NORTH SYDNEY BOYS' HIGH SCHOOL
2008 Preliminary Course Assessment Task 2

MATHEMATICS
Extension 1

General instructions

- Working time – **65 minutes**.
- Write in the booklet provided.
- Each new question is to be started on a new page.
- Write using blue or black pen.
- Board approved calculators may be used.
- All necessary working should be shown in every question.
- Attempt **all** questions.
- At the conclusion of the examination, bundle the booklets within this paper and hand to examination supervisors.

Class teacher (please ✔)

- ◯ Mr Barrett
- ◯ Mr Lowe
- ◯ Mr Rezcallah/Mr Lam
- ◯ Mr Trenwith
- ◯ Miss Wei
- ◯ Mr Weiss

STUDENT NAME:

Marker's use only.

QUESTION	MARKS
1	/15
2	/12
3	/14
4	/11
5	/10
6	/3
Bonus	/2
Total	/65
Total (%)	/100

Question 1 (15 Marks) Start a NEW page. **Marks**

(a) Solve:

i. $\dfrac{x-3}{x+1} = \dfrac{x-1}{x+2}$. **2**

ii. $y(2y+5) = 12$. **3**

iii. $|x-2| = |2x+1|$. **2**

iv. $|2x-3| = 1-x$. **3**

v. $|5-3x| < 4$. **2**

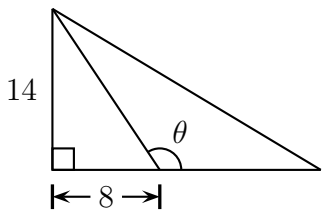
(b) Solve: $\dfrac{3}{2-x} \geq 2$. **3**

Question 2 (12 Marks) Start a NEW page.

(a) Change $125°$ to radian measure. **1**

(b) Find $\cos 2.5$ correct to 2 decimal places **1**

(c) Find θ (to the nearest degree). **2**



(d) Find the exact value of the expression $\dfrac{\tan 45° - \tan 30°}{1 + \tan 45° \tan 30°}$, writing your answer as a fraction with rational denominator. **3**

(e) If $\sin\beta = -\dfrac{1}{3}$ and $\tan\beta < 0$, find the exact value of $\cos\beta$ **2**

(f) Find all the possible values of θ if $2\cos^2\theta - 1 = 0$ and $0 \leq \theta \leq 360°$ **3**

Question 3 (14 Marks) Start a NEW page. **Marks**

(a) i. On the same axes, sketch the graphs of $y = 9 - x^2$ and $y = \dfrac{10}{x}$. **3**

ii. Hence, state the number of solutions of the equation **1**

$$9 - x^2 = \frac{10}{x}$$

(Do ***not*** find these solutions).

(b) The function $f(x)$ is defined by $f(x) = -4x^2 + 8x - 3$.

i. Find the x intercepts, y intercepts and the vertex of $y = -4x^2 + 8x - 3$. **5**

ii. Sketch the graph of $y = -4x^2 + 8x - 3$. **2**
Hence:

iii. State the domain and range of this function. **2**

iv. Solve $-4x^2 + 8x - 3 \leq 0$. **1**

Question 4 (11 Marks) Start a NEW page.

(a) Simplify:

i. $\tan(180^\circ - \theta) \times \sin(90^\circ - \theta)$. **2**

ii. $(1 - \sin\theta)^2 + (1 - \cos\theta)^2 + 2(\sin\theta + \cos\theta)$. **2**

(b) $\triangle ABC$ has an area of $30\sqrt{3}$ m^2. If $AB = 12$ m and $AC = 10$ m, find $\angle A$. **3**

(c) Sketch $y = 2\cos(2x)$, $0 \leq x \leq 360^\circ$. State the period and amplitude of this function. **4**

Question 5 (10 Marks) Start a NEW page. **Marks**

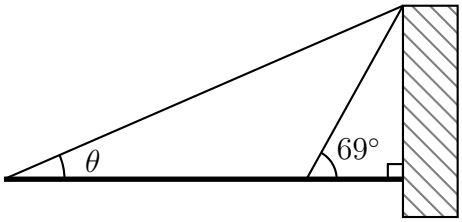
(a) A bush walker walks from Point A on a bearing of 030° for 2.4 km to Point B. He then changes direction at B to 145° to avoid a swamp and follows the course for 3.6 km to Point C.

i. Draw a diagram in your booklet and mark on it all the given information. **2**

ii. Calculate the distance from Point A to Point C. **2**

iii. What is the bearing of Point B from Point C. **1**

(b) A drawbridge is supported by two wires as shown in the diagram. The two wires are attached to the same position on the wall, and the outer wire is 1.7 times the length of the inner wire. If the inner wire makes an angle of 69° with the base, find the angle θ (correct to the nearest degree) that the outer wire makes with the base. **2**



(c) Prove that $\left(\dfrac{\sec\theta + \operatorname{cosec}\theta}{\tan\theta + \cot\theta}\right)^2 = 1 + 2\sin\theta\cos\theta$. **3**

Question 6 (3 + 2 Marks) Start a NEW page.

(a) i. Sketch $y = |x-3| + |x-2|$. **2**

ii. Hence or otherwise, solve $|x-3| + |x-2| < 3$. **1**

(b) The 2 marks BONUS QUESTION (only attempt if you have finished all the previous questions):

Solve the inequality $\Big|3|x| - 1\Big| \leq 3$.

End of paper.

STANDARD INTEGRALS

$$\int x^n \, dx = \frac{1}{n+1} x^{n+1} + C, \qquad n \neq -1; \quad x \neq 0 \text{ if } n < 0$$

$$\int \frac{1}{x} \, dx = \ln x + C, \qquad x > 0$$

$$\int e^{ax} \, dx = \frac{1}{a} e^{ax} + C, \qquad a \neq 0$$

$$\int \cos ax \, dx = \frac{1}{a} \sin ax + C, \qquad a \neq 0$$

$$\int \sin ax \, dx = -\frac{1}{a} \cos ax + C, \qquad a \neq 0$$

$$\int \sec^2 ax \, dx = \frac{1}{a} \tan ax + C, \qquad a \neq 0$$

$$\int \sec ax \tan ax \, dx = \frac{1}{a} \sec ax + C, \qquad a \neq 0$$

$$\int \frac{1}{a^2 + x^2} \, dx = \frac{1}{a} \tan^{-1} \frac{x}{a} + C, \qquad a \neq 0$$

$$\int \frac{1}{\sqrt{a^2 - x^2}} \, dx = \sin^{-1} \frac{x}{a} + C, \qquad a > 0, -a < x < a$$

$$\int \frac{1}{\sqrt{x^2 - a^2}} \, dx = \ln \left(x + \sqrt{x^2 - a^2} \right) + C, \quad x > a > 0$$

$$\int \frac{1}{\sqrt{x^2 + a^2}} \, dx = \ln \left(x + \sqrt{x^2 + a^2} \right) + C$$

NOTE: $\ln x = \log_e x, \; x > 0$

Solutions