S4 Mathematics Practice Paper 1 | Indices, sequences, quadratics, circles, probability

Senior Secondary Mathematics

S4 Mathematics practice paper: indices, logarithms, sequences, quadratic functions, circle properties, probability and compound interest. 100 marks with full answers.

1. Indices and logarithms (16 marks)

Parts (a) to (c) are algebraic and need working; part (d) is an application.

#	Question
1	(a) Evaluate log_3 81 + log_2 32.
2	(b) Solve 2^(x+1) = 64.
3	(c) Solve log x + log(x - 3) = 1 for x > 3.
4	(d) An investment grows at 6% per year compounded yearly. Use logarithms to find, to the nearest whole year, the time for the money to double.

2. 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.

#	Question
5	(a) Find the 15th term of the arithmetic sequence.
6	(b) Find the sum of the first 20 terms.
7	(c) Find the 8th term and the sum of the first 8 terms of the geometric sequence.
8	(d) Another geometric sequence has first term 8 and common ratio 0.6. Find its sum to infinity.

3. Quadratic equations and functions (16 marks)

Consider the equation x^2 - 7x + 12 = 0 and the function y = x^2 - 6x + 5.

#	Question
9	(a) Solve x^2 - 7x + 12 = 0.
10	(b) If x^2 + kx + 9 = 0 has a repeated root, find all possible values of k.
11	(c) Find the coordinates of the vertex of y = x^2 - 6x + 5.
12	(d) Find where the graph cuts the x-axis and state the direction of opening.

4. Properties of circles (18 marks)

A circle has centre O and radius 10 cm; chord AB is 6 cm from O. Another circle has centre O(0, 0) and radius 5, and the point P(13, 0) lies outside it.

#	Question
13	(a) Find the length of chord AB.
14	(b) In a cyclic quadrilateral ABCD, angle A = 72 degrees. Find angle C.
15	(c) A tangent from P touches the circle at T. Find PT.
16	(d) Find the arc length for radius 12 cm and angle 150 degrees, in terms of pi and to 1 d.p.

5. Permutations, combinations and probability (16 marks)

A group has 5 boys and 4 girls; a fair die is rolled twice.

#	Question
17	(a) How many ways are there to choose 3 people from the group?
18	(b) How many of these choices contain at least one girl?
19	(c) Find the probability that the sum of two rolls is 7 (as a fraction and to 3 d.p.).
20	(d) From A, B, C, D, E, how many arrangements give 3 people different posts in order?

6. Percentages, compound interest and discounts (16 marks)

A principal of 50,000 is invested at 4% per year for 3 years. An item is marked at 1,200 and is discounted by 20% and then a further 10%.

#	Question
21	(a) Find the amount after 3 years with yearly compounding.
22	(b) What would the simple interest be for 3 years?
23	(c) How much more interest does compounding give?
24	(d) Find the final selling price of the item.