Name: _____   Teacher: _____

SYDNEY TECHNICAL HIGH SCHOOL

(Est. 1911)

MATHEMATICS
YEAR 11
PRELIMINARY ASSESSMENT TASK 2
July 2005
Time Allowed – 70 mins

DIRECTIONS TO CANDIDATES:

- Write your solutions in ink.

- Approximate marks are shown in each question. Marks may be adjusted slightly during the marking process if necessary.

- All working should be shown in every question.

- Full marks may not be awarded for careless or badly arranged work.

- Approved calculators may be used.

- Each question attempted is to be started ON A NEW PAGE, clearly marked with the number of the question and your name and class on the top right hand side of the page.
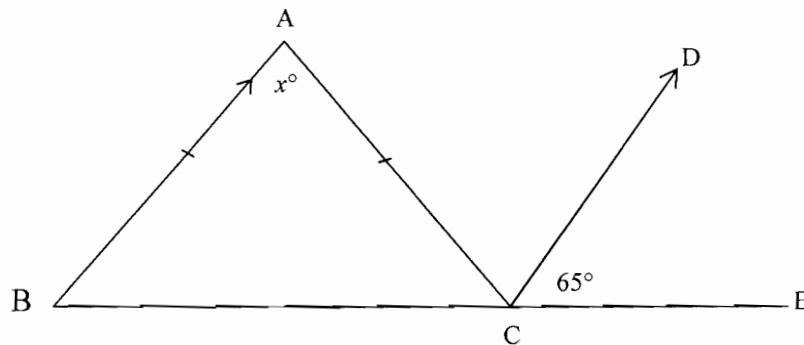
QUESTION	MARK
Question 1	
Question 2	
Question 3	
Question 4	
Question 5	
Question 6	
Question 7	
Question 8	
TOTAL	

Question 1   **(7 marks)**

a)   Solve $2\sin A = \sqrt{3}$ for $0° \le A \le 360°$ **2**

b)   State the domain for $y = \dfrac{\sqrt{x+1}}{x-1}$ **2**

c)   Sketch the region where $y \le 4 - x^2$ **1**

d)   i)   Sketch $y = |x + 4|$, $-5 < x < 1$ **1**

        ii)   Hence or otherwise, write down the solution for $|x + 4| = -x$ **1**

Question 2   **(7 marks)**   **START A NEW PAGE**

a)   Find the exact value of $\sec 60°$ **1**

b)   In the diagram AB = AC and AB ∥ DC   **3**
       Giving a reason for each step, find the value of x.

c)   Find the exact solution of $\tan^2 A - 3 = 0$ if $0° \le A \le 360°$ **3**

Question 3   (7 marks)   START A NEW PAGE

The points A (-3, 6), B (-6, 0) and C form a right angled triangle with the right angle at A. The point C is on the y axis.

       a)   Draw a neat sketch showing this information.   **1**

       b)   Find the exact length of AB.   **1**

       c)   Find the slope of AB.   **1**

       d)   Find, in general form, the equation of AC (do not attempt to find the y intercept yet)   **2**

       e)   Hence find the x and y intercepts of the line through A and C.   **2**

Question 4   (7 marks)   START A NEW PAGE

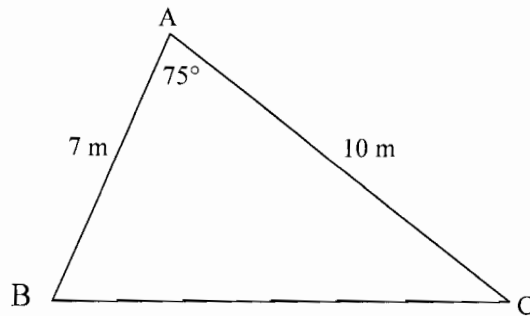a) $y=f(x)$ has been drawn for $x \geq 0$ **2**
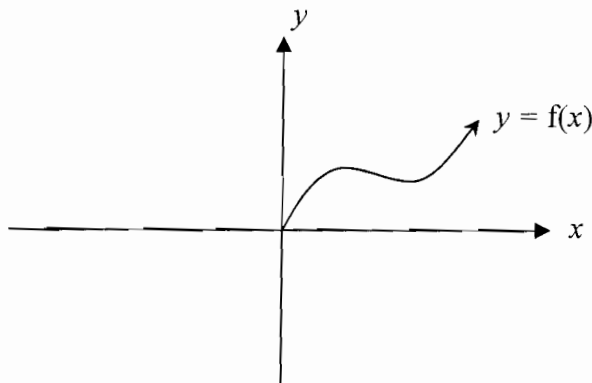
       i)   Copy the diagram and complete the graph of $y = f(x)$ if $f(x)$ is an EVEN function

       ii)   Copy the diagram and complete the graph of $y = f(x)$ if $f(x)$ is an ODD function

b)   Sketch the region defined by the inequations $x + y \leq 1$ and $x + y \geq 0$ **3**

c)   Prove that $\dfrac{\cos^2 \theta}{(1 - \cos\theta)(1 + \cos\theta)} = \cot^2 \theta$ **2**

Question 5   **(7 marks)**   **START NEW PAGE**

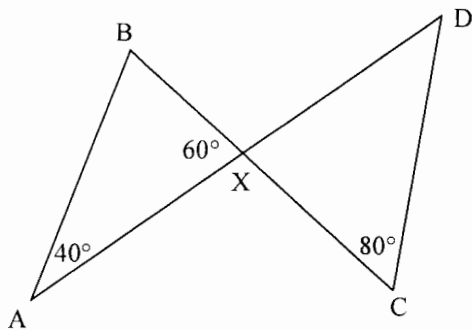a)   If $\tan A = -\frac{3}{8}$ and $\cos A < 0$ find the exact value of $\sin A$ **2**

b)

A

75°

7 m   10 m

B   C

     i)   Find the length of BC to the nearest cm.   **3**

     ii)   Find the area of $\triangle$ ABC (in m^2 to 2 dec. places)   **2**

Question 6   **(7 marks)**   **START A NEW PAGE**

a)   Lines AD and BC intersect at X. Prove that AB is parallel to CD.   **2**

B   D

60°

X

40°   80°

A   C

b)

400 m

l m

60°

50°

h m
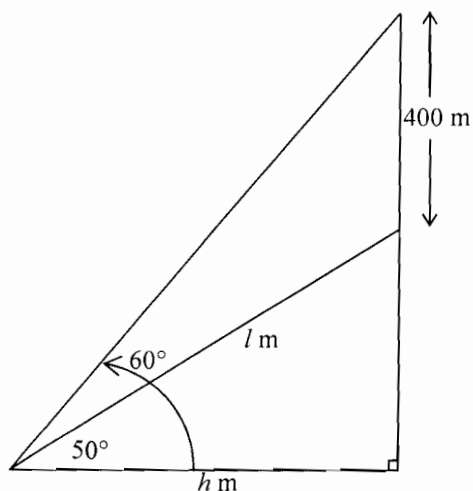
     i)   Use the sine rule to find the value of l correct to 1 decimal place.   **3**

   ii)   Use this value of l to find the value of h correct to 1 dec. place.   **2**

Question 7 (7 marks) **START A NEW PAGE**

a) Determine the sum of the interior angles of a regular polygon if each exterior angle is 24°. **2**

b) i) From $\sin^2\theta + \cos^2\theta = 1$ obtain another Pythagorean Identity for $\cos ec^2\theta$ (show your reasoning clearly). **2**

ii) Hence simplify $1 - \cot^2\theta + \cos ec^2\theta$ **1**

c) Find the equation of the line which is parallel to the line $2x - 5y + 3 = 0$ and contains the point (1, 4). **2**

Question 8 (7 marks) **START A NEW PAGE**

a) **5**
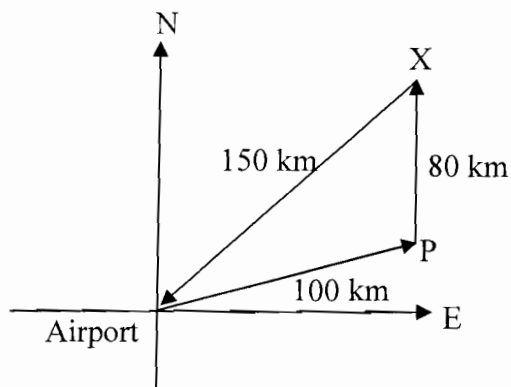
A pilot flies out from the airport on a bearing which is roughly a bit north of east for 100 km to point P. She then turns due north and flies for 80 km to point X. At this point she is exactly 150 km from the airport.

i) Calculate the bearing to the nearest minute on which she must fly to return directly to the airport.

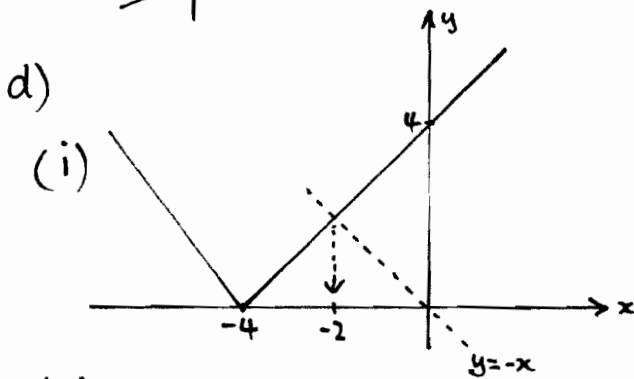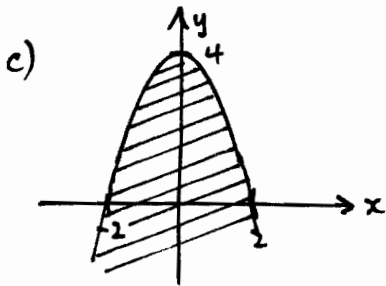ii) Write down the bearing of point X from the airport.

b) **2**
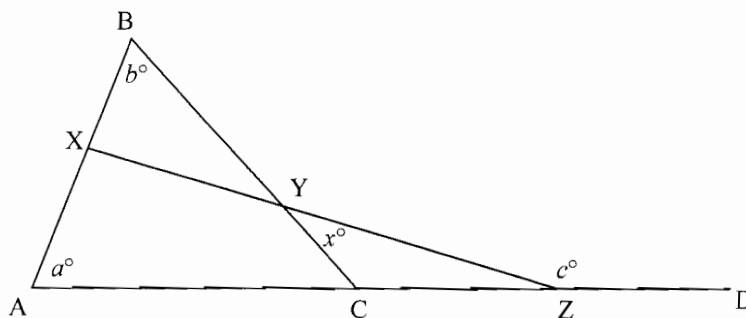
AD, XZ, AB and BC are straight lines. Find an expression for x in terms of a, b and c.

YEAR 11 2 UNIT ASSESSMENT TASK 2   JULY 2005

QUESTION 1.

SOLUTIONS AND MARKING SCHEME.

a) $\sin A = \dfrac{\sqrt{3}}{2}$

∴ A = 60° or 120°
   ①   ①

1 for each value

b) $x \ne 1, \; x \ge -1$

1 mark each

c)

1 or 0. At least x or y intercepts correct.

d)

(i)

i) 1 or 0. x intercept must be shown. $y = -x$ need not be shown.

(ii) $x = -2$

(ii) ① No working required.

QUESTION 2

a) $\sec 60° = \dfrac{1}{\cos 60°} = 2$

a) ① mark

b)
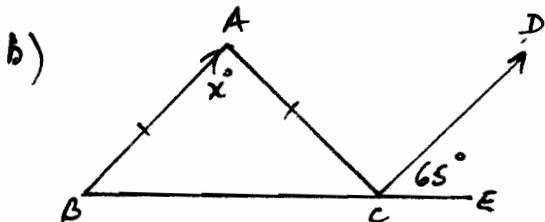
∠B = 65° (Corresponding ∠s, AB‖DC)
∠ACB = 65° (∠s opposite equal sides)
$x + 65 + 65 = 180$ (∠ sum of △ABC)
∴ $x = 50$

① statement + reason
①   "   "
①   "   "

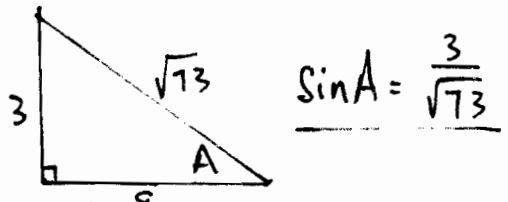c) $\tan^2 A = 3 \Rightarrow \tan A = \pm\sqrt{3}$
    ∴ A = 60° 240°

All 4 answers correct – 3 marks
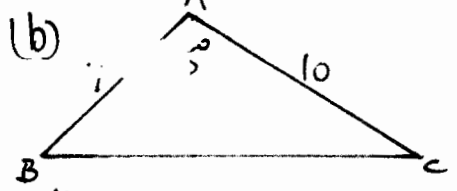60° and 240° only – 2 marks

QUESTION 5

(a) A is in 2nd quadrant

$\sin A = \dfrac{3}{\sqrt{13}}$

Correct answer – 2 marks
or
1 mark for choosing 2nd quadrant

(b)

(i) $BC^2 = 7^2 + 10^2 - 2.7.10.\cos 75°$

∴ $BC = 10.62$ m

(ii) $Area = \frac{1}{2}.10.7.\sin 75°$

$= 33.81$ m²

3 marks if correct   or
2 marks if incorrect rounding (2dp.)
1 mark for correct formula

QUESTION 6

(a)
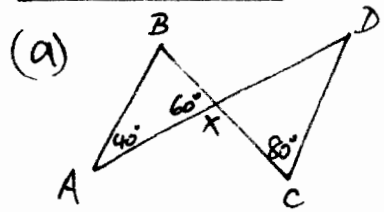
$40° + 60° + \angle B = 180°$

∴ $\angle B = 80°$ (∠ sum of $\triangle ABX$)

∴ $\angle B = \angle C$
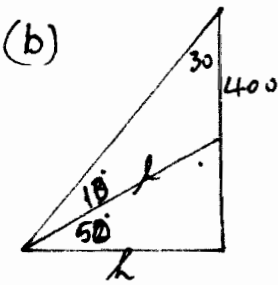
∴ $AB \parallel CD$ (alternate ∠s equal)

1 mark for showing $\angle B = 80°$
or $\angle D = 40°$

AND
1 mark for correct reason
for parallelism

(b)

(i) $\dfrac{l}{\sin 30°} = \dfrac{400}{\sin 10°}$

∴ $l = \dfrac{400.\sin 30°}{\sin 10°}$

$\doteqdot 1151.75$

(ii) $\dfrac{h}{l} = \cos 50°$

$h = 1151.75 \times \cos 50°$

$\doteqdot 740.3$

(i) 3 for correct answer –   or
2 for correct formula   or
1 for finding 30°

(ii) 2 for correct answer (~740)
– allow more exact answer
if better value of l used
from (i).   OR

QUESTION 7

a) $24n = 360°$

    $\therefore n = 15$

    $\angle Sum = 15 \times 156° = 2340°$

- 2 marks for correct answer OR
- 1 mark for $n = 15$

b) i) $\sin^2\theta + \cos^2\theta = 1$

    ie $\dfrac{\sin^2\theta}{\sin^2\theta} + \dfrac{\cos^2\theta}{\sin^2\theta} = \dfrac{1}{\sin^2\theta}$

    ie $1 + \cot^2\theta = \csc^2\theta$

- 2 marks for correct answer OR
- 1 mark if working not shown.

  ii) $1 - \cot^2\theta + \csc^2\theta$

    $= 1 - \cot^2\theta + 1 + \cot^2\theta$ from (i)

    $= 2$

- 1 mark

c) Parallel line has eqn

    $2x - 5y + c = 0$

  $x = 1, y = 4:$ $2 - 20 + c = 0$

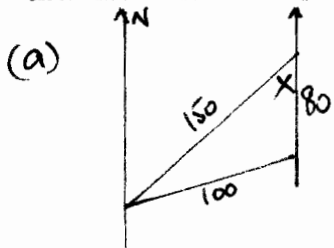 $\therefore c = 18$

  Req^d Eqn: $2x - 5y + 18 = 0$

- 2 marks for correct answer OR
- 1 for showing $2x - 5y + c = 0$ OR
- 1 for showing slope is $\frac{2}{5}$

QUESTION 8

(a)

(i) $100^2 = 150^2 + 80^2 - 2 \cdot 150 \cdot 80 \cos X$

  ie $\cos X = \dfrac{150^2 + 80^2 - 100^2}{2 \cdot 150 \cdot 80}$

          $= 38°3'$ ———(d)

$\therefore$ Course to Airport $218°3'$

- 3 for correct answer OR
- 2 for correct formula for $\cos X$ OR
- 1 for attempting to find $\angle X$

(ii) X bears $38°3'$ from Airport

- 1 mark if same as (d)

(b)

    $x = c - a - b$

- 2 for correct answer OR
- 1 if an exterior ∠ calculated correctly