

NAME :

SOUTH SYDNEY HIGH SCHOOL



YEAR 10 - MATHEMATICS (ADVANCED)

TOPIC TEST: STRAIGHT LINE GRAPHS

INSTRUCTIONS:

- Place all answers in the spaces provided.
- Show all necessary working.
- Marks will be deducted for untidy work.
- All questions are NOT of equal value.

Question 1 (10 marks)

Plot the points $A(-4, 8)$, $B(8, 2)$ and $C(6, 13)$ on a number plane to form a triangle ABC . (2 m)

If D is the mid point of AB .

(a) Find the co-ordinates of D . (2 m)

(b) Show that CD is perpendicular to AB . (3 m)

(c) Find the area of triangle ABC . (3 m)

Question 2 (7 marks)

The points $A(0, 6)$, $B(-6, 2)$, $C(2, -10)$ and $D(8, -6)$ are the vertices of a quadrilateral. Without graphing the points,

(a) Show that the quadrilateral is a rectangle. (4 m)

(b) Find the area of the rectangle. (3 m)

Question 3 (8 marks)

ABCD is a rectangle. *A* has co-ordinates (4, 6), *B*, (-2, 4) and *C*, (-1, 1).

(a) Find the equation of *AD*. (2 m)

(b) Find the equation of *CD*. (1 m)

(c) Hence, or otherwise, find the co-ordinates of *D*. (2 m)

(d) Find the area of the rectangle. (3 m)

Question 4 (10 marks)

Sketch the points $A(-2, 1)$, $B(4, 4)$ and $C(1, -5)$ and join them to form a triangle. (2 m)

- (a) Calculate the gradients of AB and AC . Hence show the triangle is right angled, stating which angle is 90° . (2 m)

(b) Find the area of the triangle ABC . (3 m)

(c) If D and E are the mid points of AB and BC respectively, show algebraically that DE is parallel to AC . (3 m)

100% Excellence

NAME: Alice Lee

SOUTH SYDNEY HIGH SCHOOL Y10



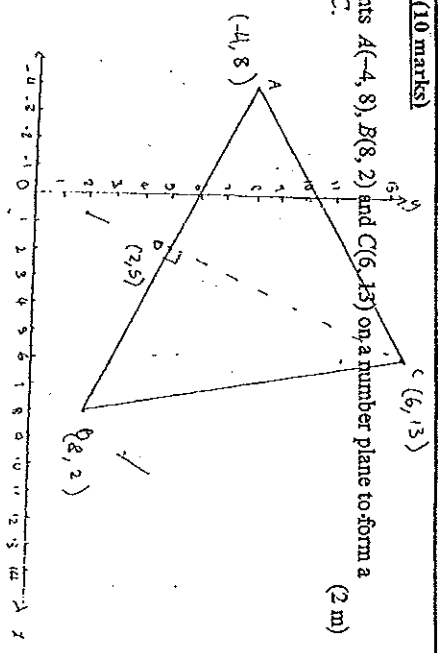
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Plot the points A(-4, 8), B(8, 2) and C(6, 13) on a number plane to form a triangle ABC. (2 m)



IF D is the mid point of AB. (a) Find the co-ordinates of D. (2 m)

(b) Show that CD is perpendicular to AB. (3 m)

$$m_{AB} = \frac{8-2}{-4-8} = \frac{6}{-12} = -\frac{1}{2}$$

$$m_{CD} = \frac{13-5}{6-2} = \frac{8}{4} = 2$$

$$-\frac{1}{2} \times 2 = -1$$

$\therefore CD \perp AB$ (negative reciprocal gradients)

(c) Find the area of triangle ABC. (3 m)

$$AC = \sqrt{(-4-6)^2 + (8-13)^2} = \sqrt{100 + 25} = \sqrt{125} = 5\sqrt{5}$$

$$BC = \sqrt{(8-6)^2 + (2-13)^2} = \sqrt{4 + 121} = \sqrt{125} = 5\sqrt{5}$$

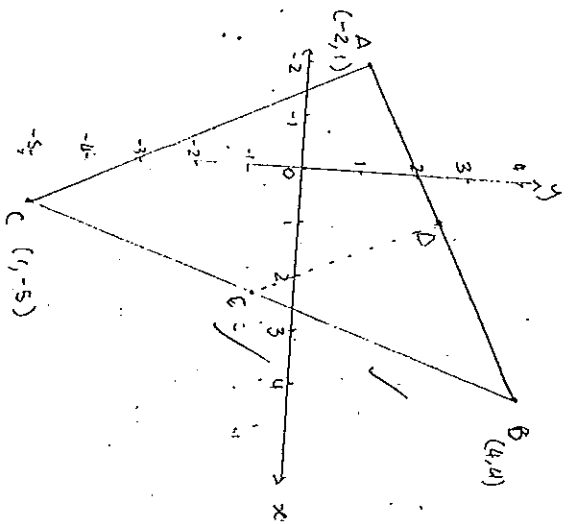
$$AB = \sqrt{(-4-8)^2 + (8-2)^2} = \sqrt{144 + 36} = \sqrt{180} = 6\sqrt{5}$$

$$A = \frac{5\sqrt{5} \times 5\sqrt{5}}{2} = 60 \text{ units}^2$$

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Sketch the points A(-2, 1), B(4, 4) and C(1, -5) and join them to form a triangle.

(2 m)



(a) Calculate the gradients of AB and AC. Hence show the triangle is right angled, stating which angle is 90° .

(2 m)

$$\begin{aligned}
 m_{AB} &= \frac{1-4}{-2-4} & m_{AC} &= \frac{1+5}{-2-1} \\
 &= \frac{-3}{-6} & &= \frac{6}{-3} \\
 &= \frac{1}{2} & &= -2
 \end{aligned}$$

$\therefore \angle BAC = 90^\circ$
 since $AB \perp AC$ ✓

(b) Find the area of the triangle ABC.

(3 m)

$$\begin{aligned}
 AB &= \sqrt{(-2-4)^2 + (1-4)^2} & AC &= \sqrt{(-2-1)^2 + (1+5)^2} \\
 &= \sqrt{36+9} & &= \sqrt{9+36} \\
 &= 3\sqrt{5} & &= 3\sqrt{5}
 \end{aligned}$$

$$\text{area} = \frac{3\sqrt{5} \times 3\sqrt{5}}{2} = 22.5 \text{ units}^2$$

(c) If D and E are the mid points of AB and BC respectively, show algebraically that DE is parallel to AC.

(3 m)

$$\angle BAC = 90^\circ$$

$$\begin{aligned}
 D &= \left(\frac{-2+4}{2}, \frac{1+4}{2} \right) & E &= \left(\frac{4+1}{2}, \frac{4-5}{2} \right) \\
 &= \left(1, \frac{5}{2} \right) & &= \left(\frac{5}{2}, -\frac{1}{2} \right)
 \end{aligned}$$

$$\begin{aligned}
 m_{DE} &= \frac{\frac{5}{2} + \frac{1}{2}}{1 - \frac{5}{2}} \\
 &= -2
 \end{aligned}$$

Since $m_{AB} = \frac{1}{2}$

$$\frac{1}{2} \times -2 = -1$$

$\therefore DE \perp AB$
 and $\angle BDE = 90^\circ$

$\therefore DE \parallel AC$ (corresponding \angle are equal)

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