XINMIN SECONDARY SCHOOL
新民中学
SEKOLAH MENENGAH XINMIN
Weighted Assessment 1 2022

CANDIDATE NAME

CLASS | | | | INDEX NUMBER | | |

ADDITIONAL MATHEMATICS 4049

Secondary 4 Express

22 February 2022

Setter: Mr Johnson Chua

45 minutes

Vetter: Mrs Loh Si Lan

Candidates answer on the Question Paper

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class in the spaces at the top of this page.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.
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 an approved scientific calculator is expected, where appropriate. If working is needed for any question it must be shown with the answer.
Omission of essential working will result in loss of marks.
The use of an approved scientific calculator is expected, where appropriate.
You are reminded of the need for clear presentation in your answers.

At the end of the paper, fasten all your work securely together.
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 **30.**

Errors	Qn No.	Errors	Qn No.
Accuracy		Simplification	
Brackets		Units	
Geometry		***Marks Awarded***	
Presentation		***Marks Penalised***	

For Examiner's Use

30

Parent's/Guardian's Signature:

Mathematical Formulae

1. ALGEBRA

Quadratic Equation

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

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

Binomial expansion

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

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

2. TRIGONOMETRY

Identities

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

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

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

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

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

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

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

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

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

Formulae for ΔABC

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

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

$$\Delta = \frac{1}{2}bc\sin A$$

Answer **all** the questions.

1 Differentiate each function with respect to x.

(a) $y = 2 - x^2 - \frac{16}{x^2}$, leaving your answer in positive index. [1]

(b) $y = \frac{5x^3 + 4x^2 - 7x + 3}{x^2}$, leaving your answer in positive index. [2]

(c) $y = 4\left(5 - 3x^2\right)^4$ [2]

2 **(i)** Differentiate $\frac{5x^2+3}{10x^2-6}$ with respect to x. [2]

(ii) Differentiate $\left(\frac{5x^2+3}{10x^2-6}\right)^4$ with respect to x, leaving your answer in the form $\frac{kx\left(5x^2+3\right)^m}{\left(5x^2-3\right)^n}$ where k, m and n are constants. [2]

3 The equation of a curve is $y = 3x\sqrt{5 + x^2}$. Find the gradient(s) of the curve at the point(s) where it crosses the line $y = 6x$. [5]

4 **(i)** By considering the general term, explain why the binomial expansion of $\left(\frac{3}{x^2}+x\right)^7$ does not have a term independent of x. [3]

(ii) Find the term independent of x in the expansion of $\left(\frac{3}{x^2}+x\right)^7\left(5-2x^2\right)$. [3]

5 A tangent to a circle at the point $(-6, 6)$ passes through the origin. The centre, *C*, of the circle lies on the line $4y - 3x = 40$.

(i) Show that the centre of the circle is $(-8, 4)$. [4]

(ii) Find the equation of the circle. [2]

(iii) Find the coordinates of the circle which is nearest to the *y*-axis. [2]

(iv) Explain why the point $P(-10, 6.5)$ lies outside the circle. [2]

END OF PAPER

Answer Key

1.	**(a)** $-2x + \frac{32}{x^3}$
	(b) $5 + \frac{7}{x^2} - \frac{6}{x^3}$
	(c) $-96 \times (5 - 3x^2)^3$
2	**(i)** $\frac{-120x}{(10x^2-6)^2}$
	(ii) $\frac{-15x(5x^2+3)^3}{(5x^2-3)^5}$
3	$3\sqrt{5}$
4	**(i)** Since r = 14/3, which is not an integer, there is no term independent of x.
	(ii) – 1890
5	**(i)** (–8 , 4)
	(ii) $(x + 8)^2 + (y - 4)^2 = 8$
	(iii) $\left(-8 + \sqrt{8}, 4\right)$
	(iv) Since the distance between P and centre of circle is longer than the length of radius, P lies outside the circle.