



Name	Register Number	Class
------	-----------------	-------



GREENRIDGE SECONDARY SCHOOL

End-of-Year Examination 2016 Secondary 3 Express

ADDITIONAL MATHEMATICS
Paper 1

4047/1
October 2016
2 hours

Additional Materials: Answer Paper

GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL
GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL
GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL
GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL GREENRIDGE SECONDARY SCHOOL

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **ALL** questions.
Write your answers on the separate Answer Paper provided.
Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.
The use of a scientific calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

The number of marks is given in brackets [] at the end of each question or part question.
The total number of marks for this paper is 80.

Setter: Mrs Goh-Kok Mei Leng

For Examiner's Use
80

Mathematical Formulae

1. ALGEBRA

Quadratic Equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial Theorem

$$(a + b)^n = a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 + \cdots + \binom{n}{r} a^{n-r} b^r + \cdots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)! r!} = \frac{n(n-1)\dots(n-r+1)}{r!}$

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$

$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$

$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$

$$\sin 2A = 2 \sin A \cos A$$

$$\cos 2A = \cos^2 A - \sin^2 A = 2 \cos^2 A - 1 = 1 - 2 \sin^2 A$$

$$\tan 2A = \frac{2 \tan A}{1 - \tan^2 A}$$

$$\sin A + \sin B = 2 \sin \frac{1}{2}(A + B) \cos \frac{1}{2}(A - B)$$

$$\sin A - \sin B = 2 \cos \frac{1}{2}(A + B) \sin \frac{1}{2}(A - B)$$

$$\cos A + \cos B = 2 \cos \frac{1}{2}(A + B) \cos \frac{1}{2}(A - B)$$

$$\cos A - \cos B = -2 \sin \frac{1}{2}(A + B) \sin \frac{1}{2}(A - B)$$

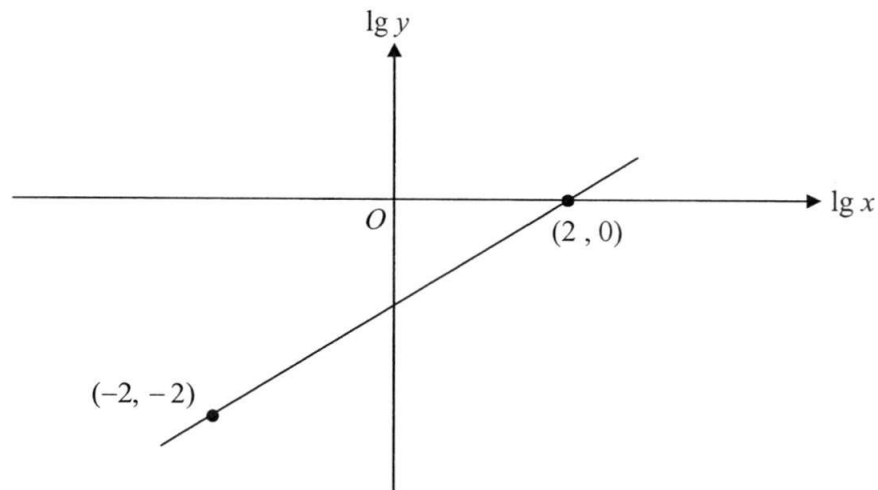
Formulae for $\triangle ABC$

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} ab \sin C$$

- 1 The line $2y - x = 3$ meets the curve $x^2 - xy - y^2 = 1$ at the points P and Q . Show that the distance PQ can be expressed in the form $a\sqrt{b}$, where a and b are integers. [5]
- 2 Simplify
- (i) $(2\sqrt{3} - \sqrt{10})(3\sqrt{6} + 2\sqrt{5})$, [2]
- (ii) $\sqrt[3]{16} + \sqrt[3]{250} - \sqrt[3]{\frac{125}{4}}$. [3]
- 3 Find the range of values of k for which the expression $k(x^2 + 2x + 3) - 4x - 2$ is always positive for all real values of x . [4]
- 4 The diagram shows part of the straight line graph drawn to represent the equation $y = ax^b$. Given that the straight line passes through $(2, 0)$ and $(-2, -2)$, find the value of a and of b . [4]



- 5 $(x - 2)$ is a factor of the polynomial $x^3 - 4x^2 + ax + b$, where a and b are constants. It leaves a remainder of -60 when the polynomial is divided by $x + 3$.
- (i) Find the value of a and of b . [4]
- (ii) Factorise the polynomial completely and hence solve the equation $(x + 1)^3 - 4(x + 1)^2 + (x + 1) + 6 = 0$. [5]
- 6 (a) Express $\frac{9x + 6}{(2x - 3)(x^2 + 1)}$ in partial fractions. [4]

- (b) Divide $x^2 - x + 1$ by $x^2 - 5x - 6$. Hence, express $\frac{x^2 - x + 1}{x^2 - 5x - 6}$ in partial fractions. [5]
- 7 The equation $2x^2 - 3x + 4 = 0$ has roots α and β . Write down the value of $\alpha + \beta$ and $\alpha\beta$.
Find the equation whose roots are $\alpha + \frac{1}{\alpha}$ and $\beta + \frac{1}{\beta}$. [7]
- 8 (a) Find, in ascending powers of x , the first 4 terms in the expansion of $\left(2x - \frac{1}{2}\right)^9$. Hence obtain the coefficient of x^7 in the expansion $(1-x)\left(2x - \frac{1}{2}\right)^9$. [4]
- (b) The term independent of x in the binomial expansion of $\left(x^3 + \frac{a}{x^2}\right)^{10}$ is 210. Find the values of a . [4]
- 9 (a) Express $(11 + \sqrt{3}) - \left(\frac{13}{4 + \sqrt{3}}\right)^2$ in the form $a + b\sqrt{3}$, where a and b are integers to be determined. [4]
- (b) Given that $\frac{9^{n+2} - 3^{2n+2}}{2^5} = 2^a 3^b$, where a and b are integers, find the value of a and express b in terms of n . [3]
- 10 Solve the following equations.
- (i) $\log_5(x-1) + \log_5(x-2) = 2\log_5 \sqrt{6}$ [3]
- (ii) $\log_2 x = 4 - 3\log_x 2$ [4]
- 11 (i) Using the substitution $u = 2^x$, express the equation $8^x + 48 = 7(4^x)$ as a cubic equation in u . [2]
- (ii) Show that $u = 4$ is the only integer solution of this equation. [3]
- (iii) Hence find the integral value of x for $8^x + 48 = 7(4^x)$. [1]

-
- 12 The line $3y - 2x = 6$ meets the x -axis at A and the y -axis at B . Find
- (i) the coordinates of A and B , [2]
 - (ii) the area of triangle OAB , where O is the origin, [1]
 - (iii) the line which is parallel to AB and which passes through the point $C(4, -4)$, [2]
 - (iv) the coordinates of the point D if $ABCD$ is a parallelogram, [2]
 - (v) the area of $ABCD$. [2]

End of Paper

Greenridge Secondary School
Preliminary Examination 2016
Secondary 4 Express Additional Mathematics Paper 1

Qn	Parts	Answer
1		$P(13,8)$ and $Q(-1,1)$ Dist = $7\sqrt{5}$ units
2	(i)	$8\sqrt{2} - 2\sqrt{15}$
	(ii)	$\frac{9}{2}\sqrt[3]{2}$
3		$k < -2$ (NA), $k > 1$
4		$a = \frac{1}{10}$, $b = \frac{1}{2}$
5	(i)	$a = 1$, $b = 6$
	(ii)	$f(x) = (x-2)(x-3)(x+1)$ $x = 1, 2, -2$
6	(a)	$\frac{6}{2x-3} - \frac{3x}{x^2+1}$
	(b)	$1 + \frac{31}{7(x-6)} - \frac{3}{7(x+1)}$
7		$x^2 - \frac{9}{4}x + \frac{13}{8} = 0$
8	(a)	1824
	(b)	1 or -1
9	(a)	$-8 + 9\sqrt{3}$
	(b)	$a = -2$, $b = 2n + 2$
10	(i)	$x = 4$ or -1 (NA)
	(ii)	8 or 2
11	(i)	$u^3 - 7u^2 + 48 = 0$
	(iii)	$x = 2$
13	(i)	$A(-3,0)$ and $B(0,-2)$
	(ii)	3 unit ²

	(iii)	$y = \frac{2}{3}x - \frac{20}{3}$
	(iv)	$D(1, -6)$
	(v)	26 units ²