at a distance of 4 units from *x*-axis lying below *x*-axis. The coordinates of Y are **1**
(i) (4, 0) (ii) (0, 4) (iii) (–4, 0) (iv) (0, –4)

(h) If $\Delta ABC \sim \Delta PQR$, $\angle B = 45°$ and $\angle C = 60°$, what is the measure of $\angle Q$? **1**

(i) 45° (ii) 60° (iii) 75° (iv) 105°

(i) In the given figure, DE ‖ BC and $\frac{AD}{DB} = \frac{3}{5}$. If AC = 5.6 cm , then AE = ? **1**



(i) 4.2 cm (ii) 3.1 cm (iii) 2.8 cm (iv) 2.1 cm

(j) What is the angle with which the tangent to a circle makes with the radius, at the point of contact? **1**

(i) 0° (ii) 45° (iii) 90° (iv) 180°

(k) The area of a sector of central angle 4θ of a circle of radius r is **1**

(i) $\frac{\pi r\theta}{10°}$ (ii) $\frac{\pi r\theta}{30°}$ (iii) $\frac{\pi r^2\theta}{10°}$ (iv) $\frac{\pi r^2\theta}{30°}$

(l) A cylinder and a cone have the same height and radius. What is the ratio of the volume of the cylinder to the volume of the cone? **1**

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

(m) The mode and median of a distribution are 65 and 51 respectively. What is the value of mean? **1**

(i) 58 (ii) 44 (iii) 23 (iv) 14

(n) In the formula for finding mean, $\bar{x} = a + h\left(\frac{\sum f_i u_i}{\sum f_i}\right)$, what is the value of u_i? **1**

(i) $\frac{x_i + a}{h}$ (ii) $\frac{x_i - a}{h}$ (iii) $\frac{a - x_i}{h}$ (iv) $\frac{1 + x_i\ a}{h}$

(o) What is the total number of possible outcomes when two unbiased coins are tossed simultaneously? **1**

(i) 0 (ii) 2 (iii) 3 (iv) 4

Section – B

2. Show that $\frac{3+\sqrt{7}}{5}$ is an irrational number, given that $\sqrt{7}$ is irrational. **2**

3. Find the value of k for which the quadratic equation $2x^2 + kx + 3 = 0$ has equal roots. **2**

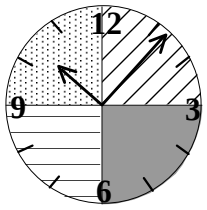
4. If 15cotA = 8, find sin A and sec A with the help of a right angled triangle. **2**

5. A tower 30 m high casts a shadow $10\sqrt{3}$ m long on the ground. What is the angle of elevation of the sun? **2**

6. Find the distance between the pair of points (a, b) and $(-a, -b)$. **2**

7. A tangent PQ, at a point P of a circle of radius 5 cm, meets a line through the centre O at a point Q, so that OQ = 12 cm. Find the length of PQ. **2**

8. John painted the face of a circular clock of radius 21 cm, which is divided into four equal parts (*as shown in the figure*) using four different colours. Find the area of each equal coloured part. [Use $\pi = \frac{22}{7}$]



2

Section – C

9. Find a quadratic polynomial whose sum and product of zeroes are 1 and –6 respectively. Also, find its zeroes. **3**

10. **a.** Solve the given pair of linear equations by substitution method:
$\frac{3x}{2} - \frac{5y}{3} = -2$ and $\frac{x}{3} + \frac{y}{2} = \frac{13}{6}$

Or **3**

b. Find the nature of the roots of the equation $3x^2 - 4\sqrt{3}x + 4 = 0$. If the real roots exist, find them.

11. Determine the AP whose 3rd term is 16 and the 7th term exceeds the 5th term by 12. **3**

12. **a.** Evaluate: $\frac{\sin 30° + \tan 45° - \text{cosec}\, 60°}{\sec 30° + \cos 60° + \cot 45°}$

Or **3**

b. Prove the identity: $\frac{\sin\theta - 2\sin^3\theta}{2\cos^3\theta - \cos\theta} = \tan\theta$, where the angles involved are acute angles.

13. **a.** The shadow of a tower standing on a level ground is found to be 40 m longer when the sun's altitude is 30° than when it is 60°. Find the height of the tower.

Or **3**

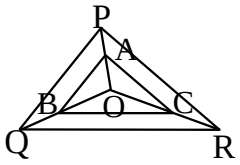
b. From a point on the ground, the angles of elevation of the bottom and the top of a transmission tower, fixed at the top of a 20 m high building, are 45° and 60° respectively. Find the height of the tower.

14. **a.** If P($9a$–2, $-b$) divides the line segment joining the points A($3a$+1, –3) and B($8a$, 5) in the ratio 3 : 1, find the values of a and b.

Or **3**

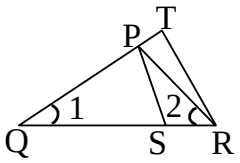
b. If PQ = QR, where P, Q and R have coordinates (6, –1), (1, 3) and (a, 8) respectively, then find the value of a.

15. **a.** In the adjoining figure, A, B and C are points on OP, OQ and OR respectively, such that AB || PQ and AC || PR. Show that BC || QR.



Or **3**

b. In the adjoining figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$. Show that $\Delta PQS \sim \Delta TQR$.



16. Prove that the lengths of tangents drawn from an external point to a circle are equal. **3**

17. **a.** A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor and major segments of the circle. [Use π = 3.14 and $\sqrt{3}$ = 1.73]

Or **3**

b. A cubical block of side 7 cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have? Find the surface area of the solid.

18. A group of 82 people attended a workshop on a certain day. The following table shows their ages:

Age(in years)	Less than 20	Less than 30	Less than 40	Less than 50	Less than 60	Less than 70
Number of people	10	24	39	59	71	82

Based on the above information, compute the median age of the persons who attended the workshop. **3**

19. The following table shows the daily expenditure on food of 25 households in a locality. Find the mean daily expenditure on food by Assumed Mean method. **3**

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

20. A box contains 90 discs which are numbered from 1 to 90. If one disc is drawn at random from the box, find the probability that it bears: (i) a two-digit number (ii) a perfect square number (iii) a number divisible by 5. **3**

Section – D

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

a. Draw the graphs of the equations $x-y+1=0$ and $3x+2y-12=0$. Determine the coordinates of the vertices of the triangle formed by these lines and the *x*-axis, and shade the triangular region.

Or

b. The sum of the digits of a two-digit number is 9. Also, nine times this number is twice the number obtained by reversing the order of the digits. Find the number.

Or

c. A manufacturer of TV sets produced 600 sets in the third year and 700 sets in the seventh year. Assuming that the production increases uniformly by a fixed number every year, find: (i) the production in the 1^{st} year, (ii) the production in the 10^{th} year, (iii) the total production in the first 7 years.

22. **Answer any one from the following questions (a) to (c).** **5**

a. State and prove Thales Theorem.

Or

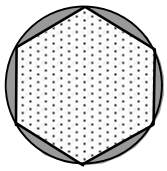
b. Sides AB and AC, and median of a triangle ABC are respectively proportional to sides PQ and PR, and median PM of another triangle PQR. Show that $\Delta ABC \sim \Delta PQR$.

Or

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

23. **Answer any one from the following questions (a) to (c).** **5**

a. A round table cover has six equal designs (*as shown in the figure*). If the radius of the cover is 28 cm, find the cost of making the designs at the rate of ` 0.35 per cm^2. [Use $\sqrt{3}$ = 1.73]



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 2.8m, 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^2.

Or

b. A spherical glass vessel has a cylindrical neck 8 cm long, 2 cm in diameter; the diameter of the spherical part is 8.5 cm. By measuring the amount of water it holds, a child finds its volume to be 345 cm^3. Check whether she is correct, taking the above as the inside measurements, and π = 3.14.

MATHEMATICS-B (IX & X)

DESIGN OF THE QUESTION PAPER

Weightage to different forms of questions:

Section	Forms of questions	Marks for each question	No. of questions	Total Marks
A	MCQ	1	15	15
B	SA-I	2	7	14
C	SA-II	3	12	36
D	LA	5	3	15
Total :			**37**	**80**

Weightage level of questions:

Sl.No.	Level	Percentage	Marks
1.	Easy	40	32
2.	Average	50	40
3.	Difficult	10	8
Total :		**100**	**80**

Scheme of options:

1. Internal choice shall be provided in *any* 6 (six) questions of 3 marks in Section C.

2. General choice shall be provided in *all* 3 (three) questions of 5 marks in Section D.

3. The internal choice and general choice questions shall be set from the same unit with the same difficulty level.

4. Minimum 10% of the marks will be of Higher Order Thinking Skills (HOTS)/ Competency Based Questions.

Model Question Paper
MATHEMATICS B (X)

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 and General choice have been provided in some questions.
v) Marks allocated to every question are indicated against it.

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.**

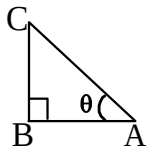
(a) What is the degree of the polynomial x^3+3x^2+4x+5? **1**
(i) 1 (ii) 2 (iii) 3 (iv) 4

(b) What is the coordinate of the point of intersection of *x*-axis and *y*-axis? **1**
(i) (0, 0) (ii) (1, 1) (iii) (2, 2) (iv) (3, 3)

(c) In a quadratic equation $ax^2+bx+c=0$, if $b^2-4ac=0$, what is the nature of the roots? **1**
(i) Two distinct real roots. (ii) Two equal real roots.
(iii) No real roots. (iv) One real and one unreal root.

(d) Which of the following is an AP ? **1**
(i) –1.0, –1.5, –2.0, –2.5, ... (ii) 0.5, 0.7, 1.0, 1.4, ...
(iii) $\frac{1}{4},\frac{5}{4},\frac{13}{4},\frac{25}{4},\ldots$ (iv) $\sqrt{4},\sqrt{9},\sqrt{25},\sqrt{64},\ldots$

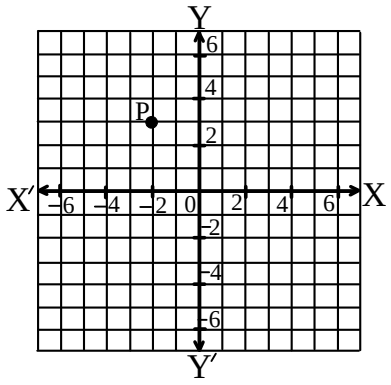
(e) In the figure given below, BC = 2 units and AC = 4 units.
What is the value of θ? **1**



(i) 0° (ii) 30° (iii) 45° (iv) 60°

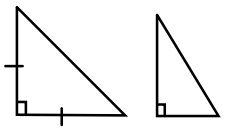
(f) If the angles of elevation of the sun is 45°, then what is the length of the shadow of 12 m high electric pole? **1**
(i) 6 m (ii) 12 m (iii) 24 m (iv) 48 m

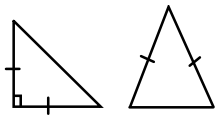
(g) In the given figure, what is the coordinate of the point P? **1**

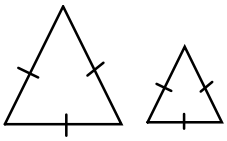


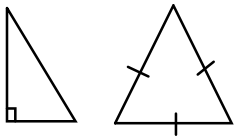
(i) (2, 3) (ii) (–2, 3) (iii) (–2, –3) (iv) (2, –3)

(h) Choose the pair of similar triangles from the following: **1**

(i) 

(ii) 

(iii) 

(iv) 

(i) If ΔPQR and ΔXYZ are similar triangles such that, ∠P = 30°, ∠Y = 110°, then what is the value of ∠R? **1**

(i) 140° (ii) 80° (iii) 70° (iv) 40°

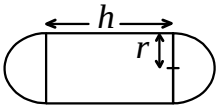
(j) How many tangents can be drawn to a circle from one external point? **1**

(i) 0 (ii) 1 (iii) 2 (iv) Infinite

(k) The area of a sector is $\frac{1}{3}$ of the area of a circle. What is the value of θ? **1**

(i) 60° (ii) 90° (iii) 120° (iv) 180°

(l) What is the total surface area of the adjoining figure?



1

(i) $2\pi r^2 h$ sq.units (ii) $2\pi r^2(h + 1)$ sq.units

(iii) $2\pi r^2(h + 2)$ sq.units (iv) $2\pi r^2(h + 3)$ sq.units

(m) The modal class of the following frequency distribution is: **1**

Class interval	0-10	10-20	20-30	30-40	40-50	50-60
Frequency	3	9	15	30	18	5

(i) 10-20 (ii) 20-30 (iii) 30-40 (iv) 40-50

(n) A class has lower limit 15 and upper limit 20. What is the class mark? **1**
(i) 7.5 (ii) 15 (iii) 17.5 (iv) 25.5

(o) What is the probability of getting a head when a coin is tossed once? **1**
(i) $-\frac{1}{2}$ (ii) 0 (iii) $\frac{1}{2}$ (iv) 1

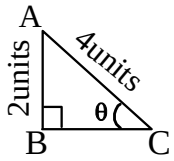
Section – B

2. Find the LCM and HCF of 26 and 91. **2**

3. Find the roots of the quadratic equation $x^2 - 36 = 0$. **2**

4. Evaluate: $\sin 30° + \cos 60°$ **2**

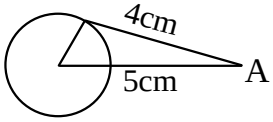
5. In the adjoining figure, if AB = 2 units and AC = 4 units, then find the value of θ.



2

6. Find the distance between the points (2, 3) and (4, 41). **2**

7. The length of a tangent from a point A at a distance 5 cm from the centre of a circle is 4 cm. Find the radius of the circle. **2**



8. Find the area of a circle whose radius is 7 cm . **2**

Section – C

9. Find the zeroes of the quadratic polynomial $x^2 - 2x + 8$. **3**

10. **a.** Solve the given pair of linear equations by substitution method:
$x - y = 5$ and $2x - 3y = 4$

Or **3**

b. Solve the given pair of linear equations by elimination method:
$x + y = 5$ and $2x - y = 4$

11. How many three-digit natural numbers are divisible by 7? **3**

12. **a.** If $\sin A = \frac{3}{4}$, find cos A and tan A, with the help of a right-angled triangle.

Or **3**

b. Prove the identity: $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$, where the angles involved are acute angles.

13. **a.** The angle of elevation of the top of a tower from a point on the ground, which is 30 m away from the foot of the tower, is 30°. Find the height of the tower.

Or **3**

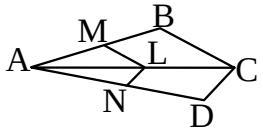
b. A tree breaks due to a storm and the broken part bends so that the top of the tree touches the ground, making an angle 30° with it. The distance between the foot of the tree, to the point where the top touches the ground, is 8 m. Find the height of the tree.

14. **a.** The coordinates of four points are A(1, 2), B(4, 6), C(5, 6) and D(2, 2). Show that AB = CD.

Or **3**

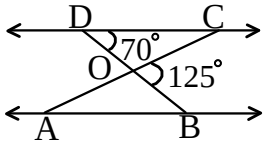
b. Find the coordinates of the points which divide the line segment joining A(–3, 3) and B(–3, –3) into two equal parts.

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



Or **3**

b. In the adjoining figure, ΔODC ~ ΔOBA, ∠BOC = 125° and ∠CDO = 70°. Find ∠DOC, ∠DCO and ∠OAB.



16. Prove that the tangents drawn at the ends of a diameter of a circle are parallel. **3**

17. **a.** The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes.

Or **3**

b. 2 cubes each of volume 64 cm^3 are joined end to end. Find the surface area of the resulting cuboid.

18. A test of 20 marks is conducted on 40 students of Class-10 students of a school. The following table shows the result of the test:

Marks	0-5	5-10	10-15	15-20
Number of students	5	10	15	10

Based on the above information, find the mean marks of the students. **3**

19. During the month of July 2020, the number of patients admitted for Covid-19 in a district Hospital, and their ages are given below. Find the median age. **3**

Age (in years)	0-10	10-20	20-30	30-40	40-50	50-60
No. of patients	5	8	20	15	7	5

20. Two players, Avizo and Chingwang, play a tennis match. It is known that the probability of Avizo winning the match is 0.62. What is the probability of Chingwang winning the match? **3**

Section – D

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

a. Solve graphically the following pair of linear equations:
$x+y=8$ and $y=x-2$

Or

b. Mary went to a bank to withdraw `2000. She asked the cashier to give her `50 and `100 notes only. Mary got 25 notes in all. Find how many notes of `50 and `100 she received.

Or

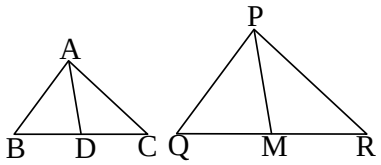
c. The difference between two numbers is 26. If one number is three times the other, find the numbers.

22. **Answer any one from the following questions (a) to (c).** **5**

a. State and prove Basic Proportionality Theorem.

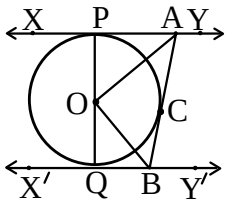
Or

b. Sides AB and AC, and median AD of a triangle ABC are respectively proportional to sides PQ and QR, and median PM of ΔPQR. Show that ΔABC ~ ΔPQR.



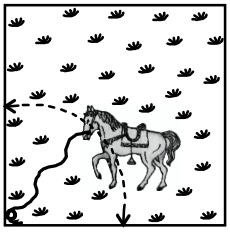
Or

c. In the adjoining figure, XY and X′Y′ are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting XY at A and X′Y′ at B. Prove that ∠AOB = 90°



23. **Answer any one from the following questions (a) to (c).** **5**

a. A horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope. Find: (i) the area of that part of the field in which the horse can graze. (ii) the increase in the grazing area if the rope were 10 m long instead of 5 m. [Use $\pi = 3.14$]



Or

b. A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy.

Or

c. A solid iron pole consists of a cylinder of height 220 cm and base diameter 24 cm, which is surmounted by another cylinder of height 60 cm and radius 8 cm. Find the mass of the pole, given that 1 cm^3 of iron has approximately 8 g mass. [Use $\pi = 3.14$]