DESIGN OF QUESTION PAPER
CLASS X
MATHEMATICS

Full Marks :   80 MARKS   **Time : 3 Hours**

Weightage of Objectives:

Objectives	Knowledge	Understanding	Application	Skill	Total
Percentage of Marks	37	45	12	6	100
Marks	30	36	9	5	80

1. Weightage to Forms of questions:

Form of Questions	LA	SA1 4 marks	SA2 3marks	SA3 2 marks	VSA 1 mark	Objective 1 mark	Total
No. of Questions	5	3	6	5	8	5	32
Marks Allotted	27	12	18	10	8	5	80
Estimated Time(in minutes)	70	33	36	20	13	8	180

2. Weightage of Contents :

Unit	Name of the Unit	Marks
I	Number System (excluding Euclid's division lemma), Polynomials (excluding factorisation of polynomials using factor Theorem) and Factorisation(excluding 3.6 and 3.10)	15
II	Pair of Linear Equations, Quadratic Equations (excluding 5.8) and A.P.	15
III	Triangles (excluding proof of theorems 7.5,7.7, 7.8 and 7.10), Circles and Construction (excluding 9.3)	15
IV	Trigonometry (excluding uniqueness of T-Ratios of an angle & Trigonometric Ratios of Complimentary angle), Coordinate Geometry (excluding area of a triangle)	15
V	Mensuration (excluding area of combinations of plane figures and frustum of a cone)	10
VI	Statistics (excluding partition values, Quartiles, Deciles and Percentiles) and Probability	10

3. **Scheme of Section   : NIL**
4. **Scheme of option   : Internal option must be given in Essay/Long Answer type questions testing the same objective.**
5. **Difficulty level   : Easy 40%, Average 50%, Difficult 10%**

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Subject : MATHEMATICS **Full Marks** : **80 marks**

Class : X **Time** : **3 hours**

Unit	Objective Content Unit / Forms of Questions	Knowledge E/LA	SA/I	SA II	SA III	VSA	O	Understanding E/LA	SA/I	SA II	SA III	VSA	O	Application E/LA	SA/I	SA II	SA III	VSA	O	Skill E/LA	SA1	SA2	SA III	Total
I	Number System		4(1)	3(1)	2(1)	1(1)	1(1)			2(1)	1(1)	1(1)												15(8)
II	Pair of Linear Equations, Quadratic Equations and			3(1)		1(1)				2(1)	1(1)	1(1)			4(1)							3(1)		15(7)
III	Triangles, Circles, Construction	6(1)			2(1)	1(1)		3*(1)			1(1)									2*(0)				15(5)
IV	Trigonometry, Coordinate Geometry			3(1)		1(1)			4(1)		2(1)			5(1)										15(5)
V	Mensuration						1(1)	5(1)		3(1)			1(1)											10(4)
VI	Statistics					1(1)		6(1)		3(1)														10(3)
	Marks with forms of Questions	6(1)	4(1)	9(3)	4(2)	5(5)	2(2)	14*(3)	4(1)	6(2)	6(3)	3(3)	3(3)	5(1)	4(1)					2*(0)		3(1)		80(32)
	Marks with no. of Questions with objective	30(14)						36*(15)						9(2)						5*(1)				80(32)

Notes: **(1) Figure within brackets indicate the number of questions and figures outside the brackets indicate marks.**

(2)* Denotes that marks have been combined to form one question.

Summary :

Type of question	No. of Question	Marks	Total	Type of question	No. of Question	Marks	Total
Essay/Long Answer (E)/LA	5		27	Short Answer (3)	5		10
Short Answer (SA)1	3		12	Very Short Answer	8		8
Short Answer (SA)2	6		8	Objective Type	5		5

MATHEMATICS

Full Marks: **80**
Pass Marks: **20**
Time: Three hours

Attempt all questions
The figures in the right hand margin indicate full marks for the questions

1. If $p(x)$ is a polynomial of degree ≥ 1 and a is any real number, then the remainder when $p(x)$ is divided by $x-a$ is   1

   (A) $p(a)$ (B) $p(-a)$ (C) $-p(a)$ (D) $-p(-a)$

2. If $x+1$ is a factor of $p(x)=4x^2+3x+k$, then the value of k is   1

   (A)   8   (B)   -8   (C)   1   (D)   -1

3. If one root of the equation $2x^2-3x+k=0$ be reciprocal of the other, then the value of k is   1

   (A) $\dfrac{3}{2}$ (B) $-\dfrac{3}{2}$ (C)   3   (D)   2

4. Two concentric circles are of radii 6 cm and 10 cm. The length of a chord of the larger circle which touches the smaller circle is   1

   (A)   8 cm   (B)   12 cm   (C)   16 cm   (D)   18 cm

5. Length of an arc of a sector of a circle with radius r and sectorial angle θ (measured in degrees) is   1

   (A) $\dfrac{\pi r\theta}{360}$ (B) $\dfrac{\pi r\theta}{180}$ (C) $\dfrac{\pi r^2\theta}{360}$ (D) $\dfrac{\pi r^2\theta}{180}$

6. Define a cyclic expression.   1

7. Write any two irrational numbers whose sum is a rational number.   1

8. Define discriminant of a quadratic equation.   1

9. Write the quadratic equation if the sum and the product of the roots are 5 and 6 respectively.   1

10. Write the statement of SSS-similarity Theorem.   1

11. Write any one Pythagorean relation of trigonometric ratios. 1

12. Find the area of a circle whose circumference is 44 cm. 1

13. When are events of a random experiment said to be equally likely? 1

14. If $x, y, z \in \square$ and $x + y = x + z$, then prove that $y = z$. 2

15. When a polynomial $p(x)$ is divided by $3x - 1$, the quotient and the remainder are $x^2 + 3x - 2$ and 4 respectively. Find $p(x)$. 2

16. If α, β are the roots of the equation $x^2 + px + q = 0$, find the value of $(\alpha + 1)(\beta + 1)$ in terms of p and q. 2

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

2

18. Prove that $\dfrac{1 + \sin A}{\cos A} = \dfrac{\cos A}{1 - \sin A}$. 2

19. Factorise : $a^2(b+c) + b^2(c+a) + c^2(a+b) + 3abc.$ 3

20. If a be the first term and d, the common difference and S_n, the sum of the first n terms of an AP, prove that $S_n = \dfrac{n}{2}\left[2a + (n-1)d\right] = \dfrac{n}{2}(a + l)$, where l is the nth term. 3

21. Solve graphically : 3

$$x + y = 5$$

$$2x + 3y = 12$$

22. By taking a right triangle ABC right angled at B in which $\angle A = 45^0$, calculate the values of $\sin 45^0$, $\cos 45^0$ and $\tan 45^0$. 3

23. A solid is in the form of a cylinder surmounted by a cone of the same radius. If the radius of the base and the height of the cone are r and h respectively and the total height of the solid is $3h$, prove that the volume of the solid is $\dfrac{7}{3}\pi r^2 h$. 3

24. A die is tossed 3 times. Find the probability that 6 appears at least once. 3

25. If $x, y, \delta \in \square$ and $\delta > 0$, prove that $|x - y| < \delta$ if and only if $y - \delta < x < y + \delta$. 　　　　4

26. Twenty years ago a father was five times as old as his son and 4 years hence he will be twice as old as his son. Find the present ages of the father and the son. 　　4

Or

Two stations A and B on a highway are 90 km apart. A car starts from A and another car starts from B at the same time. If they travel in the same direction they meet in 9 hours, but if they travel towards each other they meet in 1 hour after start. Find the speeds of the two cars, the car from A moving faster.

27. Find the ratio in which the line segment joining the points (-2, -3) and (3, 7) is divided by the x-axis. Also find the coordinates of the point of division. 　　4

28. Divide a given line segment AB internally in the ratio 3:5. Write the steps of construction. 　　　　(2+3=5)

Or

Construct a pair of tangents to a given circle from an external point. Write the steps of construction

29. A straight highway leads to the foot of a tower of height 50 m. From the top of the tower, the angles of depression of two cars standing on the highway are 30^0 and 60^0. Find the distance between the two cars and the distance of each car from the foot of the tower. 　　　　5

30. A vessel is in the form of an inverted cone of height 8 cm and radius 6 cm. It is filled with water upto the rim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-sixth of the water flows out. Find the number of lead shots dropped into the vessel. 　　　　5

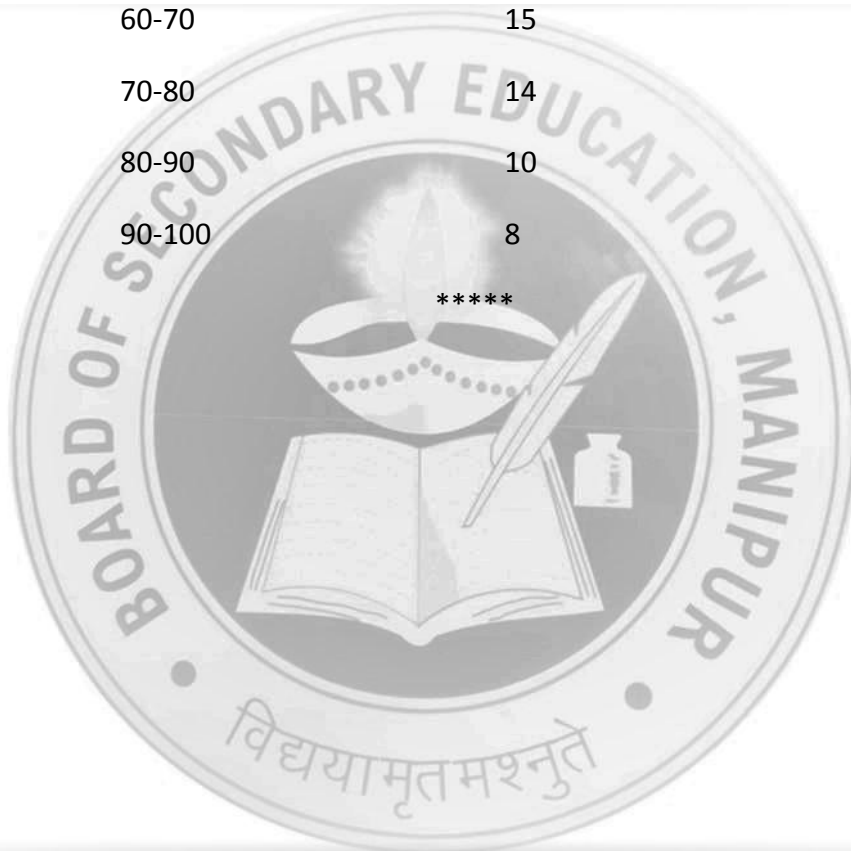31. State and prove SAS similarity Theorem. 　　　　6

Or

State and prove Pythagoras Theorem.

32.   Find the mean and median of the following distribution: 6

Class	Frequency
10-20	8
20-30	11
30-40	12
40-50	16
50-60	26
60-70	15
70-80	14
80-90	10
90-100	8

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QUESTION ANALYSIS OF PROPOSED SAMPLE QUESTION

MATHEMATICS

Sl. no.	Objective K/U/A/S Or K/E/C	Topic Chapter No. & Name	Specification	Form of Question E/SA1/SA2/ SA3/ VSA/O	Marks allotted	Estimated Difficulty Level A/B/C	Time (in minutes)
1	K	2-Polynomials	Recognises	O	1	A	1
2	U	2-Polynomials	Identifies	O	1	A	1
3	U	5-Quadratic Equations	Identifies	O	1	A	1
4	U	8-Circles	Identifies	O	1	B	1
5	K	12-Mensuration	Recognises	O	1	A	1
6	K	3-Factorisation	Recalls	VSA	1	A	1
7	U	1-Number System	Identifies	VSA	1	A	1
8	K	5-Quadratic Equations	Recalls	VSA	1	A	1
9	U	5-Quadratic Equations	Identifies	VSA	1	A	1
10	K	7-Triangles	Recalls	VSA	1	A	1
11	K	10-Trigonometry	Recalls	VSA	1	A	1
12	U	12-Mensuration	Identifies	VSA	1	A	1
13	K	14-Probability	Recalls	VSA	1	A	1
14	K	1-Number System	Recalls	SA3	2	A	5
15	U	2-Polynomials	Identifies	SA3	2	A	5
16	U	5-Quadratic Equations	Identifies	SA3	2	B	5
17	K	8-Circles	Recalls	SA3	2	A	5
18	U	10-Trigonometry	Identifies	SA3	2	A	5
19	K	3-Factorisation	Recalls	SA2	3	B	7
20	K	6-AP	Recalls	SA2	3	A	7
21	S	4-Pair of Lin. Equations	Draws	SA2	3	B	7
22	K	10-Trigonometry	Recalls	SA2	3	A	7
23	U	12-Mensuration	Identifies	SA2	3	A	7
24	U	14-Probability	Identifies	SA2	3	B	7
25	K	1-Number System	Recalls	SA1	4	B	9
26	A	4-Pair of Lin. Equations	Establishes	SA1	4	C	9
27	U	11-Coordinate Geometry	Identifies	SA1	4	C	9
28	S+U	9-Construction	Draws/Identifies	E	2+3	B	14
29	A	10-Trigonometry	Establishes	E	5	B	14
30	U	12-Mensuration	Identifies	E	5	B	14
31	K	7-Triangles	Recalls	E	6	B	15
32	U	13-Statistics	Identifies	E	6	B	16
				Total	**80**		**180**