XINMIN SECONDARY SCHOOL
新民中学
SEKOLAH MENENGAH XINMIN
Weighted Assessment 1 2023

CANDIDATE NAME

CLASS | | | | INDEX NUMBER | | |

ADDITIONAL MATHEMATICS 4049

Secondary 4 Express

22 February 2023

Setter: Mr Johnson Chua

45 minutes

Vetter: Ms Vanessa Chia

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) $y = 4x^3 - 3x^2 + x - 1$ [1]

(b) $y = \dfrac{\left(2x^2 - 1\right)^2}{\sqrt{2x^2 - 1}}$, leaving your answer in the form $kx\sqrt{2x^2 - 1}$, where k is a constant. [2]

2 A curve has the equation $y = \left(px - 5\right)^2$. The gradient of the curve at $(2, q)$ is -4. Find the value(s) of p and q given that $p > q$. [4]

3 **(a)** Find the first three terms, in ascending powers of x, in the expansion of $(2-px)^8$. [2]

(b) When $(1-2x)^2(2-px)^8$ is expanded as far as the term in x^2, the result is $q+rx^2$. Find the value of p, q and r. [4]

TURN OVER FOR QUESTION 4

4 **(a)** Write down the general term in the binomial expansion of $\left(3x+\frac{1}{x^3}\right)^{14}$. [1]

(b) Write down the power of x in this general term. [1]

(c) Explain why the term in $\frac{1}{x^4}$ does not exist in the expansion of $\left(3x+\frac{1}{x^3}\right)^{14}$. [2]

(d) Find the middle term in the expansion of $\left(3x+\frac{1}{x^3}\right)^{14}$. [2]

5 The equation of a circle, C_1, with centre A, is $x^2 + y^2 - 6x + 4y = 27$.

(a) Show that coordinates of A is $(3, -2)$ and that radius of C_1 is $\sqrt{40}$ units. [3]

(b) The highest point on circle, C_1, is P.
Find the equation of the tangent to circle, C_1, at P. [1]

(c) Explain why the point $Q(-3, 8)$ lies outside the circle, C_1. [2]

(d) A second circle, C_2, passes through the points A and Q.
Given that the line $3y - 2x = 7$ passes through the centre of C_2, find the equation of C_2. [5]

END OF PAPER

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Answer Key

1	**(a)** $12x^2-6x+1$ **(b)** $6x\sqrt{2x^2-1}$
2	$p=2, q=-1$
3	**(a)** $256-1024px+1792p^2x^2+...$ **(b)** $p=-1, q=256, r=-1280$
4	**(a)** $\binom{14}{r}3^{14-r}x^{14-4r}$ **(b)** $14-4r$ **(c)** Since $r=\frac{9}{2}$, which is not an integer, $\frac{1}{x^4}$ term does not exist. **(d)** $\frac{7505784}{x^{14}}$
5	**(b)** $y=-2+\sqrt{40}$ **(c)** Length of CQ: $\sqrt{136}$ units Since length of CQ is longer than the length of radius, Q lies outside the circle. **(d)** $(x-10)^2+(y-9)^2=170$