

## A60 (H) Straight Line Graphs - Perpendicular Lines

OCR

**18 (a)** A straight line passes through the point  $(0, 6)$  and is perpendicular to  $y = 4x - 5$ .

*ALOK* Find the equation of this line, giving your answer in the form  $y = mx + c$ .

**(a)** ..... **[3]**

18 (a) A straight line passes through the point  $(0, 6)$  and is perpendicular to  $y = 4x - 5$ .

ALOH Find the equation of this line, giving your answer in the form  $y = mx + c$ .

x y ↙

Gradient of  $y = 4x - 5 \Rightarrow 4$

Gradient of  $\underline{b}$  = neg rec of 4  
 $= -\frac{1}{4}$

↙ gradient → y-intercept

(a)  $y = -\frac{1}{4}x + 6$  ..... [3]

**18** P is the point (0, -1) and Q is the point (5, 9).

Find the equation of the line through P that is perpendicular to the line PQ.

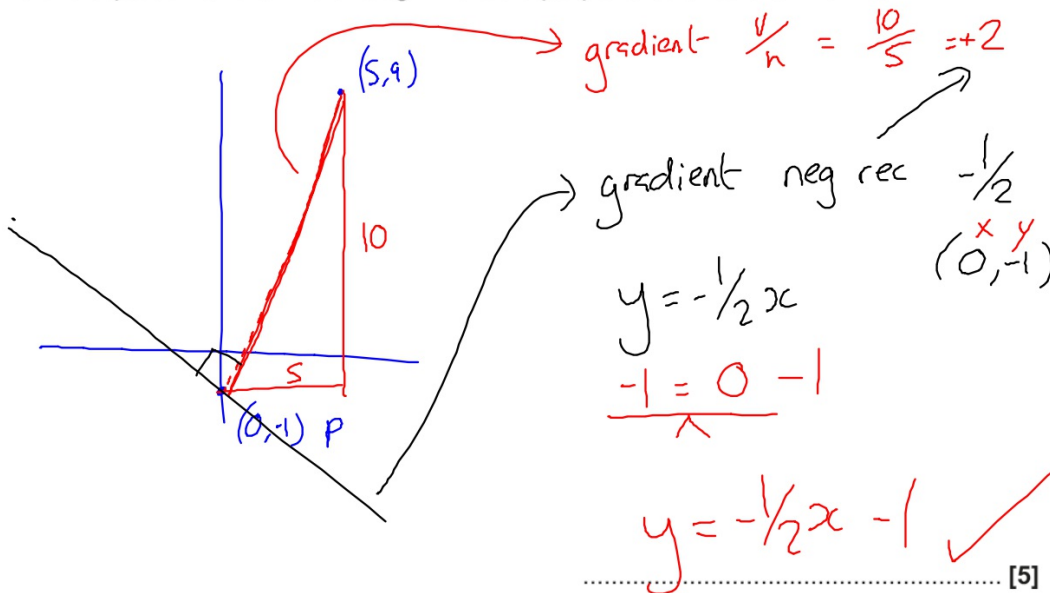
**A60**

..... **[5]**

18 P is the point (0, -1) and Q is the point (5, 9).

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A60



EDEXCEL

**25**  $A(-2, 1)$ ,  $B(6, 5)$  and  $C(4, k)$  are the vertices of a right-angled triangle  $ABC$ .  
Angle  $ABC$  is the right angle.

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Find an equation of the line that passes through  $A$  and  $C$ .  
Give your answer in the form  $ay + bx = c$  where  $a$ ,  $b$  and  $c$  are integers.

.....  
**(Total for Question 25 is 5 marks)**

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25  $A(-2, 1)$ ,  $B(6, 5)$  and  $C(4, k)$  are the vertices of a right-angled triangle  $ABC$ .

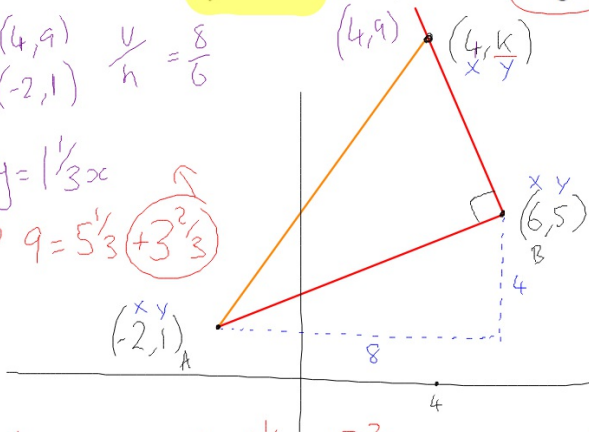
Angle  $ABC$  is the right angle.

Find an equation of the line that passes through  $A$  and  $C$ .

Give your answer in the form  $ay + bx = c$  where  $a$ ,  $b$  and  $c$  are integers.

AC.  $C(4, 9)$   $\frac{v}{h} = \frac{8}{6}$   
 $A(-2, 1)$

AC =  $y = 1\frac{1}{3}x$   
 $(4, 9) \rightarrow 9 = 5\frac{1}{3} + 3\frac{2}{3}$



$4 \times 1 = 4$   
 $4 \times \frac{1}{3} = 1\frac{1}{3}$

$y = 1\frac{1}{3}x + 3\frac{2}{3}$   
 $y - 1\frac{1}{3}x = 3\frac{2}{3} \quad \downarrow \times 3$   
 $3y = 4x + 11$

Grad AB ...  $\frac{v}{h} = \frac{4}{8} = 0.5$   
 ↓ neg rec

Grad AC ... -2

AC ...  $y = -2x + 17$

$(6, 5) \rightarrow 5 = -12 + 17$

find k ...  $y = -2x + 17$

$(4, k) \rightarrow y = -8 + 17$

$y = 9 \quad (4, 9)$

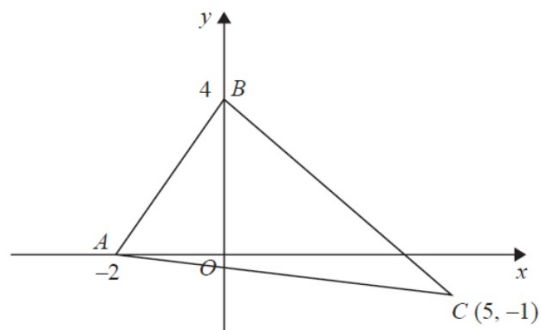
$k = 9$

$3 \times 3 = 9$   
 $3 \times \frac{2}{3} = 2$

(Total for Question 25 is 5 marks)

23

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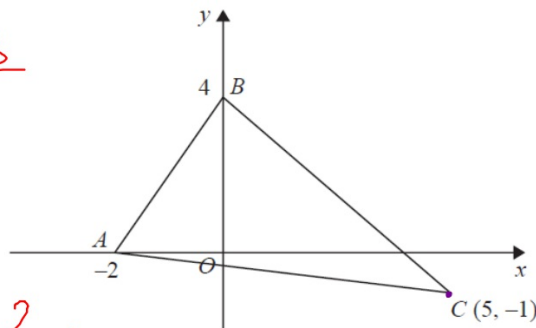
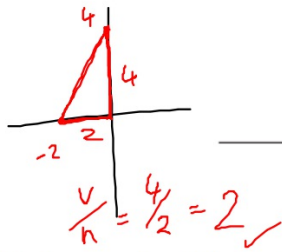


Find an equation of the line that passes through  $C$  and is perpendicular to  $AB$ .

.....  
(Total for Question 23 is 4 marks)

23

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Gradient of ABFind an equation of the line that passes through C and is perpendicular to AB.

gradients

Gradient of a perpendicularNegative Reciprocal of  $\frac{2}{1}$   
 $-\frac{1}{2}$ 

$$y = mx + c$$

Ans grad

$$y = -\frac{1}{2}x$$

$$\begin{matrix} x & y \\ (5, & -1) \end{matrix}$$

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

$$y = -\frac{1}{2}x + 1\frac{1}{2} \checkmark$$

(Total for Question 23 is 4 marks)

**19**  $P$  has coordinates  $(-9, 7)$   
 $Q$  has coordinates  $(11, 12)$

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$M$  is the point on the line segment  $PQ$  such that  $PM:MQ = 2:3$

Line  $L$  is perpendicular to the line segment  $PQ$ .  
 $L$  passes through  $M$ .

Find an equation of  $L$ .

.....  
(Total for Question 19 is 5 marks)

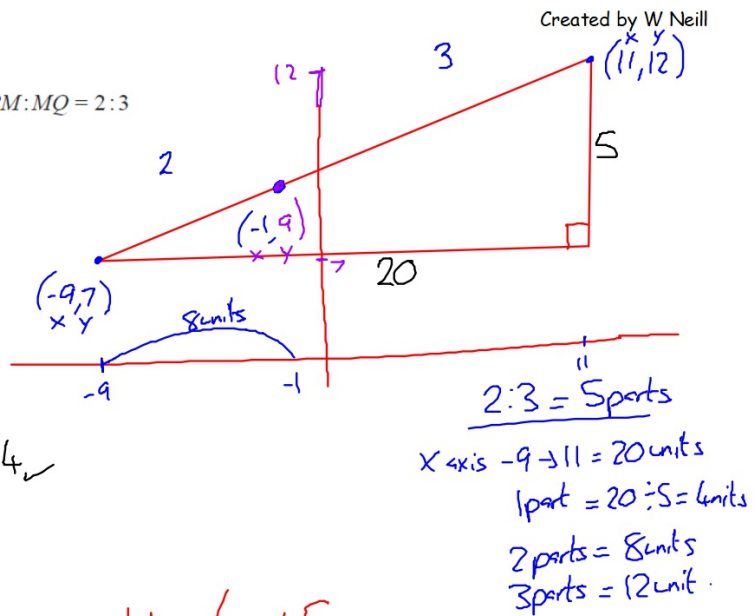
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Gradient of  $PQ = \frac{5}{20} = \frac{1}{4}$

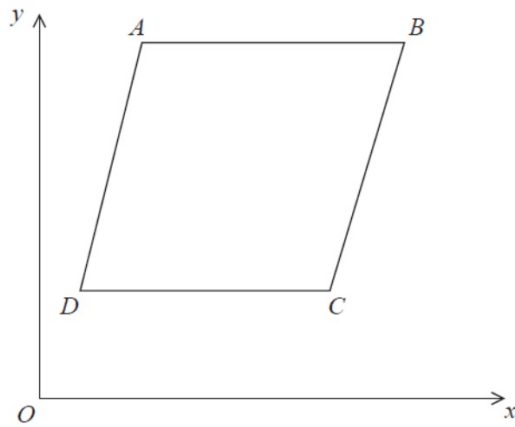
Gradient of  $L = \text{neg recip of } \frac{1}{4} \rightarrow -4$

$L = y = -4x + 5$   
 $(-1, 9)$   $9 = 4(+5)$

$y = -4x + 5$  ✓

(Total for Question 19 is 5 marks)

18



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$ABCD$  is a rhombus.

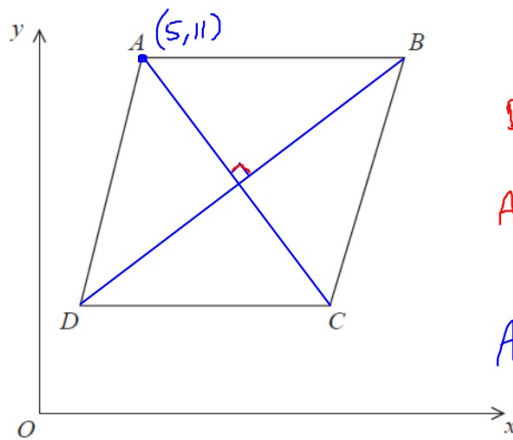
The coordinates of  $A$  are  $(5, 11)$

The equation of the diagonal  $DB$  is  $y = \frac{1}{2}x + 6$

Find an equation of the diagonal  $AC$ .

.....  
(Total for Question 18 is 4 marks)

18



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$$DB = \text{Gradient } \frac{1}{2}$$

$$AC = \text{neg rec } -2$$

$$AC = y = -2x + 21$$

$$(5, 11) \quad \underline{11 = -10 + 21}$$

$$y = -2x + 21 \checkmark$$

$ABCD$  is a rhombus.

The coordinates of  $A$  are  $(5, 11)$

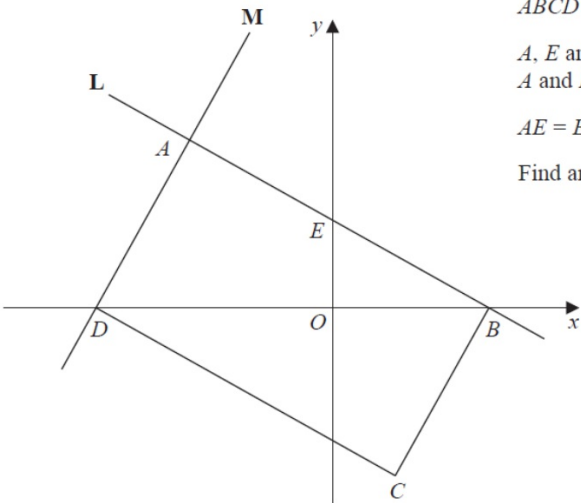
The equation of the diagonal  $DB$  is  $y = \frac{1}{2}x + 6$

Find an equation of the diagonal  $AC$ .

(Total for Question 18 is 4 marks)

19

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$ABCD$  is a rectangle.

$A$ ,  $E$  and  $B$  are points on the straight line  $L$  with equation  $x + 2y = 12$   
 $A$  and  $D$  are points on the straight line  $M$ .

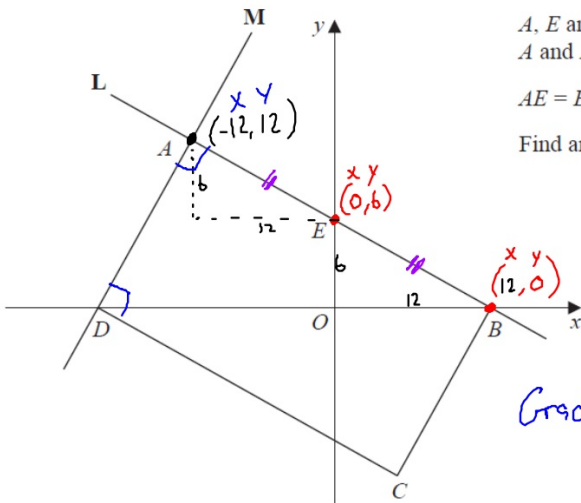
$$AE = EB$$

Find an equation for  $M$ .

.....  
(Total for Question 19 is 4 marks)



19



$ABCD$  is a rectangle.

Created by W Neill

$A$ ,  $E$  and  $B$  are points on the straight line  $L$  with equation  $x + 2y = 12$   
 $A$  and  $D$  are points on the straight line  $M$ .

$AE = EB$

Find an equation for  $M$ .

$y = mx + c$   
 $\hookrightarrow$  y-intercept

$y = mx + c$

$L \Rightarrow x + 2y = 12$

$2y = -x + 12$

$y = -\frac{1}{2}x + 6$

$\leftarrow$   $y = -\frac{1}{2}x + 6$

Neg Reciprocal

Gradient of  $M = L$

$-\frac{1}{2} \rightarrow +2$

$\frac{1}{2}x = 6$

$x = 12$

eqn =  $y = 2x + 36$   
 $(-12, 12)$   
 $12 = -24 + 36$

$y = 2x + 36$

(Total for Question 19 is 4 marks)

**19** A triangle has vertices  $P$ ,  $Q$  and  $R$ .

The coordinates of  $P$  are  $(-3, -6)$

The coordinates of  $Q$  are  $(1, 4)$

The coordinates of  $R$  are  $(5, -2)$

$M$  is the midpoint of  $PQ$ .

$N$  is the midpoint of  $QR$ .

Prove that  $MN$  is parallel to  $PR$ .

You must show each stage of your working.

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**(Total for Question 19 is 4 marks)**

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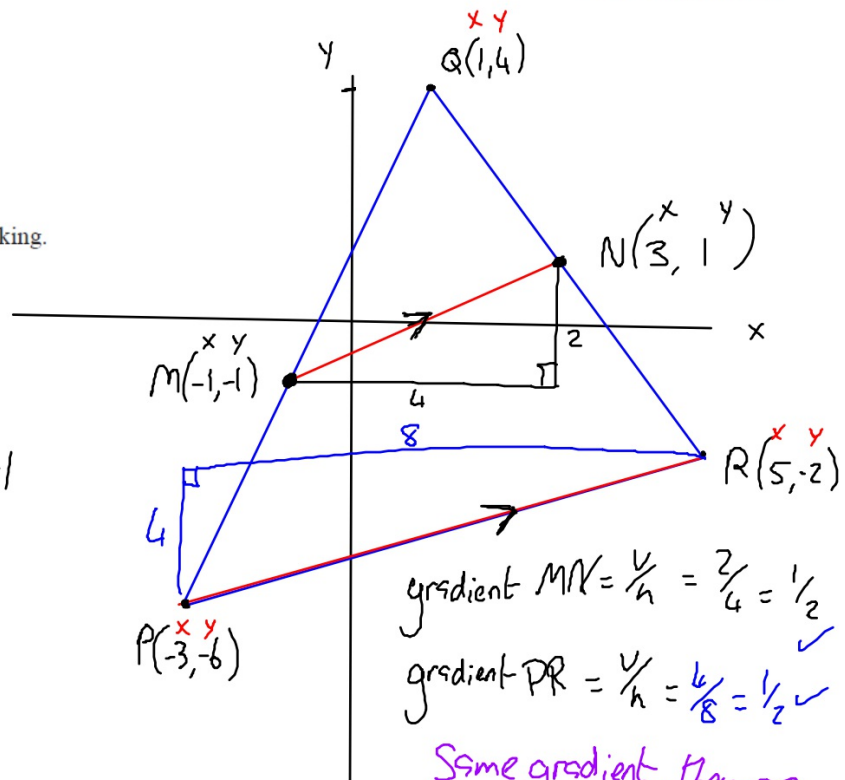
Prove that  $MN$  is parallel to  $PR$ .

You must show each stage of your working.

$$\begin{matrix} x & y \\ P & (-3, -6) \\ & (-1 & -1) \\ x & y \\ Q & (1, 4) \end{matrix}$$

$$-6 + 4 = \frac{-2}{2} = -1$$

$$\cancel{-3}, \cancel{1}, -1, \cancel{0}, \cancel{1}$$



$$\text{gradient } MN = \frac{y}{x} = \frac{2}{4} = \frac{1}{2}$$

$$\text{gradient } PR = \frac{y}{x} = \frac{6}{8} = \frac{1}{2}$$

Same gradient, they are parallel.

(Total for Question 19 is 4 marks)

**19** The point  $P$  has coordinates  $(3, 4)$

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A26 The point  $Q$  has coordinates  $(a, b)$

A60 A line perpendicular to  $PQ$  is given by the equation  $3x + 2y = 7$

Find an expression for  $b$  in terms of  $a$ .

.....  
**(Total for Question 19 is 5 marks)**

- 19 The point  $P$  has coordinates  $(3, 4)$   
 A26 The point  $Q$  has coordinates  $(a, b)$   
 A60 A line perpendicular to  $PQ$  is given by the equation  $3x + 2y = 7$

Find an expression for  $b$  in terms of  $a$ .

$$\begin{aligned}
 & \perp PQ \quad y = mx + c \\
 & 3x + 2y = 7 \\
 & 2y = -3x + 7 \\
 & y = -\frac{3}{2}x + \frac{7}{2}
 \end{aligned}$$

$$\begin{aligned}
 \text{Gradient of } PQ &= +\frac{2}{3} \\
 y &= \frac{2}{3}x
 \end{aligned}$$

$$\begin{aligned}
 & \begin{matrix} x & y \\ (3, 4) \end{matrix} \\
 & y = \frac{2}{3}x \\
 & 4 = \frac{b}{3} \\
 & 4 = 2 + 2 \\
 & y = \frac{2}{3}x + 2 \\
 & \begin{matrix} x & y \\ (a, b) \end{matrix} \\
 & b = \frac{2}{3}a + 2 \checkmark
 \end{aligned}$$

(Total for Question 19 is 5 marks)

AQA