

**RONDEBOSCH BOYS' HIGH SCHOOL**



**GRADE 11**

**MATHEMATICS (PAPER 2)**  
**10 JUNE 2016**

**MARKS: 100**

**EXAMINER: D GELDENHUYS**

**TIME: 2 HOURS**

**MODERATOR: S VERSTER**

**This question paper consists of 6 pages and 1 diagram sheet.**

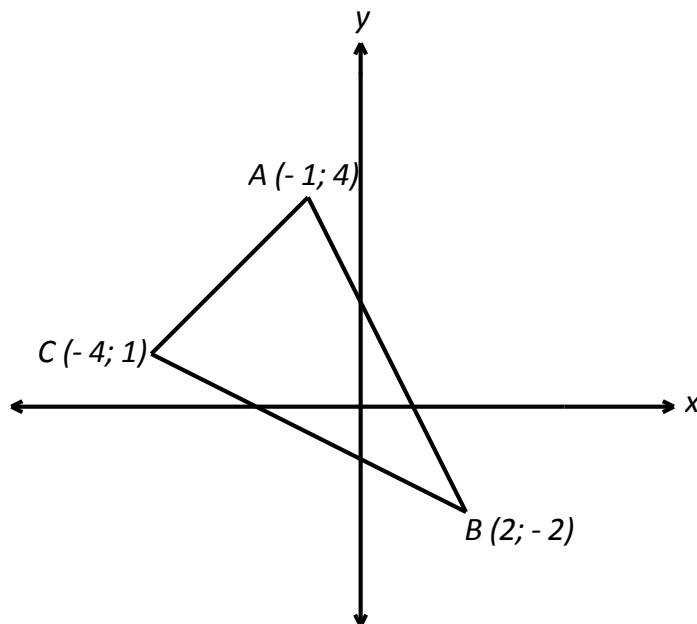
**INSTRUCTIONS AND INFORMATION**

Read the following instructions carefully before answering the questions.

1. This question paper consists of 8 questions including a DIAGRAM SHEET.
2. Answer ALL the questions.
3. Use the DIAGRAM SHEET to answer QUESTION 7. Place the diagram sheet INSIDE your answer booklet.
4. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
5. Start each question on a clean side of paper.
6. Answers only will NOT necessarily be awarded full marks.
7. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
8. If necessary, round off answers to TWO decimal places, unless stated otherwise.
9. Diagrams are NOT necessarily drawn to scale.
10. Number the answers correctly according to the numbering system used in this question paper.
11. Write neatly and legibly.

## QUESTION 1

$A(-1; 4)$ ,  $B(2; -2)$  and  $C(-4; 1)$  are the vertices of triangle ABC in the Cartesian plane below.



- 1.1 Calculate the length of BC. Leave the answer in simplified surd form. (2)
- 1.2 Determine the co-ordinates of point D, the midpoint of AB. (2)
- 1.3 Find the equation of the perpendicular bisector of AB. (4)
- 1.4 Find the equation of the line parallel to AC and going through point B. (3)
- 1.5 Calculate the magnitude of  $\hat{BAC}$ . (4)
- 1.6 Determine the coordinates of E so that ACBE is a parallelogram. (2)

[17]

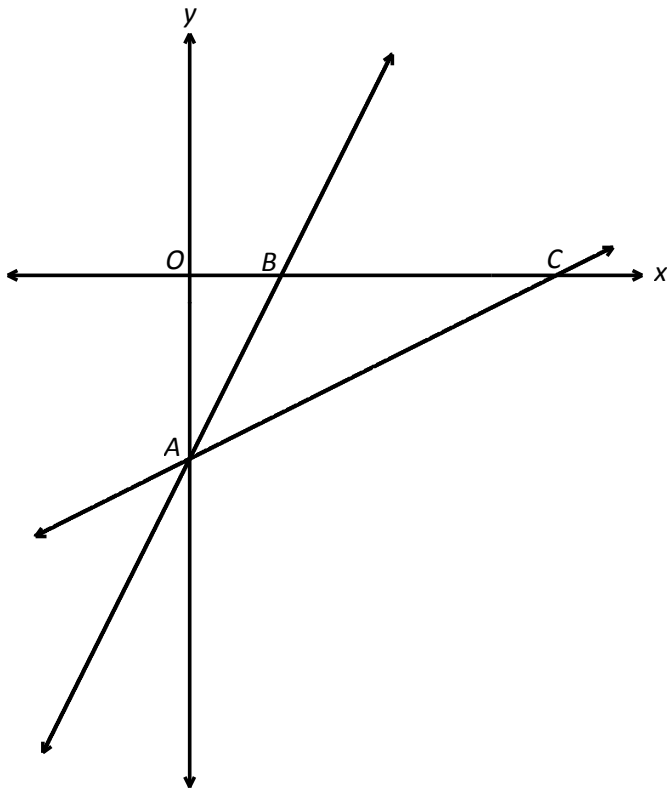
## QUESTION 2

- 2.1 Given the coordinates  $D(-4; 3)$ ;  $E(2; 3)$  and  $P(-6; 7)$ ; show that  $2 DP = EP$ . (3)
- 2.2 The line AB is perpendicular to the line  $y = \frac{3}{2}x - 5$ . Given coordinates  $A(x; -4)$  and  $B(7; -10)$ , find the value of  $x$ . (3)
- 2.3 Given the coordinates  $Q(0; 0)$ ;  $R(6; 0)$  and  $S(a; b)$ . What values of  $a$  and  $b$  will make  $\Delta QRS$  equilateral, where  $b > 0$ ? (5)

[11]

## QUESTION 3

$y - 2x + q = 0$  and  $2y - x + 2q = 0$  are sketched below.



- 3.1 Determine the coordinates of A in terms of  $q$ . (1)
- 3.2 Determine, in terms of  $q$ , the coordinates of B and C. (4)
- 3.3 Determine the area of  $\Delta ABC$  in terms of  $q$ . (3)

[8]

## QUESTION 4

CALCULATORS MAY NOT BE USED IN THIS QUESTION

4.1 If  $6 \sin A = 1$  and  $\tan A < 0$ , use a sketch to find the value of  $\cos(180^\circ - A)$ . (5)

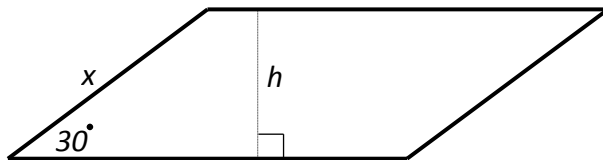
4.2 Simplify:

$$\frac{\cos(180^\circ - x) \cdot \tan(360^\circ - x) \cdot \cos^2(90^\circ - x)}{\sin(180^\circ - x)} + \cos^2 x \quad (7)$$

4.3 Calculate the numerical value of:

$$\frac{\tan 420^\circ}{\cos 60^\circ} \quad (4)$$

4.4 Determine the height,  $h$ , of the parallelogram shown below, in terms of  $x$ . (2)



[18]

## QUESTION 5

CALCULATORS MAY NOT BE USED IN THIS QUESTION

5.1 If  $\tan 58^\circ = m$ , express the following in terms of  $m$ :

5.1.1  $\cos 58^\circ$  (2)

5.1.2  $\sin(-122^\circ)$  (2)

5.2 Given:  $\sin \theta \left[ \sin \theta + \frac{1}{\tan \theta} \right] - \sin(90^\circ + \theta) = 1 - \cos^2 \theta$

5.2.1 Prove the identity. (4)

5.2.2 Give the general solution for the values of  $\theta$  for which the identity is undefined. (2)

[10]

## QUESTION 6

6.1 Solve for  $x$ ; using the given restrictions:

$$6.1.1 \quad \cos(2x - 20^\circ) = -0,37 \quad \text{if } 0^\circ \leq x \leq 180^\circ \quad (4)$$

$$6.1.2 \quad 9^{\tan x} = 27 \quad \text{if } x \in [-180^\circ; 360^\circ] \quad (5)$$

6.2 Given:  $\sin^2 x - 3 \cos^2 x = 2 \sin x \cdot \cos x$

6.2.1 Find the general solution to the equation. (6)

6.2.2 Solve for  $x$ , if  $x \in [-90^\circ; 90^\circ]$ . (2)

[17]

## QUESTION 7

Given the functions  $f(x) = \cos 2x$  and  $g(x) = \sin(x + 60^\circ)$ . Using the DIAGRAM SHEET, answer the following questions:

7.1 The graph of  $f(x)$  has been drawn on the diagram sheet for  $x \in [-90^\circ; 180^\circ]$ . On the set of axes, draw the graph of  $g(x)$ . (3)

7.2 Determine for which values of  $x$   $f(x) = g(x)$  if  $x \in [-90^\circ; 180^\circ]$ . (6)

7.3 For which values of  $x$  is:

$$7.3.1 \quad f(x) > g(x); \text{ if } x \in [-90^\circ; 180^\circ] \quad (2)$$

$$7.3.2 \quad f(x) \cdot g(x) < 0; \text{ if } x \in [-90^\circ; 45^\circ] \quad (1)$$

[12]

## QUESTION 8

8.1 If  $\tan \beta + \sin \beta = m$  and  $\tan \beta - \sin \beta = n$ , then prove that  $m^2 - n^2 = 4 \sin \beta \cdot \tan \beta$ . (5)

8.2 Determine the value of  $\tan 1^\circ \times \tan 2^\circ \times \tan 3^\circ \times \dots \times \tan 87^\circ \times \tan 88^\circ \times \tan 89^\circ$ . (2)

[7]

**Total Marks: 100**

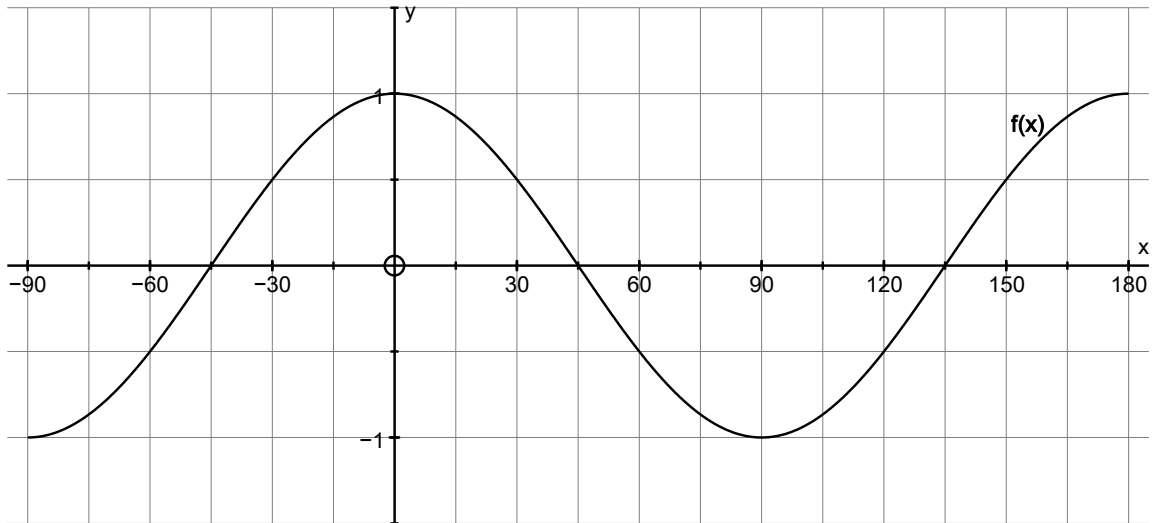
# DIAGRAM SHEET

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

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

## QUESTION 7

7.1



(3)

7.2

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(6)

7.3.1 \_\_\_\_\_  
\_\_\_\_\_ (2)

7.3.2 \_\_\_\_\_ (1)  
[12]