

# HORNSBY GIRLS' HIGH SCHOOL



## YEAR 11 MATHEMATICS 2010 Preliminary Assessment Task 1

Student Number: \_\_\_\_\_

**Time Allowed:** 65 minutes

### Instructions:

- Attempt all questions
- Start a new page for each question
- The marks for each question are indicated
- Show all necessary working
- Use blue or black pen
- Marks may be deducted for untidy or badly arranged work
- Board approved calculators may be used

### Outcomes Assessed:

- P1 Demonstrates confidence in obtaining realistic solutions to problems  
P2 Provides reasoning to support conclusions in the correct context  
P3 Performs routine arithmetic and algebraic manipulation involving surds, simple rational expressions and trigonometric identities  
P4 Chooses and applies appropriate arithmetic, algebraic, graphical, trigonometric and geometric techniques  
P5 Understands the concept of a function and the relationship between a function and its graph

### Marking Scheme:

Outcomes	Questions				Totals
	Q1	Q2	Q3	Q4	
Basic Algebra and Arithmetic	/8	/10	/9	/10	/37
Functions and Graphs	Q5	/8	Q6.	/8	/16
				<b>Total</b>	<b>/53</b>

*This assessment task constitutes 20% of the final Preliminary Course Assessment.*

**Question 1 (8 Marks) START A NEW PAGE****Marks**

- a) Evaluate correct to 2 decimal places:  $\frac{2.3+19^2}{\sqrt{4.2 \times 0.16}}$  2
- b) Express  $0.3\dot{3}\dot{7}$  as a common fraction 2
- c) Rationalise the denominator of  $\frac{2}{\sqrt{10}-\sqrt{5}}$  2
- d) Given  $x = \sqrt{3}$ ,  $y = 8\sqrt{3}$  find in its simplest form, the exact value of:  $\sqrt[3]{\frac{x}{y}}$  2

**Question 2 (10 Marks) START A NEW PAGE****Marks**

- a) Expand and simplify  $(\sqrt{x+y}-\sqrt{x})(\sqrt{x+y}+\sqrt{x})$  2
- b) Expand then simplify  $(rs+2t)^2$  2
- c) If  $F = W - kV$ , find  $V$  (correct to 1 decimal place) if  $F = 98$ ,  $W = 146$  and  $k = 5.2$  2
- d) Factorise  $(2a-2)x+2(1-a)y$  2
- e) Factorise  $3x^2-11x+6$  2

**Question 3 (9 Marks) START A NEW PAGE****Marks**

- a) Solve  $x^2+6x-2=0$  2
- b) Solve  $1-x+2x=-2x-x-1$  2
- c) Solve  $4 - \frac{2}{6x+8} = 6$  2
- d) Simplify  $\frac{x^3-8}{3x^2+6x+12} \div \frac{x^3-2x^2}{3}$  3

Question 4 (10 Marks)	START A NEW PAGE	Marks
a)	Solve $3x + 5 \leq -1$	2
b)	Solve $\frac{2x-1}{3} - \frac{3x-2}{4} < \frac{1}{2}$	3
c)	Solve $ 2x-3  \leq 5$	2
d)	Solve simultaneously: $6x + 5y = -32$ $3x - 2y = 2$	3

Question 5 (8 Marks)	START A NEW PAGE	Marks
a)	For the function $f(x) = x + \frac{1}{x}$	
	i) Find the value of $f\left(\frac{1}{2}\right)$	2
	ii) Show that $f(a) \times f(b) - f(ab) = \frac{a}{b} + \frac{b}{a}$	3
b)	$f(x) = \begin{cases} x+1, & x \geq 1 \\ -1, & -1 < x < 1 \\ 1-x, & x \leq -2 \end{cases}$	
	Find the value of $f(2) + f(-2) + f(0)$	3

Question 6 (8 Marks)	START A NEW PAGE	Marks
a)	Sketch $y = x^2 - 6x$ showing the $x$ and $y$ intercepts and the vertex	2
b)	Show that the function $y = \frac{1}{x^2-1} - \sqrt{ x }$ is an even function	2
c)	i) Sketch $(x-2)^2 + (y-5)^2 = 16$	2
	ii) Find the domain and range of $(x-2)^2 + (y-5)^2 = 16$	2



Answers

Q1

$$a) \frac{2.3 + 19^2}{\sqrt{4.2 \times 0.16}} = 443.18$$

$$b) \text{ Let } x = 0.337373 \dots$$

$$\therefore 100x = 33.7373 \dots$$

$$100x - x = 33.4$$

$$99x = 33.4$$

$$x = \frac{33.4}{99}$$

$$= \frac{334}{990}$$

$$= \frac{167}{495}$$

$$c) \frac{2}{\sqrt{10} - \sqrt{5}} \times \frac{(\sqrt{10} + \sqrt{5})}{(\sqrt{10} + \sqrt{5})} = \frac{2(\sqrt{10} + \sqrt{5})}{10 - 5}$$

$$= \frac{2\sqrt{10} + 2\sqrt{5}}{5}$$

$$d) \sqrt[3]{\frac{x}{y}} = \sqrt[3]{\frac{\sqrt[3]{x}}{8\sqrt[3]{y}}}$$

$$= \sqrt[3]{\frac{1}{8}}$$

$$= \frac{1}{2}$$

$$Q2. a) (\sqrt{x+y} - \sqrt{x})(\sqrt{x+y} + \sqrt{x})$$

$$= (\sqrt{x+y})^2 - (\sqrt{x})^2$$

$$= x + y - x$$

$$= y$$

$$b) (rs + 2t)^2 = r^2s^2 + 4rst + 4t^2$$

$$98 = 146 - 5.2V$$

$$5.2V = 48$$

$$V = 9.2$$

$$d) (2a-2)x + 2(1-a)y$$

$$= 2(a-1)x + 2(1-a)y$$

$$= 2(a-1)x - 2(a-1)y$$

$$= 2(a-1)(x-y)$$

$$e) 3x^2 - 11x + 6 \quad \begin{array}{l} P: 18 \\ S: -11 \\ F: -9, -2 \end{array}$$

$$= 3x^2 - 9x - 2x + 6$$

$$= 3x(x-3) - 2(x-3)$$

$$= (3x-2)(x-3)$$

$$Q3. a) x^2 + 6x - 2 = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-6 \pm \sqrt{36 - 4 \cdot 1 \cdot -2}}{2}$$

$$= \frac{-6 \pm \sqrt{44}}{2}$$

$$= \frac{-6 \pm 2\sqrt{11}}{2}$$

$$= -3 \pm \sqrt{11}$$

$$b) 1 - x + 2x = -2x - x - 1$$

$$4x = -2$$

$$x = -\frac{1}{2}$$

$$c) 4 - \frac{2}{6x+8} = 6$$

$$-\frac{2}{6x+8} = 2$$

$$-2 = 2(6x+8)$$

$$-1 = 6x+8$$

$$6x = -9$$

$$x = -\frac{3}{2}$$

$$d) \frac{x-8}{3x^2+6x+12} \div \frac{x^2-2x^2}{3}$$

$$= \frac{(x-2)(x^2+2x+4)}{3(x^2+2x+4)} \times \frac{3}{x^2(x-2)}$$

$$= \frac{1}{x^2}$$

Q4 a)  $3x+5 \leq -1$

$$3x \leq -6$$

$$x \leq -2$$

b)  $\frac{2x-1}{3} - \frac{3x-2}{4} < \frac{1}{2}$

$$4(2x-1) - 3(3x-2) < 6$$

$$8x-4-9x+6 < 6$$

$$-x < 4$$

$$x > -4$$

c)  $|2x-3| \leq 5$

$$2x-3 \leq 5 \quad \text{or} \quad -(2x-3) \leq 5$$

$$2x \leq 8 \quad -2x+3 \leq 5$$

$$x \leq 4 \quad -2x \leq 2$$

$$x \geq -1$$

$$\therefore -1 \leq x \leq 4$$

d)  $6x+5y = -32$  (1)

$$3x-2y = 2$$
 (2)

(2)  $\times 2$ :  $6x-4y = 4$  (3)

(1)  $-(3)$ :  $9y = -36$

$$y = -4$$

Sub  $y = -4$  in (2):

$$3x-2(-4) = 2$$

$$3x+8 = 2$$

$$3x = -6$$

$$x = -2$$

Q5. a)  $f(x) = x + \frac{1}{x}$

i)  $f\left(\frac{1}{2}\right) = \frac{1}{2} + \frac{1}{\frac{1}{2}}$

$$= 2\frac{1}{2}$$

ii)  $f(a) \times f(b) - f(ab)$

$$= \left(a + \frac{1}{a}\right)\left(b + \frac{1}{b}\right) - \left(ab + \frac{1}{ab}\right)$$

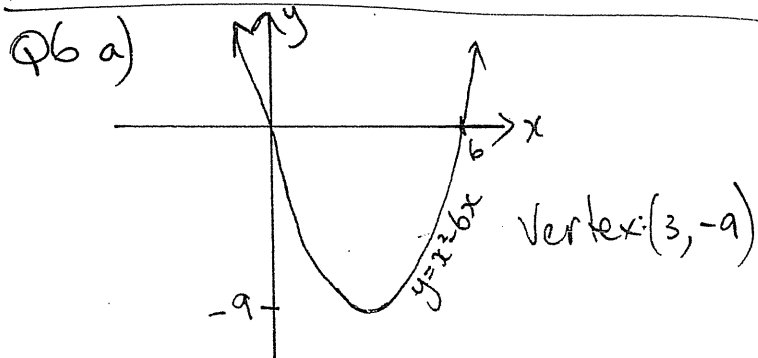
$$= \cancel{ab} + \frac{a}{b} + \frac{b}{a} + \frac{1}{\cancel{ab}} - \cancel{ab} - \frac{1}{\cancel{ab}}$$

$$= \frac{a}{b} + \frac{b}{a}$$

b)  $f(2) = 2+1 = 3$        $f(-2) = 1-(-2) = 3$

$f(0) = -1$

$\therefore f(2) + f(-2) + f(0) = 3+3+(-1) = 5$



b)  $f(-x) = \frac{1}{(-x)^2-1} - \sqrt{|-x|}$

$$= \frac{1}{x^2-1} - \sqrt{x}$$

$$= f(x) \quad \therefore \text{Even.}$$

