



Waverley College



# MATHEMATICS

Year 10, Criteria Test II

Monday August 1<sup>st</sup>, Term III, 2011

Weighting: 50%

Time Allowed: 45 minutes

Student Name: \_\_\_\_\_

Class: 10MA1 / 10MA2 / 10MA3 / 10MA4 / 10MA5 / 10MA6

**INSTRUCTIONS:**

1. Attempt all questions.
2. Calculators may be used.
3. Write in blue or black pen only, or pencil for diagrams only.
4. Show all necessary working, marks may be deducted for careless or badly arranged work.

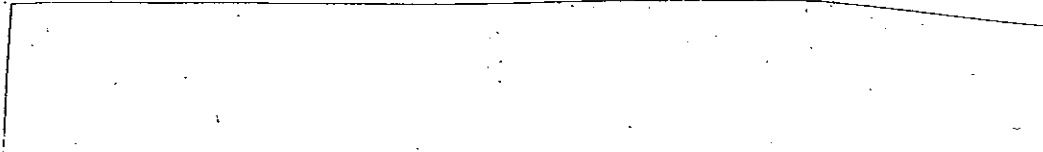
Section 1: Coordinate Geometry	/32
Section 2: Trigonometry	/22
Total:	/54

Section 1: Coordinate Geometry

(32 marks)

Question 1

- a) Find the midpoint of the following points:  $A(4,9)$  and  $B(-2,-4)$ . (2 marks)



- b)  $M(5,-2)$  is the midpoint of  $A(-1,10)$  and  $B$ . Find the coordinates of  $B$  (2 marks)



Question 2

- a) Which point is closer to the origin,  $O(0,0)$ ; the point  $A(12,2)$  or  $B(6,10)$ ?

Show working for full marks.

(2 marks)

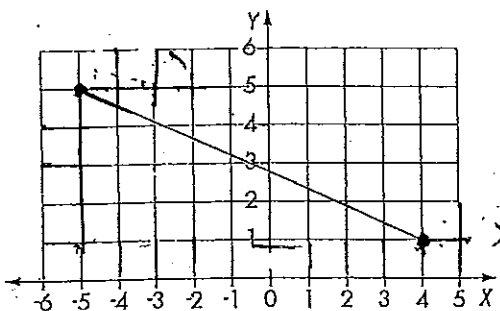
- b) How much closer is this point?

(1 mark)

Question 3

- a) Find the gradient of the following line.

(2 marks)



b) The gradient of the line segment joining  $(a, 2)$  and  $(1, 5)$  is 3. What is the value of  $a$ ?  
(2 marks)

**Question 4**

Give the  $y$ -intercept and the gradient for the line  $y = 10 - 4x$ . (2 marks)

$y$ -intercept = \_\_\_\_\_

gradient = \_\_\_\_\_

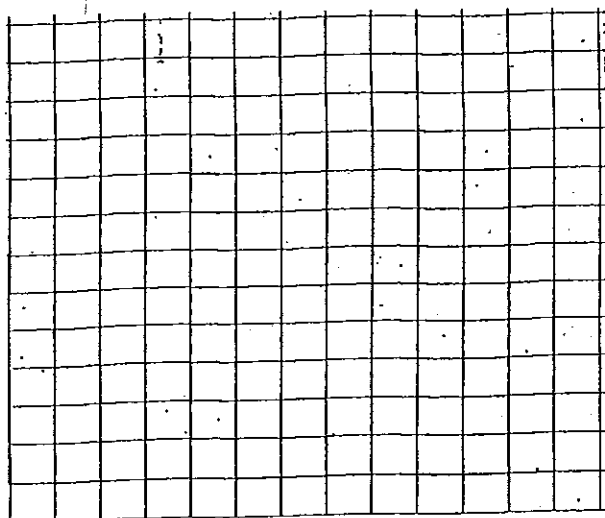
**Question 5**

Concerning the line,  $3x + 2y = 4$

i) What is the gradient? (1 mark)

ii) What is the  $y$ -intercept? (1 mark)

iii) Graph this line. (2 marks)



**Question 6**

Determine the x- and y- intercepts for the line,  $3x + y - 6 = 0$  and hence graph the line.

i) x-intercept:

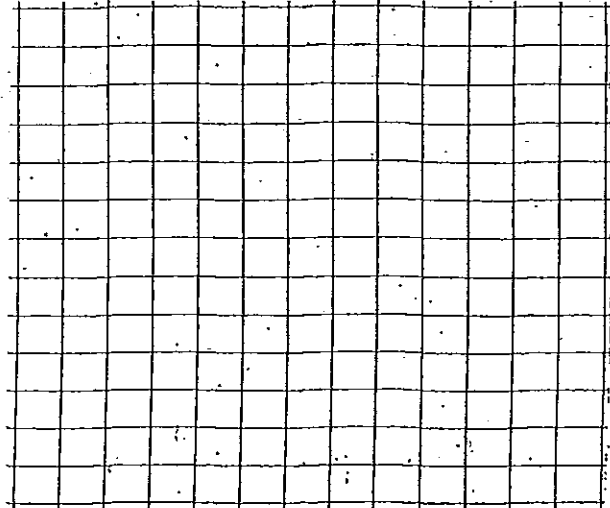
(1 mark)

ii) y-intercept:

(1 mark)

iii) Graph the line

(2 marks)



**Question 7**

Find the equation of the line:

a) with gradient 2 and y-intercept ~~1~~

(2 marks)

b) passing through (4,1) with a gradient of 3

(2 marks)

c) passing through (2,4) and (1,5). Give your answer in general form.

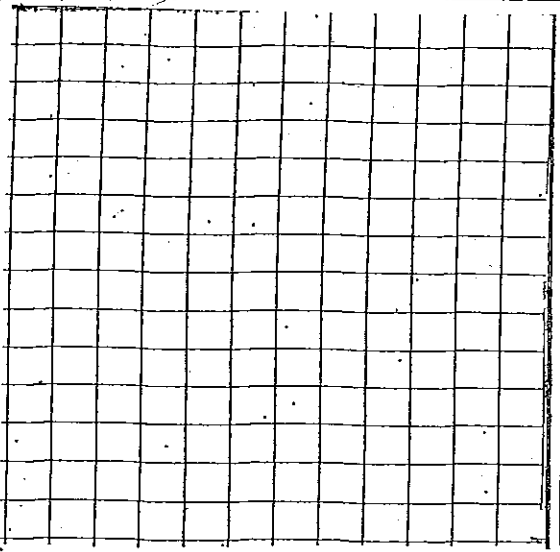
(3 marks)

Question 8

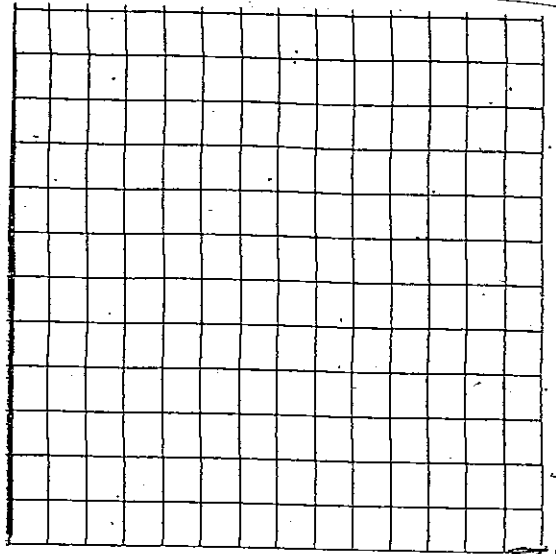
(4 marks)

Sketch the graph of the following regions.

(a)  $x < 2$



(b)  $y \leq x + 3$



Section 2: Trigonometry

(22 marks)

Formulae

Sine rule

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

Cosine rule

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

Area of a triangle

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

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

Question 1

Use your calculator to find  $\sin 5^\circ 22'$  correct to four decimal places.

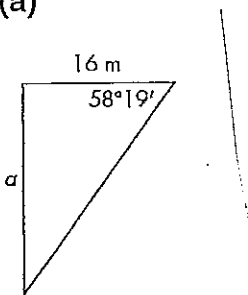
(1 mark)

Question 2

Find the value of the pronumeral in each of the following, correct to one decimal place.

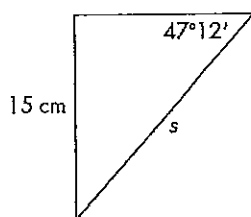
(a)

(2 marks)



(b)

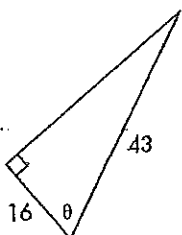
(2 marks)



Question 3

Find the value of angle  $\theta$ , to the nearest minute.

(2 marks)



#### Question 4

A car travels 920 m south and then a further 620 m west. To the nearest degree, what is the bearing of the car from its starting position? (2 marks)

#### Question 5

Which of the following statements is untrue?

Circle the correct answer.

(1 mark)

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

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

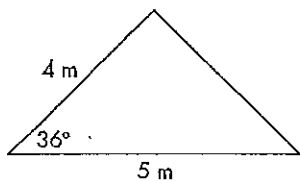
C  $\sin 0^\circ = 0$

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

#### Question 6

(2 marks)

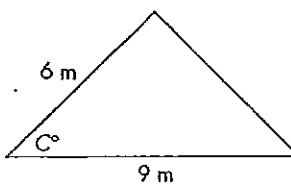
Using the Area formula, calculate the area of the triangle below.



#### Question 7

If the area of the following triangle is 20 m<sup>2</sup>, what is angle C in degrees and minutes?

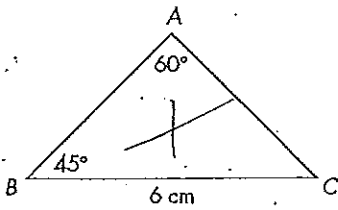
(2 marks)



**Question 8**

(2 marks)

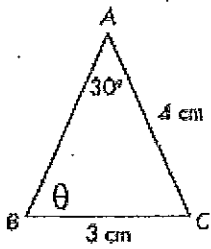
Using the Sine rule, find the length of AC to two decimal places.



**Question 9**

Using the Sine rule, find the value of  $\theta$ , to the nearest minute.

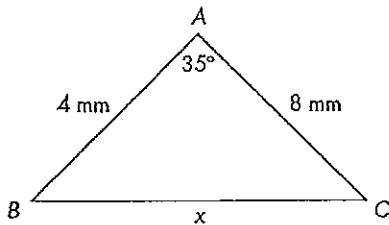
(2 marks)



**Question 10**

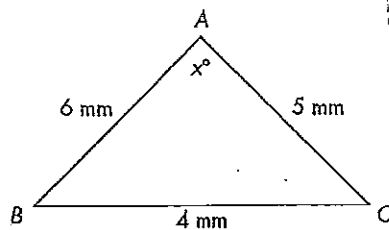
(a) Use the Cosine Rule to find  $x$ , correct to two decimal places.

(2 marks)



(b) Use the Cosine Rule to find the value of  $x$  to the nearest minute.

(2 marks)



END OF EXAMINATION



Section 1: Coordinate Geometry

Question 1

- a) Find the midpoint of the following points: A(4,9) and B(-2,-4).

(2 marks)

$$\left( \frac{x_1+x_2}{2}, \frac{y_1+y_2}{2} \right) = \left( \frac{4+(-2)}{2}, \frac{9+(-4)}{2} \right) = (1, 2.5)$$

(32 marks)

- b) M(5,-2) is the midpoint of A(-1,10) and B. Find the coordinates of B

(2 marks)

$$\left( \frac{-1+x_2}{2}, \frac{10+y_2}{2} \right) = (5, -2)$$

$$\frac{-1+x_2}{2} = 5 \implies -1+x_2 = 10 \implies x_2 = 11$$

$$\frac{10+y_2}{2} = -2 \implies 10+y_2 = -4 \implies y_2 = -14$$

$$\therefore B(11, -14)$$

Question 2

- a) Which point is closer to the origin, O(0, 0); the point A(12, 2) or B(6, 10)?

Show working for full marks.

(2 marks)

$$OA = \sqrt{(12-0)^2 + (2-0)^2}$$

$$OA = \sqrt{144+4}$$

$$OA = \sqrt{148} \approx 12.17$$

$$OB = \sqrt{(6-0)^2 + (10-0)^2}$$

$$OB = \sqrt{36+100}$$

$$OB = \sqrt{136} \approx 11.66$$

$$OB < OA$$

- b) How much closer is this point?

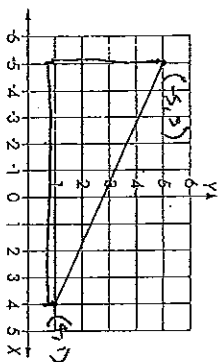
Point B is closer to the origin (1 mark)

$$2\sqrt{37} - 2\sqrt{34} \approx 0.50$$

Question 3

- a) Find the gradient of the following line.

(2 marks)



$$\text{rise} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{1 - 2}{9 - 5} = \frac{-1}{4}$$

$$m = \frac{-1}{4}$$

- b) The gradient of the line segment joining (a, 2) and (1, 5) is 3. What is the value of a?

(2 marks)

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 2}{1 - a} = 3$$

$$\frac{3}{1-a} = 3 \implies 3 = 3(1-a)$$

$$3 = 3 - 3a \implies 0 = -3a \implies a = 0$$

good!

Question 4

- Give the y-intercept and the gradient for the line  $y = 10 - 4x$

(2 marks)

y-intercept = 10

gradient = -4

Question 5

- Concerning the line,  $3x + 2y = 4$

$$2y = -3x + 4 \implies y = -\frac{3}{2}x + 2$$

- i) What is the gradient?

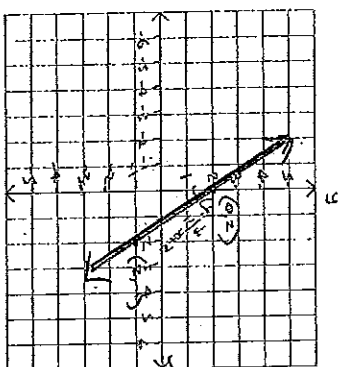
(1 mark)

- ii) What is the y-intercept?

(1 mark)

- iii) Graph this line.

(2 marks)



8

**Question 6**

Determine the x- and y- intercepts for the line,  $3x + y - 6 = 0$  and hence graph the line.

i) x-intercept:  $3x - 6 = 0$

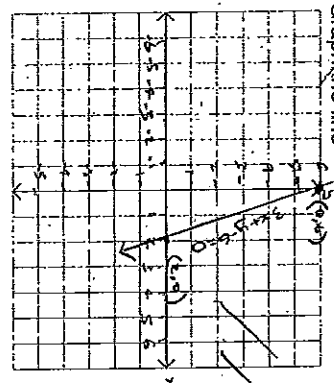
(1 mark)

ii) y-intercept:  $y - 6 = 0$

(1 mark)

iii) Graph the line

(2 marks)

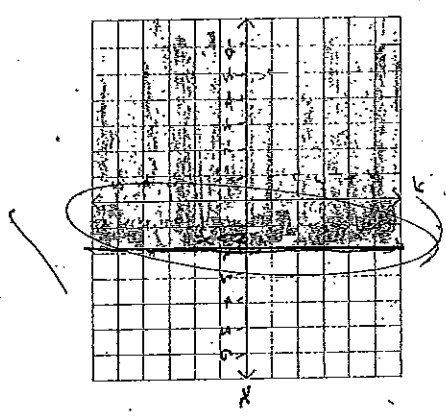


**Question 8**

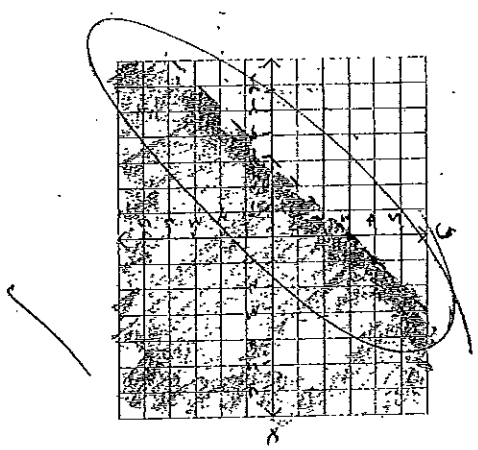
Sketch the graph of the following regions.

(4 marks)

(a)  $x < 2$



(b)  $y \leq x + 3$

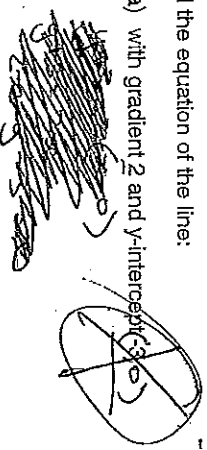


**Question 7**

Find the equation of the line:

a) with gradient 2 and y-intercept (3, 0)

(2 marks)



b) passing through (4, 1) with a gradient of 3

(2 marks)

$y - 1 = 3(x - 4)$   
 $y - 1 = 3x - 12$   
 $3x - y - 11 = 0$

c) passing through (2, 4) and (1, 5). Give your answer in general form. (3 marks)

$\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$

$\frac{y - 4}{x - 2} = \frac{5 - 4}{1 - 2}$

$-y + 4 = x - 2$   
 $x + y - 6 = 0$

$\frac{y - 4}{x - 2} = \frac{5 - 4}{1 - 2}$   
 $\frac{y - 4}{x - 2} = -1$

Section 2: Trigonometry

(22 marks)

Formulae		
Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$	Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$ $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$	Area of a triangle: $A = \frac{1}{2} ab \sin C$

Question 1

Use your calculator to find  $\sin 5^{\circ}22'$  correct to four decimal places.

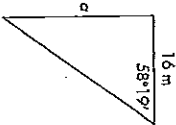
(1 mark)

0.0935 ✓

Question 2

Find the value of the pronumeral in each of the following, correct to one decimal place.

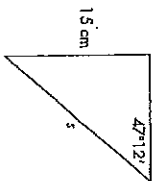
(a)



$\tan 58^{\circ}19' = \frac{a}{16}$   
 $a = 16 \tan 58^{\circ}19'$   
 $a = 25.9 \text{ m}$  ✓

(2 marks)

(b)



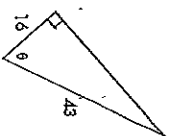
$\sin 47^{\circ}12' = \frac{s}{15}$   
 $s = \frac{15 \sin 47^{\circ}12'}{1}$   
 $s = 20.4 \text{ cm}$  ✓

(2 marks)

Question 3

Find the value of angle  $\theta$ , to the nearest minute.

(2 marks)



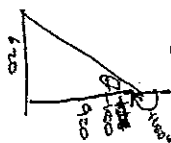
$\cos \theta = \frac{16}{4.3}$   
 $\theta = \cos^{-1}\left(\frac{16}{4.3}\right)$   
 $\theta = 68^{\circ}09'$  ✓

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Question 4

A car travels 920 m south and then a further 620 m west. To the nearest degree, what is the bearing of the car from its starting position? (2 marks)



$\tan \theta = \frac{620}{920}$   
 $\theta = \tan^{-1}\left(\frac{620}{920}\right)$   
 $\theta = 33^{\circ}59' + 180$  ✓

∴ The bearing is  $214^{\circ}$  ✓

Question 5

Which of the following statements is untrue?

Circle the correct answer.

(1 mark)

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

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

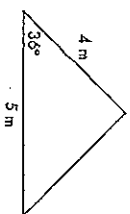
C  $\sin 0^{\circ} = 0$

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

Question 6

Using the Area formula, calculate the area of the triangle below.

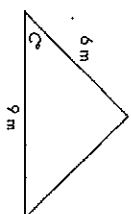
(2 marks)



$A = \frac{1}{2} \times a \times b \times \sin C$   
 $A = \frac{1}{2} \times 4 \times 5 \times \sin 36^{\circ}$   
 $A = 5.88 \text{ m}^2$  ✓

Question 7

If the area of the following triangle is  $20 \text{ m}^2$ , what is angle  $C$  in degrees and minutes? (2 marks)



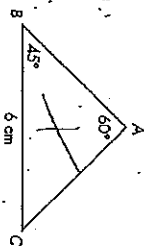
$20 = \frac{1}{2} \times 6 \times 9 \times \cos C$   
 $40 = 27 \times \cos C$   
 $\frac{40}{27} = \cos C$   
 $C = \cos^{-1}\left(\frac{40}{27}\right)$  of 8  
 $C = 47^{\circ}17'$  ✓

6

Question 8

(2 marks)

Using the Sine rule, find the length of AC to two decimal places.



$$\frac{AC}{\sin 45^\circ} = \frac{6}{\sin 60^\circ}$$

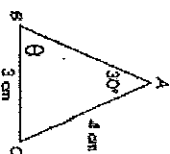
$$AC = \frac{6 \sin 45^\circ}{\sin 60^\circ}$$

$$AC = 4.90 \text{ cm}$$

Question 9

Using the Sine rule, find the value of  $\theta$ , to the nearest minute.

(2 marks)



$$\frac{\sin \theta}{4} = \frac{\sin 30^\circ}{3}$$

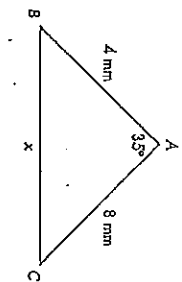
$$\theta = \sin^{-1} \left( \frac{4 \sin 30^\circ}{3} \right)$$

$$\theta = 41^\circ 49'$$

Question 10

(a) Use the Cosine Rule to find  $x$ , correct to two decimal places.

(2 marks)



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

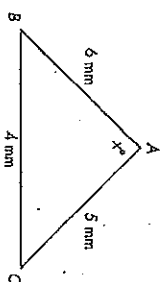
$$x^2 = 4^2 + 8^2 - 2 \times 4 \times 8 \times \cos 35^\circ$$

$$x^2 = 27.57$$

$$x = 5.25 \text{ mm}$$

(b) Use the Cosine Rule to find the value of  $x$  to the nearest minute.

(2 marks)



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

$$\cos A = \frac{6^2 + 5^2 - 4^2}{2 \times 6 \times 5}$$

$$A = \cos^{-1} \left( \frac{6^2 + 5^2 - 4^2}{2 \times 6 \times 5} \right)$$

$$A = 41^\circ 25'$$

END OF EXAMINATION

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