

RONDEBOSCH BOYS' HIGH SCHOOL



GRADE 11

**MATHEMATICS (PAPER 2)
19 JUNE 2017**

MARKS: 100

EXAMINER: T EDWARDS

TIME: 2 HOURS

MODERATOR: D GELDENHUYS

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

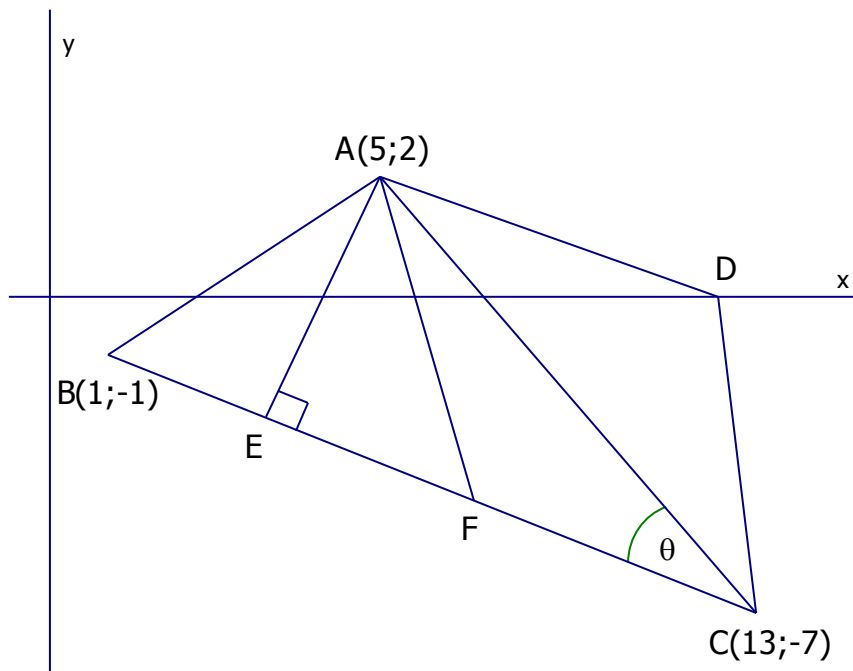
INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 7 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

In the diagram, $ABCD$ is a trapezium ($AD \parallel BC$) with vertices $A(5; 2)$, $B(1; -1)$, $C(13; -7)$ and D . AE is the perpendicular height of $ABCD$, F is the midpoint of BC and $\hat{ACB} = \theta$.



- 1.1 Determine the coordinates of F . (2)
- 1.2 Determine the equation of AD . (4)
- 1.3 Determine the equation of AE . (3)
- 1.4 Determine the coordinates of E . (6)
- 1.5 Show that $BE = \frac{1}{5}EC$. (5)
- 1.6 Calculate the size of θ . (5)

[25]

QUESTION 2

The equation of a line is defined by $(3 - 2k)x + y = 12$

Find the value of k if:

2.1 the line is parallel to $y = 4x + 7$. (3)

2.2 the line is parallel to the x -axis. (2)

2.3 the line passes through the point $(-3; 4)$. (3)

[8]

QUESTION 3

A circle with a centre at the origin (O) is given by the equation $x^2 + y^2 = r^2$, where r is the radius.

Given the equation $x^2 + y^2 = 24$, determine whether the point $A(-3; 4)$ lies inside or outside the given circle. Show your reasoning. **[4]**

QUESTION 4

NO CALCULATORS MAY BE USED IN THIS ENTIRE QUESTION.

Given: $\cos \alpha = \frac{8}{17}$ with $\sin \alpha < 0$ and $\tan \beta = -\frac{4}{3}$ with $\sin \beta > 0$

4.1 Represent the given information in two separate sketches. (4)

4.2 Determine the value of: $\cos(90^\circ - \alpha) + \cos \beta$. (4)

[8]

QUESTION 5

NO CALCULATORS MAY BE USED IN THIS ENTIRE QUESTION.

5.1 Simplify:

5.1.1 $\frac{\cos 495^\circ \cdot \sin 300^\circ \cdot \sin(-\theta)}{\cos(90^\circ + \theta)}$ (6)

5.1.2 $\frac{1 - \sin^2 220^\circ}{\sin 50^\circ}$ to a single trigonometric function. (4)

5.2 Prove that:

5.2.1 $\sin(180^\circ - x) \cdot \tan(180^\circ + x) - \cos(180^\circ + x) = \frac{1}{\cos x}$ (6)

5.2.2 $\frac{\sin^n \theta - \cos^n \theta}{1 - \tan^n \theta} = -\cos^n \theta$ (5)

5.3 Given $\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \cdot \tan B}$ show that $\tan 15^\circ = \frac{\sqrt{3} - 1}{\sqrt{3} + 1}$. (3)

[24]

QUESTION 6

6.1 Solve for x as instructed.

6.1.1 $2 \sin x = 0,71$ $x \in [0^\circ; 360^\circ]$ (3)

6.1.2 $\cos(2x + 30^\circ) = -0,25$ General solution (4)

6.2 Determine, without the use of a calculator, the value of:

$\cos^2 1^\circ + \cos^2 2^\circ + \cos^2 3^\circ + \dots + \cos^2 88^\circ + \cos^2 89^\circ + \cos^2 90^\circ$ (4)

[11]

QUESTION 7

ANSWER THIS ENTIRE QUESTION ON THE DIAGRAM SHEET PROVIDED.

Given the functions $f(x) = \sin 2x$ and $g(x) = \cos(x - 60^\circ)$

7.1 Determine the general solution for $f(x) = g(x)$. (5)

7.2 Hence, solve for x if $x \in [-90^\circ; 180^\circ]$. (2)

7.3 On the set of axes provided on the diagram sheet, sketch $f(x)$ and $g(x)$.

Label all starting, ending and turning points. (7)

7.4 Write down the period of $f(x)$. (1)

7.5 For which values of x where $x \in [-90^\circ; 180^\circ]$ is:

7.5.1 $f(x) \geq g(x)$ (3)

7.5.2 $f(x) \cdot g(x) < 0$ (2)

[20]

[TOTAL: 100 MARKS]