Student Name: .... Class:...........................

YEAR 11 PRELIMINARY ASSESSMENT

TASK 1

March 2013

General Instructions

- Reading Time – 5 minutes

- Working Time – 60 Minutes

- Start each question on a new page.

Arithmetic/Surds Q 1	
Indices Q 2	
Equations Q 3	
Functions Q 4	
TOTAL	

Question 1 (10 marks)

(a) Express $0.2\dot{3}$ as a fraction in simplest form. 2

(b) Evaluate $\dfrac{\sqrt{\pi + 3.4}}{\pi \times 14.9}$ correct to 3 significant figures. 2

(c) Find integers a and b such that $\dfrac{4}{\sqrt{3}-2} = a + b\sqrt{3}$ 2

(d) Rationalise the denominators and simplify $\dfrac{\sqrt{2}}{2\sqrt{2}+3} + \dfrac{2}{\sqrt{3}+1}$ 2

(e) A merchant buys tea from a wholesaler and then sells it at a profit of 37.5%.

If the merchant sells a packet of tea for $3.08, what price does he pay to the

wholesaler per packet of tea? 2

Question 2 Start on a new page. (14 marks)

(a) Find in index form the value of $\dfrac{A^2 C}{B^2}$ where $A = \left(\dfrac{2}{3}\right)^2$ $B = \left(\dfrac{4}{3}\right)^4$ $C = \left(\dfrac{8}{3}\right)^2$ 3

(b) Express $\dfrac{3^{-1} a^{-2}}{2^{-2} a^{-3}}$ with positive indices in simplest form 2

(c) Find the value of n and a if $\left(3x^n\right)^3 \times \left(3x\right)^{n-6} = ax^2$ 3

(d) Simplify $\dfrac{16^x}{2^{3x} \times 8^{1-x}}$ 2

(e) Simplify $\dfrac{a^{-2} + b^{-2}}{a^{-1} b^{-1}}$ 2

(f) Solve $81^{2x+3} = 27^{5x-2}$ 2

Question 3. Start on a new page   (14 marks)

(a)   Find the exact values of x if $2x^2 - 4x + 1 = 0$ in simplest form   2

(b)   Solve $3 - x \le \dfrac{x-1}{2}$ 2

(c)   Solve $(2x-2)^2 = 18$ leaving in simplest surd form   2

(d)   Solve the following simultaneous equations

    i) $3x - y = 10$ and $x^2 + y^2 = 100$ 2

    ii) $x + y = 6$ and $xy = 8$ 2

    iii) $y = x^2 + 4x - 5$ and $y = 2x + 3$ 2

(e)   Solve $|x + 2| = 2x - 5$.   2

Question 4. Start on a new page   (12 marks)

(a)   Sketch the graph $y = \sqrt{4 - x^2}$ and state its range.   2

(b)   Sketch $y = 1 - (x + 2)^2$ labelling all intercepts with the axes.   2

(c)   Sketch $y = |2x - 3|$ and state the range of the function.   2

(d)   If $f(x) = x^2 + x$ express $\dfrac{f(x+h) - f(x)}{h}$ in simplest form.   2

(e)   Show whether the function $f(x) = \dfrac{x}{1 - x^2}$ is odd, even or neither   2

(f)   Find the value of $g(1) - g(-2) - g(3)$ if   2

$$g(x) = x^2 \quad when\ x > 2$$
$$= 2x - 1 \ when\ -1 \le x \le 2$$
$$= 5 \quad when\ x < -1$$

QUESTION 1

a) $10x = 2.333$
$x = 0.2333$

$9x = 2.1$

$x = \frac{2.1}{9} = \frac{21}{90} = \frac{7}{30}$

b) $\frac{2.55765}{46.80973} = $

$= 0.0546$

c) $\frac{4}{\sqrt{3}-2} \times \frac{\sqrt{3}+2}{\sqrt{3}+2}$

$= \frac{4\sqrt{3}+8}{-1}$

$= -4\sqrt{3} - 8$

$a = -8 \quad b = -4$

d) $\frac{\sqrt{2}}{2\sqrt{2}+3} \times \frac{2\sqrt{2}-3}{2\sqrt{2}-3} = \frac{4-3\sqrt{2}}{8-9}$

$\frac{2}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1} = \frac{2\sqrt{3}-2}{3-1}$

$\therefore -4+3\sqrt{2} + \frac{2\sqrt{3}-2}{2}$

$= -5 + \sqrt{3} + 3\sqrt{2}$

c) $137.5\% = 3.08$
$1\% = .0224$
$100\% = \$2.24$

QUESTION 2

a) $\frac{\left(\frac{2}{3}\right)^4 \times \left(\frac{8}{3}\right)^2}{\left(\frac{4}{3}\right)^8}$

$\frac{2^4}{3^4} \times \frac{2^6}{3^2} \times \frac{3^8}{2^{16}}$

$= \frac{3^2}{2^6}$

b) $\frac{3^{-1}a^{-2}}{2^{-2}a^{-3}} = \frac{2^2 a^3}{3 a^2} = \frac{4a}{3}$

c) $3^3 \cdot x^{3n} \times 3^{n-6} \cdot x^{n-6}$

$\left. \begin{array}{l} 3^{n-3} = a \\ 3^{2-3} = a \\ \frac{1}{3} = a \end{array} \right\} \quad \left. \begin{array}{l} x^{4n-6} = x^2 \\ 4n-6 = 2 \\ 4n = 8 \\ n = 2 \end{array} \right.$

a) $\frac{2^{..}}{2^{3x} \times 2^{3-3x}} = \frac{2^{...}}{2^3}$

$= 2^{4x-3}$

e) $\left(\frac{1}{a^2} + \frac{1}{b^2}\right) \times ab$

$\frac{b^2+a^2}{a^2 b^2} \times ab$

$= \frac{b^2+a^2}{ab}$

f) $3^{4(2x+3)} = 3^{3(5x-2)}$

$8x+12 = 15x-6$

$18 = 7x$

$\frac{18}{7} = x$

QUESTION 3

a) $2x^2 - 4x + 1 = 0$

$x = \frac{4 \pm \sqrt{16-8}}{4}$

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

$= \frac{2 \pm \sqrt{2}}{2}$

b) $6 - 2x \le x - 1$

$7 \le 3x$

$x \ge \frac{7}{3}$

c) $(2x-2) = \pm\sqrt{18}$

$2x = 2 \pm 3\sqrt{2}$

$x = \frac{2 \pm 3\sqrt{2}}{2}$

d)(i) $x^2 + (3x-10)^2 = 100$

$x^2 + 9x^2 - 60x + 100 = 100$

$10x^2 - 60x = 0$

$10x(x-6) = 0$

$x = 0 \qquad x = 6$
$y = -10 \qquad y = 8$

ii) $x + y = 6 \qquad xy = 8$

$x(6-x) = 8$

$6x - x^2 = 8$

$x^2 - 6x + 8 = 0$

$(x-4)(x-2) = 0$

$x = 4 \quad \text{or} \quad x = 2$
$y = 2 \qquad\qquad y = 4$

iii) $2x+3 = x^2 + 4x - 5$

$x^2 + 2x - 8 = 0$

$(x+4)(x-2) = 0$

$x = -4 \qquad x = 2$
$y = -5 \qquad y = 7$

d) $|x+2| = 2x-5$

$x+2 = 2x-5 \quad \text{or} \quad -x-2 = 2x-5$

$7 = x \qquad\qquad -3x = -3$
$\qquad\qquad\qquad\qquad x = 1$

check

$|7+2| = 2 \times 7 - 5 \qquad |1+2| = 2\times 1 - 5$

$|9| = 14 - 5 \qquad\qquad |3| = -3$

$|9| = 9 \qquad\qquad\qquad \text{False}$

true

only $x = 7$ a solution

a)

R: $0 \leq y \leq 2$.
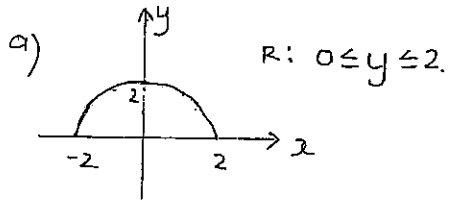
b) let $y = 0$ $(x+2)^2 = 1$

$$x + 2 = \pm 1$$
$$x = -2 \pm 1$$
$$= -3, 1$$

let $x = 0$ $y = 1 - (2)^2$
$$= -3$$

$(-2, 1)$

c) $y = |2x - 3|$ $y = 0$ $x = \frac{3}{2}$

R: $y \geq 0$
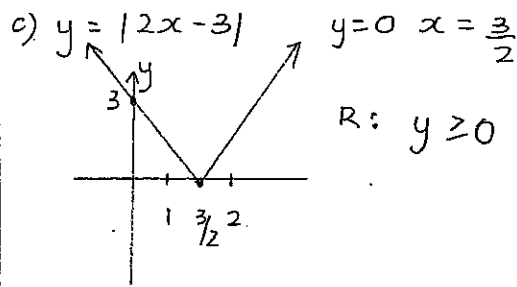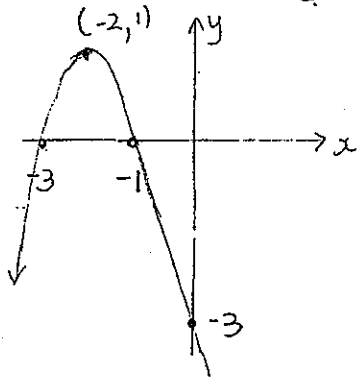
d) $f(x) = x^2 + x$

$f(x+h) = (x+h)^2 + (x+h)$
$$= x^2 + 2xh + h^2 + x + h$$

$\dfrac{f(x+h) - f(x)}{h} = \dfrac{2xh + h^2 + h}{h}$

$$= 2x + h + 1$$

e) $f(x) = \dfrac{x}{1 - x^2}$

$f(-x) = \dfrac{-x}{1 - (-x)^2}$

$$= \dfrac{-x}{1 - x^2}$$

$$= -f(x) \quad \therefore \text{ODD}$$

f) $g(1) = 2x - 1$
$$= 2 - 1$$
$$= 1$$

$g(-2) = 5$

$g(3) = 3^2 = 9$

$g(1) - g(-2) - g(3)$

$$1 - 5 - 9$$

$$= -13$$