Student Name: .

SCEGGS Darlinghurst

2012

Preliminary Assessment Task 3
Tuesday 12 June 2012

Mathematics

Task Weighting: 25%
Assessment Outcomes: P2, P3, P4 and P5

General Instructions

- Time allowed – 1 hour
- You are allowed to bring in one A4 handwritten page of notes
- This paper has a **Multiple Choice Section** and **three** questions
- Answer in the writing booklets provided
- Start each question in a **new writing booklet**
- Write your Student Number on each booklet
- Attempt **all** questions and show all necessary working
- Marks may be deducted for careless or badly arranged work
- Mathematical templates, geometrical equipment and scientific calculators may be used

Total marks (39)

- Attempt **all** Questions

Question	Functions	Linear F	Geometry	Total
Multiple Choice	/2	/2	/1	/5
6	/2	/9		11
7	/6		/5	/11
8	/6		/6	/12
Total	/16	/11	/12	/39

Multiple Choice

5 marks
Attempt Questions 1– 5

Use the multiple-choice answer sheet provided.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: $2 + 4 =$ (A) 2 (B) 6 (C) 8 (D) 9

A ○ B ● C ○ D ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ● B ⊗ C ○ D ○

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word ***correct*** and drawing an arrow as follows.

correct ↙

A ● B ● C ○ D ○

1 What is the value of $f(2a+1)$ if $f(x)=3x-2$?

(A) $6a-2$

(B) $6a-1$

(C) $6a+1$

(D) $6a+2$

2 What is the midpoint of $(-3,5)$ and $(2,-3)$?

(A) $(-\frac{1}{2},1)$

(B) $(\frac{1}{2},-1)$

(C) $(0,1)$

(D) $(2\frac{1}{2},4)$

3 What is the point of intersection of the lines $y=x+2$ and $y=-x+4$?

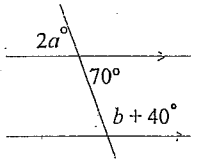
(A) $(1,2)$

(B) $(2,1)$

(C) $(1,3)$

(D) $(3,2)$

4



What are the values of a and b?

(A) $a=35^\circ, b=30^\circ$

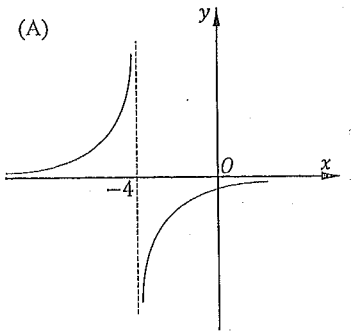
(B) $a=35^\circ, b=70^\circ$

(C) $a=70^\circ, b=30^\circ$

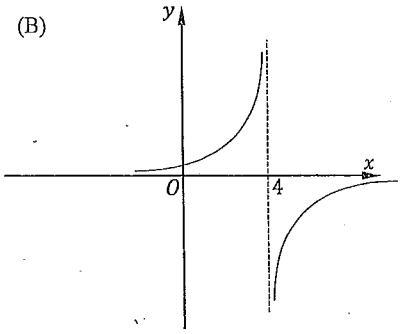
(D) $a=70^\circ, b=70^\circ$

5 Which of the following best represents the graph of $y=\frac{1}{x-4}$?

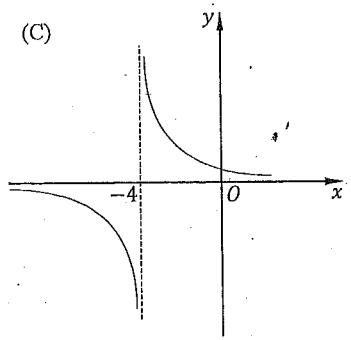
(A)



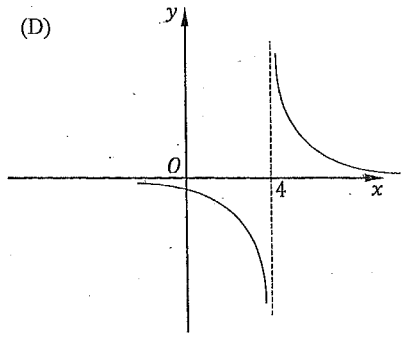
(B)



(C)



(D)

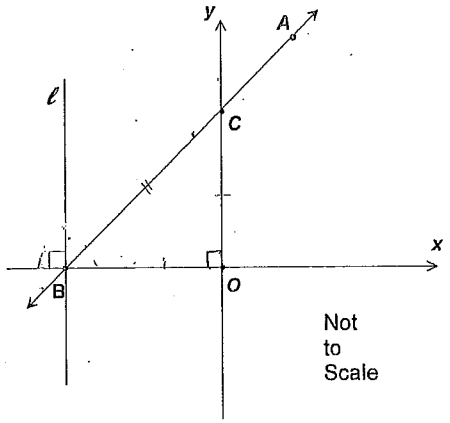


Marks

Question 6

(a) Graph the function $y = |x - 4|$ and state the range. **2**

(b)



The diagram shows the points $A(1, 3)$ and $B(-2,0)$.
The line ℓ is drawn perpendicular to the x axis through the point B.

(i) Calculate the exact length of AB. **1**

(ii) Find the gradient of AB. **1**

(iii) What is the size of the obtuse angle between AB and line ℓ? **2**

(iv) Verify that the equation of line AB is $y = x + 2$. **1**

(v) What is the equation of line ℓ? **1**

(vi) If AB cuts the y axis at C, find the area of ΔBOC. **1**

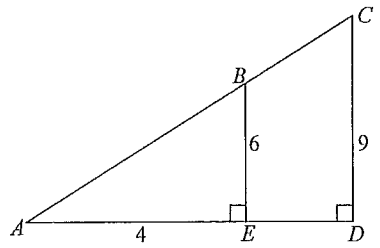
(vii) Write down the inequalities that define the area of ΔBOC. **2**

- **Start a new booklet**

Marks

Question 7

(a)



In the diagram $BE \perp AD$, $CD \perp AD$, $AE = 4$cm, $BE = 6$cm, $CD = 9$cm.

(i) Show that $\Delta ABE \,|||\, \Delta ACD$. **3**

(ii) Find the length of ED. **2**

(b) Consider the parabola $y = -x^2 - 2x + 3$.

(i) Find the x intercepts of the parabola. **2**

(ii) Find the vertex of the parabola. **2**

(iii) Draw a neat sketch of the parabola showing all the important features of the curve. **2**

Start a new booklet

Marks

Question 8

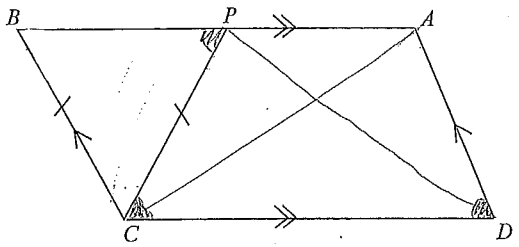
(a) If $f(y) = \begin{cases} 2 - y^2 \text{ if } y \geq 0 \\ 3 - y \text{ if } y < 0 \end{cases}$

Evaluate $f(4) + f(-4) + f(0)$ **3**

(b) Determine if the function $f(x) = 8 - 3x^2$ is even, odd or neither. Justify your answer. **2**

(c) Given $f(x) = x + \frac{1}{x}$, show that $f\left(\frac{1}{x}\right) = f(x)$. **1**

(d)



$ABCD$ is a parallelogram and $CP = CB$.

(i) Explain why $\angle CBP = \angle CPB$. **1**

(ii) Prove that $\angle PCD = \angle ADC$. **2**

(iii) Prove that $\Delta PCD \equiv \Delta ADC$. **3**

End of paper

Preliminary Mathematics Assessment Task 3 2012 – SOLUTIONS

M/C

Q1 $f(2a+1) = 3(2a+1) - 2$
$= 6a + 3 - 2$
$= 6a + 1$

C
F – 1

All multiple choice questions were well done.

Q2 $x_M = \frac{-3+2}{2}$ $\quad y_M = \frac{5+-3}{2}$
$= -\frac{1}{2}$ $\quad = 1$
$\left(-\frac{1}{2}, 1\right)$

A
LF + 1

Q3 $y = x + 2$
$y = -x + 4$
solve simultaneously
$x + 2 = -x + 4$
$2x = 2$
$x = 1 \quad y = 3$
$(1, 3)$

C
LF – 1

Q4 $2a = 70$ $\quad b + 40 + 70 = 180$
$a = 35$ $\quad b = 70$

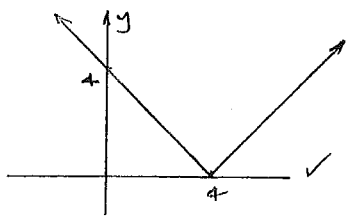
B
G – 1

Q5

D
F – 1

Written Response

Q6 a)



range: $y \geq 0$ ✓

F – 2

Some students had clearly not practised these graphs

b) i) $d = \sqrt{(1--2)^2 + (3-0)^2}$
$= \sqrt{3^2 + 3^2}$
$= \sqrt{18} \quad (3\sqrt{2})$ units ✓

Only a few could not handle the negative

ii) $m_{AB} = \frac{3-0}{1--2}$
$= 1$ ✓

Students still made calculation errors.

iii) $m = \tan\theta$
$1 = \tan\theta$
$\theta = 45°$ ✓
$\therefore$ obtuse angle $= 135°$ ✓

Many students did not remember this important formula – others did not find the obtuse angle

iv) $y = mx + b$
$y = 1x + b$
sub $(1, 3)$ $\quad 3 = 1 \times 1 + b$ ✓
$b = 2$
$\therefore y = x + 2$

Generally well done

v) $l: x = -2$ ✓

Some students did not know the equation of a vertical line.

vi) $C(0, 2)$
$\therefore$ Area $= \frac{1}{2} \times 2 \times 2$
$= 2$ units^2 ✓

Don't look for complications – it has a right angle.

vii) $y \leq x + 2 \quad y \geq 0 \quad x \leq 0$

LF – 9

Poorly done

Q7 a)i) In ΔABE and ΔACD

$\angle AEB = \angle ADC = 90°$ ($BE \perp AD$, $CD \perp AD$) ✓

$\angle BAE = \angle CAD$ (LA is common) ✓

$\therefore \Delta ABE \equiv \Delta ACD$ (equiangular) ✓

A-3

ii) $\frac{4}{6} = \frac{4+ED}{9}$ ✓ corresponding sides in similar triangles

$36 = 24 + 6 \times ED$

$6 \times ED = 12$

$ED = 2$ units ✓

A-2

b) i) x-intercept $y=0$

$-x^2 - 2x + 3 = 0$

$x^2 + 2x - 3 = 0$

$(x+3)(x-1) = 0$

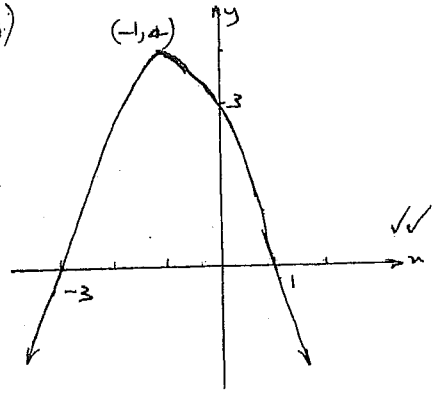
$x = -3 \quad x = 1$ ✓✓

ii) axis of symmetry $x = -1$

$\therefore$ vertex $(-1, a)$

✓✓

iii)



✓✓

F-6.

Well articulated reasons are required.

Some students failed to state the test.

Some students successfully used trigonometry — this is time-consuming and not recommended.

Those students that dealt with the negative "easily" had more success.

The negative coefficient of x caused great confusion among those who could not handle it

Many students drew parabolas that were clearly not symmetrical. This should provide the students with a strong hint that their solution has an error.

Students confused y intercept and vertex of the parabola.

Q8 a) $f(4) = -14$

$f(-4) = 7$

$f(0) = 2.$ } ✓✓

$f(4) + f(-4) + f(0) = -14 + 7 + 2$

$= -5$ ✓

F-3

b) $f(x) = 8 - 3x^2$

$f(-a) = 8 - 3(-a)^2$ ✓

$= 8 - 3a^2$

$= f(a)$ ✓

$\therefore f(x)$ is an even function

F-2

c) $f(x) = x + \frac{1}{x}$

$f\left(\frac{1}{x}\right) = \frac{1}{x} + \frac{1}{\frac{1}{x}}$

$= \frac{1}{x} + x$ ✓

$\therefore f(x) = f\left(\frac{1}{x}\right)$

F-1

d) i) $\angle CBP = \angle CPB$ (angles opposite equal sides are equal) ✓

ii) $\angle PCD = \angle BPC$ (alternate angles in parallel lines) ✓

$\angle BPC = \angle CBP$ (from i))

$\angle CBP = \angle ADC$ (opposite angles in a parallelogram) ✓

$\therefore \angle PCD = \angle ADC$

mostly well done.

Well done by most, but a few girls tried to 'fudge' the answer.

Also well done, but some girls didn't realize $\frac{1}{\frac{1}{x}} = x$!!

mostly well done.

Some students used a longer, acceptable proof. This was time consuming.

Generally explanations need to be more clear and concise.

iii) In ΔPCD and ΔADC

$\angle PCD = \angle ADC$ (proven in ii))

$PC = BC$ (given)

$BC = AD$ (opposite sides in a parallelogram are equal) ✓

$\therefore PC = AD$

DC is common. ✓

$\therefore \Delta PCD \equiv \Delta ADC$ (SAS). ✓

G-6.

Many students did not use previously proven information. Try to keep a reason to <u>one</u> fact. Too many concepts were included in one reason.