

Secondary 4 Mathematics 1st Term Pre-exam

Time allowed: 1 hour 15 minutes

Total Mark: 60

Instructions:

- 1. This paper consists of 3 sections, A(1), A(2) and B. Sections A(1) and A(2) carry 38 marks and Section B carries 22 marks.*
- 2. Attempt ALL questions. Write your answers in the spaces provided in this Question/Answer paper.*
- 3. Unless otherwise specified, all workings must be clearly shown.*
- 4. Unless otherwise specified, numerical answers must either be exact or correct to 3 significant figures.*
- 5. The diagrams in this paper are not necessarily drawn to scale.*

SECTION A(1): (18 marks)

1. Find the number of x-intercepts of the graph $y = 2x^2 - 7x - 3$.

(3 marks)

2. Simplify $(\sqrt{45} - \sqrt{3})(\sqrt{5} + \sqrt{27})$.

(4 marks)

3. It is given that $f(x) = x^2$ and $g(x) = x + 1$. Find the values of x if $f(x) = 2g(x) + 6$.
(4 marks)

4. Find the H.C.F. and L.C.M. of $8xy^3$ and $12x^2yz$.
(3 marks)

5. John is 12 years older than Tom. Twelve years ago, John was twice as old as Tom. Find the present age of Tom.
(4 marks)

SECTION A(2): (20 marks)

6. Let $f(x) = 4x^3 - 8x^2 - 3x + 9$.

(a) Show that $x + 1$ is a factor of $f(x)$.

(1 marks)

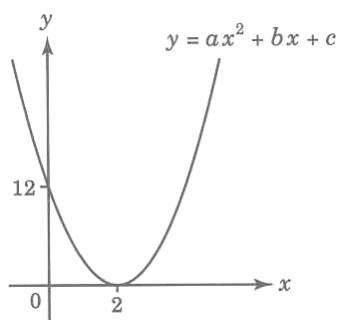
(b) Hence factorize $f(x)$.

(2 marks)

(c) Using (b), factorize $f(x) - (x + 1)(y - 1)^2$.

(3 marks)

7. The figure shows the graph of a quadratic function $y = ax^2 + bx + c$. The graph cuts the y -axis at $(0, 12)$ and touches the x -axis at $(2, 0)$.



- (a) Write down the value of c .

(1 mark)

- (b) Show that $b^2 = 48a$.

(3 marks)

- (c) Find the values of a and b .

(4 marks)

8. Let α and β be the roots of the quadratic equation $x^2 + px + q = 0$.

(a) Find, in terms of p and q , the values of

(i) $(\alpha - 2) + (\beta - 2)$

(ii) $(\alpha - 2)(\beta - 2)$

(4 marks)

(b) Find a quadratic equation in x whose roots are $\alpha - 2$ and $\beta - 2$.

(2 marks)

SECTION B: (22 marks)

9. Consider a line $L: y = 2x + c$ and a curve $C: x^2 + x - y^2 + y = 0$.

(a) Find the value(s) of c if C and L intersect at only one point.

(5 marks)

(b) Hence, find the coordinates of point of intersection.

(4 marks)

- (c) If $c = 1$, how many points of intersection do the line and the curve have?
(2 marks)

10. Let $f(x) = x^{1997} - 1$.

- (a) Find the remainders when $f(x)$ is divided by

- (i) $x + 1$;
(ii) $x - 1$.

(2 marks)

- (b) Hence, find the values of a and b if $f(x) = (x^2 - 1)Q(x) + ax + b$ where $Q(x)$ is a polynomial in x and a, b are constants.

(4 marks)

(c) Using (b), find the remainders when

(i) 8^{1997} is divided by 63;

(ii) 8^{1998} is divided by 63.

(5 marks)

End of Paper