Name : _____ Teacher : _____

SYDNEY TECHNICAL HIGH SCHOOL

MATHEMATICS
Year11

PRELIMINARY ASSESSMENT

TASK 2

JULY 2003

Time allowed: 70 minutes

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	TOTAL
/8	/8	/8	/8	/8	/8	/9	/9	/66

Instructions:

- **Show all necessary working in every question.**
- **Attempt all questions.**
- **All questions are not of equal value.**
- **Full marks may not be awarded for careless or badly arranged work.**
- **Approved calculators may be used.**
- **These questions are to be handed in with your answers.**

QUESTION 1: (8 marks)

(1) a. Write down the exact value of $\tan 30°$

(3) b. Factorise i. $x^3 - 27$

ii. $x^2 - xy - 3x + 3y$

(2) c. Solve $|2x+1| \leq 7$

(2) d. Solve $3x^2 - 14x - 5 = 0$

QUESTION 2: (8 marks)

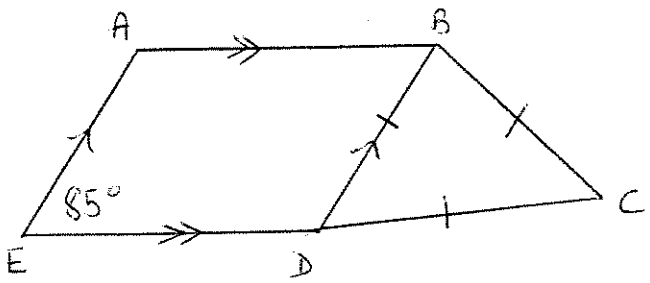
(2) a. Rationalise the denominator of

$$\frac{3}{\sqrt{7}+2}$$

(3) b. Solve simultaneously

$$2x+3y+1=0$$
$$3x-y=4$$

(3) c. Find the value of $\angle ABC$, giving reasons.



Not to scale

QUESTION 3: (8 marks)

(6) a) Write down the exact value of:

i. $\cos 225°$

ii. $\sec(-30°)$

iii. $\tan^2 390°$

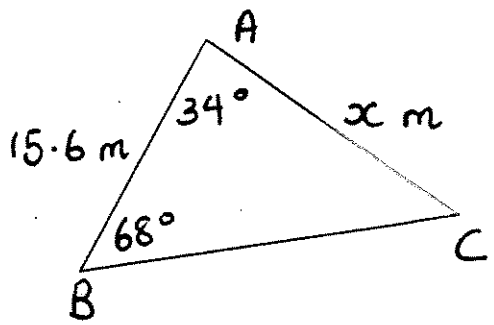
(2) b) If $\cos\theta = p$ and $\sin\alpha = q$, find an expression for,

$$\cos(360^0 - \theta)\sin(180^0 + \alpha)$$

QUESTION 4: (8 marks)

(1) a. Solve $\sin(2x)° = \cos(40 + x)°$, where $0^0 \leq x \leq 90°$

(5) b.



i. Find x, correct to the nearest centimetre.

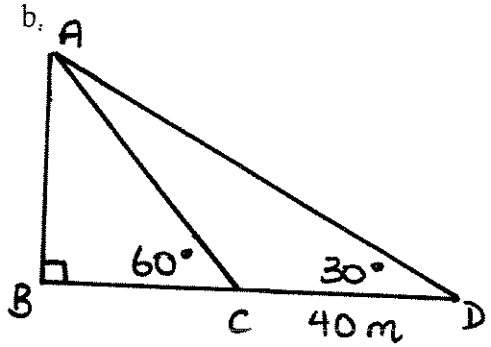
ii. Calculate the area of ΔABC, correct to the nearest square metre.

(2) c. The midpoint M of the interval AB is (1,-3)
Find the co-ordinates of B given A is (7,2)

QUESTION 5: (8 marks)

(3) a. If $\sin \alpha = m$ and α is obtuse, find an expression for $\cos \alpha$

(5) b.



i. Write down the size of $\angle ACD$

ii. Find the length of AC

iii. Find the exact length of AB

QUESTION 6: (8 marks)

(2) a. Solve $\cos x = -\frac{1}{2}$ for $-180° \leq x \leq 180°$

(3) b. Solve $3\tan^2 x - 1 = 0$ for $0° \leq x \leq 360°$

(3) c. Solve $\sec 2x = 1$ for $0° \leq x \leq 360°$

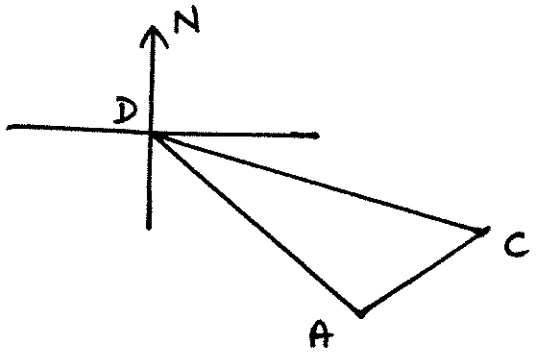
QUESTION 7: (9 marks)

(4) a. Prove that

$$\frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta} = 2\operatorname{cosec}\theta$$

(5) b. Daffy walks on a bearing of 150° T, from D, for 12km before changing his course at

A to 040° T and continuing for 8km to C.

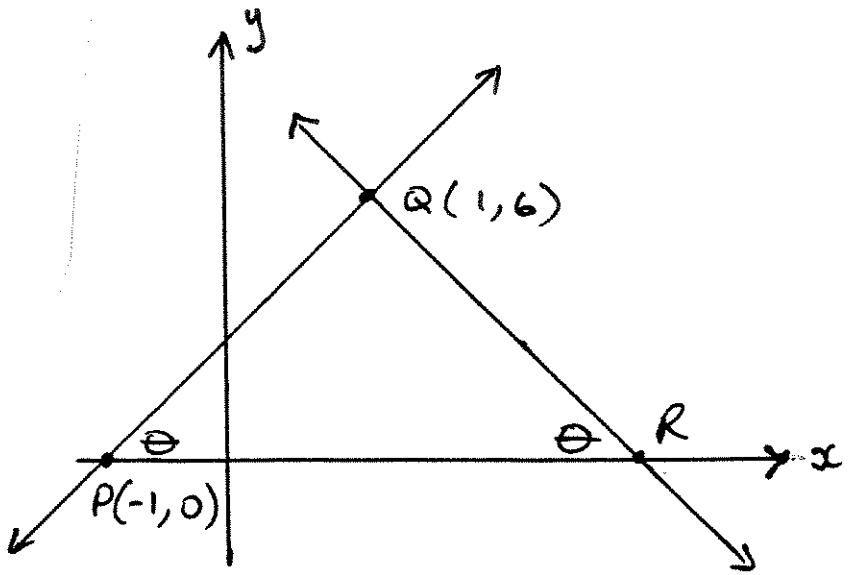


i Copy the diagram and explain why $\angle DAC = 70°$

ii How far is Daffy from his starting point?

iii What is the bearing of C from Daffy's starting point D?

QUESTION 8: (9 marks)



Triangle PQR is isosceles with
P (-1,0) , Q (1,6)

(1) a. Find the distance of PQ

(2) b. Find the equation of the line through P and Q

(1) c. Find the size of θ, correct to the nearest degree

(3) d. Find the equation of the QR, and hence find the co-ordinates of R

(2) e. Find the perpendicular distance from P to QR

2003

YEAR 11 TERM 3 COMMON TEST 2 UNIT

S | A
T | C

Question 1

a) $\tan 30° = 1/\sqrt{3}$ ①

b) i. $x^3 - 27 = (x-3)(x^2+3x+9)$ ①

ii. $x^2 - xy - 3x + 3y$
$= x(x-y) - 3(x-y)$ ①
$= (x-y)(x-3)$ ①

c) $|2x+1| \leq 7$

$2x+1 \leq 7$ $\quad -2x-1 \leq 7$
$2x \leq 6$ $\quad -2x \leq 8$
$x \leq 3$ ① $\quad x \geq -4$ ①

d) $3x^2 - 14x - 5 = 0$

$3x \; +1$
$x \; -5$

$(3x+1)(x-5) = 0$
$x = -\frac{1}{3}$ ①, $x = 5$ ①

Question 2

a) $\frac{3}{\sqrt{7}+2} \times \frac{\sqrt{7}-2}{\sqrt{7}-2}$ ① $= \frac{3(\sqrt{7}-2)}{7-4}$
$= \sqrt{7} - 2$ ①

b) $2x + 3y = -1$
$9x - 3y = 12$ ①

$11x = 11$
$x = 1$ ①
$y = -1$ ①

c) ① $\angle DBC = 60°$ (ΔBDC is equilateral)
① $\angle ABD = 85°$ (opp $\angle$'s in $\parallel$ogram equal)
∴ $\angle ABC = 60 + 85 = 145°$ (sum of adj $\angle$'s)

Question 3

a) i. $\cos 225° = -\cos 45°$
$= -1/\sqrt{2}$ //

ii. $\sec(-30°) = \frac{1}{\cos 30°} = \frac{2}{\sqrt{3}}$ //

iii. $\tan^2 390° = (\tan 30°)^2$
$= (1/\sqrt{3})^2$ ✓✓
$= 1/3$

b) $\cos(360 - \theta) \sin(180 + \alpha)$
(4th quad) (3rd quad)
$= \cos\theta \cdot -\sin\alpha$ ✓
$= p \times -q$
$= -pq$ ✓

Question 4

a) $\sin 2x = \cos(40 + x)$
$2x + 40 + x = 90$
$3x = 50$
$x = 50/3$ ✓①

b) i. $\frac{x}{\sin 68°} = \frac{15.6}{\sin 78°}$ ① = 78° ① = Sine rule
$x = \frac{15.6 \sin 68°}{\sin 78°}$
$= 14.79$ m ① Ans correct to 2 dec pl.

ii. $A = \frac{1}{2} ab \sin C$ ①
use ans to part (i) $= \frac{1}{2} \times 15.6 \times 14.79 \times \sin 34°$
$= 64.509...$
$= 65 \text{ m}^2$ > ① either

c) (x, y) (7, 2) Midpt (1, -3)

$\frac{x+7}{2} = 1$ $\quad \frac{y+2}{2} = -3$
$x + 7 = 2$ $\quad y + 2 = -6$
$x = -5$ ① $\quad y = -8$ ①

∴ B (-5, -8)

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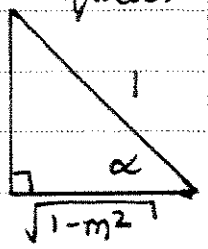
Question 5

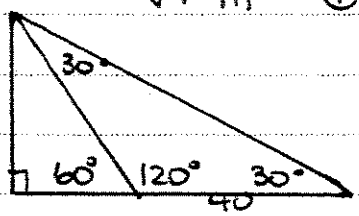
a) $\sin\alpha = m$ — 2nd quad



$\therefore \cos\alpha = -\frac{\sqrt{1-m^2}}{1}$

$= -\sqrt{1-m^2}$ ①

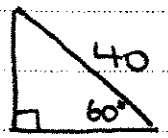
b)



i. $\angle ACD = 120°$ ①

ii. $AC = 40$ m $\triangle ACD$ is isosceles. ①

iii.



$\sin 60° = \frac{AB}{40}$ ①

$AB = 40\sin 60°$

$= 40\frac{\sqrt{3}}{2}$ ①

$= 20\sqrt{3}$ ①

Question 6

a) $\cos x = -1/2 \quad -180° \le x \le 180°$

$x = 120°, -120°$ ① ①

S	A
T	C

$\cos 60° = 1/2$

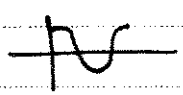
b) $3\tan^2 x - 1 = 0$

$\tan x = \pm 1/\sqrt{3}$ ①

$x = 30°, 150°, 210°, 330°$ ②

c) $\sec 2x = 1$

$\therefore \cos 2x = 1$ ①



$2x = 0°, 360°, 720°$ ①

$x = 0°, 180°, 360°$ ①

Question 7

a) LHS $= \frac{\sin\theta}{1+\cos\theta} + \frac{1+\cos\theta}{\sin\theta}$

$= \frac{\sin^2\theta + (1+\cos\theta)^2}{\sin\theta(1+\cos\theta)}$ ①

$= \frac{\sin^2\theta + 1 + 2\cos\theta + \cos^2\theta}{\sin\theta(1+\cos\theta)}$ ①

$= \frac{1 + 1 + 2\cos\theta}{\sin\theta(1+\cos\theta)}$

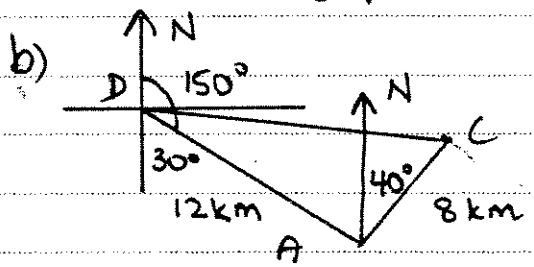
$= \frac{2(1+\cos\theta)}{\sin\theta(1+\cos\theta)}$ ①

$= \frac{2}{\sin\theta}$ ①

$= 2\operatorname{cosec}\theta$

$=$ RHS.

b)



① include diagram

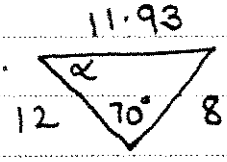
i. $\angle DAC = 30° + 40°$

$= 70°$

ii. $x^2 = 12^2 + 8^2 - 2\times 12\times 8\times\cos 70°$

$x = 11.93$ km (2dp)

iii.



$\frac{\sin\alpha}{8} = \frac{\sin 70°}{11.93}$

$\sin\alpha = \frac{\sin 70° \times 8}{11.93}$

$\alpha = 39°$

$\therefore$ bearing $= 150 - 39$

$= 111°$ T

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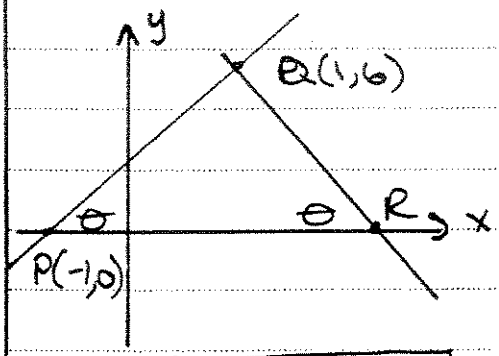
Question 8



a) $d = \sqrt{(1--1)^2 + (6-0)^2}$

$= \sqrt{2^2 + 6^2}$

$= \sqrt{40}$ -①

$= 2\sqrt{10}$

b) $m_{PQ} = \frac{6-0}{1--1}$

$= \frac{6}{2}$

$= 3$ ①

$\therefore y - 6 = 3(x-1)$

$y = 3x + 3$ ①

c) $\tan\theta = m$

$\tan\theta = 3$

$\theta = 72°$ ①

d) $m_{QR} = -3$ ① as $\angle QRP = \theta$

$\therefore y - 6 = -3(x-1)$

$y - 6 = -3x + 3$

$3x + y - 9 = 0$ ①

$\therefore R$ when $y = 0$

$x = 3$

$R(3,0)$ ①

e) $d_{\perp} = \frac{|ax_1 + by_1 + c|}{\sqrt{a^2 + b^2}}$ > either ①

$= \frac{|3x + y - 9|}{\sqrt{9 + 1^2}}$ pt $(-1,0)$

$= \frac{|-3 + 0 - 9|}{\sqrt{10}}$

$= \frac{12}{\sqrt{10}}$ ①

$= \frac{6\sqrt{10}}{5}$