

**CBSE Class 10 Mathematics Standard  
Sample Paper - 01 (2020-21)**

**Maximum Marks: 80**

**Time Allowed: 3 hours**

**General Instructions:**

- i. This question paper contains two parts A and B.
- ii. Both Part A and Part B have internal choices.

**Part – A consists 20 questions**

- i. Questions 1-16 carry 1 mark each. Internal choice is provided in 5 questions.
- ii. Questions 17-20 are based on the 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 consists 16 questions**

- i. Question No 21 to 26 are Very short answer type questions of 2 mark each,
- ii. Question No 27 to 33 are Short Answer Type questions of 3 marks each
- iii. Question No 34 to 36 are Long Answer Type questions of 5 marks each.
- iv. Internal choice is provided in 2 questions of 2 marks, 2 questions of 3 marks and 1 question of 5 marks.

**Part-A**

1. Show that there is no value of  $n$  for which  $(2^n \times 5^n)$  ends in 5.

OR

Determine the prime factorisation of positive integer: 45470971

2. Find the discriminant of the quadratic equation:

$$x^2 + 2x + 4 = 0$$

3. Obtain the condition for the following system of linear equations to have a unique solution:  $ax + by = c$  and  $lx + my = n$

- From an external point C, k tangents can be drawn to the circle. Find the value of k.
- Find the nth term. Given a = first term = 3.5, d = common difference = 0, n = 105,  $a_n$  = the nth term = ?

OR

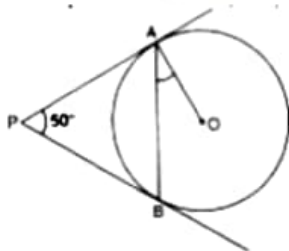
Write down the first four terms of the sequences whose general terms are  $T_n = 3^{n+1}$ .

- Does the sequence  $-1, -1, -1, -1, \dots$  form an AP? Justify your answer.
- Find the discriminant of equation:  $3x^2 - 2x + 8 = 0$

OR

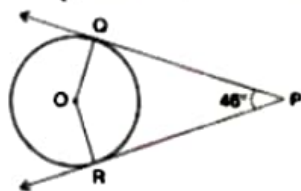
Does  $(x - 1)^2 + 2(x + 1) = 0$  have a real root? Justify your answer.

- What will be the distance between two parallel tangents to a circle of radius 5 cm?
- In fig., PA and PB are tangents to the circle with centre O such that  $\angle APB = 50^\circ$ . Write the measure of  $\angle OAB$

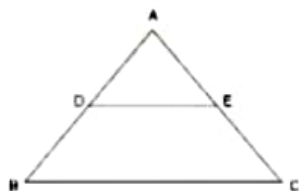


OR

If PQ and PR are two tangents to a circle with centre O. If  $\angle QPR = 46^\circ$ , find  $\angle QOR$



- In the given figure,  $DE \parallel BC$ . If  $AD = 3$  cm,  $DB = 4$  cm and  $AE = 6$  cm, find EC.



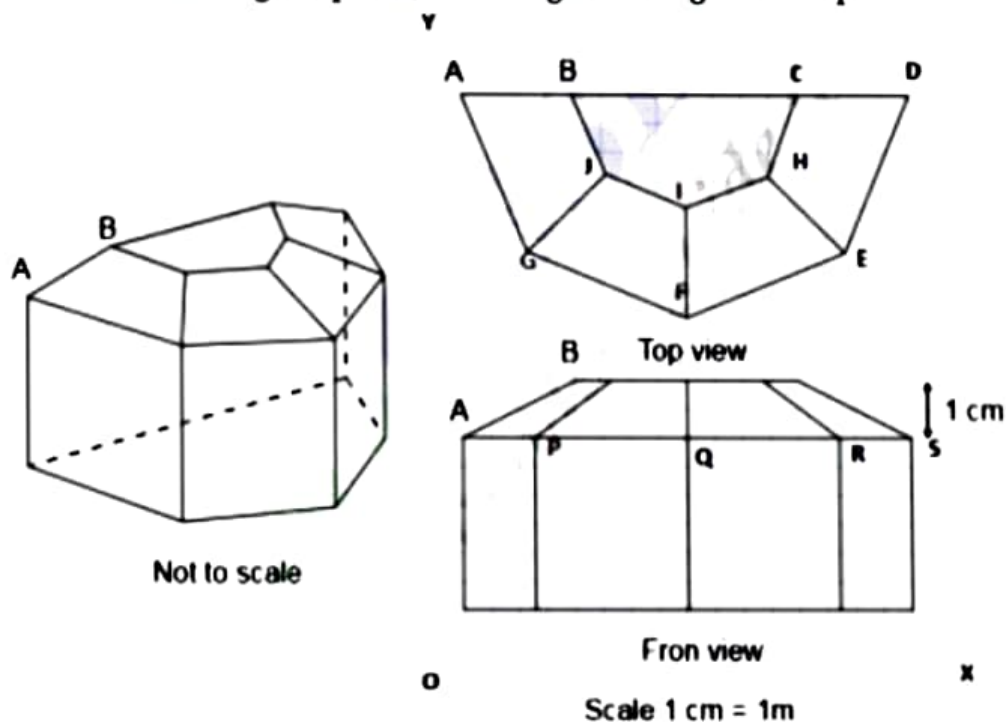
- What is 18th term of the sequence defined by  $a_n = \frac{n(n-3)}{n+4}$  ?

12. Write a negative integer and a positive integer whose difference is  $-3$ .
13. If  $A$  and  $B$  are acute angles and  $\operatorname{cosec} A = \sec B$ , then find the value of  $A + B$ .
14. A right cylindrical vessel is full of water. How many right cones having the same radius and height as those of the right cylinder will be needed to store that water?
15. The first three terms of an A.P. are  $3y - 1$ ,  $3y + 5$  and  $5y + 1$  respectively then find  $y$ .
16. 14 defective bulbs are accidentally mixed with 98 good ones. It is not possible to just look at the bulb and tell whether it is defective or not. One bulb is taken out at random from this lot. Determine the probability that the bulb is taken out is a good one.

17. **SUN ROOM**

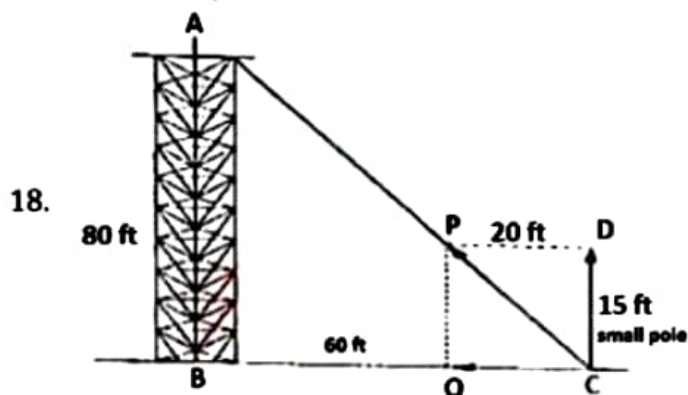
The diagrams show the plans for a sun room. It will be built onto the wall of a house. The four walls of the sunroom are square clear glass panels. The roof is made using

- Four clear glass panels, trapezium in shape, all the same size
- One tinted glass panel, half a regular octagon in shape



- i. Find the mid-point of the segment joining the points  $J(6, 17)$  and  $I(9, 16)$ . [Refer to Top View ]
  - a.  $(\frac{33}{2}, \frac{15}{2})$
  - b.  $(\frac{3}{2}, \frac{1}{2})$
  - c.  $(\frac{15}{2}, \frac{33}{2})$
  - d.  $(\frac{1}{2}, \frac{3}{2})$
- ii. The distance of the point  $P$  from the  $y$ -axis is; [Refer to Top View]

- a. 4
  - b. 15
  - c. 19
  - d. 25
- iii. The distance between the points A and S is: [Refer to Front View]
- a. 4
  - b. 8
  - c. 16
  - d. 20
- iv. Find the coordinates of the point which divides the line segment joining the points A and B in the ratio 1:3 internally. [Refer to Front View]
- a. (8.5, 2.0)
  - b. (2.0, 9.5)
  - c. (3.0, 7.5)
  - d. (2.0, 8.5)
- v. If a point (x,y) is equidistant from the Q(9,8) and S(17,8), then [Refer to Front View]
- a.  $x + y = 13$
  - b.  $x - 13 = 0$
  - c.  $y - 13 = 0$
  - d.  $x - y = 13$



There exist a tower near the house of Shankar. The top of the tower AB is tied with steel wire and on the ground, it is tied with string support.

One day Shankar tried to measure the longest of the wire AC using Pythagoras theorem.

- i. In the figure, the length of wire AC is: (take  $BC = 60$  ft)
- a. 75 ft
  - b. 100 ft

c. 120 ft

d. 90 ft

ii. What is the area of  $\triangle ABC$ ?

a.  $2400 \text{ ft}^2$

b.  $4800 \text{ ft}^2$

c.  $6000 \text{ ft}^2$

d.  $3000 \text{ ft}^2$

iii. What is the length of the wire PC?

a. 20 ft

b. 30 ft

c. 25 ft

d. 40 ft

iv. What is the length of the hypotenuse in  $\triangle ABC$ ?

a. 100 ft

b. 80 ft

c. 60 ft

d. 120 ft

v. What is the area of a  $\triangle POC$ ?

a.  $100 \text{ ft}^2$

b.  $150 \text{ ft}^2$

c.  $200 \text{ ft}^2$

d.  $250 \text{ ft}^2$

### 19. 1000m HORSE-RACE

A stopwatch was used to find the time that it took a group of jockey to run 1000 m. race.



Time (in sec.)	0-20	20-40	40-60	60-80	80-100
No. of participants(jockey)	8	10	13	6	3

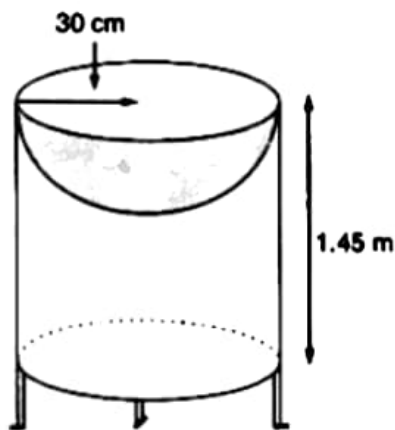
- i. Estimate the mean-time taken by a jockey to finish the race.
- a. 54
  - b. 63
  - c. 43
  - d. 50
- ii. What will be the upper limit of the modal class?
- a. 20
  - b. 40
  - c. 60
  - d. 80
- iii. The construction of the cumulative frequency table is useful in determining the:
- a. Mean
  - b. Median
  - c. Mode
  - d. All of the above
- iv. The sum of lower limits of the median class and modal class is:
- a. 60
  - b. 100
  - c. 80
  - d. 140
- v. How many participants finished the race within 1 minute?
- a. 8
  - b. 37
  - c. 31
  - d. 18

**20. STUDY OF FIGURES AND SURFACES:**





Mayank a student of class 7<sup>th</sup> loves watching and playing with birds of different kinds. One day he had an idea in his mind to make a bird-bath on his garden. His brother who is studying in class 10<sup>th</sup> helped him to choose the material and shape of the birdbath. They made it in the shape of a cylinder with a hemispherical depression at one end as shown in the Figure below. They opted for the height of the hollow cylinder as 1.45 m and its radius is 30 cm.



By using the above-given information, find the following:

- i. The curved surface area of the hemisphere is:
  - a.  $0.36 \text{ m}^2$
  - b.  $0.46 \text{ m}^2$
  - c.  $0.26 \text{ m}^2$
  - d.  $0.56 \text{ m}^2$
- ii. The curved surface area of the cylinder is:
  - a.  $0.78\pi \text{ m}^2$
  - b.  $\frac{0.87}{2}\pi \text{ m}^2$
  - c.  $0.87\pi^2 \text{ m}^2$
  - d.  $0.87\pi \text{ m}^2$
- iii. The total surface area of the bird-bath is: (Take  $\pi = \frac{22}{7}$ )
  - a.  $2.3 \text{ m}^2$
  - b.  $3.3 \text{ m}^2$
  - c.  $3.5 \text{ m}^2$
  - d.  $5.3 \text{ m}^2$

iv. The Total surface area of the cylinder is given by:

- a.  $2\pi \times r \times h + 2\pi r^3$
- b.  $2\pi \times r \times h + \pi r^2$
- c.  $2\pi \times r \times h + 2\pi r^2$
- d.  $\pi \times r \times h + 2\pi r^2$

v. During the conversion of a solid from one shape to another the volume of the new shape will:

- a. remain unaltered
- b. decrease
- c. double
- d. increase

**Part-B**

- 21. Prove that  $\sqrt{2} + \sqrt{3}$  is an irrational number.
- 22. If (3, 3), (6, y), (x, 7) and (5, 6) are the vertices of a parallelogram taken in order, find the values of x and y.

OR

Find the value of y for which the distance between the points P (2, -3) and Q(10, y) is 10 units.

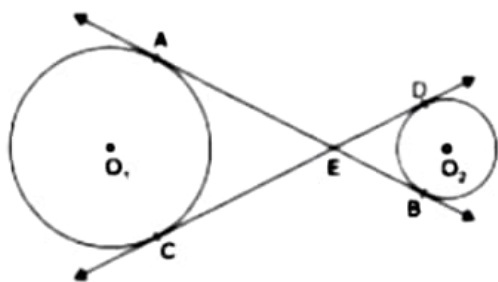
- 23. Find the zeroes of the quadratic polynomial  $4x^2 - 4x - 3$  and verify the relation between the zeroes and its coefficients.
- 24. Draw a pair of tangents to a circle of radius 5cm which are inclined to each other at  $60^\circ$ .
- 25. Prove the following identity :  $\frac{\sin A + \cos A}{\sin A - \cos A} + \frac{\sin A - \cos A}{\sin A + \cos A} = \frac{2}{2 \sin^2 A - 1}$

OR

Prove the trigonometric identity:  $\sec^4\theta - \sec^2\theta = \tan^4\theta + \tan^2\theta$ .

- 26. In Figure, common tangents AB and CD to the two circles with centres  $O_1$  and  $O_2$  intersect at E. Prove that  $AB = CD$ .





27. Prove that  $7\sqrt{5}$  is irrational.

28. Solve for x:

i.  $\sqrt{6x+7} - (2x-7) = 0$

ii.  $\sqrt{2x+9} + x = 13$

OR

If  $x = \frac{2}{3}$  and  $x = -3$  are the roots of the equation  $ax^2 + 7x + b = 0$ , find the values of a and b.

29. Find the zeroes of the polynomial  $f(x) = x^3 - 5x^2 - 16x + 80$ , if its two zeroes are equal in magnitude but opposite in sign.

30. An aeroplane leaves an airport and flies due north at a speed of 1000 km/hr. At the same time, another aeroplane leaves the same airport and flies due west at a speed of 1200 km/hr. How far apart will be the two planes after  $1\frac{1}{2}$  hours?

OR

A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower.

31. Cards numbered 1 to 30 are put in a bag. A card is drawn at random. Find the probability that the drawn card is

i. prime number  $> 7$

ii. not a perfect square

32. From the top of a building AB, 60 m high, the angles of depression of the top and bottom of a vertical lamp post CD are observed to be  $30^\circ$  and  $60^\circ$  respectively. Find

i. the horizontal distance between AB and CD.

ii. the height of the lamp post.

iii. the difference between the heights of the building and the lamp post.

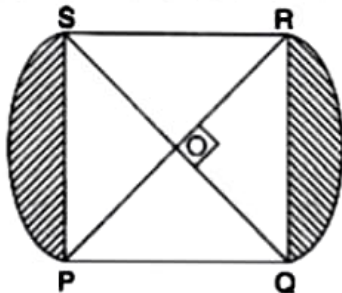
33. Following frequency distribution shows the daily expenditure on milk of 30 households

in a locality:

Daily expenditure on milk (in Rs)	0 - 30	30 -60	60 -90	90 -120	120-150
Number of households	5	6	9	6	4

Find the mode for the above data.

34. In figure, PQRS is square lawn with side  $PQ = 42$  metre. Two circular flower beds are there on the sides PS and QR with centre at O, the intersection of its diagonals. Find the total area of the two flower beds (shaded parts).



35. Find the values of  $a$  and  $b$  for which the system of equations:  
 $3x + 4y = 12$   
 $(a + b)x + 2(a - b)y = 5a - 1$   
has infinitely many solutions.
36. The string of a kite is 100 metres long and it makes an angle of  $60^\circ$  with the horizontal. Find the height of the kite, assuming that there is no slack in the string.