

St. Catherine's School  
Waverley

2007  
ASSESSMENT TASK 1  
(15%)

# Mathematics

## Year 11

### General Instructions

- Working time – 55 minutes
- Start each question on a new page in your answer booklet.
- If any additional booklet is used, please label it clearly and attach it to the appropriate booklet.
- Write using black or blue pen only.
- Board-approved calculators may be used.
- All necessary working must be shown.
- Marks may be deducted for careless or badly arranged work.

Total marks – 45

- Attempt Questions 1–3
- Marks for each question are indicated on the back of this page.

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

QUESTION 1      START A NEW PAGE      MARKS

a) Simplify the following:

(i)  $8m - 6h + 2m - 4h$       1

(ii)  $\frac{16b^3k^5}{36b^7k^7}$       1

b) Express in simplest terms:

(i)  $\frac{3m}{5} - \frac{m+1}{4}$       2

(ii)  $\frac{ab}{d^2} + \frac{ab^2}{d^3}$       2

c) Factorise fully:

(i)  $2k + 2j + mk + mj$       1

(ii)  $h^2 - 5h + 6$       1

(iii)  $27 - r^3$       1

d) Express as fractions in simplest terms:

(i)  $0.5\overline{64}$       2

(ii)  $62\frac{1}{3}\%$       2

e) Find the value of:

(i)  $\frac{1}{\sqrt{5.8^2 - 17}}$  (to 2 decimal places)      1

(ii)  $\sqrt[3]{8.9^2 + 3.14^4}$  (to 4 significant figures)      1

**QUESTION 2**      **START A NEW PAGE**      **MARKS**

a) Expand and simplify:

(i)  $-5 - 4(m - 2) + 10$       2

(ii)  $(g - 5m)(g + 2m)$       2

(iii)  $(-3q^6r^5)^3$       1

b) Solve the pair of simultaneous equations:

$x - 2y = 8$   
 $2x + y = 1$       3

c) Find the value of  $x$ :

(i)  $3(x + 7) + 2 = -2(x - 9)$       3

(ii)  $2x - \frac{8x - 20}{3} = 24$       3

d) Solve the following equations:

(i)  $5t^2 - 13t + 6 = 0$       2

(ii)  $x^2 + 2x = 2$       3

**QUESTION 3**      **START A NEW PAGE**      **MARKS**

a) Simplify:

$\frac{x}{x^2 - 81} + \frac{2}{x - 9}$       3

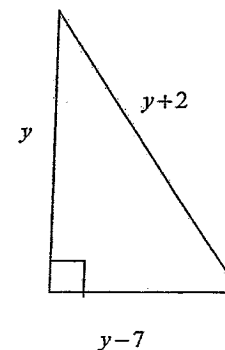
b) Solve simultaneously for  $p, q$ :

$3p + q = 9$   
 $pq = 6$       4

c) Simplify the following:

$\frac{2x^2 + x - 15}{x^2 + 3x - 28} \div \frac{x^2 + 6x + 9}{x^2 - 4x}$       3

d) (i) Using the diagram below show that  $y = \sqrt{(y+2)^2 - (y-7)^2}$       2



(ii) Hence show that  $y^2 - 18y + 45 = 0$       2

(iii) Find the value of  $y$ .      2

Qn.	Solutions	Marks	Comments+Criteria
1a.	Simplify:		
(i)	$8m - 6h + 2m - 4h$ $= 10m - 10h$	1	
(ii)	$\frac{4 \sqrt[4]{16b^4k^8}}{\sqrt[4]{36b^4k^2}} = \frac{4}{9b^4k^2}$	1	
1b.	Express in simplest terms:		
(i)	$\frac{3m}{5} - \frac{m+1}{4}$ $= \frac{4(3m) - 5(m+1)}{20}$ $= \frac{12m - 5m - 5}{20}$ $= \frac{7m - 5}{20}$	1	
(ii)	$\frac{ab}{d^2} \div \frac{ab^2}{d^3}$ $= \frac{ab}{d^2} \times \frac{d^3}{ab^2}$ $= \frac{d}{b}$	1	
c.	Factorise fully:		
(i)	$2k + 2j + mk + mj$ $2(k+j) + m(k+j)$ $(2+m)(k+j)$	1	

1c.	(ii) $h^2 - 5h + 6$ $(h-3)(h-2)$	1	
(iii)	$27 - r^3$ $a^3 - b^3 = (a-b)(a^2 + ab + b^2)$ $3^3 - r^3$ $(3-r)(9 + 3r + r^2)$	1	
1d.	Express as fractions in simplest terms:		
(i)	$0.5\bar{6}1$ $x = 0.561 \text{ --- (1)}$ $100x = 56.161 \text{ --- (2)}$ $(2) - (1)$ $99x = 55.6$ $x = \frac{55.6}{99} = \frac{556}{990}$ $\therefore x = \frac{278}{495}$	1	$10x = 5.6161 \dots$ $1000x = 561.6161 \dots$ $990x = 556$ $x = \frac{556}{990} = \frac{278}{495}$
(ii)	$62\frac{1}{3}\%$ as fraction decimal = 0.623 $x = 0.623 \text{ --- (1)}$ $10x = 6.233 \text{ --- (2)}$ $(2) - (1)$ $9x = 5.61$ $x = \frac{5.61}{9} = \frac{561}{900}$ $\therefore x = \frac{187}{300}$	1	$100x = 62.3333 \dots$ $1000x = 623.3333 \dots$ $900x = 561$ $x = \frac{561}{900} = \frac{187}{300}$ $\text{OR } 62\frac{1}{3}\% = \frac{62\frac{1}{3}}{100} = \frac{187}{300}$

note alternative methods

1e. Find the value of:

$$(i) \frac{1}{\sqrt{5 \cdot 8^2 - 17}} = 0.25 \text{ (to 2 dec places)}$$

$$(ii) \sqrt[3]{8 \cdot 9^2 + 3 \cdot 14^4} = 5.609 \text{ (to 4 sig fig)}$$

2a. Expand & simplify:

$$(i) -5 - 4(m-2) + 10 \\ -5 - 4m + 8 + 10 \\ = -4m + 13$$

$$(ii) (g-5m)(g+2m) \\ g^2 + 2gm - 5gm - 10m^2 \\ g^2 - 3gm - 10m^2$$

$$(iii) (-3q^6r^5)^3 \\ = -27q^{18}r^{15}$$

2b. Solve simultaneously:

$$x - 2y = 8 \quad \text{--- (1)}$$

$$2x + y = 1 \quad \text{--- (2)}$$

Method 1. (by elimination)

(1)  $\times 2$

$$2x - 4y = 16 \quad \text{--- (3)}$$

(3) - (2)

$$-5y = 15$$

$$\therefore y = \frac{15}{-5} = -3$$

Sub.  $y = -3$  into (2)

$$2x + (-3) = 1$$

20 CONT...

$$2x - 3 = 1$$

$$2x = 4$$

$$x = 2$$

$$\therefore x = 2, y = -3$$

Method 2. (by substitution)

$$x = 8 + 2y \quad \text{(from (1))}$$

Sub  $x$  into (2)

$$2(8 + 2y) + y = 1$$

$$16 + 4y + y = 1$$

$$5y = -15$$

$$\therefore y = -3$$

Sub  $y = -3$  into (1)

$$x - 2(-3) = 8$$

$$x + 6 = 8$$

$$\therefore x = 2$$

2c. Find the value of  $x$ .

$$(i) 3(x+7) + 2 = -2(x-9)$$

$$3x + 21 + 2 = -2x + 18$$

$$5x + 23 = 18$$

$$5x = -5$$

$$\therefore x = -1$$

$$(ii) 2x - \frac{8x-20}{3} = 24$$

$$3(2x) - \cancel{3} \left( \frac{8x-20}{\cancel{3}} \right) = 3(24)$$

$$6x - 8x + 20 = 72$$

$$-2x = 52$$

$$\therefore x = -26$$

2d. Solve the following equations.

$$(i) 5t^2 - 13t + 6 = 0$$

$$5t^2 - 10t - 3t + 6 = 0$$

$$5t(t-2) - 3(t-2) = 0$$

$$(5t-3)(t-2) = 0$$

$$5t-3=0 \text{ or } t-2=0$$

$$\therefore t = \frac{3}{5} \text{ or } t = 2$$

$$(ii) x^2 + 2x = 2$$

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

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

$$x = \frac{-2 \pm \sqrt{4 - 4(1)(-2)}}{2}$$

$$= \frac{-2 \pm \sqrt{12}}{2} = \frac{-2 \pm 2\sqrt{3}}{2}$$

$$= \frac{-2(1 \pm \sqrt{3})}{2}$$

$$\therefore x = -1 + \sqrt{3} \text{ or } x = -1 - \sqrt{3}$$

$$\begin{array}{l} P - 30t^2 \\ S - 13t \\ F - 10t, -3t \end{array}$$

Simplification of surd unnecessary for full marks

3a. Simplify:

$$\frac{x}{x^2 - 81} + \frac{2}{x - 9}$$

$$= \frac{x}{(x-9)(x+9)} + \frac{2}{x-9}$$

$$= \frac{x + 2(x+9)}{(x-9)(x+9)}$$

$$= \frac{x + 2x + 18}{(x-9)(x+9)}$$

$$= \frac{3x + 18}{(x-9)(x+9)} \text{ OR } \frac{3(x+6)}{(x-9)(x+9)}$$

not testing def of two squares

$$\text{OR } \frac{3x+18}{x^2-81}$$

3b. Solve simultaneously for  $p, q$ :

$$3p + q = 9 \quad \text{--- (1)}$$

$$pq = 6 \quad \text{--- (2)}$$

$$3p^2 + pq = 9p$$

$$2p^2 - 9p + 6 = 0$$

by substitution:

$$q = 9 - 3p \quad (\text{from 1})$$

Sub  $q$  into (2)

$$p(9 - 3p) = 6$$

$$9p - 3p^2 = 6$$

$$3p^2 - 9p + 6 = 0$$

$$(p-1)(3p-6) = 0$$

$$p = 1 \text{ or } p = \frac{6}{3} = 2$$

Sub  $p = 1$  into (2)

$\frac{1}{2}$  for  $p=2$  bel

3b cont...

$$pq = 6$$

$$(1) q = 6$$

$$\therefore q = 6$$

sub  $p=2$  into (2)

$$2q = 6$$

$$\therefore q = 3$$

$$\text{When } p=1, q=6$$

$$\text{When } p=2, q=3$$

3c. Simplify the following:

$$\frac{2x^2+x-15}{x^2+3x-28} \times \frac{x^2-4x}{x^2+6x+9}$$

$$\frac{(2x-5)(x+3)}{(x+7)(x-4)} \times \frac{x(x-4)}{(x+3)(x+3)}$$

$$= \frac{x(2x-5)}{(x+7)(x+3)}$$

3d. (1) Using Pythagoras' theorem.

$$y^2 + (y-7)^2 = (y+2)^2$$

$$y^2 = (y+2)^2 - (y-7)^2$$

$$\therefore y = \sqrt{(y+2)^2 - (y-7)^2}$$

3d cont...

$$(ii) y^2 = (y+2)^2 - (y-7)^2$$

$$y^2 = y^2 + 4y + 4 - (y^2 - 14y + 49)$$

$$y^2 = y^2 + 4y + 4 - y^2 + 14y - 49$$

$$y^2 = 18y - 45$$

$$\therefore y^2 - 18y + 45 = 0$$

$$(iii) y^2 - 18y + 45 = 0$$

$$(y-3)(y-15) = 0$$

$$y = 3 \text{ or } y = 15$$

but  $y \neq 3$  since the shortest side  $y-7 < 0$

$$\therefore y = 15$$