



Waverley College

Year 10 Level 3

Mathematics

Half Yearly Examination 2006

Weighting: 80%

Time Allowed: 80 Minutes

Student Name: _____

Teacher's Name: _____

Instructions to Students:

- Use a blue or black pen only.
- Show all working where necessary.
- Approved Scientific calculators may be used.
- Marks may be deducted for careless or poorly arranged work

Section A – Literacy	/10	
Section B – Number & Measurement Review	/10	
Section C – Algebraic Techniques	/15	Excellent
Section D – Equations & Inequations	/15	
Section E – Trigonometry	/25	
TOTAL	/75	%

SECTION A: Literacy (10 Marks)

Use the list of words below to answer the following:

discriminant conjugate surds squares perfect square substitution tan
~~sine~~ ~~minutes~~ solve scientific notation quadratic trinomial cos

1 $(\sqrt{2} + \sqrt{5})$ and $(\sqrt{2} - \sqrt{5})$ are

2 A shorthand way of writing very large or small numbers using powers of ten

3 The expression $(a + b)^2$ is considered to be a

4 An equation of the form $ax^2 + bx + c$ is called a

5 An expression of the form $(a + b)(a - b)$ is called a difference of two

6 Replacing a variable with a number

7 Find the solution

8 Used to determine the number and type of solutions to a quadratic expression

9 Ratio defined as opposite over hypotenuse

10 There are 60 of these in 1 degree

SECTION B: Number & Measurement Review (10 Marks)

For multiple choice questions 1 to 10, circle the correct response.

1 $\frac{4}{3-\sqrt{3}}$ in simplest form is:

A $\frac{12+4\sqrt{3}}{3}$

B $\frac{6+2\sqrt{3}}{6}$

C $\frac{3+\sqrt{3}}{3}$

D $\frac{6+2\sqrt{3}}{3}$

2 $\frac{a^{11} \times a^2}{a^{12} \div a^9}$ simplified is:

A a^{-10}

B a^{10}

C a^{11}

D $\frac{1}{a}$

3 $\frac{4.8 \times 3.6}{\sqrt{2.5}}$ correct to three significant figures is:

A 10.9

B 10.92

C 10.929

D 11

4 $\frac{3.5 \times 10^5 + 6.1 \times 10^8}{4.7 \times 10^3}$ is closest to:

A 4.80×10^{10}

B 1.30×10^{11}

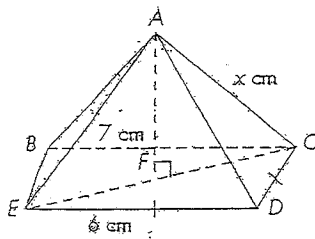
C 4.54×10^{16}

D 2.04×10^{10}

5. $\frac{\sqrt{60}}{2\sqrt{5}}$ in simplest form is:

- A $\frac{\sqrt{12}}{2}$
- B $\sqrt{6}$
- C $\sqrt{3}$
- D $2\sqrt{3}$

6. The exact length of the slant edge of a square pyramid with base side length 6 cm and height 7 cm would be:



- A $\sqrt{67}$
- B $\frac{\sqrt{67}}{4}$
- C 8
- D $3\sqrt{2}$

7. \$12 000 is invested for 5 years at an interest rate of 3.5% per annum compounded quarterly. The interest earned is:

- A \$5 182
- B \$2 284.08
- C \$2 100
- D \$1 104.97

8. At a clearance sale, a television worth \$600 is discounted by 30%, then discounted by a further 20%. The final price of the television is:

- A \$480
- B \$420
- C \$336
- D \$300

9 Which of the following formulae does not give the area of the stated polygon?

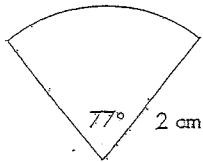
A $A = \frac{1}{2}h(a + b)$ Trapezium

B $A = \frac{1}{2}xy$ Kite

C $A = xy$ Rhombus

D $A = bh$ Parallelogram

10 Find the area of the following figure correct to 1 decimal place:



A 1.3 cm²

B 2.7 cm²

C 12.6 cm²

D 5.4 cm²

SECTION C: Algebraic Techniques

1 Expand the following expressions:

3 Marks

(a) $3a(4b + 7)$

.....

(b) $(x - 6)(x + 7)$

.....

2 The expansion of $(3x - 2)(3x + 2)$ is:

1 Mark

A $(3x - 2)^2$

B $9x^2 - 4$

C $9x^2$

D $9x^2 + 4$

3 $(5x + 3)^2$ is the same as:

1 Mark

A $25x^2 + 30x + 9$

B $25x^2 - 15x + 9$

C $25x^2 + 9$

D $25x^2 + 15x + 9$

4 Factorise the following:

3 Marks

(a) $x^2 - 100$

(b) $16x^2 - 25y^2$

5 A rectangle with an area $3x^2 + 11x - 20$ has length $x + 5$. Its breadth is:

1 Mark

- A $3x - 4$
- B $3x^2 + 10x - 15$
- C $3x^3 + 26x^2 + 35x - 100$
- D $2x - 4$

6 Simplify the fraction:

3 Marks

$$\frac{y^2 - 16}{y^2 + 6y + 8}$$

7 Simplify the following expression:

3 Marks

$$\frac{x-6}{4} + \frac{2x+7}{9}$$

SECTION D: Equations & Inequations

1 Solve to find the value of y :

2 Marks

$$\frac{3y-9}{6} = 3$$

2 Solve the following equations:

1 Mark

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

3 Use the quadratic formula to solve the following equation

2 Marks

$$-4x^2 - 5x + 6 = 0$$

4 The area of an envelope is 72 cm^2 . If the length is 6 cm longer than the breadth, find the dimensions of the envelope.

3 Marks

5

Solve the following pairs of simultaneous equations.

4 Marks

$$2x^2 + y = 9$$

$$2x + 3y = 7$$

6

Solve:

2 Marks

$$7(x + 3) \leq 14$$

7

Transposing $x = \sqrt{y^2 + z^2}$ to make z the subject gives:

1 Mark

A

$$z = -\sqrt{x^2 - y^2}$$

B

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

C

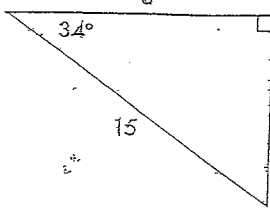
$$z = x^2 - y^2$$

D

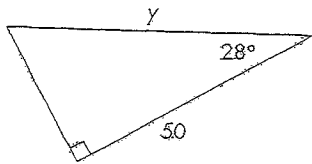
$$z = \pm\sqrt{x^2 - y^2}$$

SECTION E: Trigonometry

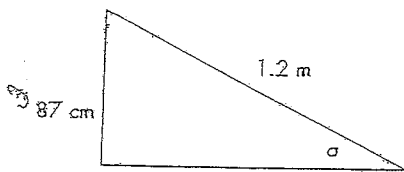
- 1 Find the value of the pronumeral in this diagram correct to the nearest whole number. *2 Marks*



- 2 Find the value of the pronumeral in this diagram, correct to 2 decimal places. *3 Marks*



- 3 A ramp 1.2 m long reaches a point 87 cm above the ground. The angle the ramp makes with the ground, to the nearest minute, is: *2 Marks*



- 4 Which of the following statements is untrue? *1 Mark*

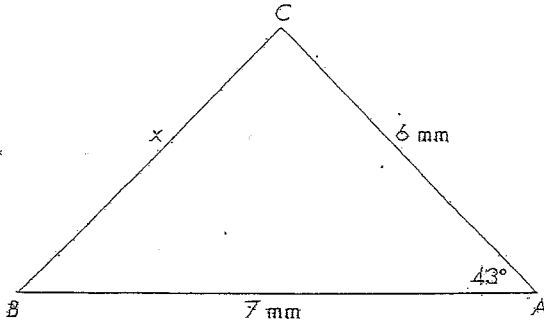
- A $\sin 30^\circ = \frac{1}{2}$
- B $\tan 60^\circ = \sqrt{3}$
- C $\sin 0^\circ = 0$
- D $\cos 45^\circ = \frac{1}{\sqrt{3}}$

5

Find the value of x in each of the following triangles correct to two decimal places or in degrees and minutes.

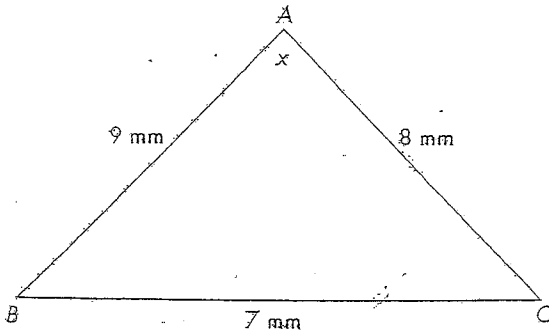
6 Marks

(a)



Handwriting practice lines consisting of a solid top line, a dashed middle line, and a solid bottom line.

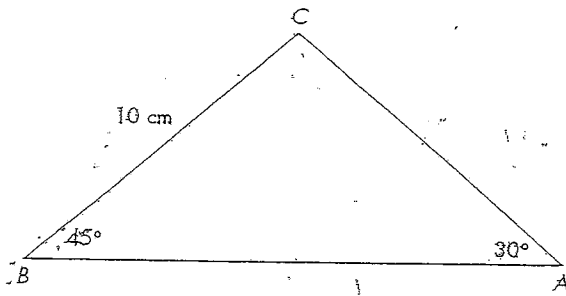
(b)



Handwriting practice lines consisting of a solid top line, a dashed middle line, and a solid bottom line.

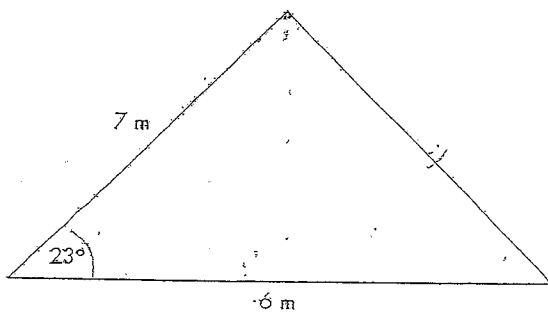
6

Given the following side and two angles in the diagram below, find the remaining sides and angle correct to the nearest whole number. 3 Marks



Handwriting practice lines consisting of solid top and bottom lines with a dashed middle line.

7



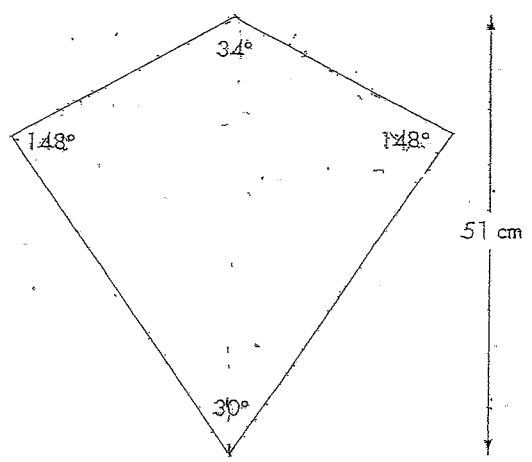
The area of the triangle shown is:

- A 21 m^2
- B 16.42 m^2
- C 42 m^2
- D 8.21 m^2

1 Mark

8

Melissa's kite has angles of 148° , 148° , 30° and 34° . If the height from the top to the bottom is 51 cm, find: 7 Marks



- (a) the length of all the sides on her kite, correct to two decimal places
- (b) the total area of material in cm^2 that covers the kite, correct to two decimal places
- (c) the cost to replace the material if it costs 65 cents/ cm^2 .

Handwriting practice lines consisting of solid top and bottom lines with a dashed middle line. There are 10 such lines provided for the student's answer.

END OF EXAM



SOLUTIONS



Waverley College

Year 10 Level 3

Mathematics

Half Yearly Examination

Weighting: 80%

Time Allowed: 80 Minutes

Student Name: Jason Lam Hong

Teacher's Name: Mrs Farnell

Instructions to Students:

- Use a blue or black pen only.
- Show all working where necessary.
- Approved Scientific calculators may be used.
- Marks may be deducted for careless or poorly arranged work

Section A - Literacy	/10	
Section B - Number & Measurement Review	/10	
Section C - Algebraic Techniques	15/15	Excellent
Section D - Equations & Inequations	15/15	
Section E - Trigonometry	12/5	
TOTAL	75/175	%

SECTION A - Literacy (10 Marks)

Use the list of words below to answer the following:

discriminant conjugate surds squares perfect square substitution tan
~~sine~~ minutes solve scientific notation quadratic trinomial cos

1. $(\sqrt{2} + \sqrt{5})$ and $(\sqrt{2} - \sqrt{5})$ are
conjugate surds ✓
2. A shorthand way of writing very large or small numbers using powers of ten
Scientific notation ✓
3. The expression $(a + b)^2$ is considered to be a
perfect square ✓
4. An equation of the form $ax^2 + bx + c$ is called a
quadratic trinomial ✓
5. An expression of the form $(a + b)(a - b)$ is called a difference of two
squares ✓
6. Replacing a variable with a number
substitution ✓
7. Find the solution
same ✓
8. Used to determine the number and type of solutions to a quadratic expression
discriminant ✓
9. Ratio defined as opposite over hypotenuse
sine ✓
10. There are 60 of these in 1 degree
minutes ✓

SECTION B: Number & Measurement Review (10 Marks)

For multiple choice questions 1 to 10, circle the correct response.

1 $\frac{4}{3-\sqrt{3}}$ in simplest form is:

$$\frac{4}{3-\sqrt{3}} \times \frac{3+\sqrt{3}}{3+\sqrt{3}} = \frac{12+4\sqrt{3}}{9-3} = \frac{12+4\sqrt{3}}{6} = \frac{6+2\sqrt{3}}{3}$$

A $\frac{12+4\sqrt{3}}{3}$

B $\frac{6+2\sqrt{3}}{6}$

C $\frac{3+\sqrt{3}}{3}$

D $\frac{6+2\sqrt{3}}{3}$

2 $\frac{a^{11} \times a^2}{a^{12} + a^9}$ simplified is:

$$\frac{a^{13}}{a^9}$$

A a^{-10}

B a^{10}

C a^{11}

D $\frac{1}{a}$

3 $\frac{4.8 \times 3.6}{\sqrt{2.5}}$ correct to three significant figures is:

A 10.9

B 10.92

C 10.929

D 11

4 $\frac{3.5 \times 10^5 + 6.1 \times 10^8}{4.7 \times 10^3}$ is closest to:

A 4.80×10^{10}

B 1.30×10^{11}

C 4.54×10^{16}

D 2.04×10^{10}

5 $\frac{\sqrt{60}}{2\sqrt{5}}$ in simplest form is:

$$\frac{2\sqrt{15}\sqrt{3}}{2\sqrt{5}}$$

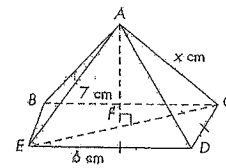
A $\frac{\sqrt{12}}{2}$

B $\sqrt{6}$

C $\sqrt{3}$

D $2\sqrt{3}$

6 The exact length of the slant edge of a square pyramid with base side length 6 cm and height 7 cm would be:



A $\sqrt{67}$

B $\frac{\sqrt{67}}{4}$

C 8

D $3\sqrt{2}$

$$EC^2 = 6^2 + 6^2 = 72$$

$$EC = \sqrt{72} = 6\sqrt{2}$$

$$\therefore FC = 3\sqrt{2}$$

$$\therefore x^2 = (3\sqrt{2})^2 + 7^2$$

$$= 18 + 49 = 67$$

$$\therefore x = \sqrt{67}$$

7 \$12 000 is invested for 5 years at an interest rate of 3.5% per annum compounded quarterly. The interest earned is:

A \$5 182

B \$2 284.08

C \$2 100

D \$1 104.97

$$A = 12000 \left(1 + \frac{0.035}{4}\right)^{20}$$

$$A = 14284.08 - 12000$$

$$= 2284.08$$

8 At a clearance sale, a television worth \$600 is discounted by 30%, then discounted by a further 20%. The final price of the television is:

A \$480

B \$420

C \$336

D \$300

$$\frac{30}{100} \times 600 = 180$$

$$600 - 180 = 420$$

$$\frac{20}{100} \times 420 = 84$$

$$420 - 84 = 336$$

4

9 Which of the following formulae does not give the area of the stated polygon?

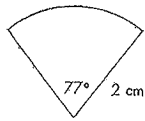
A $A = \frac{1}{2}h(a+b)$ Trapezium

B $A = \frac{1}{2}xy$ Kite

C $A = xy$ Rhombus

D $A = bh$ Parallelogram

10 Find the area of the following figure correct to 1 decimal place:



A 1.3 cm²

B 2.7 cm²

C 12.6 cm²

D 5.4 cm²

$$\frac{\pi R^2 \theta}{360}$$

$$= \frac{\pi \times 2^2 \times 77}{360}$$

$$= 2.7 \text{ cm}^2$$

SECTION C: Algebraic Techniques

1 Expand the following expressions:

(a) $3a(4b+7)$

$12ab + 21a$

(b) $(x-6)(x+7)$

$x^2 + 7x - 6x - 42$

$= x^2 + x - 42$

2 The expansion of $(3x-2)(3x+2)$ is:

A $(3x-2)^2$

B $9x^2 - 4$

C $9x^2$

D $9x^2 + 4$

$(5x+3)(5x+3)$

$= 25x^2 + 15x + 15x + 9$

$= 25x^2 + 30x + 9$

3 $(5x+3)^2$ is the same as:

A $25x^2 + 30x + 9$

B $25x^2 - 15x + 9$

C $25x^2 + 9$

D $25x^2 + 15x + 9$

4 Factorise the following:

(a) $x^2 - 100$

$(x+10)(x-10)$

(b) $16x^2 - 25y^2$

$(4x-5y)(4x+5y)$

5 A rectangle with an area $3x^2 + 11x - 20$ has length $x+5$. Its breadth is:

A $3x-4$

B $3x^2 + 10x - 15$

C $3x^3 + 26x^2 + 35x - 100$

D $2x-4$

$(x+5) = 3x^2 + 11x - 20$

$(3x-4)(x+5)$

$= 3x^2 + 15x - 4x - 20$

$= 3x^2 + 11x - 20$

6 Simplify the fraction:

$\frac{y^2-16}{y^2+6y+8}$

$= \frac{(y+4)(y-4)}{(y+4)(y+2)}$

$= \frac{(y-4)}{(y+2)}$

$= \frac{y-4}{y+2}$

7 Simplify the following expression:

$\frac{x-6}{4} + \frac{2x+7}{9}$

$\frac{9(x-6) + 4(2x+7)}{36}$

$= \frac{9x - 54 + 8x + 28}{36}$

$= \frac{17x - 26}{36}$

SECTION D: Equations & Inequations

1 Solve to find the value of y :

$$\frac{3y-9}{6} = 3$$

2 Marks

$$3y - 9 = 18$$

$$3y = 27$$

$$y = 9$$

2 Solve the following equations:

1 Mark

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

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

$$x = 2$$

3 Use the quadratic formula to solve the following equation

2 Marks

$$-4x^2 - 5x + 6 = 0$$

$$a = -4 \quad b = -5 \quad c = 6$$

$$x = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(-4)(6)}}{2(-4)}$$

$$= \frac{5 \pm \sqrt{25 + 96}}{-8}$$

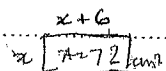
$$= \frac{5 \pm \sqrt{121}}{-8}$$

$$= \frac{5 \pm 11}{-8}$$

$$x = -2 \text{ or } x = \frac{3}{4}$$

4 The area of an envelope is 72 cm^2 . If the length is 6 cm longer than the breadth, find the dimensions of the envelope.

3 Marks



$$x(x+6) = 72$$

$$x^2 + 6x = 72$$

$$x^2 + 6x - 72 = 0$$

$$(x+12)(x-6) = 0$$

$$\therefore x = 6 \text{ but } x \neq -12$$

\therefore Sides are 6 and 12

5 Solve the following pairs of simultaneous equations.

4 Marks

$$2x^2 + y = 9$$

$$2x + 3y = 7$$

$$6x^2 + 3y = 27 \quad \text{--- (1)}$$

$$2x + 3y = 7 \quad \text{--- (2)}$$

$$(1) - (2):$$

$$6x^2 - 2x = 20 \quad (= 2)$$

$$3x^2 - x - 10 = 0$$

$$(3x+5)(x-2) = 0$$

$$\therefore x = 2 \text{ or } x = -5/3 \quad \leftarrow \text{Subs. into (1) } y = 9 - 2x^2$$

$$\therefore y = 9 - 2(2)^2$$

$$\text{or } y = 9 - 2(-5/3)^2$$

$$= 9 - 8$$

$$= 9 - 2(25/9)$$

$$= 1$$

$$= 9 - 50/9$$

$$= 31/9$$

$$\boxed{x = 2 \text{ or } x = -5/3}$$

$$\boxed{y = 1 \quad \text{or} \quad y = 31/9}$$

6 Solve:

2 Marks

$$7(x+3) \leq 14$$

$$7x + 21 \leq 14$$

$$7x \leq -7 \quad (+?)$$

$$x \leq -1$$

7 Transposing $x = \sqrt{y^2 + z^2}$ to make z the subject gives:

1 Mark

A $z = -\sqrt{x^2 - y^2}$

B $z = +\sqrt{x^2 - y^2}$

C $z = x^2 - y^2$

D $z = \pm\sqrt{x^2 - y^2}$

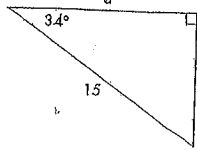
$$x^2 = y^2 + z^2$$

$$x^2 - y^2 = z^2$$

$$\pm\sqrt{x^2 - y^2} = z$$

SECTION E: Trigonometry

- 1 Find the value of the pronumeral in this diagram correct to the nearest whole number. 2 Marks

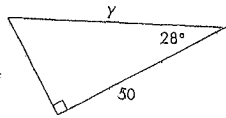


$$\cos 34 = \frac{a}{15}$$

$$a = 12$$

$$15 \cdot \cos 34 = a$$

- 2 Find the value of the pronumeral in this diagram, correct to 2 decimal places. 3 Marks



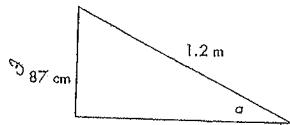
$$\cos 28 = \frac{50}{y}$$

$$y \cdot \cos 28 = 50$$

$$y = \frac{50}{\cos 28}$$

$$y = 56.63$$

- 3 A ramp 1.2 m long reaches a point 87 cm above the ground. The angle the ramp makes with the ground, to the nearest minute, is: 2 Marks



$$\sin a = \frac{87}{120}$$

$$\sin a = 0.725$$

$$a = 46^{\circ} 28'$$

- 4 Which of the following statements is untrue? 1 Mark

A $\sin 30^{\circ} = \frac{1}{2}$

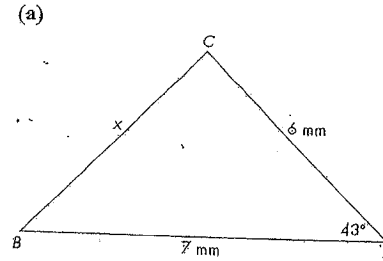
B $\tan 60^{\circ} = \sqrt{3}$

C $\sin 0^{\circ} = 0$

D $\cos 45^{\circ} = \frac{1}{\sqrt{3}}$



- 5 Find the value of x in each of the following triangles correct to two decimal places or in degree and minutes. 6 Marks

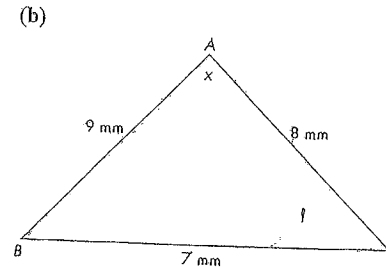


$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$a^2 = 6^2 + 7^2 - 2 \times 7 \times 6 \cos 43$$

$$a^2 = 23.57$$

$$a = 4.85 \text{ mm}$$



$$\cos A = \frac{8^2 + 9^2 - 7^2}{2 \times 8 \times 9}$$

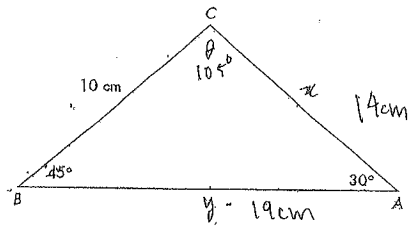
$$\cos A = \frac{96}{144}$$

$$\cos = 0.666$$

$$\cos = 48^{\circ} 11'$$

5

Given the following side and two angles in the diagram below, find the remaining sides and angle correct to the nearest whole number.



$$45 + 30 = 75$$

$$180 - 75 = 105^\circ$$

$$\theta = 105^\circ$$

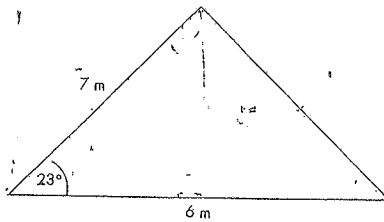
$$\frac{10}{\sin 30} = \frac{x}{\sin 45}$$

$$x = 14 \text{ cm}$$

$$\frac{10}{\sin 30} = \frac{y}{\sin 105}$$

$$y = 19 \text{ cm}$$

7



The area of the triangle shown is:

- A 21 m²
- B 16.42 m²
- C 42 m²
- D 8.21 m²

$$\text{Area} = \frac{1}{2} ab \sin C$$

$$= \frac{1}{2} \times 7 \times 6 \times \sin 23^\circ$$

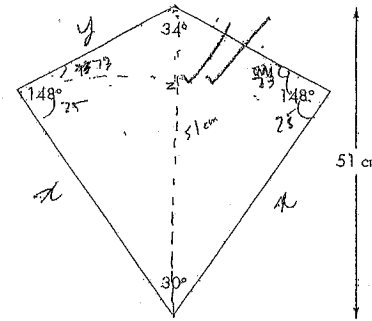
$$= 8.205$$

1 Mark

8

Melissa's kite has angles of 148°, 148°, 30° and 34°. If the height from the top to the bottom is 51 cm, find

7 Marks



(a) the length of all the sides on her kite, correct to two decimal places

(b) the total area of material in cm² that covers the kite, correct to two decimal places

(c) the cost to replace the material if it costs 65 cents/cm².

$$\frac{51}{\sin 148} = \frac{x}{\sin 17}$$

$$x = 28.14 \text{ cm}$$

$$\frac{51}{\sin 148} = \frac{y}{\sin 15}$$

$$y = 24.91 \text{ cm}$$

$$A = 2 \times \frac{1}{2} ab \sin C$$

$$= 28.14 \times 24.91 \times \sin 148^\circ$$

$$= 371.456 \text{ cm}^2$$

$$c) \text{ } \$241.1501$$

$$\text{ } \$241.15$$

END OF EXAM

