



TRINITY GRAMMAR SCHOOL  
MATHEMATICS DEPARTMENT



# YEAR 11 MATHEMATICS

## ASSESSMENT TASK 2

Time Allowed : 60 minutes

DATE : Monday 19<sup>th</sup> February 2007

**WEIGHTING : 20%**

Name : \_\_\_\_\_ Class : \_\_\_\_\_

Teacher: \_\_\_\_\_

### INSTRUCTIONS:

- \* Do not open this paper until instructed to do so.
- \* Approved Calculators may be used.
- \* All necessary working must be shown to gain full marks. Marks may be deducted for careless or badly arranged work.
- \* This paper consists of Three Questions.
  - Question 1 - (13 Marks)
  - Question 2 - (23 Marks)
  - Question 3 - (34 Marks)
- \* Total 70 Marks
- \* Attempt all questions.

Show all necessary working in the spaces provided

	Mark Value	Question 1 (13 Marks)
1)	1	Find the value of $\frac{I}{7 + 5 \times 3}$ correct to three significant figures.
2)	1	Simplify $ 2  +  -5 $ .
3)	2	Simplify $\frac{16}{2^{3x} \times 8^{I-x}}$ .
4)	1	Find the value of $19^{-0.5}$ to two decimal places.
5)	2	Express 0.23 as a fraction in its simplest form.

6)	2	<p>At Octopus Communications' annual sale, all mobile phones were discounted by 40%. Cedric paid \$630 for a mobile phone at the sale. What was the original price of the phone?</p>
7)	2	<p>A car engine is running at 7000 revolutions per minute.</p> <p>a. How many revolutions are made in one hour?</p> <p>b. If this engine uses 10 litres of fuel in one hour, how much fuel in ml does it use every revolution? Leave answer to 2 decimal places.</p>
8)	2	<p>The volume <math>V</math> of a sphere is given by <math>V = \frac{4}{3}\pi r^3</math>. If a sphere has volume <math>5.7 \text{ cm}^3</math>, find the radius correct to two decimal places.</p>

Question 2 ( 23 Marks )		
1)	2	<p>Simplify <math>5\sqrt{3} + \sqrt{20} - 2\sqrt{12} + \sqrt{45}</math></p>
2)	2	<p>Express <math>\frac{2}{4 + \sqrt{3}}</math> with a rational denominator.</p>
3)	1	<p>Write <math>5\sqrt{7}</math> as a complete surd.</p>
4)	1	<p>Simplify <math>\frac{6}{x} \times \frac{10y}{3} \div \frac{5y}{x}</math>.</p>
5)	2	<p>Simplify <math>\frac{2x}{4} - \frac{x+2}{3}</math>.</p>
6)	2	<p>Factorise <math>2x^2 - 7x - 15</math>.</p>

7)	2	Factorise fully $ab - a - bx + x$ .
8)	2	Factorise fully $64x^2 - 16x^4$ .
9)	2	Factorise fully $27p^3 + 125$ .
10)	2	Factorise fully: $x^2 - y^2 + 3x + 3y$
11)	2	Factorize and simplify: $\frac{t^2 - 9}{3t - 9}$

12)	3	Expand and simplify $(3a - b)^2 - (a - b)(a + b)$
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Question 3 ( 34Marks )

1)	1	i) Change to index form: a) $\frac{1}{2a-b}$
	1	ii) Write without negative indices: $\left(\frac{x+y}{x-y}\right)^{-1}$
2)	1	Find those values of $x$ which satisfy the inequality $15 - 4x < 7$ .
3)	2	Solve the equation $4(x-5) = 3 - 2(x-1)$ .
4)	2	Solve $\frac{2}{3x} + \frac{7}{5x} = 1$ .

5)	2	Solve the equation $\frac{3}{x+1} = \frac{4}{x}$ .
6)	3	Graph on the number line the solution set of: $\frac{x-1}{2} - \frac{2x-3}{3} < 1$ .
7)	3	Use the quadratic equation formula to solve the equation $4h^2 + 12h + 1 = 0$ . Give answer to two decimal places.
8)	2	Solve the quadratic equation $3x^2 - 4x - 4 = 0$ .

9) 2 Solve for  $x$ :  $(2x + 3)^2 = 25$ .

10) 2 Solve the simultaneous equations

$$\begin{aligned} x + y &= 1 \\ 2x - y &= 5. \end{aligned}$$

11) 3 Graph the solution of  $|x + 2| \leq 3$  on a number line.

12) 3 Solve  $|8y - 1| = 4y + 7$ .

13) 3 Solve simultaneously  
 $y = 2x + 1$   
 $y = x^2 - 3x + 5$ .

14) 4 Simplify  $\frac{3x+6}{x^2-4} + \frac{2x^2+6x}{x^2+x-6}$ .

SOLUTIONS



TRINITY GRAMMAR SCHOOL  
MATHEMATICS DEPARTMENT



YEAR 11 MATHEMATICS

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  - Question 3 - (34 Marks)
- \* Total 70 Marks
- \* Attempt all questions.

Show all necessary working in the spaces provided	
Mark Value	Question 1 (13 Marks)
1	Find the value of $\frac{1}{7+5 \times 3}$ correct to three significant figures. $\frac{1}{22}$ $= 0.0455$ $= 4.55 \times 10^{-2} \checkmark$
1	Simplify $ 2  +  -5 $ . $7 \checkmark$
2	Simplify $\frac{16}{2^{3x} \times 8^{1-x}}$ . $= \frac{2^4}{2^{3x} \times (2^3)^{1-x}}$ $= \frac{2^4}{2^{3x} \cdot 2^{3-3x}} = \frac{2^4}{2^3} = \frac{2}{1} = 2$ <del> <math display="block">\frac{16}{16^{3x+1-x}}</math> <math display="block">= \frac{16}{2x+1}</math>                     continue.                 </del>
1	Find the value of $19^{-0.5}$ to two decimal places. $0.23 \checkmark$
2	Express $0.\overline{23}$ as a fraction in its simplest form. $\text{let } n = 0.232323 \dots$ $100n = 23.232323 \dots$ $100n - n = 23$ $99n = 23$ $n = \frac{23}{99} \checkmark$

6)	<p>2 At Octopus Communications' annual sale, all mobile phones were discounted by 40%. Cedric paid \$630 for a mobile phone at the sale. What was the original price of the phone?</p> <p><i>let original price be \$x</i></p> $\frac{140}{100} \times 630 = 882$ $60\% \text{ of } x = 630$ $0.6x = 630$ $x = \frac{630}{0.6}$ $= \$1050$
7)	<p>2 A car engine is running at 7000 revolutions per minute.</p> <p>a. How many revolutions are made in one hour?</p> <p>b. If this engine uses 10 litres of fuel in one hour, how much fuel in ml does it use every revolution? Leave answer to 2 decimal places.</p> <p>a) 420000 revolutions ✓</p> <p>b) <math>4.2 \times 10^5 \text{ rev.} = 10 \text{ L}</math>  <math>= 10^4 \text{ mL}</math>  <math>\therefore 1 \text{ rev} = 42 \text{ mL}</math>  <math>= \frac{10^4}{4.2 \times 10^5} = 0.02 \text{ mL (to 2 dp)}</math></p>
8)	<p>2 The volume <math>V</math> of a sphere is given by <math>V = \frac{4}{3}\pi r^3</math>. If a sphere has volume <math>5.7 \text{ cm}^3</math>, find the radius correct to two decimal places.</p> <p><math>5.7 \text{ cm}^3 = \frac{4}{3}\pi r^3</math>  <math>\frac{17.1}{4\pi} = \frac{4\pi r^3}{4\pi}</math>  <math>13.4303 = r^3</math>  <math>r = 2.38</math></p>


<p>Question 2 ( 23 Marks )</p>	
2)	<p>Simplify <math>5\sqrt{3} + \sqrt{20} - 2\sqrt{12} + \sqrt{45}</math></p> $5\sqrt{3} + 2\sqrt{5} - 4\sqrt{3} + 3\sqrt{5}$ $\sqrt{3} + 5\sqrt{5}$
2)	<p>Express <math>\frac{2 + 4\sqrt{3}}{4 + \sqrt{3} + 4 - \sqrt{3}}</math> with a rational denominator.</p> $\frac{2(4 - \sqrt{3})}{16 - 3} = \frac{8 - 2\sqrt{3}}{13}$
1)	<p>Write <math>5\sqrt{7}</math> as a complete surd.</p> $= \sqrt{175}$
1)	<p>Simplify <math>\frac{6}{x} \times \left( \frac{10y}{3} \div \frac{5y}{x} \right)</math> BODMAS</p> $\frac{6}{x} \times \left( \frac{10y}{3} \times \frac{x}{5y} \right) = \frac{6}{x} \times \left( \frac{10xy}{15y} \right)$ <p>cancel early!</p> $= 4$
2)	<p>Simplify <math>\frac{2x^2 \times x + 2 \times 4}{4 \times 3 \times 3 \times 4} = \frac{6x - (4x - 8)}{12}</math></p> <p>cancel!</p> $= \frac{6x - 4x + 8}{12}$ $= \frac{2x + 8}{12} = \frac{x + 4}{6}$
2)	<p>Factorise <math>2x^2 - 7x - 15</math></p> $2x^2 - 10x + 3x - 15$ $= 2x(x - 5) + 3(x - 5)$ $= (2x + 3)(x - 5)$

7)	2	Factorise fully $ab - a - bx + x$ $a(b-1) - x(b-1)$ $= (a-x)(b-1)$ ✓
8)	2	Factorise fully $64x^2 - 16x^4$ $16x^2(4 - x^2)$ ✓ $16x^2(2-x)(2+x)$ ✓
9)	2	Factorise fully $27p^3 + 125$ $(3p)^3 + (5)^3$ ← must remember formulae! $(3p+5)(9p^2 + 15p + 25)$ ✓
10)	2	Factorise fully: $x^2 - y^2 + 3x + 3y$ $(x+y)(x-y) + 3(x+y)$ ✓ $(x+y)(x-y+3)$ ✓
11)	2	Factorize and simplify: $\frac{t^2-9}{3t-9}$ $\frac{(t+3)(t-3)}{3(t-3)}$ ✓ $\frac{t+3}{3}$ ✓

1)	3	Expand and simplify $(3a-b)^2 - (a-b)(a+b)$ $9a^2 - 6ab + b^2 - (a^2 - b^2)$ <del><math>8a^2 - 6ab</math></del> Watch the signs. $= 9a^2 - 6ab + b^2 - a^2 + b^2$ $= 8a^2 - 6ab + 2b^2$
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Question 3 (34Marks)	
1)	<p>i) Change to index form: a) <math>\frac{1}{2a-b} (2a-b)^{-1}</math> ✓</p> <p>ii) Write without negative indices: <math>\left(\frac{x+y}{x-y}\right)^{-1} \left(\frac{x-y}{x+y}\right)</math> ✓</p>
2)	<p>Find those values of <math>x</math> which satisfy the inequality <math>15 - 4x &lt; 7</math>.</p> <p><math>-4x &lt; -8</math>  <math>x &gt; 2</math> ✓</p>
3)	<p>Solve the equation <math>4(x-5) = 3 - 2(x-1)</math>.</p> <p><math>4x - 20 = 3 - 2x + 2</math>  <math>4x - 20 = 5 - 2x</math>  <math>4x = 24 - 2x</math>  <math>6x = 24</math>  <math>x = 4</math></p>
4)	<p>Solve <math>\frac{2}{3x} + \frac{7}{5x} = 1</math>.</p> <p><math>15x\left(\frac{2}{3x}\right) + 15x\left(\frac{7}{5x}\right) = 15x</math>  <math>10 + 21 = 15x</math> ✓  <math>31 = 15x</math>  <math>x = \frac{31}{15}</math> ✓</p>

2	<p>Solve the equation <math>\frac{3}{x+1} = \frac{4}{x}</math>.</p> <p><math>4(x+1) = 3x</math>  <math>4x+4 = 3x</math>  <math>4 = -x</math> ✓  <math>x = -4</math> ✓</p>
3	<p>Graph on the number line the solution set of: <math>\frac{x-1}{2} - \frac{2x-3}{3} &lt; 1</math>.</p> <p><math>6\left(\frac{x-1}{2}\right) - 6\left(\frac{2x-3}{3}\right) &lt; 6</math>  <math>3(x-1) - 2(2x-3) &lt; 6</math> <i>Try again, cards!</i>  <math>3x - 3 - 4x + 6 &lt; 6</math>  <math>-x + 3 &lt; 6</math>  <math>-x &lt; 3</math>  <math>x &gt; -3</math></p> 
3	<p>Use the quadratic equation formula to solve the equation <math>4h^2 + 12h + 1 = 0</math>. Give answer to two decimal places.</p> <p><math>h = \frac{-12 \pm \sqrt{12^2 - 4 \times 4 \times 1}}{2 \times 4}</math>  <math>= \frac{-12 \pm \sqrt{128}}{8}</math>  <math>= \frac{-12 \pm 8\sqrt{2}}{8}</math>  <math>= \frac{-3 \pm \sqrt{2}}{2}</math>  <math>= -0.09</math> or <math>-2.91</math> (+ 2 dp).</p>
2	<p>Solve the quadratic equation <math>3x^2 - 4x - 4 = 0</math>.</p> <p><math>3x^2 - 6x + 2x - 4 = 0</math>  <math>3x(x-2) + 2(x-2) = 0</math>  <math>(3x+2)(x-2) = 0</math> ✓  <math>\therefore x = -\frac{2}{3}, 2</math> ✓</p>

9) 2 Solve for  $x: \sqrt{2x+3} = \sqrt{5}$ .

~~$2x+3 = 5$~~

$2x = 2$  or  $2x+3 = -5$  ... solve these as well!

$x = 1$  or  $2x = -8$   
 $x = -4$

10) 2 Solve the simultaneous equations

$x+y=1$  ①  
 $2x-y=5$  ②

①+②  $3x=6$   
 $x=2$

∴ substitute  $x=2$  into ①  
 $2+y=1$   
 $∴ y=-1$

11) 3 Graph the solution of  $|x+2| \leq 3$  on a number line.

$-3 \leq x+2 \leq 3$   
 $-3-2 \leq x \leq 3-2$   
 $-5 \leq x \leq 1$

12) 3 Solve  $|8y-1|=4y+7$ .

$8y-1=4y+7$  or  $-(8y-1)=4y+7$  Solve these.

$4y=8$  or  $-8y+1=4y+7$   
 $y=2$  or  $-6=12y$   
 $∴ y = -\frac{1}{2}$

3 Solve simultaneously

$y=2x+1$  ①  
 $y=x^2-3x+5$  ②

Substitute ① into ②

$2x+1 = x^2-3x+5$   
 ~~$2x+1 - x^2+3x-5 = 0$~~   
 $5x - x^2 + 5x - 4 = 0$  ✓  
 $x^2 - 5x + 4 = 0$  ✓  
 $(x-4)(x-1) = 0$  ✓  
 $x=4, 1$  ✓

∴ substitute  $x=4, x=1$  into ①  
 $y=8+1$  or  $y=2(1)+1$   
 $y=9$  or  $y=3$

4 Simplify  $\frac{3x+6}{x^2-4} \div \frac{2x^2+6x}{x^2+x-6}$

$\frac{3(x+2)}{(x+2)(x-2)} \div \frac{2x(x+3)}{(x-2)(x+3)}$  ✓

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