

# **SYDNEY TECHNICAL HIGH SCHOOL**



## **YEAR 11 MATHEMATICS**

### **PRELIMINARY ASSESSMENT TASK 1**

**MAY 2012**

Time Allowed: 70 MINUTES

#### **Instructions**

1. Attempt all questions
2. Start each question on a new page
3. Show all necessary working
4. Write your name and your teachers name on each booklet used
5. Approved calculators may be used

**QUESTION 1**

(10 MARKS)

MARKS

- a) Calculate  $\frac{3.7 \times 8.9}{\sqrt{16.94} + 10}$  to 4 significant figures. 2
- b) Write  $0.2\dot{6}$  as a fraction in its lowest terms, showing working. 2
- c) Evaluate  $\sqrt[4]{256}$  1
- d) A manufacturer produces an item for \$225. At what price must the item be sold to make a profit of 40% ? 1
- e) Evaluate  $|2^2 - 8| - |-7|$  1
- f) (i) Express  $\sqrt[3]{x^5}$  in index notation. 1  
(ii) Express  $\frac{1}{3x^2}$  using negative indices. 1

**QUESTION 2** (9 MARKS)

MARKS

- a) An insect weighs  $2.3 \times 10^{-3}$  grams. How much would 2500 of these insects weigh? 1
- b) Simplify (i)  $2x - 4y + 6x - 9y$  1  
(ii)  $(3\sqrt{7})^2$  1
- c) Simplify  $2\sqrt{75} + 4\sqrt{147}$  2
- d) Find  $m$  and  $n$  if  $m - n\sqrt{5} = (3 - \sqrt{5})^2$  2
- e) Express  $\frac{4 + \sqrt{3}}{2\sqrt{6}}$  with a rational denominator. 2

**QUESTION 3** (9 MARKS)

MARKS

a) Expand and simplify

$$(i) \ 5(x - 2) + 3(2x - 9) \quad 2$$

$$(ii) \ (x - 1)^2 - (x + 2)(2x + 5) \quad 3$$

b) Factorise

$$(i) \ 2x^2 + 3x - 2 \quad 1$$

$$(ii) \ 8m^3 + 125 \quad 1$$

$$(iii) \ xy - y^2 - x + y \quad 2$$

**QUESTION 4** (9 MARKS)

$$a) \quad \text{Simplify} \quad (i) \ \frac{9m + 6}{3m^2 + 2m} \quad 2$$

$$(ii) \ \frac{x^2 - x - 20}{x^2 - 25} \div \frac{x + 1}{x^2 + 5x} \quad 3$$

$$b) \quad \text{Factorise} \ (2x - 3)^2 - 25 \quad 2$$

$$c) \quad \text{Express} \ \frac{2x}{5} - \frac{x + 1}{10} \text{ as a single fraction in its lowest terms.} \quad 2$$

**QUESTION 5** (8 MARKS)

MARKS

- |       |                                     |   |
|-------|-------------------------------------|---|
| Solve | a) $3t - 3 = 5t + 8$                | 2 |
|       | b) $ 2x + 3  = 11$                  | 2 |
|       | c) $\frac{7}{a} + 2 = \frac{3}{2a}$ | 2 |
|       | d) $x^2 + 5x = -6$                  | 2 |

**QUESTION 6** (10 MARKS)

- |    |   |   |
|----|---|---|
| a) | The curved surface area ( $A$ ) of a cylinder is given by $A = 2\pi rh$ .<br>Find the height ( $h$ ) if the area of the curved surface is $132\pi \text{ cm}^2$<br>and the radius is $6\text{cm}$ . | 2 |
| b) | Solve $3x - 4 > x + 7$ and graph its solution on a number line.   | 3 |
| c) | Solve simultaneously $2x + y = 8$<br>$3x + 2y = 13$   | 3 |
| d) | Make $y$ the subject of $x = \sqrt{\frac{A}{y}}$  | 2 |

**QUESTION 7** (10 MARKS)

MARKS

- a) Solve  $|2x - 5| \geq 7$  2
- b) Sketch the following on separate diagrams, stating the domain and the range:
- (i)  $2x + 3y - 6 = 0$  3
- (ii)  $y = x^2 - 4$  3
- c) Given that  $f(x) = 3x^2 - 5x + 2$ , evaluate  $f(-2)$ . 2

**QUESTION 8** (9 MARKS)

MARKS

- a) Simplify  $\frac{3}{x^2 + 2x + 1} + \frac{3}{x^2 - 1}$  3
- b) Solve  $4x^2 + 12x + 1 = 0$ , leaving your answer in simplest surd form. 3
- c) If  $x = (\frac{2}{3})^3$  and  $y = (\frac{1}{2})^2$ , find the exact value of  $x^2 y^4$  3

QUESTION 1 (9)

a)  $2.33284... = 2.333$  (4 sig figs) 2

b) let  $x = 0.2666...$

$10x = 2.666...$

$100x = 26.666...$

$90x = 24$

$x = \frac{24}{90} = \frac{4}{15}$

$\therefore 0.2\bar{6} = \frac{4}{15}$

c) 4

d) 140% of \$225 = \$315

e) -3

f) i)  $x^{\frac{5}{3}}$

ii)  $3^{-1}x^{-2}$

QUESTION 2 (9)

a)  $2500 \times 2.3 \times 10^{-3} = 5.75g$

b) i)  $8x - 13y$

ii) 63

c)  $10\sqrt{3} + 28\sqrt{3} = 38\sqrt{3}$

d)  $m - n\sqrt{5} = 9 - 6\sqrt{5} + 5 = 14 - 6\sqrt{5}$

$m = 14$   $n = 6$

e)  $\frac{4+\sqrt{3}}{2\sqrt{6}} \times \frac{\sqrt{6}}{\sqrt{6}} = \frac{4\sqrt{6}+\sqrt{18}}{12}$

$= \frac{4\sqrt{6}+3\sqrt{2}}{12}$

QUESTION 3 (9)

a) i)  $5x - 10 + 6x - 27 = 11x - 37$

ii)  $x^2 - 2x + 1 - (2x^2 + 5x + 4x + 10)$

$= -x^2 - 11x - 9$

b) i)  $(2x-1)(x+2)$

ii)  $(2m+5)(4m^2-10m+25)$

iii)  $y(x-y) - (x-y) = (x-y)(y-1)$

QUESTION 4 (9)

a) i)  $\frac{3(3m+2)}{m(3m+2)} = \frac{3}{m}$

ii)  $\frac{(x-5)(x+4)}{(x-5)(x+5)} \times \frac{x(x+5)}{x+1} = \frac{x(x+4)}{x+1}$

b)  $(2x-3-5)(2x-3+5) = (2x-8)(2x+2)$   
 $= 4(x-4)(x+1)$

c)  $\frac{4x-x-1}{10} = \frac{3x-1}{10}$

QUESTION 5 (8)

a)  $2t-3=5t+8$

$-11 = 3t$

$t = -\frac{11}{3}$

b)  $2x+3=11$   $-2x-3=11$

$2x=8$

$-2x=14$

$x=4$

$x=-7$

c)  $\frac{7}{a} + 2 = \frac{3}{2a}$

$14 + 4a = 3$

$4a = -11$

$a = -\frac{11}{4}$

d)  $x^2+5x+6=0$

$(x+2)(x+3)=0$

$x=-2, x=-3$

QUESTION 6 (10)

a)  $A = 2\pi rh$

$132\pi = 2\pi \times 6h$

$h = 11$   $\therefore$  Height is 11cm

b)  $3x-4 > x+7$

$2x > 11$

$x > \frac{11}{2}$

c)  $2x+y=8$  - ①

$3x+2y=13$  - ②

①  $\times 2$ :  $4x+2y=16$  - ③

③ - ②:  $x=3$

Sub in ①:  $6+y=8$

$y=2$

$\therefore x=3, y=2$

d)  $x = \sqrt{\frac{A}{y}}$

$x^2 = \frac{A}{y}$

$y = \frac{A}{x^2}$

# QUESTION 7 (10)

a)  $|2x-5| \geq 7$

$$2x-5 \geq 7 \quad -2x+5 \geq 7$$

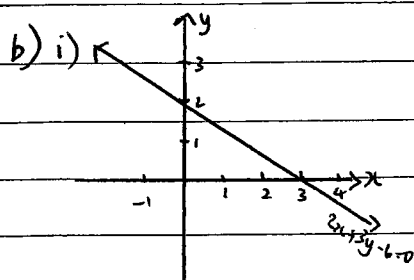
$$2x \geq 12$$

$$-2x \geq 2$$

2

$$x \geq 6$$

$$x \leq -1$$

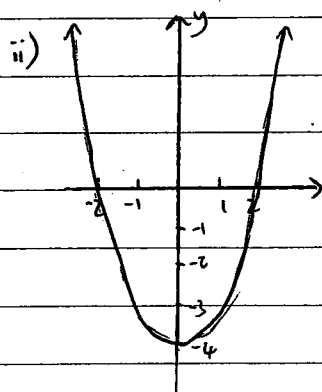


Domain: All real  $x$  values

1

Range: All real  $y$  values

1



Domain: all real  $x$  values

1

Range:  $y \geq -4$

1

c)  $f(x) = 3x^2 - 5x + 2$

$$f(-2) = 3(-2)^2 - 5(-2) + 2$$

2

$$= 24$$

# QUESTION 8 (9)

a)  $\frac{3}{(x+1)(x+1)} + \frac{3}{(x-1)(x+1)}$

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

3

$$= \frac{3x-3 + 3x+3}{(x+1)^2(x-1)}$$

$$= \frac{6x}{(x+1)^2(x-1)}$$

b)  $4x^2 + 12x + 1 = 0$

$$x = \frac{-12 \pm \sqrt{144 - 4 \times 4 \times 1}}{2 \times 4}$$

$$= \frac{-12 \pm \sqrt{128}}{8}$$

3

$$= \frac{-12 \pm 8\sqrt{2}}{8}$$

$$= \frac{-3 \pm 2\sqrt{2}}{4}$$

c)  $x^2 y^4 = \left(\left(\frac{2}{3}\right)^2\right)^2 \left(\left(\frac{1}{2}\right)^2\right)^4$

$$= \frac{2^4}{3^4} \times \frac{1}{2^8}$$

3

$$= \frac{1}{2^4 3^4}$$

$$= \frac{1}{1296}$$