

Mathematics SA -2 Sample paper-4

Time allowed: 3 hours Maximum Marks: 90

General Instructions:

- All questions are compulsory.
- The question paper consists of 31 questions divided into four sections – A, B, C and D.
- Section A contains 4 questions of 1 mark each which are multiple choice questions, Section B contains 6 questions of 2 marks each, Section C contains 10 questions of 3 marks each and Section D contains 11 questions of 4 marks each.
- Use of calculator is not permitted.

Section A

- If the circumference and area of the circle are numerically equal, the diameter of the circle is
 - π
 - $\pi/2$
 - 2
 - 4
- If the string of a kite is 75 m long and it makes an angle of 60° with the ground, then the height of kite is:
 - $75/2$ m
 - $75\sqrt{3}$ m
 - $(75\sqrt{3})/2$ m
 - 75 m
- 12 defective pens are accidentally mixed with 132 good ones. It is not possible to just look at a pen and tell whether or not it is defective. One pen is taken out at random from this lot. Determine the probability that the pen taken out is a good one.
- A point on y – axis equidistant from the points A (6, 5) and B–4,3 is:
 - (0, 3)
 - (0, 4)
 - (0, 6)
 - (0, 9)

Section B

- Find the roots of the equation $5x^2 - 6x - 2 = 0$ by the method of completing

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the square

6. Find a relation between x and y such that the point (x, y) is equidistant from the point $(3, 6)$ and $(-3, 4)$.

7. If the roots of the equation $(a-b)x^2 + (b-c)x + (c-a) = 0$ are equal. Prove that $2a=b+c$

8. The area of the sector of the circle of radius 5 cm is $5\pi \text{ cm}^2$. Find the angle subtended by the sector

9. A glass cylinder with diameter 20 cm has water to a height of 9cm. A metal cube of 8cm edge is immersed in its completely. Calculate the height by which water will rise in the cylinder

10. If the points $(a, 0)$, $(0, b)$ and $(1, 1)$ are collinear then show that $1/a + 1/b = 1$

Section C

11. Find the roots of the quadratic equation

$$\frac{1}{x} - \frac{1}{x-2} = 3, x \neq 0, 2$$

12. Find the sum of all two digit natural numbers which when divided by 3 yield 1 as remainder.

13. A man on the deck on a ship 14m above water level, observes that the angle of elevation of the top of a cliff is 60° and the angle of depression of the base of the cliff is 30° . Calculate the distance of the cliff from the ship and the height of the cliff.

14. If $x = -2$ is a root of the equation $3x^2 + 7x + p = 0$, find the values of k so that the roots of the equation $x^2 + k(4x + k - 1) + p = 0$ are equal.

15. Three coins are tossed together. Find the probability of getting of at least two heads?

16. If a number K is chosen from set $A = \{-3, -2, -1, 0, 1, 2, 3\}$. What is the probability that $k^2 < 4$?

17. Prove that the points $(3, 0)$, $(6, 4)$ and $(-1, 3)$ are vertices of a right angled triangle. Also, prove that the vertices of an isosceles triangle.

18. The length of an arc subtending an angle of 72° at the center is 44 cm. Find the area of the circle

19. The circumference of a circular plot is 220 m. A 15 m wide concrete track runs around outside the plot. Find the area of the track. (use $\pi = 22/7$)

20. A cone, a hemi-sphere and a cylinder stand on equal bases and have the same height. Find the ratio of their volumes as well the ratio of their total surface areas

Section D

21. Solve for x:

$$\frac{1}{a} + \frac{1}{b} + \frac{1}{x} = \frac{1}{a+b+x}$$

Where $a \neq 0$, $b \neq 0$ and $a+b+x \neq 0$

22. A trader bought a number of articles for Rs.900. Five articles were found damaged. He sold each of the remaining articles at Rs.80 in the whole transaction. Find the number of articles he bought.

23. A cistern, internally measuring $150 \text{ cm} \times 120 \text{ cm} \times 110 \text{ cm}$, has 129600 cm^3 of water in it. Porous bricks are placed in the water until the cistern is full to the brim. Each brick absorbs one-seventeenth of its own volume of water. How many bricks can be put in without overflowing the water, each brick being $22.5 \text{ cm} \times 7.5 \text{ cm} \times 6.5 \text{ cm}$?

24. Find the area of the rhombus, if its vertices are $(3,0)$, $(4,5)$, $(-1,4)$ and $(-2,-1)$ taken in order.

25. Prove that the length of tangents drawn from an external point to a circle are equal. Hence, find BC, if a circle is inscribed in a $\triangle ABC$ touching AB, BC & CA at P, Q & R respectively, having $AB=10\text{cm}$, $AR=7\text{cm}$ & $RC=5\text{cm}$.

26. Construct a triangle similar to a given triangle with sides 7 cm, 9 cm and 10 cm and whose sides are $\frac{5}{7}$ of the corresponding sides of the given triangle.

27. From the top of a building 60m. high the angles of depression of the top and the bottom of a tower are observed to be 30° and 60° . Find the height of the tower.

28. True and False question

a) Cards with numbers 2 to 101 are placed in a box. A card selected at random from the box. the probability that the card which is selected has a number which is a perfect square is $\frac{9}{100}$

b) The probability of getting the letter A in the word "MATHEMATICS" is $\frac{2}{11}$

29. If $(-4, 3)$ and $(4, 3)$ are two vertices of an equilateral triangle, find the coordinates of the third vertex, given that the origin lies in the interior of the triangle

30. A solid is in the form of a right circular cylinder with hemispherical ends. The total height of the solid is 28 cm. Find the total surface area of the solid.

31. The height of the cone is 30 cm. A small cone is cut off at the top by a plane parallel to the base. The ratio of the volume of small cone to the volume of the given cone is 1:27. Find the height of the Frustum Formed