O	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

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 $\binom{n}{r} = \frac{n!}{(n-r)!\,r!} = \frac{n(n-1)\ldots(n-r+1)}{r!}$

2. TRIGONOMETRY

Identities

$$\sin^2 A + \cos^2 A = 1.4$$
$$\sec^2 A = 1 + \tan^2 A.$$
$$\operatorname{cosec}^2 A = 1 + \cot^2 A.$$
$$\sin(A \pm B) = \sin A \cos B \pm \cos A \sin B$$
$$\cos(A \pm B) = \cos A \cos B \mp \sin A \sin B$$
$$\tan(A \pm B) = \frac{\tan A \pm \tan B}{1 \mp \tan A \tan B}$$
$$\sin 2A = 2 \sin A \cos A$$
$$\cos 2A = \cos^2 A - \sin^2 A = 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$
$$\sin A + \sin B = 2 \sin \tfrac{1}{2}(A+B) \cos \tfrac{1}{2}(A-B)$$
$$\sin A - \sin B = 2 \cos \tfrac{1}{2}(A+B) \sin \tfrac{1}{2}(A-B)$$
$$\cos A + \cos B = 2 \cos \tfrac{1}{2}(A+B) \cos \tfrac{1}{2}(A-B)$$
$$\cos A - \cos B = -2 \sin \tfrac{1}{2}(A+B) \sin \tfrac{1}{2}(A-B)$$

Formulae for ΔABC

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

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

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

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]

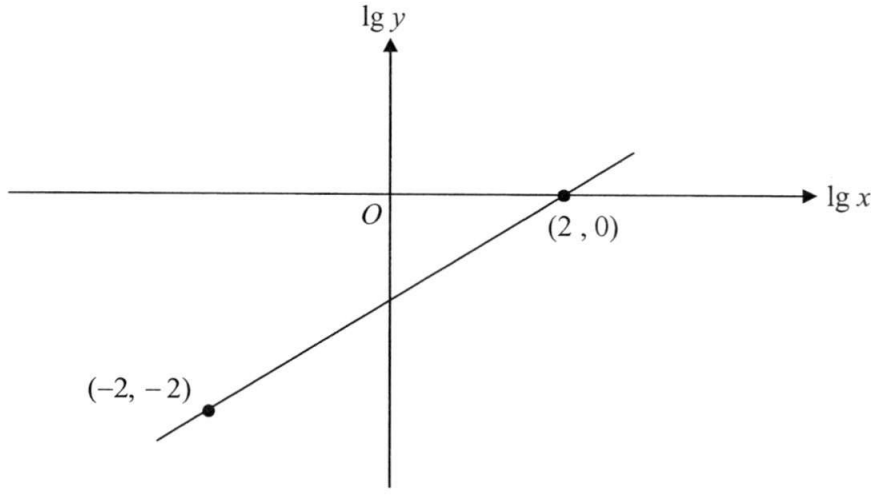
2 Simplify

(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 $\dfrac{x^2-x+1}{x^2-5x-6}$ 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 $\alpha+\dfrac{1}{\alpha}$ and $\beta+\dfrac{1}{\beta}$. [7]

8 **(a)** Find, in ascending powers of x, the first 4 terms in the expansion of $\left(2x-\dfrac{1}{2}\right)^9$. Hence obtain the coefficient of x^7 in the expansion $(1-x)\left(2x-\dfrac{1}{2}\right)^9$. [4]

(b) The term independent of x in the binomial expansion of $\left(x^3+\dfrac{a}{x^2}\right)^{10}$ is 210. Find the values of a. [4]

9 **(a)** Express $(11+\sqrt{3})-\left(\dfrac{13}{4+\sqrt{3}}\right)^2$ in the form $a+b\sqrt{3}$, where a and b are integers to be determined. [4]

(b) Given that $\dfrac{9^{n+2}-3^{2n+2}}{2^5}=2^a3^b$, 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