



ITL PUBLIC SCHOOL
Pre-Board 1 (2020-21)

Date: 11.01.2021

Class: X

Mathematics (Code-041)

Time: 3 Hour

M.M: 80

General Instructions:

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

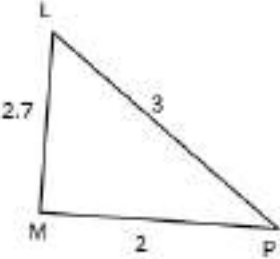
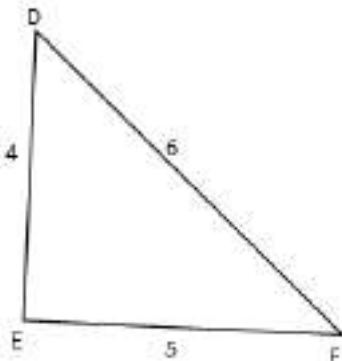
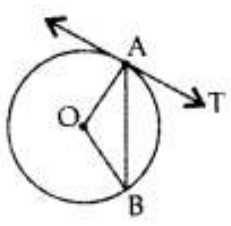
Part – A:


1. It consists two 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.

Question No.	Part-A	Marks Allocated
	Section-1 Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.	
1	If the LCM of p and 18 is 36 and the HCF of p and 18 is 2, then find the value of p. OR Can two numbers have 18 as their HCF and 380 as their LCM? Give reason.	1
2	Find the value of m so that the quadratic equation $mx(x - 3) + 9 = 0$ has two equal roots.	1
3	For what value of k, the pair of equations $4x - 5y = 9$, $2x + ky = 11$ has no solution? OR Find whether the following pair of linear equations is consistent or inconsistent: $3x + 2y = 8,$ $6x - 4y = 9$	1

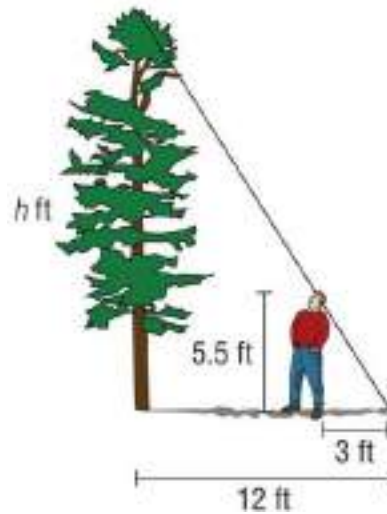
4	One card is drawn at random from a pack of 52 cards. Find the probability that the card drawn is a black face card.	1
5	Find the 10 th term from the end of an A.P. 4, 9, 14,, 254. OR If m times the m^{th} term of an A.P. is equal to n times its n^{th} term. Find its $(m + n)^{\text{th}}$ term.	1
6	Check whether the given pair of triangles is similar or not. Justify. <div style="display: flex; justify-content: space-around; align-items: center;">   </div>	1
7	In a triangle ABC, right angled at B, the ratio of AB to AC is $1:\sqrt{2}$. Find the value of $\frac{2\tan A}{1+\tan^2 A}$. OR If $\sqrt{3}\sin\theta - \cos\theta = 0$ and $0^\circ < \theta < 90^\circ$, find the value of θ .	1
8	Find the length of tangent drawn from a point 8 cm away from the centre of a circle of radius 6 cm. OR In the given figure, O is the centre of a circle, AB is a chord and AT is the tangent at A. If $\angle AOB = 100^\circ$, then calculate $\angle BAT$. 	1
9	Draw a line segment of length 5 cm. Using compasses and ruler, find a point P on it which divides it in the ratio 2:1.	1
10	Form a quadratic polynomial whose zeroes are $3 + \sqrt{2}$ and $3 - \sqrt{2}$.	1
11	A wire is looped in the form of a circle of radius 28 cm. It is rebent into a square form. Find the length of the side of the square.	1

12	A bag contains 20 marbles. The probability of drawing a red marble is $\frac{2}{5}$. Find the number of red marbles in the bag.	1
13	State whether the sequence whose n^{th} term is $a + 5d$ is an A.P. or not. Justify your answer.	1
14	An observer 1.4 m tall is 28.6 m away from a tower which is 30 m high. Determine the angle of elevation of the top of the tower from his eyes.	1
15	How are the tangents drawn at the ends of a diameter of a circle related to each other? Explain by giving valid reasons.	1
16	Metallic spheres of radii 6 cm, 8 cm and 10 cm, respectively, are melted to form a single solid sphere. Find the radius of the resulting sphere.	1
	Section-II Case study-based questions are compulsory. Attempt any four sub parts of each question. Each subpart carries 1 mark.	
17	<p>Case Study based-1</p> <p style="text-align: center;">You versus Horse</p> <p>It's a race! You can run 0.2 km every minute. The Horse can run 0.5 km every minute. But it takes 6 minutes to saddle the horse (i.e. to fasten the seat on the back).</p>  <p>How far can you get before the horse catches you!</p> <p>i. We know that the Distance covered by an object is given as: Distance = Speed \times Time Taking the distance covered as y km and time as x minute, the given situation can be expressed as:</p> <p>(a) $y = 0.2x$ $y = 0.5(x - 6)$ (b) $x = 0.2y$ $x = 0.5(y - 6)$ (c) $y = 0.2x$ $y = 0.5(x + 4)$</p>	4

	<p>(d) $x = 0.2y$ $x = 0.5y + 6$</p> <p>ii. The graphical representation of the above situation will give:</p> <p>(a) A pair of lines intersecting at a point (b) A pair of parallel lines (c) A pair of coincident lines (d) None of these</p> <p>iii. The point where you get caught by the horse i.e. the solution of the problem stated in (i) is:</p> <p>(a) (2, 8) (b) (10, 2) (c) (8, 2) (d) (2, 10)</p> <p>iv. A pair of linear equations is inconsistent, if</p> <p>(a) It has exactly one solution (b) It has many solutions (c) It has no solution (d) It has one or many solutions</p> <p>v. Equation of a line parallel to $x + 4y = 6$ is:</p> <p>(a) $2x + 8y = 12$ (b) $x + 4y = -6$ (c) $4x + y = 6$ (d) $4x + y = -6$</p>	
18	<p>Case Study based-2</p> <p style="text-align: center;">Similar Triangles and Forestry</p> <p>Foresters, environmentalists, and other professionals in the timber industry take many measurements in their field work for purposes including forest management planning, forest health monitoring, and timber sales appraisal. Two tools commonly used are a clinometer, to measure angles of elevation, and a Biltmore Stick, to measure diameter and height of trees. These tools are based on the concepts of similar triangles.</p>	4

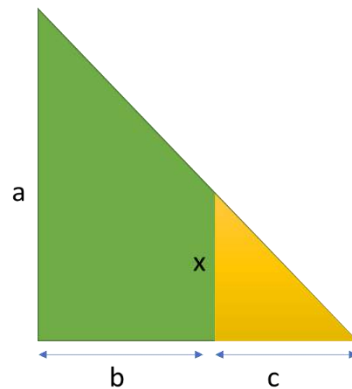
- i. A tree has a shadow 12 feet long.
A forester's shadow is 3 feet long.
If the height of the forester is 5.5 feet, then what will be the height of the tree?

- (a) 15 feet
(b) 20 feet
(c) 22 feet
(d) 25.5 feet

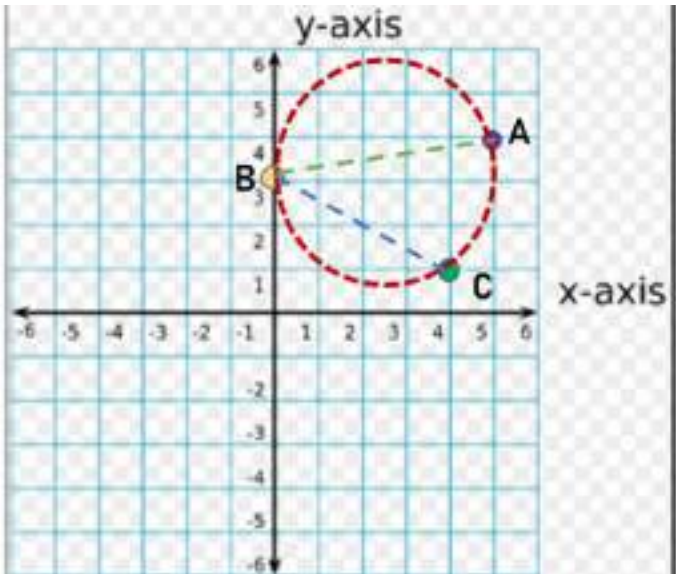


- ii. If the dimensions are given as follows, find the correct relationship between x , a , b and c .

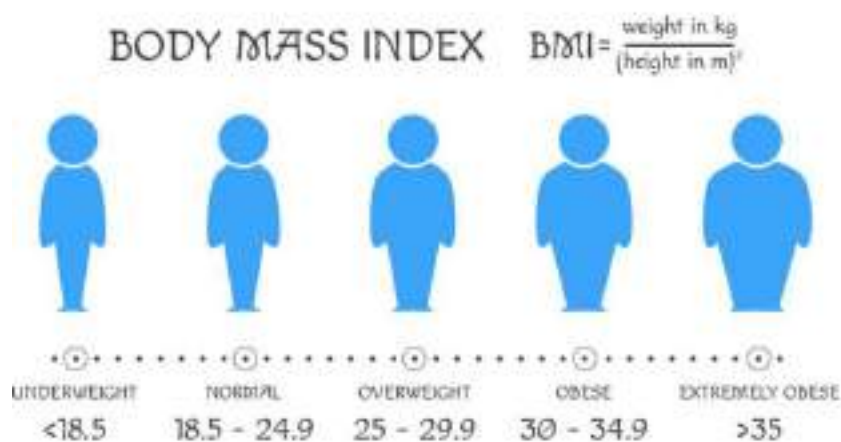
- (a) $a = \frac{x(b+c)}{c}$
(b) $a = \frac{x(b+c)}{b}$
(c) $a = \frac{c(b-x)}{x}$
(d) $a = \frac{ab-cx}{x}$



- iii. Which one of the following is not correct?
- (a) All similar figures having the same area need to be congruent.
(b) All the corresponding sides of two similar triangles are proportional.
(c) All congruent figures are similar, but the similar figures need not be congruent.
(d) All congruent figures are similar, and all similar figures are congruent.
- iv. The ratio of two corresponding sides in similar figures is called the scale factor. The possible scale factor of the smaller triangle to the larger triangle in sub-part (i) can be:
- (a) 1:3
(b) 1:4
(c) 3:1
(d) 4:1

	<p>v. If the scale factor of the similar triangles is 4:9, then the ratio of the areas of these triangles will be:</p> <p>(a) 2:3 (b) 4:9 (c) 81:16 (d) 16:81</p>	
19	<p>Case Study based-3</p> <p style="text-align: center;">Tree Plantation Activity</p> <p>In a school, the students of class X participated in tree plantation activity. They worked in 4 groups. The trees planted by the first three groups are represented by the letters A, B and C respectively in the figure given below:</p>  <p>i. The coordinates for the positions of the trees A, B and C respectively are given as:</p> <p>(a) (4, 5), (0, 3) and (4, 1) (b) (5, 4), (3, 0) and (4, 1) (c) (4, 5), (0, 3) and (1, 4) (d) (5, 4), (0, 3) and (4, 1)</p> <p>ii. What is the distance between the trees A and B.</p> <p>(a) 5 units (b) $\sqrt{24}$ units (c) $\sqrt{26}$ units (d) $2\sqrt{5}$ units</p>	4

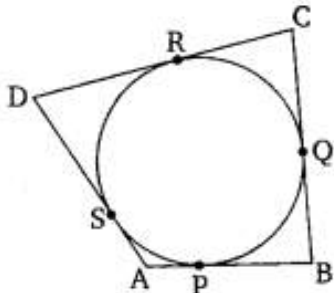
	<p>iii. How far is tree C from tree B?</p> <p>(a) $2\sqrt{5}$ units (e) $2\sqrt{3}$ units (f) $3\sqrt{5}$ units (g) $3\sqrt{2}$ units</p> <p>iv. Tree D is to be planted by the fourth group in such a way that it lies exactly in the mid-way of the trees A and B. Then the position of tree D will be given as:</p> <p>(a) $\left(2, \frac{7}{2}\right)$ (b) $\left(\frac{5}{2}, \frac{1}{2}\right)$ (c) $\left(\frac{5}{2}, 3\right)$ (d) $\left(\frac{5}{2}, \frac{7}{2}\right)$</p> <p>v. As per the availability of space and time, the school decided to plant one more tree named as E on the line joining trees B and C such that it divides the line BC in the ratio 1:2. Then position of the tree E will be given as:</p> <p>(a) $\left(\frac{5}{3}, \frac{7}{3}\right)$ (b) $\left(\frac{4}{3}, \frac{7}{3}\right)$ (c) $\left(\frac{5}{2}, \frac{7}{2}\right)$ (d) (2, 4)</p>	
20	<p>Case Study based-4</p> <p>The statistics of Body Mass Index</p> <p>Students of class X were given a project to find the BMI. Body Mass Index (BMI) is a measurement of a person's weight with respect to his or her height. It is more of an indicator than a direct measurement of a person's total body fat. It is given as:</p> $\text{BMI} = \frac{\text{Weight (Kg)}}{(\text{Height in metres})^2}$	4



As a part of the project, 60 students of class X surveyed, and the weights were grouped in a tabular form:

Weight (in Kg)	Number of students
40 – 44	4
44 – 48	6
48 – 52	10
52 – 56	14
56 – 60	10
60 – 64	8
64 – 68	6
68 – 72	2

- i. The cumulative frequency corresponding to the class 60-64 is:
 (a) 35 (b) 52 (c) 45 (d) 58
- ii. The sum of the upper limit of the median class and the lower limit of the modal class is:
 (a) 108 (b) 100 (c) 112 (d) 104
- iii. The median weight of a student is approximately equal to:
 (a) 50 (b) 52.5 (c) 49.84 (d) 54.85
- iv. If the weight of a student is 68 kg and the square of the height in m is 2.5, then his/her BMI will be equal to:
 (a) 27.2 (b) 50.2 (c) 24 (d) 21.5

	<p>v. The empirical relation between the three measures of central tendencies is given as:</p> <p>(a) $2 \text{ Median} = 3 \text{ Mean} - \text{Mode}$. (b) $2 \text{ Mean} = 3 \text{ Median} - \text{Mode}$. (c) $2 \text{ Mode} = 3 \text{ Median} - \text{Mean}$. (d) $2 \text{ Mean} = \text{Median} - 3 \text{ Mode}$.</p>	
	<p style="text-align: center;">Part –B</p> <p>All questions are compulsory. In case of internal choices, attempt any one</p>	
21	Prove that $2 - 3\sqrt{5}$ is an irrational number, given that $\sqrt{5}$ is irrational.	2
22	Find the sum of first 21 terms of an A.P., whose 2 nd term is 8 and 4 th term is 14.	2
23	<p>Determine the ratio in which the line $x + y = 5$ divides the line segment joining the points A (2, – 2) and B (3, 7).</p> <p style="text-align: center;">OR</p> <p>Check whether A(5, – 1), B(6, 2) and C(7, –3) are the vertices of an isosceles triangle or not.</p>	2
24	Find the value of $\operatorname{cosec} 30^\circ$ geometrically.	2
25	<p>A circle is touching the side BC of a $\triangle ABC$ at P and is touching AB and AC when produced at Q and R respectively. Prove that $AQ = \frac{1}{2}$ (perimeter of $\triangle ABC$)</p> <p style="text-align: center;">OR</p> <p>A quadrilateral ABCD is drawn to circumscribe a circle (see figure). Prove that $AB + CD = AD + BC$.</p> <div style="text-align: center;">  </div>	2
26	Draw a pair of tangents to a circle of radius 4.5 cm, which are inclined to each other at an angle of 65° .	2

27	There is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field, while Ravi takes 12 minutes for the same. Suppose they both start from the same point and at the same time and go in the same direction. After how many minutes will they meet again at the starting point?	3
28	Find the zeroes of the polynomial $5\sqrt{5}x^2 + 30x + 8\sqrt{5}$. Also verify the relationship between its zeroes and coefficients.	3
29	Solve the given system of linear equation graphically: $4x - 5y - 20 = 0$; $3x + 5y - 15 = 0$ Determine the vertices of the triangle formed by the lines, representing the above equations and the y – axis.	3
30	The area of a rectangular plot is 528 m^2 . The length of the plot in meters is one more than twice its breadth. Find the length and breadth of the plot.	3
31	State and prove Thales theorem. OR BL and CM are medians of a triangle ABC right angled at A. Prove that $4(BL^2 + CM^2) = 5 BC^2$.	3
32	Using the identity $\sec^2\theta = 1 + \tan^2\theta$, prove that: $\frac{\sin\theta - \cos\theta + 1}{\sin\theta + \cos\theta - 1} = \frac{1}{\sec\theta - \tan\theta}$	3
33	In Fig., a square OABC is inscribed in a quadrant OPBQ. If $OA = 20 \text{ cm}$, find the area of the shaded region. (Use $\pi = 3.14$) OR	3

	<p>In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find:</p> <p>(i) the length of the arc</p> <p>(ii) area of the segment formed by the corresponding chord.</p>															
34	<p>As observed from the top of a 75 m high lighthouse from the sea-level, the angles of depression of two ships are 30° and 45°. If one ship is exactly behind the other on the same side of the lighthouse, find the distance between the two ships.</p>	5														
35	<p>Water in a canal, 30m wide and 12m deep is flowing at the rate of 10km/hr. How much area will it irrigate in 30 minutes if 8cm of standing water is required for irrigation?</p> <p style="text-align: center;">OR</p> <p>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 2.8 m, 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 Rs 500 per m^2.</p>	5														
36	<p>The mean of the data in the following table is 50. Find the missing frequencies a and b.</p> <table><tr><th>Class Intervals</th><th>Frequencies</th></tr><tr><td>10-30</td><td>9</td></tr><tr><td>30-50</td><td>a</td></tr><tr><td>50-70</td><td>3</td></tr><tr><td>70-90</td><td>b</td></tr><tr><td>90-110</td><td>4</td></tr><tr><td>Total</td><td>20</td></tr></table> <p>Now, if the mode of the given data is 21.2, then find the median.</p>	Class Intervals	Frequencies	10-30	9	30-50	a	50-70	3	70-90	b	90-110	4	Total	20	5
Class Intervals	Frequencies															
10-30	9															
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