MATHEMATICS   **CLASS X**
Time:3 hrs   **Maximum Marks:80**

General Instructions:
1. This question paper contains two parts A and B.
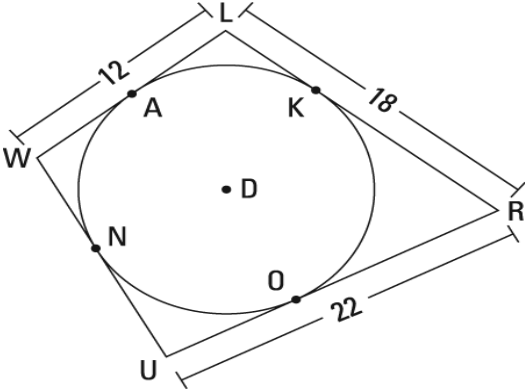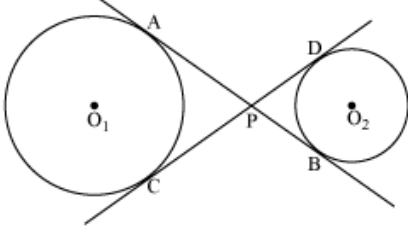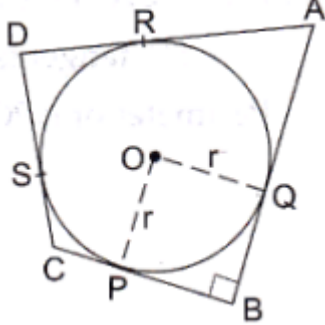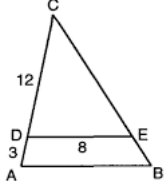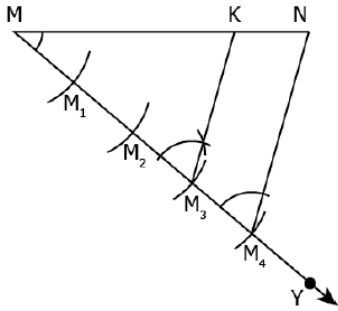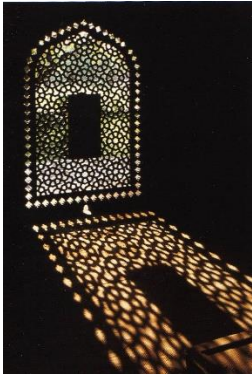2. Both Part A and Part B have internal choices.

Part – A:
1. It consists three sections- I and II.
2. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
3. Section II has 4 questions on case study. Each case study has 5 case-based sub-parts. An examinee is to attempt any 4 out of 5 sub-parts.

Part – B:
1. Question No 21 to 26 are Very short answer Type questions of 2 mark each.
2. Question No 27 to 33 are Short Answer Type questions of 3 marks each.
3. Question No 34 to 36 are Long Answer Type questions of 5 marks each.
4. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

Sr. No	Part – A	Marks
	Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.	
1.	If $\frac{364}{p \; x \; 2^3}$ has a terminating decimal expansion and p is a positive integer such that $2 < p < 9$, then find the value of p. **OR** The HCF and LCM of two numbers are 4 and 9696. When the first number is divided by 2^5, the quotient is 3. Find the other number.	1
2.	What is value of p for which the polynomial $x^3 + 4x^2 -px + 8$ is exactly divisible by (x-2).	1
3.	Write the value of k for which the following pair of linear equations have a unique solution $2x+ky+5=0,3x+3y+6=0$.	1
4.	Akshat went to a stationary stall and purchased 20 pencils and 4 erasers for Rs.80 and his friend Vishal purchased 15 pencils and 3 erasers for Rs. 60. Form linear equations to represent this situation.	1
5.	In an A.P., if a = 15, d=-3 and $a_n = 0$, then what is the value of n? **OR** Find the 12th term from the last term of the AP: 3, 8, 13, … 253	1
6.	If the equation $2x^2+kx+8=0$ has equal roots, find the value(s) of k.	1

7.	Find the roots of the equation $x^2-(\sqrt{3}+1)x+\sqrt{3}=0$	1
	OR	
	If $ax^2 +bx + c = 0$ has equal roots then find c = ---------- .	
8.	In the given figure, find WU.	1
9.	Common tangents AB and CD intersect at P . If AP = 4 cm and PB = 3 cm. find CD. **OR** If AD =23 cm, AB = 29cm and DS=5 cm and PBQO is a square, then find the radius r.	1
10.	If DE//AB. Find AB.	1

11.	In the figure, if M1, M2, M3 and M4 have been marked at equal distances. In what ratio K divides MN?	1
12.	Evaluate $99 \csc^2 A - 99 \cot^2 A$.	1
13.	If $p = 2\sin^2 45° - 4\cos^2 60° + 2\tan^2 45°$, find p.	1
14.	If the area of a sector of a circle is 5/8 of the area of the circle, then find the angle of the sector.	1
15.	A letter is chosen from the letter of the word "PROBABILITY". Find the probability that it is not a vowel.	1
16.	Two dice are thrown simultaneously. Find the probability of getting a doublet of even number. **OR** Apply complement of probability to find the probability that it will not rain tomorrow given that the probability that it will rain tomorrow is 0.85.	1
	Section-II **Case study-based questions are compulsory. Attempt any 4 sub parts from each question. Each question carries 1 mark**	
17.	**Case Study 1: Shadow and Similarity.** Shadows are formed when sunlight or any other light source falls on an object. Many objects have been designed to capture the beauty of shadows. Also buildings are designed in such a way that different patterns are formed by shadows during the course of the day. 	

The length of a shadow is proportional to the height of the object on which light falls. This is true if the same light source falls on more than one object.

Here's how……
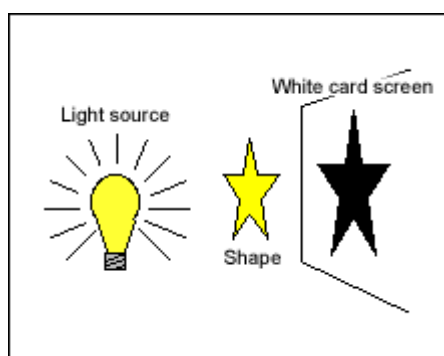
This picture shows how a shadow is formed thus forming a figure which is similar to the original figure.

Attempt any 4 out of the 5 questions below :

(a) A vertical pole and a tower cast shadows at the same instant of time. Look at the picture and calculate the height of the tower(DE)

(i) 28 m   (ii) 42 m   (iii) 4 m   (iv) 6m
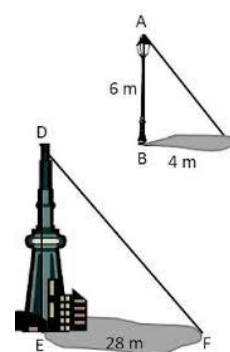
1
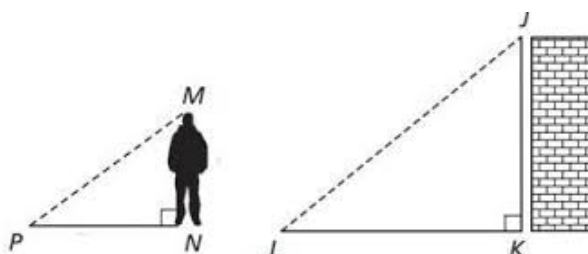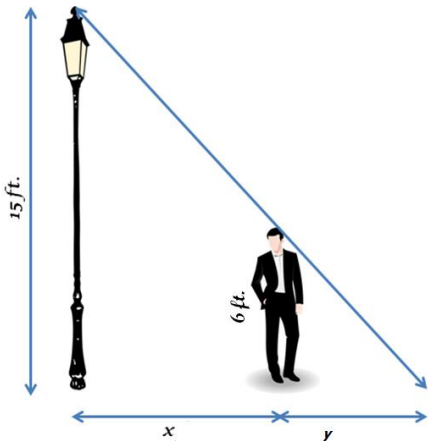
(b) Let the height of the person MN = 1.5 m and the length of his shadow be 2 m. What is the height of the wall (JK), if it is given that the length of its shadow is 16 m ?
(i) 10 m   (ii) 15 m   (iii) 12 m   (iv) None of the above

1

1

(c) Look at the picture above and based on the length of the shadows, find the ratio of the height of the girl to the height of the tree.

(i) 2:5   (ii) 5:2   (iii) 1:5   (iv) None of the above

(d) A man is standing at a distance x from a lamp pole which casts a shadow of length y feet. Examine the picture above to find the ratio x : y

(i) 3:2   (ii) 2:5m   (iii) 2:3   (iv) 5: 2 m

(e) Refer to the same picture above (d). If the length of shadow of the man is 12 feet, what will be length of shadow of the light pole ?
(i) 24 feet   (ii) 30 feet   (iii) 15 feet   (iv) 12 feet

18.	**Case Study 2: Maps and Coordinate Geometry.** MAPS use a system similar to coordinate system to help locate a place. **Latitude and longitude**, comprise the coordinate system by means of which the position or location of any place on Earth's surface can be determined and described. Given below is the map of Uttar Pradesh – placed on a coordinate plane. Look at the map and answer the questions given below. The dots indicate the position from where the coordinates can be seen.	
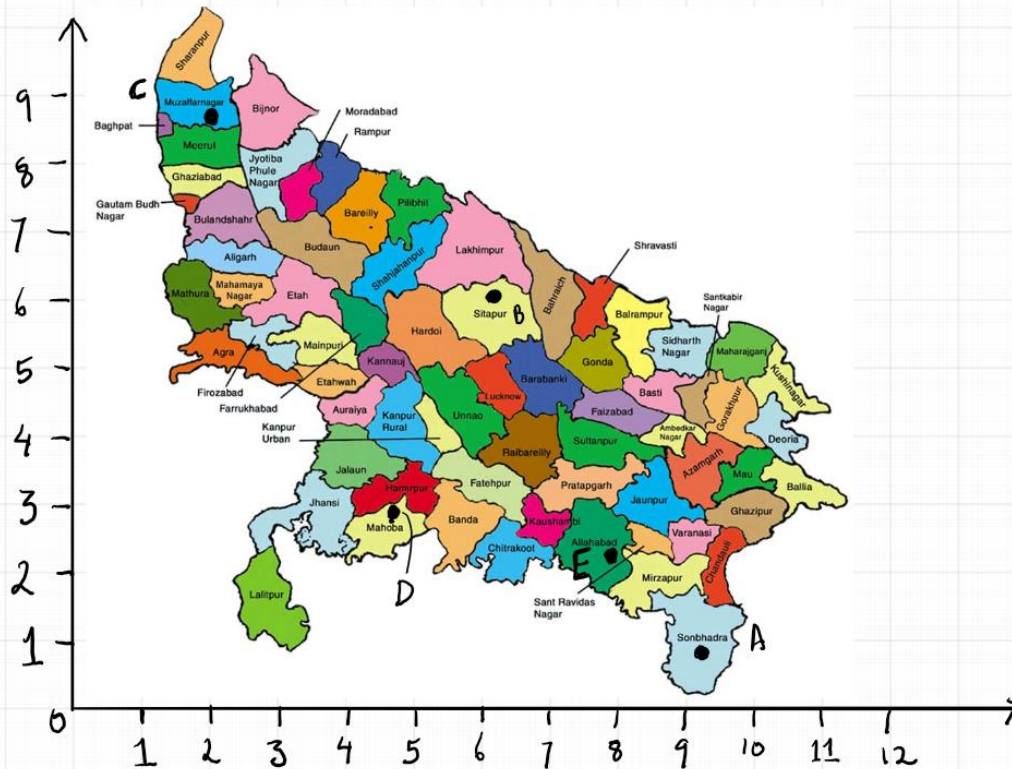
Attempt any 4 out of the 5 questions below :

(a) What the coordinates of A(Sonbhadra) and B(Sitapur).

(i) A(9,1) and B(6,6)   (ii) A(1, 9) and B(6, 6)

(iii) A(10, 2) and B(7, 7)   (iv) A(2, 10) and B(7, 7)

1

(b) What is the distance between C(Muzaffarnagar) and E(Allahabad)

(i) $\sqrt{(8 - 2.5)^2 + (2 - 8.7)^2}$ (ii) $\sqrt{(8.7 - 2.5)^2 + (8 - 8.7)^2}$

(iii) $\sqrt{(8 - 4)^2 + (4 - 8.7)^2}$ (iv) $\sqrt{(4 - 2.5)^2 + (4 - 8.7)^2}$

1

(c) Name the place located at (5,3) .

(i) Sitapur   (ii) Mahoba

(iii) Muzaffarnagar   (iv) Allahabad

1

(d) Gautam Budh Nagar is located at (2, 7.5) what is the actual distance between Gautam Budh Nagar and Sitapur(B). Use the scale as 1unit = 86 km.

(i) $(\sqrt{(6 - 2)^2 + (6 - 7.5)^2}) \times 86 \ km$

(ii) $(\sqrt{(6 - 6)^2 + (2 - 7.5)^2}) \times 86 \ km$

(iii) $(\sqrt{(7 - 2)^2 + (7 - 7.5)^2}) \times 86 \ km$

(iv) 86 km

1

	(e) What is the distance of Gautam Budh Nagar from Y-axis ? (i) 7.5 units (ii) 6 units (iii) 10 units (iv) 2 units	1
19.	**Case Study 3 : Polynomials in real life.** How do we use polynomials ? It is surprising to see the number of instances where polynomials are used. • An engineer designing a roller coaster uses polynomials to model the curves • Another may use polynomials to design roads, buildings and other structures • An object falling from a distance also follows a path of a polynomial known as parabola – A parabola is a quadratic polynomial as its degree is 2. • The list is endless….. **Attempt any 4 out of the 5 questions below :**	1
	A roller coaster (a) The graph shows the path taken by a roller coaster At an entertainment park. How many zeroes does the polynomial represented in the graph have ? (i) 3 zeroes (ii) 2 zeroes (iii) 4 zeroes (iv) No zeroes	1
	(b) The polynomial represented by the graph above is a _____. (i) Linear polynomial (ii) Quadratic polynomial (iii) Cubic polynomial (iv) Not enough information to say	1

This is a picture of a highway overpass/ underpass. The shape is called a parabola.

(c) If the polynomial represented by the parabola above is $x^2 - 7x + 10$, then its zeroes are ….

(i) 5, 2   (ii) 3, 2

(iii) 7, 10   (iv) None of the above

| | 1 |

(d) The representation of Highway Underpass whose one zero is 6 and sum of the zeroes is 0, is _____.

(i) $x^2 - 6x + 2$ (ii) $x^2 - 36$

(iii) $x^2 - 6$ (iv) $x^2 - 3$

1

(e) How many zeroes will the polynomial $x^4 - 4x^3 + 3x - 99$ have ?

(i) exactly 4 zeroes   (ii) at most 4 zeroes

(iii) at least 4 zeroes   (iv) None of the above

1

20. **Case Study 4 : Sports and Statistics**

India is a cricket crazy nation. We can see it being played in the gully's parks and sometimes even inside houses. During the international matches people stay glued to their TVs or phonefor hours.

The distribution below shows the number of wickets taken by bowlers in 50 one-day cricket matches.

Number of wickets	0-10	10-20	20-30	30-40	40-50
Number of bowlers	7	6	11	4	2

1

(a) What is the upper limit of the modal class ?

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

1

(b) What is the cumulative frequency of the class 30-40 ?

(i) 25   (ii) 45   (iii) 35   (iv) 28

1

	(c) What is the class mark of the class interval 40-50 ? (i) 45 (ii) 35 (iii) 25 (iv) 15	1
	(d) Find the mean number of wickets taken ? (i) 21 (ii) 22 (iii) 23 (iv) 24	1
	(e) How many bowlers could take up to 20 wickets? i) 10 (ii) 6 (iii) 13 (iv) 20	1
	Part B **Section III**	
21.	Two squares have sides of length 45 cm and 105 cm respectively. Find the greatest length of tape that can measure the sides of both squares exactly.	2
22.	The vertices of a parallelogram taken in order are (1, 2), (4, y), (x, 6) and (3, 5) Find the unknown values of x and y. **OR** Show that the points A(a, a), B(-a, -a) and C(-a√3, a√3) form an equilateral triangle.	2
23.	Find a quadratic polynomial whose zeroes are 2√5-3√2 and 2√5+3√2.	2
24.	Draw a circle of radius 6 cm. Draw a pair of tangents to this circle inclined to each other at 60°.	2
25.	If sin A + sin²A = 1, then find the value of the expression (cos²A + cos⁴A) . **OR** Prove that : $\dfrac{\cot A - \cos A}{\cot A + \cos A} = \dfrac{cosec\,A - 1}{cosec\,A + 1}$	2
26.	In the figure, quadrilateral ABCD is circumscribing a circle with centre O and AD⊥ AB. If radius of incircle is 10 cm, then the value of x is	2
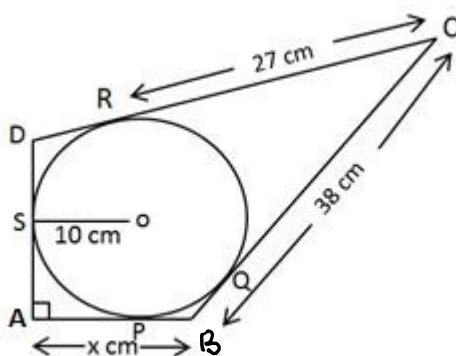
Section IV

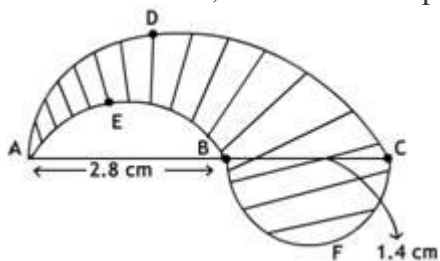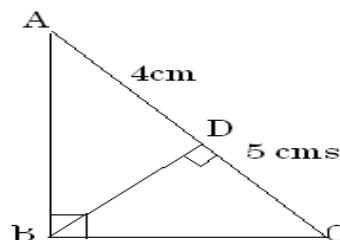| 27.	Prove that $5 + 3\sqrt{17}$ is irrational, given that $\sqrt{17}$ is irrational.	3
28.	Find the sum of integers between 300 and 500 that are divisible by 11. **OR** We are given that the sum of first n terms of an AP $8n - n^2$. Find… (i) sum of first 2 terms (ii) 3rd term (ii) n^{th} term.	3
29.	In the figure, find the perimeter of shaded region where ADC, AEB and BFC are semicircles on diameters AC, AB and BC respectively. Given that AB = 2.8 cm and BC = 1.4 cm. 	3
30.	In the given figure, ABC is a triangle, right angled at B and BD⊥AC and CD=5cm, find BD and AB. **OR** If CM and RN are respectively the medians of ΔABC and ΔPQR, if ΔABC ~ ΔPQR prove that : (i) ΔAMC ~ ΔPNR (ii) ΔCMB ~ ΔRNQ	3

| 31. | An incomplete distribution is given below: (total frequency = 140) | | | | | | | | | 3 |

Rent (in Rs.)	15-25	25-35	35-45	45-55	55-65	65-75	75-85	85-95
No.of houses	8	10	x	25	40	y	15	7

You are given that the median value is 58. Find the missing frequencies x and y.

| 32. | Abhishek was standing on the bank of a river and he observed that the angle of elevation of the top of a tree standing on opposite bank is 60^0. When he moved 30 m away from the bank, he found the angle of elevation to be 30^0. Find the height of the tree and the width of the river. [take $\sqrt{3} = 1.732$] | 3 |

| 33. | Six cards - The king of hearts, the nine, ten , jack of diamonds , queen of diamonds and ace of diamonds are well shuffled with their faces downwards, 1 card is then picked up at random
(i) what is the probability that the drawn card is a queen ?
(ii) What is the probability that it is a number card ?
(iii) If the picture cards are drawn and put aside and then a card is drawn from the remaining cards. Find the probability that it is an ace ? | 3 |

Section V

| 34. | Aditya, standing on a horizontal plane, finds a bird flying at a distance of 100 m from him at an elevation of 30 degrees. Ganesh standing on the roof of a 20 m high building, finds the angle of elevation of the same bird to be 45 degrees. Aditya and Ganesh are on opposite sides of the bird. Find the distance of the bird from Ganesh.
OR

Manek observes a cloud above a lake from a point 250 m above the lake. If angle of elevation of the cloud from a point is 30 degrees, and the angle of depression of its reflection in the lake is 60 degrees. Find the distance of the cloud from the point of observation. | 5 |

| 35. | Prove that the tangent is perpendicular to the radius at the point of contact. Hence prove that in two concentric circles, the chord of the larger circle which touches the smaller circle, is bisected at the point of contact. | 5 |

| 36. | A double decker bus travels at uniform speed from Bangalore to Hyderabad. If the bus would have been 6 km/hr faster, it would have taken 4 hours less than the planned time. If the bus would have been 6 km/hr slower, it would have taken 6 hours more than the planned time. Find the distance between Bangalore and Hyderabad by this route. | 5 |