# **Pre Board – I (2020-2021) Class - X**

**M.M.: 80 Subject Code - 041**

**Time: 3 hrs. Name of the student: Subject- MATHEMATICS**

**Instructions**

1. The question paper has two parts, A and B.
2. Both part A and B have internal choices.

**Part A:** 1. It consists of two sections, I and II.

1. Section I has 16 questions of 1 mark each. Internal choice is provided in 5 questions.
2. Section II has 4 questions on case study. Each case study has 5 case-based sub- parts. You need to attempt any 4 out of 5 sub-parts. Each carry 1 mark.

**Part B**: 1. It consists of three sections, III, IV and V

1. Section III - Q 21 to Q 26 are of 2 marks each.
2. Section IV – Q 27 to Q 33 are of 3 marks each.
3. Section V – Q 34 to Q 36 are of 5 marks each.
4. Find whether 441

22 .53 .72

**PART A SECTION - I**

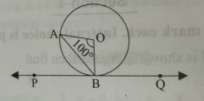
will terminate. If yes after how many places of decimal ?

1. Find the LCM of 6, 72 and 120 by Prime Factorization
2. If the pair of linear equations 2x + ky = 7 and 3x – 9y = 12 is consistent and independent, then find the values of k .
3. If 18 , a , b , -3 are in AP then find a + b

**OR**

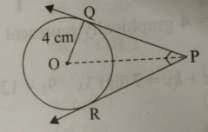
If the first term of an AP is – 7.2 , its common difference 3.6 and n th term 7.2, then find n.

1. How many terms of the AP : 9 ,17 , 25 , ….. must be taken to give a sum 636 ?
2. In the given figure , PQ is a tangent at point B, to the circle with centre O. If AOB = 100, then find ABP



**OR**

In the given figure , from an external point P two tangents PQ and PR are drawn to a circle with centre O and radius 4cm. If QPR = 90, then find the length of PQ.



1. A bag contains 5 red balls and some blue balls . If the probability of drawing a blue ball from the bag is thrice that of red ball. Find the number of blue balls in the bag.

**OR**

20 tickets on which numbers 1 to 20 are written, are mixed thoroughly and then a ticket is drawn at random out of them. Find the probability that the number on the drawn ticket multiple of 3 or 7

1. A single letter is selected from the word „PROBABILITY‟ Find the probability that the letter selected is a vowel.
2. Find the coordinates of the point where the line, x – y = 8 intersects the y- axis.
3. If the point C(k,4) divides the line segment joining two points A(2 , 6) and B(5 , 1) in the ratio 2 : 3 , what is the value of k?

**OR**

What are the coordinates of the midpoint of the line segment joining ( 4 , 3) and (-2, 1)

1. If (1,2) , (4, y), (x, 6) and (3, 5) are the vertices of a parallelogram taken in order, find x and y.
2. Metallic spheres of radii 6cm, 8cm and 10cm, respectively are melted to form a single solid sphere. Find the radius of the resulting sphere.
3. Find the area of the sector of a circle of radius 7cm ,if corresponding arc length is 6.2cm.
4. Find the area of the segment of a circle of radius 12cm whose corresponding sector has a

central angle of 90.

1. Evaluate: cos 45**

sec 30**+ 𝑐𝑜𝑠𝑒𝑐 30**

**OR**

If 7 sin2 + 3 cos 2 = 4, then find tan 

1. Express sec A in terms of cot A
2. **CASE STUDY BASED – 1**

**SECTION - II**



Rainbow is an arch of colours that is visible in the sky, caused by the refraction and dispersion of the light after rain or other water droplets in the atmosphere. The colours of the rainbow are

generally said to be red, orange, yellow, green, blue, indigo and violet. Each colour of the rainbow makes a parabola .We know that that for any quadratic polynomial ax2 +bx +c = 0, a ≠ 0, the graph of the corresponding equation y = ax2 + bx + c has one of the two shapes either open upwards like ฀ or open downwards like ∩ depending on whether a 0 or a 0.These curves are called parabolas.

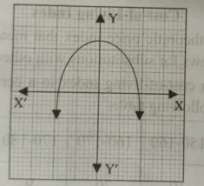
1. A rainbow is represented by the quadratic polynomial x2 + ( a+1 )x + b whose zeroes are 2 and -3 . Then

(i) a = 7 , b = -1 (ii) a = 5 , b = -1 (iii) a = 2 , b = - 6 (iv) a = 0 , b = -6

1. The polynomial x2 – 2x – (7p + 3) represents a rainbow . If -4 is zero of it, then the value of p is

(i) 1 (ii) 2 (iii) 3 (iv) 4

1. The graph of a rainbow y = f(x) is shown below



The number of zeroes of f(x) is

(i) 0 (ii) 1 (iii) 2 (iv) 3

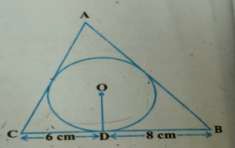
1. If graph of a rainbow does not intersect the x-axis but intersects y-axis in one point, then number of zeroes of the polynomial is equal to
   1. 0 (ii) 1 (iii) 0 or 1 (iv) none of these
2. The representation of a rainbow is a quadratic polynomial. The sum and product of the zeroes are 3 and -2 respectively. The polynomial is
   1. k( x2 – 2x -3 ), for some real k (ii) k( x2 – 5x -9 ), for some real k

(iii) k( x2 – 3x -2 ),for some real k (iv) k( x2 – 3x +2 ),for some real k

1. **Case Study Based – 2**

In a game, students of class 10th were making some designs in the combination of triangle

and circle. They draw a ∆𝐴𝐵𝐶 which circumscribes a circle such that the segments BC and DC into which BC is divided by the point of contact D are of lengths 8cm and 6cm

respectively and perimeter of ∆𝐴𝐵𝐶 is 42cm. Refer the figure to answer the following.

1. What is the length of side AB?
   1. 15 cm (ii) 13 cm (iii) 14 cm (iv) 12 cm
2. What is the length of side AC?
   1. 15 cm (ii) 13 cm (iii) 14 cm (iv) 12 cm

# Is OD perpendicular to BC ? If yes, why?

* 1. yes, because perpendicular from the centre bisects the chord.
  2. yes, because tangents from external point are equal.
  3. yes, because the tangent at any point of a circle is perpendicular to the radius through the point of contact.
  4. no, OD is not perpendicular to BC.

1. The radius of the circle, if the area of ∆𝐴𝐵𝐶 = 84𝑐𝑚2 is
   1. 5 cm (ii) 6 cm (iii) 4 cm (iv) 3 cm
2. Area of ABC excluding the circle is
   1. 33.72 sq cm (ii) 36 .5 sq cm (iii) 25.2 sq cm (iv) 45 sq cm
3. **Case Study Based III**

Electricity Energy consumptions if the form of energy consumption that uses electric energy. Global electricity consumption continues to increase faster than world population, leading to an increase in the average amount of electricity consumed per person (per capita electricity consumption)

A survey is conducted for 56 families of a colony A. The following tables gives the weekly consumption of electricity of these families.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Weekly consumption (in units) | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
| No. of Families | 15 | 12 | 18 | 6 | 4 | 1 |

The similar survey is conducted for 80 families of colony B and the data is recorded as below:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Weekly consumption (in units) | 0-10 | 10-20 | 20-30 | 30-40 | 40-50 | 50-60 |
| No. of Families | 0 | 5 | 10 | 20 | 40 | 5 |

**Refer to data received from Colony A**

* 1. The median weekly consumption is:
     1. 12 units (ii) 16 units (iii) 20.56 units (iv) None of these
  2. The mean weekly consumption is:
     1. 20.53 units (ii) 22.5 units (iii) 26 units (iv) None of these
  3. The modal class of the above data is:

(i) 0-10 (ii) 10-20 (iii) 20-30 (iv) 30-40

**Refer to data received from Colony B**

* 1. The modal weekly consumption is:
     1. 38.2 units (ii) 43.6 units (iii) 26 units (iv) 32 units
  2. The mean weekly consumption is:
     1. 15.65 units (ii) 32.8 units (iii) 38.75 units (iv) 48 units

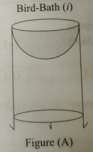
1. **Case Study Based IV**

**Bird-Bath**

A bird-bath is a small “container” which is placed in a garden and filled with water for birds to

bath in.

Mayank and Swati both made two bird-baths as their school projects. The shape of Mayank‟s bird-bath is a cylinder with a hemispherical depression at one end as shown in figure (A), whereas the shape of Swati‟s bird-bath is a cylinder with conical depression at one end as shown in figure (B)

 `   Bird-Bath (i): The height of hollow cylinder used in making this bird-bath is 1.45m and radius is 30cm.

Bird-Bath (ii): The height of the entire bird-bath is 2.6m, while the height of the conical depression is 36cm. The radius of the bird-bath is 28cm.

**Refer to Bird-Bath (i)**

* 1. The curved surface area of the cylinder is approximately:

(i) 1.45 𝑚2 (ii) 2.7 𝑚2 (iii) 3.9 𝑚2 (iv) 4.3 𝑚2

* 1. The curved surface area of the hemisphere is approximately:

(i) 0.6 𝑚2 (ii) 3.5 𝑚2 (iii) 1.5𝑚2 (iv) None of these

* 1. The volume of hemisphere is approximately:

(i) 0.06 𝑚3 (ii) 2.8 𝑚3 (iii) 5.7 𝑚3 (iv) None of these

**Refer to Bird-Bath (ii)**

* 1. The surface area of the conical depression of the bird-bath is approximately:

(i) 0.4 𝑚2 (ii) 0.6 𝑚2 (iii) 0.7 𝑚2 (iv) None of these

* 1. The volume of conical depression approximately:

(i) 0.2 𝑚3 (ii) 0.3 𝑚3 (iii) 4 𝑚3 (iv) None of these

**PART- B**

**SECTION - III**

1. 3 bells ring at an interval of 4 , 7 and 14 minutes . All three bells rang at 6am. When will the three bells ring together next?
2. Prove that 2 - 3 is irrational , given 3 is irrational.
3. Find the roots of the following quadratic equation by method of completing squares.

4x2 +43 x + 3 = 0

**OR**

Find the roots of the following quadratic equation by using quadratic formula.

p2 x2 + (p2 − q2)x – q2 = 0

1. Draw a line segment AB of length 8cm. Taking A as centre draw a circle of radius 4cm and taking B as centre draw a circle of radius 3cm. Construct tangent to each circle from the centre of the other circle.( No steps of construction required)
2. Two different dice are thrown together. Find the probability that the numbers obtained:
   1. Have a sum less than 7
   2. Have a product less than 16

26. If 𝑠𝑒𝑐𝜃 − 𝑡𝑎𝑛𝜃 = 4, then prove that 𝑐𝑜𝑠𝜃 = 8 .

17

Evaluate : sin 30 ° + tan 45 ° − cosec 60 °

sec 30° + cos 60°+ cot 45°

**OR**

**SECTION - IV**

1. Find the value of 𝑝 for which the quadratic equation 2𝑝 + 1 𝑥2 − 7𝑝 + 2 𝑥 + 7𝑝 − 3 = 0

has equal roots. Also find these roots.

Find whether the equation 1

2𝑥−3

+ 1

𝑥−5

**OR**

= 1, 𝑥 ≠ 3 , 5 has real roots. If real roots exist, find

2

them.

1. Sides AB and BC and median AD of a ∆𝐴𝐵𝐶 are respectively proportional to sides PQ and QR and median PM of ∆𝑃𝑄𝑅. Show that ∆𝐴𝐵𝐶 ~ ∆𝑃𝑄𝑅.
2. If the sum of first 7 terms of an AP is 49 and that of first 17 terms is 289 find a and d.

**OR**

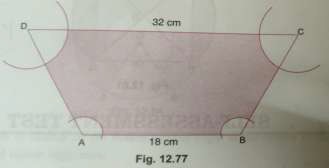
If the 12th term of an AP is -13 and the sum of first four terms is 24 , what is the sum of first 10 terms.

1. The median of the following data is 525. Find x and y if the sum of the frequencies is 100.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Class Interval | 200 - 300 | 300 - 400 | 400 - 500 | 500 – 600 | 600 - 700 | 700 - 800 |
| Frequency | 16 | x | 17 | 20 | 15 | y |

1. Name the type of quadrilateral formed, if any ,by the following points and give reasons for your answer. (-1 , -2 ) (1 , 0 ). ( -1 , 2 ). ( -3 , 0 ).
2. In the given figure, ABCD is a trapezium with AB // CD. AB = 18 cm, DC = 32 cm and distance between AB and CD is 14 cm. If arcs of equal radii 7 cm and with centres A, B, C

and D have been drawn, then find the area of the shaded region.



33. Prove that : 2 sec2 𝜃 − sec4 𝜃 − 2 cosec2 𝜃 + 𝑐𝑜sec4 𝜃 = 𝑐𝑜t4 𝜃 − 𝑡𝑎𝑛4 𝜃

**SECTION - V**

# A boat covers 25 km upstream and 44 km downstream in 9 hours. Also, it covers 15 km upstream and 22 km downstream in 5 hours. Find the speed of the boat in still water and that of the stream.

1. Prove that, in a right triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides.

**Using the above theorem prove the following :**

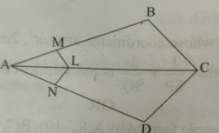
ABC is right angled at B and D is the midpoint of BC. Prove that AC2 = 4 AD2 - 3 AB2.

**OR**

Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points , the other two sides are divided in the same ratio.

Using the above theorem prove the following:

In the given figure if LM // CB and LN // CD , prove that , 𝐴𝑀

𝐴𝐵

= 𝐴𝑁

𝐴𝐷

1. The angle of elevation of a jet plane from a point A on the ground is 60°. After a flight of 15 seconds, the angle of elevation changes to 30°. If the jet plane is flying at a constant height of 15003 m, find the speed of the jet plane in Km/hr.

--------------------------------------------------------0000--------------------------------------------------------