Sample Paper 4

Class – X Exam 2021-22 (TERM – II)

Mathematics Standard (041)

Time Allowed: 120 minutes **Maximum Marks: 40**

General Instructions:

1. The question paper consists of 14 questions divided into 3 sections A, B, C.
2. All questions are compulsory.
3. Section A comprises of 6 questions of 2 marks each. Internal choice has been provided in two questions.
4. Section B comprises of 4 questions of 3 marks each. Internal choice has been provided in one question.
5. Section C comprises of 4 questions of 4 marks each. An internal choice has been provided in one question. It contains two case study based questions.

SECTION A

1. Find the value of k for which the roots of the quadratic equation $2x^2 + kx + 8 = 0$ will have the equal roots ?

OR

Find the roots of the equation $x^2 + 7x + 10 = 0$

2. Which term of the AP $3, 12, 21, 30, ...$ will be 90 more than its 50^{th} term.

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

4. Find the number of plates, 1.5 cm in diameter and 0.2 cm thick, that can be fitted completely inside a right circular of height 10 cm and diameter 4.5 cm.

5. Write the median class of the following distribution :

Classes	0- 10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	4	8	10	12	8	4

6. The following are the ages of 300 patients getting medical treatment in a hospital on a particular day :

Age (in years)	10-20	20-30	30-40	40-50	50-60	60-70
Number of students	60	42	55	70	53	20

Form the ''less than type'' cumulative frequency distribution table.

OR

Find the mean of the data using an empirical formula when it is given that mode is 50.5 and median in 45.5.

Section B

7. Solve the following quadratic equation for x :

$9x^2 - 9(a+b)x + 2a^2 + 5ab + 2b^2 = 0$

8. The 14^{th} term of an AP is twice its 8^{th} term. If the 6^{th} term is -8, then find the sum of its first 20 terms.

9. The person standing on the bank of river observes that the angle of elevation of the top of a tree standing on opposite bank is $60°$. When he moves 30 m away from the bank, he finds the angle of elevation to be $30°$. Find the height of tree and width of the river.

10. Draw a line segment AB of length 8 cm. Taking A as centre, draw a circle of radius 4 cm and taking B as centre, draw another circle of radius 3 cm. Construct tangents to each circle from the centre of the other circle.

OR

Draw a circle of radius 3.5 cm. From a point P, 6 cm from its centre, draw two tangents to the circle.

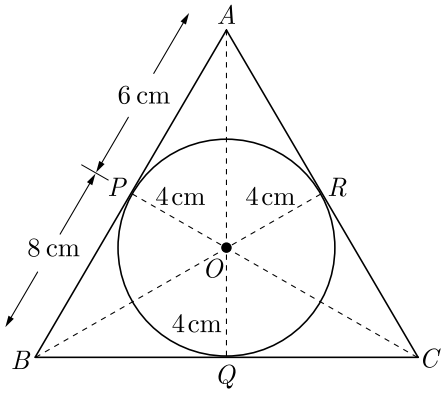
Section C

11. From the top of a tower of height 50 m, the angles of depression of the top and bottom of a pole are $30°$ and $45°$ respectively. Find :

(i) How far the pole is from the bottom of the tower,

(ii) The height of the pole. (Use $\sqrt{3} = 1.732$)

12. In Figure the radius of incircle of ΔABC of area $84\,cm^2$ and the lengths of the segments AP and BP into which side AB is divided by the point of contact are 6 cm and 8 cm Find the lengths of the sides AC and BC.



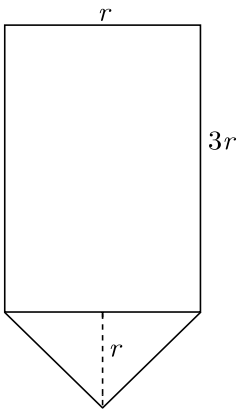
OR

Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

13. The advantages of cone bottom tanks are found in nearly every industry, especially where getting every last drop from the tank is important. This type of tank has excellent geometry for draining, especially with high solids content slurries as these cone tanks provide a better full-drain solution. The conical tank eliminates many of the problems that flat base tanks have as the base of the tank is sloped towards the centre giving the greatest possible

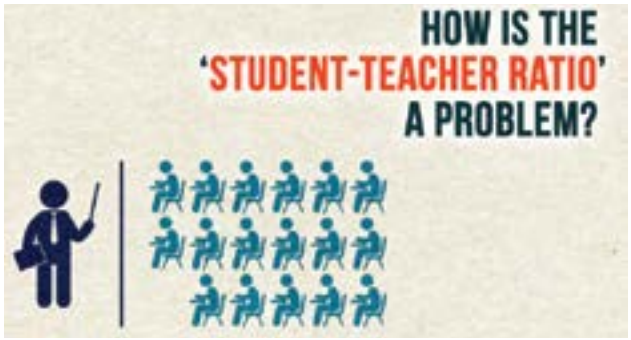
full-drain system in vertical tank design.

Rajesh has been given the task of designing a conical bottom tank for his client. Height of conical part is equal to its radius. Length of cylindrical part is the 3 times of its radius. Tank is closed from top. The cross section of conical tank is given below.



(i) If radius of cylindrical part is taken as 3 meter, what is the volume of above conical tank ?
(ii) What is the area of metal sheet used to make this conical tank ? Assume that tank is covered from top.

14. Student-teacher ratio expresses the relationship between the number of students enrolled in a school and the number teachers employed by the school. Student-teacher ratio is important for a number of reasons. It can be used as a tool to measure teacher workload as well as the allocation of resources. A low student-teacher ratio indicates the burden on a single teacher of teaching multiple students as well as the lack of time that each student gets.



A survey was conducted in the 100 secondary school of Rajasthan and following frequency distribution table was prepared

Students per teacher	Number of School
20-25	5
25-30	15
30-35	25
35-40	30
40-45	15
45-50	10

(i) What is the median value of students per teacher?
(ii) What is the model value of students per teacher ?

****