

HILLCREST HIGH SCHOOL



Grade 11 Mathematics Paper 2

MARKS: 100

TIME: 2 hours

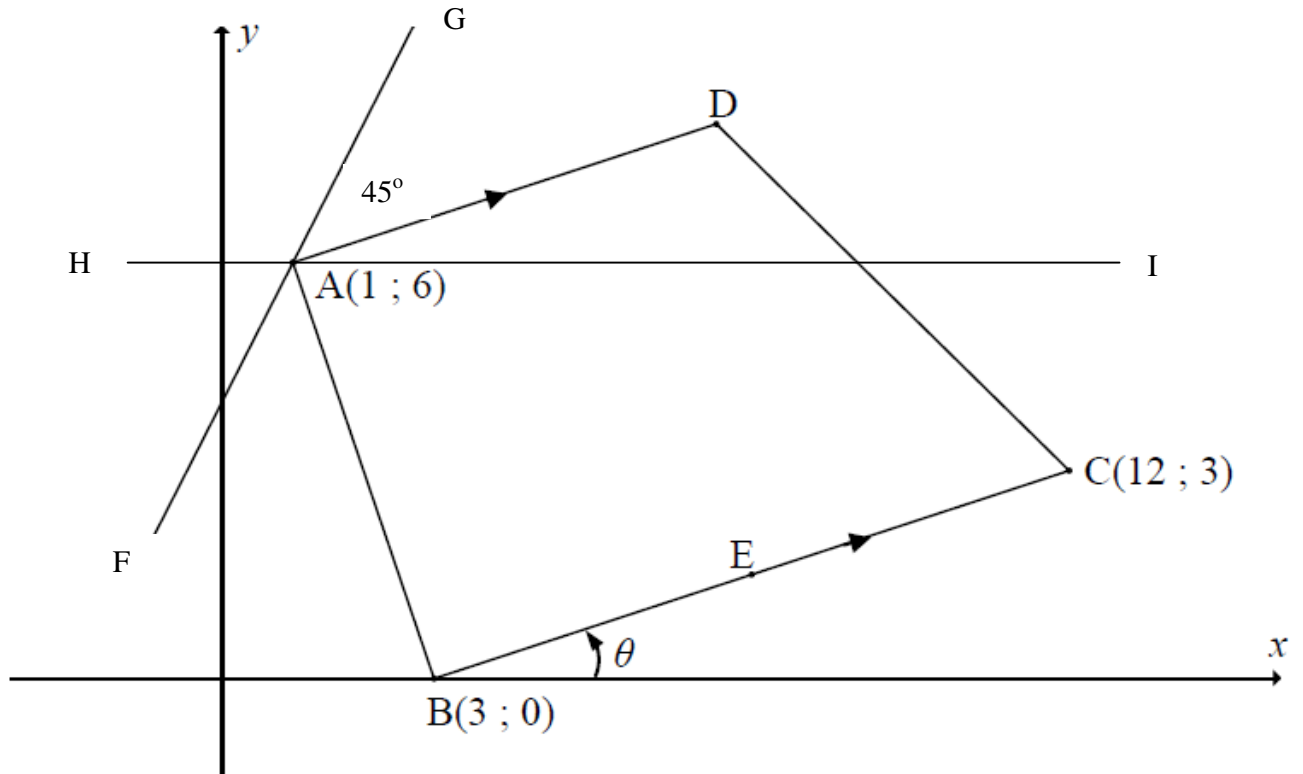
INSTRUCTIONS

1. This question paper consists of SEVEN questions. Answer ALL the questions.
2. Number the questions correctly according to the number system used in this question paper.
3. Start EACH question on a NEW page.
4. You may use an approved calculator (non-programmable and non-graphical), unless stated otherwise.
5. Show ALL calculations clearly. Answers only will not be awarded full marks.
6. Round off ALL final answers to TWO decimal places, unless stated otherwise.
7. Indicate units of measurement, where applicable.
8. Diagrams are NOT drawn to scale, unless otherwise stated.
9. Write neatly and legibly.

QUESTION 1:

$A(1 ; 6)$, $B(3 ; 0)$, $C(12 ; 3)$ and D are the vertices of a trapezium with $AD \parallel BC$. E is the midpoint of BC . The angle of inclination of the straight line BC is θ , as shown in the diagram.

and $HI \parallel x$ -axis

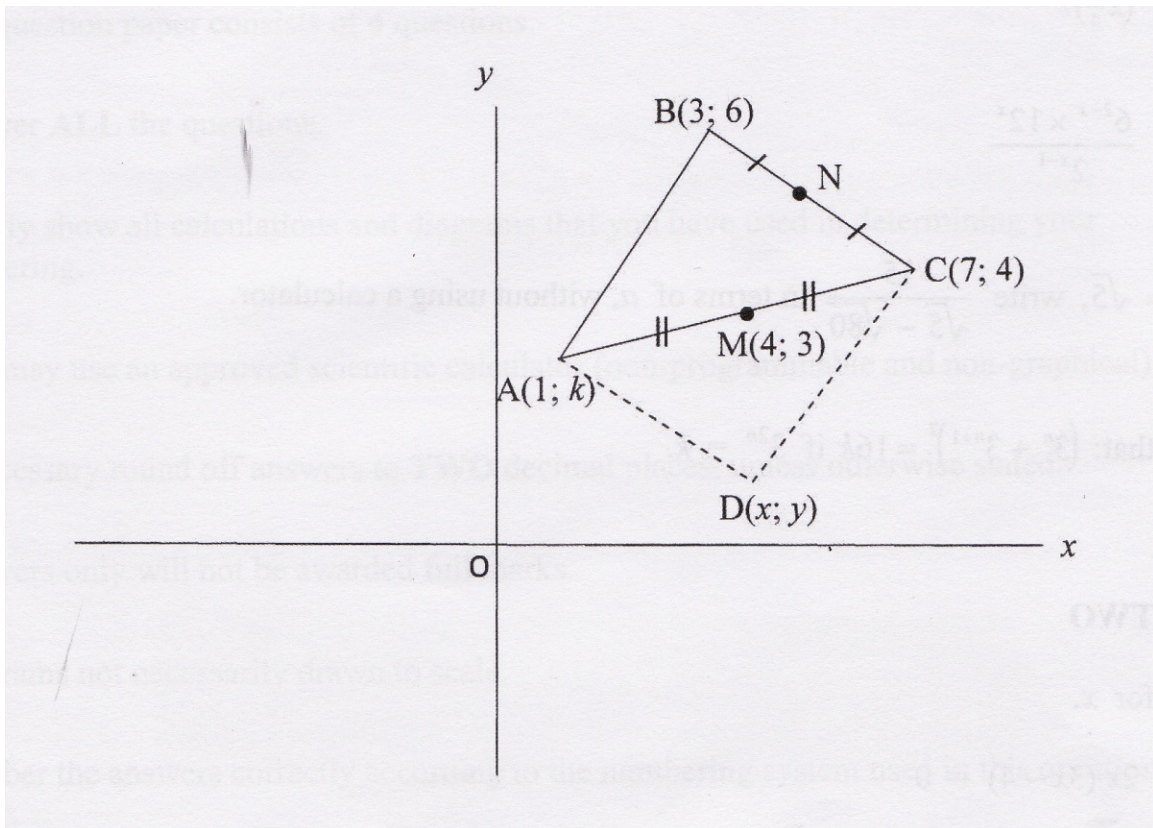


- 1.1 Calculate the coordinates of E . (2)
- 1.2 Determine the gradient of the line BC . (2)
- 1.3 Calculate the magnitude of θ . (2)
- 1.4 Prove that AD is perpendicular to AB . (3)
- 1.5.1 Determine the size of D . (1)
- 1.5.2 Hence, determine the equation of the straight line FG . (4)

[14]

QUESTION 2:

In the figure below $A(1; k)$, $B(3; 6)$ and $C(7; 4)$ are the vertices of a triangle ABC with $M(4; 3)$ and N the midpoints of AC and BC respectively.

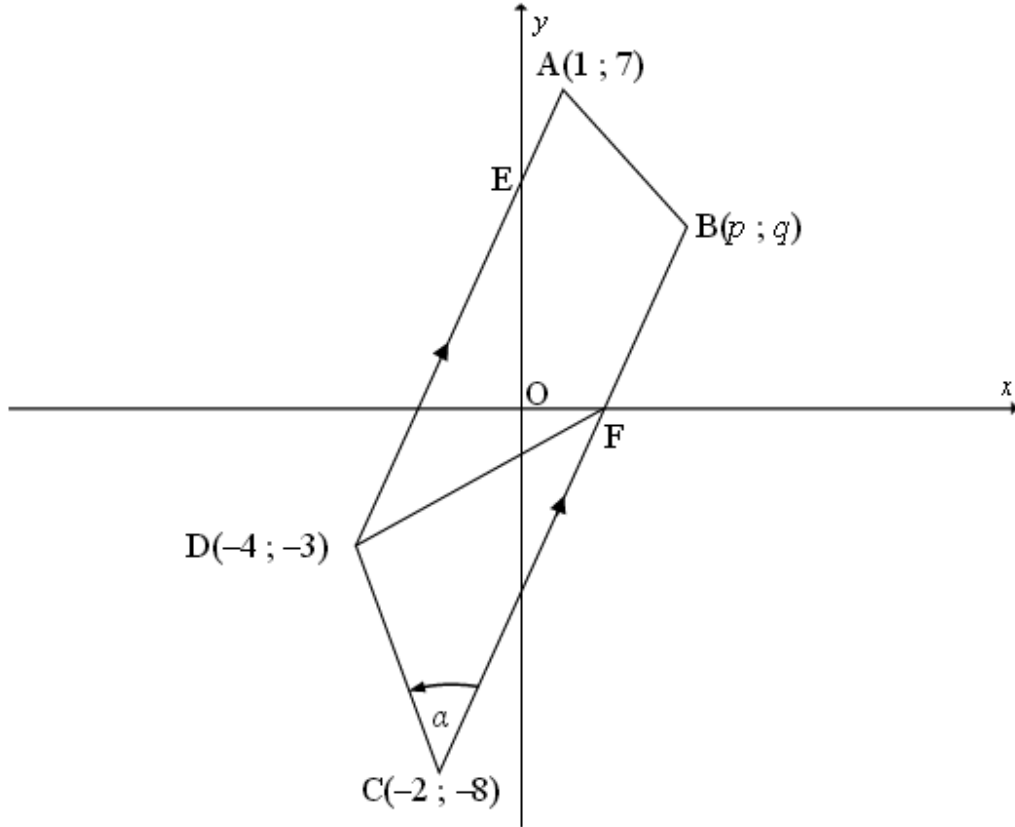


Use the figure above and answer the questions that follow:

- 2.1 Show that $k = 2$. (3)
 - 2.2 Prove that $MN = \frac{1}{2} AB$. (5)
 - 2.3 If BA is produced to cut the x -axis at E , calculate the inclination of line BAE . (4)
 - 2.4 If $D(x; y)$ is a point such that $ABCD$ is a parallelogram, calculate the co-ordinates of D . (4)
 - 2.5 Calculate the equation of the line through D perpendicular to AC . (4)
- [20]**

QUESTION 3:

In the diagram below, trapezium ABCD with $AD \parallel BC$ is drawn. The coordinates of the vertices are A (1 ; 7); B (p ; q); C (-2 ; -8) and D (-4 ; -3). BC intersects the x-axis at F. $\widehat{DCB} = \alpha$



- 3.1 Calculate the gradient of AD. (2)
 - 3.2 Determine the equation of BC in the form $y = mx + c$. (3)
 - 3.3 Determine the coordinates of point F. (2)
 - 3.4 Show that $\alpha = 48,37^\circ$ (4)
 - 3.5 Calculate the area of ΔDCF . (6)
- [17]**

QUESTION 4:

4.1 Given $5 \tan \alpha + 4 = 0$ and $\alpha \in [180^\circ ; 360^\circ]$. Use a suitable diagram to determine the following, without using a calculator:

4.1.1. $\sin x$ (4)

4.1.2. $2 \cos (180^\circ - \alpha)$ (3)

4.1.3. $\sin^2(\alpha - 90^\circ) - \sin^2 \alpha$ (3)
[10]

QUESTION 5:

5.1 Simplify without using a calculator:

5.1.1 $\cos(-x) \cdot \tan(180^\circ - x) \cdot \sin(180^\circ + x) - \cos(180^\circ + x) \sin(90^\circ - x)$ (5)

5.1.2 $\frac{\sin 120^\circ \cdot \cos 135^\circ \cdot \tan 240^\circ}{\cos 150^\circ \cdot \tan 150^\circ \cdot \sin 315^\circ}$ (6)

5.2 Given the identity:

$$\frac{\cos x}{1 - \sin x} - \frac{\cos x}{1 + \sin x} = 2 \tan x$$

5.2.1 Prove the identity. (5)

5.2.2 If $x \in [-180^\circ ; 180^\circ]$, give 2 values of x for which the identity is undefined. (2)

[18]

QUESTION 6:

6.1 Determine the general solution for:

6.1.1 $3 \sin x = 1$ (3)

6.1.2 $\tan(x - 30^\circ) = 2$ (3)

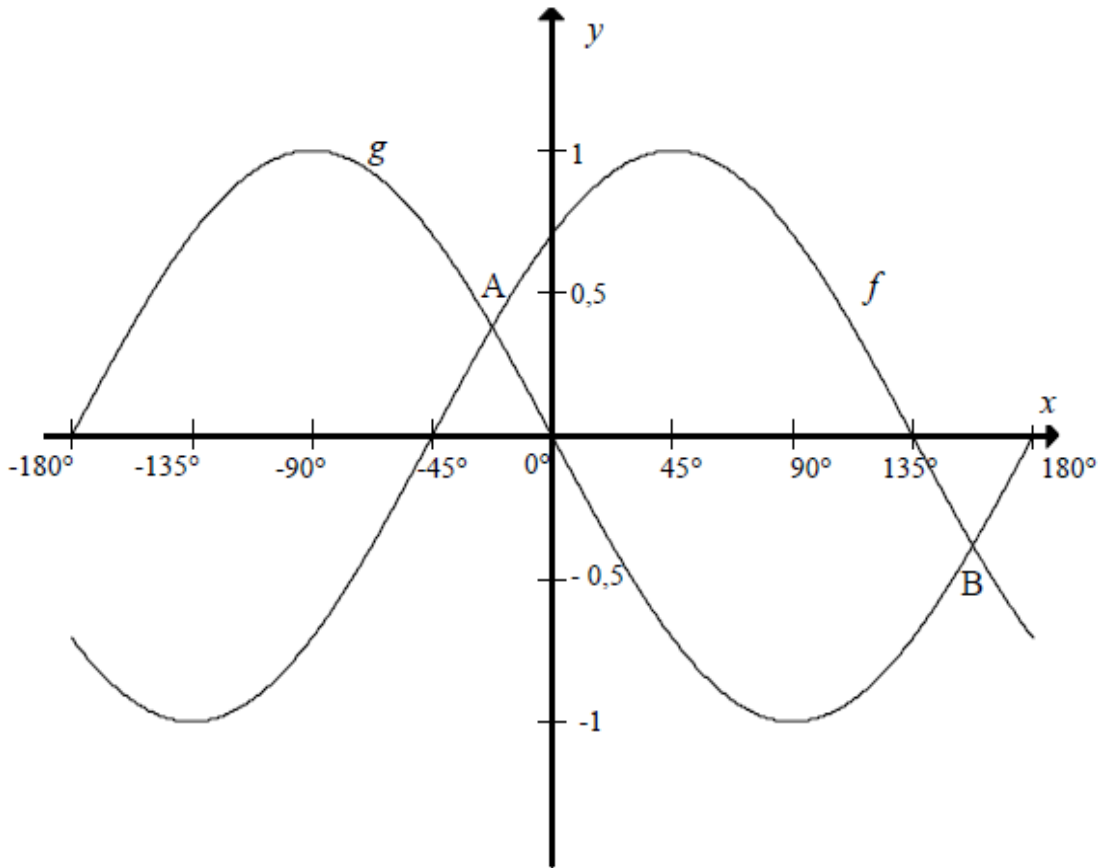
6.2 Solve for x if $x \in [0^\circ ; 360^\circ]$ for:

$$4 \cos^2 x - \tan 45^\circ = 0$$

(6)
[12]

QUESTION 7:

In the diagram below, the graphs of $f(x) = \cos(x + p)$ and $g(x) = q \sin x$ are shown for the interval $-180^\circ \leq x \leq 180^\circ$.



- 7.1 Determine the values of p and q . (2)
- 7.2 The graphs intersect at $A(-22,5^\circ ; 0,38)$ and B . Determine the coordinates of B . (2)
- 7.3 Determine the value(s) of x in the interval $-180^\circ \leq x \leq 180^\circ$ for which $f(x) - g(x) < 0$. (2)
- 7.4 The graph f is shifted 30° to the left to obtain a new graph h .
- 7.4.1 Write down the equation of h in its simplest form. (2)
- 7.4.2 Write down the value of x for which h has a minimum in the interval $-180^\circ \leq x \leq 180^\circ$. (1)
- [9]