NAME :

Centre of Excellence in Mathematics
S201 / 414 GARDENERS RD. ROSEBERY 2018
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YEAR 12 – ADVANCED MATHS

REVIEW TOPIC (SP2)
COORDINATE GEOMETRY

<u>HSC 06</u>

(3)

(a)
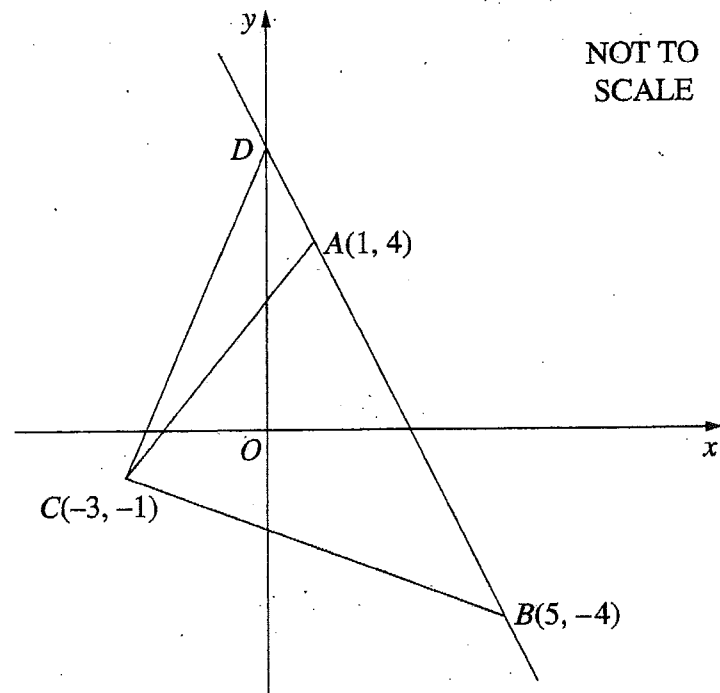
In the diagram, A, B and C are the points $(1, 4)$, $(5, -4)$ and $(-3, -1)$ respectively. The line AB meets the y-axis at D.

(i)   Show that the equation of the line AB is $2x + y - 6 = 0$.   **2**

(ii) Find the coordinates of the point D.   **1**

$\boxed{D(0,6)}$

(iii)   Find the perpendicular distance of the point C from the line AB.   **1**

$$\boxed{\dfrac{13\sqrt{5}}{5}\,\text{units}}$$

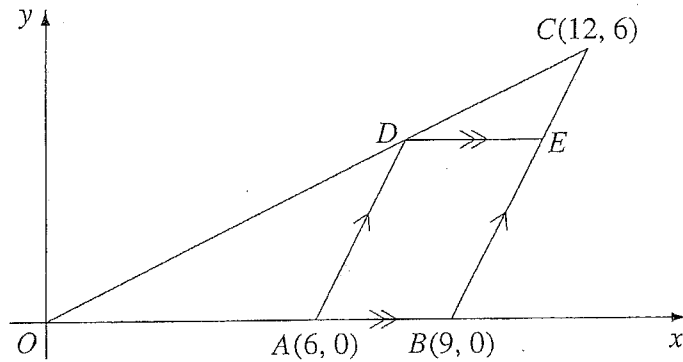(iv)   Hence, or otherwise, find the area of the triangle ADC.   **2**

$$\boxed{6\dfrac{1}{2}\ \text{units}^2}$$

HSC 05

(3)

(c)

$C(12, 6)$

NOT
TO
SCALE

D E

O $A(6, 0)$ $B(9, 0)$ x

In the diagram, A, B and C are the points $(6, 0)$, $(9, 0)$ and $(12, 6)$ respectively. The equation of the line OC is $x - 2y = 0$. The point D on OC is chosen so that AD is parallel to BC. The point E on BC is chosen so that DE is parallel to the x-axis.

   (i)   Show that the equation of the line AD is $y = 2x - 12$.   2

   (ii)   Find the coordinates of the point D.   2

$\boxed{D(8, 4)}$

3

(iii)   Find the coordinates of the point E.   1

$$\boxed{E(11,4)}$$

(iv)   Prove that $\triangle OAD \parallel\!\mid \triangle DEC$.   2
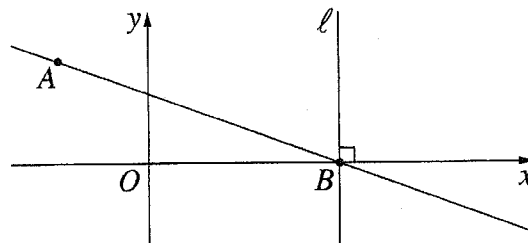
(v)   Hence, or otherwise, find the ratio of the lengths AD and EC.   1

$$\boxed{2:1}$$

4

HSC 04

(2)

(a)   The diagram shows the points $A(-1, 3)$ and $B(2, 0)$.

   The line ℓ is drawn perpendicular to the x-axis through the point B.

NOT TO SCALE

   (i)   Calculate the length of the interval AB.   **1**

$$\boxed{3\sqrt{2}}$$

(ii)   Find the gradient of the line AB.   **1**

$$\boxed{-1}$$

(iii)   What is the size of the acute angle between the line AB and the line ℓ?   **1**

$$\boxed{45^0}$$

5

(iv) Show that the equation of the line AB is $x + y - 2 = 0$.   **1**

(v)   Copy the diagram into your writing booklet and shade the region defined   **1**
      by $x + y - 2 \leq 0$.

      (Shade your region in the diagram provided on the previous page)

(vi) Write down the equation of the line ℓ.   **1**

$$\boxed{x = 2}$$

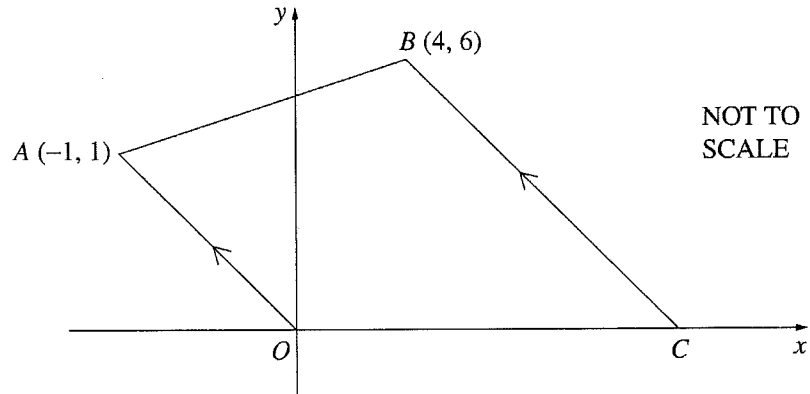(vii) The point C is on the line ℓ such that AC is perpendicular to AB. Find the   **2**
      coordinates of C.

$$\boxed{(2,6)}$$

6

HSC 03

(2)

(b)

y

B (4, 6)

NOT TO
SCALE

A (−1, 1)

O   C   x

In the diagram, *OABC* is a trapezium with *OA* ∥ *CB*. The coordinates of *O*, *A* and *B* are (0, 0), (−1, 1) and (4, 6) respectively.

(i)   Calculate the length of *OA*.   1

$\boxed{\sqrt{2}}$

(ii)   Write down the gradient of the line *OA*.   1

$\boxed{-1}$

(iii)   What is the size of ∠*AOC*?   1

$\boxed{135^0}$

7

(iv) Find the equation of the line BC, and hence find the coordinates of C.   **2**

$$\boxed{x + y - 10 = 0; \ C(10,0)}$$

(v) Show that the perpendicular distance from O to the line BC is $5\sqrt{2}$.   **2**

$$\boxed{5\sqrt{2}}$$

(vi)   Hence, or otherwise, calculate the area of the trapezium *OABC*.   **2**

35

(2)
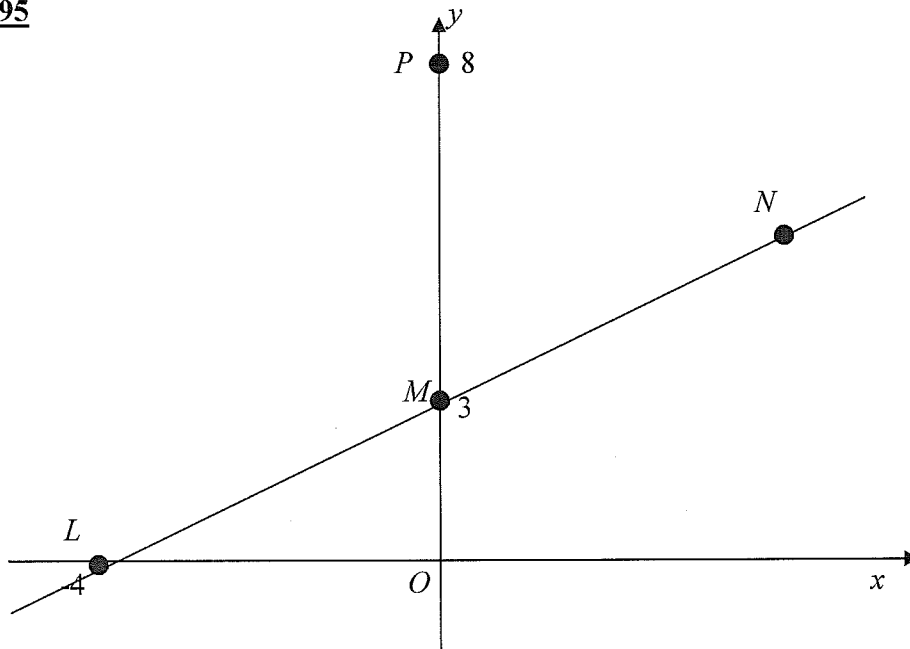
The line l cuts the x axis at L (-4, 0) and the y axis at M (0, 3) as shown. N is a point on the line l, and P is the point (0, 8).

Copy the diagram into your Writing Booklet.

(a) Find the equation of the line l. **2**

$\boxed{3x - 4y + 12 = 0}$

(b) Show that the point (16, 15) lies on the line *l*.   **1**

(c) By considering the lengths of *ML* and *MP*, show that $\triangle LMP$ is isosceles.   **2**

(d) Calculate the gradient of the line *PL*.   **1**

$\boxed{2}$

(e) *M* is the midpoint of the interval *LN*. Find the coordinates of the point *N*.   **2**

$\boxed{(4,6)}$

(f) Show that $\angle NPL$ is a right angle.   **2**

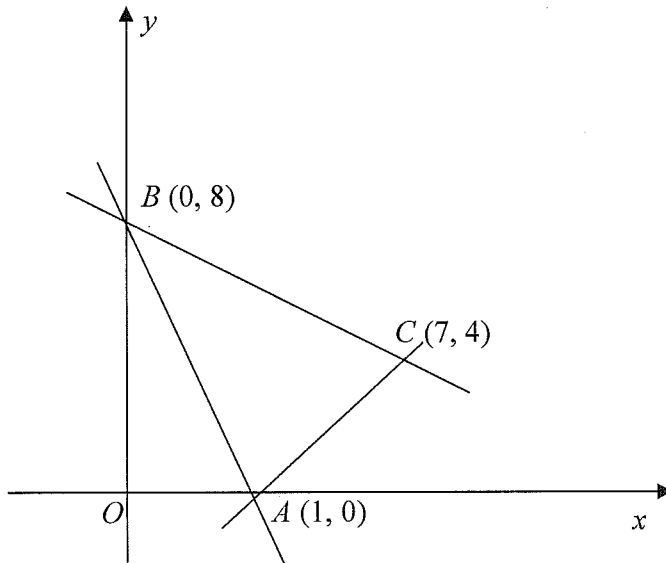(g) Find the equation of the circle that passes through the points N, P and L.   **2**

$$\boxed{x^2 + y^2 - 6y - 16 = 0}$$

(2)

NOT TO SCALE

The points A, B, and C have coordinates $(1, 0)$, $(0, 8)$, and $(7, 4)$, as shown in the diagram. The angle between the line AC and the x axis is θ.

Copy the diagram into your Writing Booklet.

(a) Find the gradient of the line AC.

$$\boxed{\dfrac{2}{3}}$$

(b) Calculate the size of angle θ in degrees.

$$\boxed{34^0}$$

(c) Find the equation of the line AC.

$$\boxed{2x - 3y - 2 = 0}$$

(d) Find the coordinates of D, the midpoint of AC.

$(4,2)$

(e) Show that AC is perpendicular to BD.

(f) What does part (e) show about $\triangle ABC$?

isosceles triangle

(g) Find the area of $\triangle ABC$.

26 units^2

14

(h) Write down the coordinates of a point E such that $ABCE$ is a rhombus.

$$\boxed{E\left(8,-4\right)}$$

HSC '93

(2) (i) On a number plane, mark the origin O and the points A (2, 1) and B (3, -1).

(ii)   Find the gradients m_1 of OA and m_2 of AB.

$$\boxed{m_1 = \frac{1}{2}, \; m_2 = -2}$$

(iii)   Show that OA is perpendicular to AB.

(iv)   Show that $OA = AB$.

$$\boxed{d_{OA} = d_{AB} = \sqrt{5}}$$

(v) Find the midpoint D of the interval OB.

$$\left(\frac{3}{2}, -\frac{1}{2}\right)$$

(vi) Find the coordinates of the point C such that D is the midpoint of AC.

$$(1, -2)$$

(vii) What shape best describes the geometric figure $OABC$?

A square