11/109/2017

A

Annual Examination 2017
Mathematics

Class : 9

Time : $2\frac{1}{2}$ Hours
Marks : 80

Instructions

1. *Read and understand each question and then write the answer*
2. *The first fifteen minutes is cool-off time for trying to understand the questions*
3. *Give explanations in the answers, wherever necessary*
4. *Numbers like $\sqrt{2}$ or π maybe given as such in the answers, instead of their decimal approximations, unless specifically asked for in the question*

Part 1

(*Answer all questions. Each question is of* **1** *mark*)

1. The length of a side of a square is 3 centimeters. What is the length of its diagonal?
2. A regular hexagon is drawn with vertices on a circle. The length of a side of the hexagon is 2 centimeters. What is the area of the circle?
3. The base area of a cylinder is 25 square centimeters and its volume is 400 cubic centimeters. What is its height?
4. The base perimeter of a prism is 25 centimeters and its height is 20 centimeters. What is the area of its lateral surface?
5. If $p(x) = 2x^3 - 5x^2 + 6x - 3$, then what is $p(0)$?
6. Write three numbers whose average is 10, with two of them greater than 10 and one less than 10

Part 2

(*Answer all questions. Each question is of* **2** *marks*)

7. See the pattern of the operations on the right

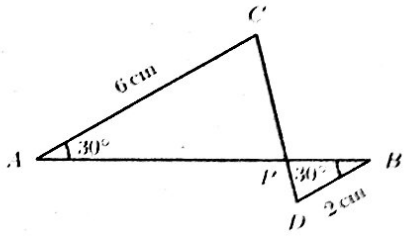
   $1 + \frac{1}{2} = \frac{3}{2}$
   $\frac{1}{2} + \frac{1}{4} = \frac{3}{4}$
   $\frac{1}{3} + \frac{1}{6} = \frac{3}{6}$

   (a) Write the next line
   (b) Write the general form of all these, using algebra
8. Te perimeter of a rectangle is 40 centimeters and its breadth is 4 centimeters less than the length. Compute the length and breadth
9. For $p(x) = x^2 + x + 1$, find $(x + 1)p(x) - (x - 1)p(x)$

Part 3

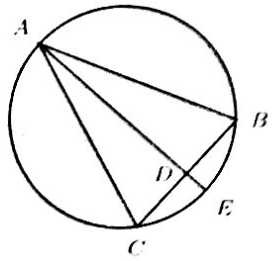
(Answer any **5** *questions. Each question is of* **3** *marks)*

10. In the figure, the lines AB and CD intersect at the point P. Prove that the length of PB is a third of the length of AP

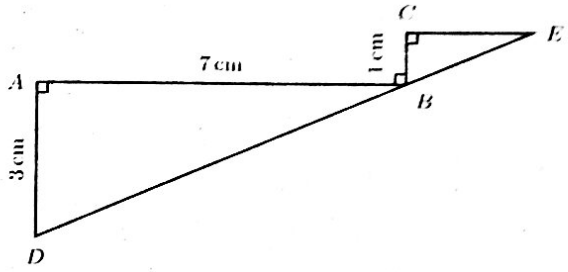


11. The speed of an object falling downwards is proportional to the time of travel. The speed at 5 seconds is 49 meters/second. What is the speed at 6 seconds?

12. In the circle shown alongside, the chords AB and AC are of the same length. The bisector of $\angle A$ intersects the chord BC at D and meets the circle at E
    (a) Prove that D is the midpoint of BC
    (b) Prove that AE is a diameter of the circle



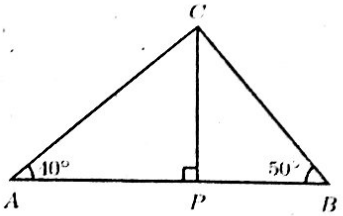
13. In the figure, the line DB extended and the perpendicular to BC at C, meet at E
    (a) Prove that the triangles ADB and CBE have the same angles
    (b) Compute the length of CE



14. Calculate the distance between each pair of points given below on the number line (a) 3, −7 (b) −3, 7 (c) −3, −7

15. Draw a triangle of sides 4 centimeters, 5 centimeters, 6 centimeters and draw its circumcircle

16. (a) Find out the angles of the triangles APC and BPC in the picture
    (b) What is the relation between the sides of these triangles?
    (c) Prove that $AP \times BP = CP^2$

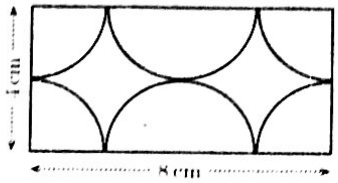


Part 4

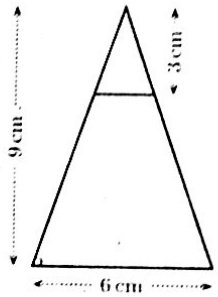
(Answer any **7** *questions. Each question is of* **4** *marks)*

17. The diagonals of a quadrilateral are perpendicular to each other. The midpoints of its sides are joined to form another quadrilateral. What is the specialty of this quadrilateral? What is the reason?

18. In the figure, circular arcs of the same radius are drawn centered at the corners and the midpoints of the top and bottom sides of a rectangle. Find the area of the shaded region



19. In the figure, a line is drawn inside an isosceles triangle, parallel to the base. What is its length?
    (a) What is the length of such a parallel line 6 centimeters down from the top of the triangle?
    (b) Prove that the length of such a line varies proportionally as its downward distance



20. The table shows the students in a class sorted according to their marks in an exam

Marks	3	4	5	6	7	8	9	10
Students	2	4	5	6	7		2	1

    (a) The average marks is 6. How many students got 8 marks?
    (b) How many students are there in the class?

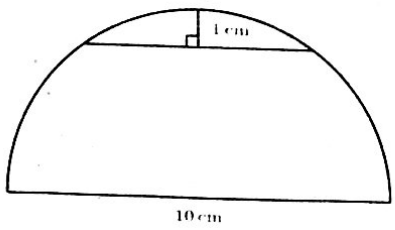
21. Draw a line and mark five points on it, 3 centimeters apart. Starting from the left, mark these points as -2, -1, 0, 1, 2. Mark the points on this line showing $-1\frac{2}{3}$ and $\sqrt{2}$

22. Draw a triangle of perimeter 11 centimeters and sides in the ratio 2 : 3 : 3

23. What is area of the circumcircle of an equilateral triangle of sides 6 centimeters?

24. The base of a prism is a rectangle of sides 5 centimeters and 12 centimeters and its height is 20 centimeters. It is split vertically along a diagonal of the base into two triangular prisms. What is the surface area of each of these triangular prisms?

25. In the semicircle shown, the top chord is parallel to the diameter. What is its length?
    (a) What is the length of such a chord drawn 2 centimeters down from the top of the semicircle?
    (b) Is the length of such a chord proportional to the distance from the top? Write the reason

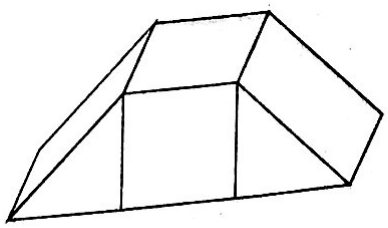


Part 5

(Answer any **5** *questions. Each question is of* **5** *marks)*

26. The base diameter of a metallic cylinder is 18 centimeters and its height is 24 centimeters. It is melted and recast into cylinders of base diameter 12 centimeters and height 6 centimeters. How many such small cylinders are got?

27. Of two cubes of sides 3 centimeters, one is split into two equal right-triangular prisms; and the pieces are joined to the other cube to make a solid as shown on the right. What is the surface area of this solid?



28. The diagonal of a square is 4 centimeters. What is its area?
    (a) What is the general relation between the length of the diagonal of a square and its area?
    (b) How do we state this relation in terms of proportion?
    (c) What is the constant of proportionality in this relation?

29. (a) What is the number which gives the midpoint of the points denoted by the numbers x and y on the number line?
    (b) If the numbers x and y are thought of as points on a number line, what is the geometrical meaning of $|x - y|$?
    (c) In each of the equations below, find the number x satisfying it:
    (i) $|x - 1| = |x - 3|$ (ii) $|x - 1| = |x + 3|$ (iii) $|x + 1| = |x - 3|$

30. (a) What are the numbers x which satisfy the equation $|x - 2| + |x - 6| = 4$?
    (b) What are the numbers x satisfying the equation $|x - 2| + |x - 6| = 5$?
    (c) Are there numbers x satisfying the equation $|x - 2| + |x - 6| = 3$? Write the reason

31. The table on the right shows 30 workers sorted according to their daily wages.
    (a) What do we take as the mean daily wages of the four workers earning wages between 300 rupees and 400 rupees?
    (b) According to this, what is the total daily wages of the workers in this class?
    (c) Making such assumptions, calculate the total wages of workers in other classes also
    (d) Calculate the mean daily wages for the entire group

Wages	Workers
300–400	4
400–500	8
500–600	10
600–700	6
700–800	2