

Name:	School:	Target Grade:
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HEADSTART QUIZ TO SECONDARY 4 A MATH

READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. This is a 30 marks quiz.
2. This quiz touches on some of the important concepts you will come across again in Sec 4.
3. You will find Nature of Roots, Partial Fractions, Coordinate Geometry & Trigonometry coming back again in Sec 4 Calculus. Revise them well so Sec 4 AM will be easy.

Word of Encouragement:

No matter your Sec 3 grades, let Secondary 4 be a fresh new chapter!

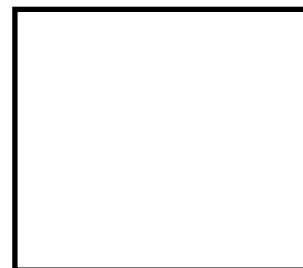
This is your O Level Year.

We want to see you get a Distinction for Math.

You've got this—believe in yourself!

I believe in you.

Team Paradigm

**PARADIGM**

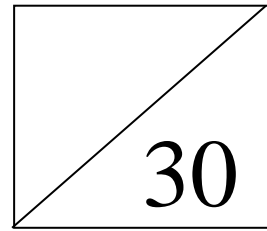
[Turn Over]

Name: _____

Class: _____

Date: _____

Secondary 4A Mathematics
HEADSTART



- 1 Find the range of values of k for which $(k - 3)x^2 + 4x + k$ is always positive for all real values of x . [2]

- 2 A triangle has an area of $(58 + 8\sqrt{5})$ cm² and a height of $(7 + 3\sqrt{5})$ cm. Without using a calculator, find the exact length of its base, expressing in the form $a + b\sqrt{5}$, where a and b are integers. [3]

- 3 Find the value(s) of y that satisfy the equation [3]
$$\log_4(2y) = \log_{16}(y - 3) + 3\log_9 3$$

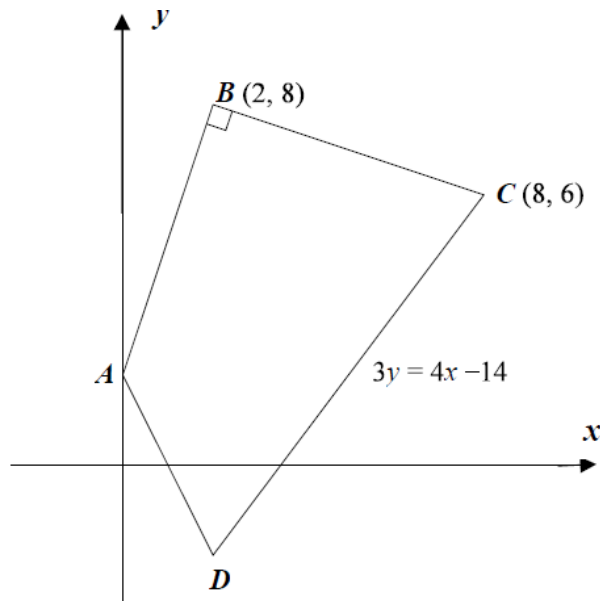
- 4 The polynomial $f(x) = ax^3 + x^2 + bx + 6$ has a factor of $(x + 2)$ and leaves a remainder of 18 when divided by $(x - 1)$.
- (a) Find the value of a and of b . [2]

(b) Factorise $f(x) = ax^3 + x^2 + bx + 6$ completely. [1]

(c) **Hence**, using the values of a and b found in (a), solve the equation [1]
$$a(y - 1)^3 + (y - 1)^2 + b(y - 1) + 6 = 0$$

- 5 Express $\frac{10x^2 - 7x + 10}{(3x - 2)(x^2 + 2)}$ in partial fractions. [3]

6 Solutions to this question by accurate drawing will not be accepted



The diagram above shows a quadrilateral $ABCD$. Point B is $(2, 8)$ and point C is $(8, 6)$. The point D lies on the perpendicular bisector of BC and the point A lies on the y -axis. The equation CD is $3y = 4x - 14$ and angle $ABC = 90^\circ$. Find

(a) the equation of AB , [1]

(b) the coordinates of A , [1]

(c) the equation of the perpendicular bisector of BC , [2]

(d) the coordinates of D . [2]

7 (a) Prove that $\sec \theta + 1 = \frac{\tan \theta \sin \theta}{1 - \cos \theta}$. [2]

(b) Hence or otherwise, solve $\frac{\tan \theta \sin \theta}{1 - \cos \theta} = \frac{3}{4} \sec^2 \theta$ for $0 \leq \theta \leq 2\pi$. [2]

8 It is given that $f(x) = 4 + \cos\left(\frac{x}{2}\right)$ and $g(x) = 3 - 2 \sin x$.
(a) State the period and amplitude of $f(x)$. [1]

(b) State the period and amplitude of $g(x)$. [1]

(c) Sketch, on the same axes, the graphs of $y = f(x)$ and $y = g(x)$ for $0^\circ \leq x \leq 360^\circ$ [2]

(d) State the number of solutions of the equation [1]
 $\cos\left(\frac{x}{2}\right) = -1 - 2 \sin x$ for $0^\circ \leq x \leq 360^\circ$.