S4 Mathematics (Compulsory Part) Practice Paper: Quadratic Equations, Indices and Logarithms, Sequences, Circle Properties, Probability and Statistics

Secondary 4 | Mathematics (Compulsory Part) | Time: 75 minutes | Total: 100 marks | 24 questions

Part 1: Quadratic Equations and the Discriminant (16 marks)

Consider the quadratic equation x^2 - 6x + 5 = 0 and the function y = x^2 - 6x + 5.

1. Solve the equation x^2 - 6x + 5 = 0.

2. Find the discriminant of 2x^2 + 3x + 4 = 0 and state the number of real roots.

3. If the equation x^2 + kx + 9 = 0 has a repeated root, find the two possible values of k.

4. Find the axis of symmetry and the coordinates of the vertex of y = x^2 - 6x + 5.

Part 2: Indices and Logarithms (16 marks)

Simplify each of the following. Exact values are required unless stated otherwise. Given log10(2) = 0.3010.

5. Find the value of log2(32).

6. Using log10(2) = 0.3010, find log10(2000) correct to 4 decimal places.

7. Solve the equation 3^(2x) = 27.

8. Find the value of (log3(9))(log2(8)).

Part 3: Arithmetic and Geometric Sequences (18 marks)

An arithmetic sequence has first term 7 and common difference 4. A geometric sequence has first term 3 and common ratio 2.

9. Find the 20th term of the arithmetic sequence.

10. Find the sum of the first 20 terms of the arithmetic sequence.

11. Find the 8th term of the geometric sequence.

12. Find the sum of the first 8 terms of the geometric sequence.

Part 4: Circle Properties and Sector Area (18 marks)

Circle C has centre (2, -3) and radius 5. Take pi = 3.1416 where needed.

13. Write down the equation of circle C.

14. A chord is at a distance of 5 from the centre of a circle of radius 13. Find the length of the chord.

15. From an external point P, a tangent PT is drawn to a circle of radius 6. If PO = 10, find PT.

16. A sector has radius 9 and central angle 80 degrees. Find its area correct to 1 decimal place.

Part 5: Permutations, Combinations and Probability (16 marks)

Show your working in each part.

17. In how many ways can 5 students be arranged in a row?

18. In how many ways can a group of 3 students be chosen from 8 students?

19. A bag contains 4 red balls and 6 blue balls. One ball is drawn at random. Find the probability that it is red.

20. Two fair dice are thrown together. Find the probability that the sum of the scores is 7.

Part 6: Statistics (16 marks)

Data set A: 3, 7, 7, 9, 14. Data set B: 2, 4, 6, 8, 10.

21. Find the mean of data set A.

22. Find the median of data set A.

23. Find the mode of data set A.

24. Find the standard deviation of data set B correct to 3 significant figures.

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