The line l_1 passes through the point P(3k , 2k) with gradient = -2.

l_1 meets the x axis at A and the y axis at B.

a) Find the equation of the line l_1 and show that $A(4k, 0)$
b) Find the area of the triangle AOB in terms of k

The line l_2 passes through P and is perpendicular to l_1.

c) Find the equation of l_2

l_2 meets the x axis at C

d) Show that the midpoint of PC lies on the line y = x

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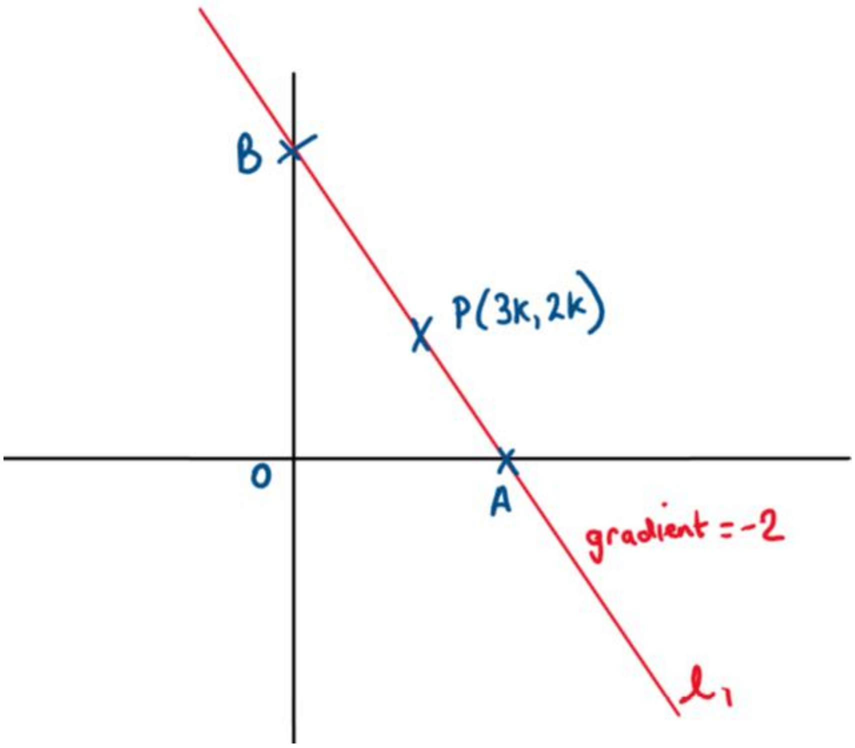
a) Drawing a sketch can be helpful to visualise the problem



Find the equation of the line l_1 in terms of k

l_1 passes through $(3k\,,\ 2k)$

with gradient = -2.

$$y - 2k = -2(x - 3k)$$

At point A, y=0

$$0 - 2k = -2(x - 3k)$$

Divide both sides by -2

$$k = x - 3k$$

$$x = 4k$$

$$A(4k, 0)$$

At point B, x=0

$$y - 2k = -2(0 - 3k)$$

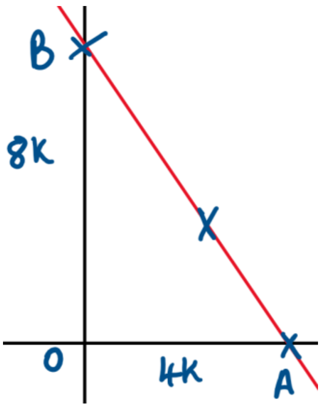
$$y - 2k = 6k$$

$$y = 8k$$

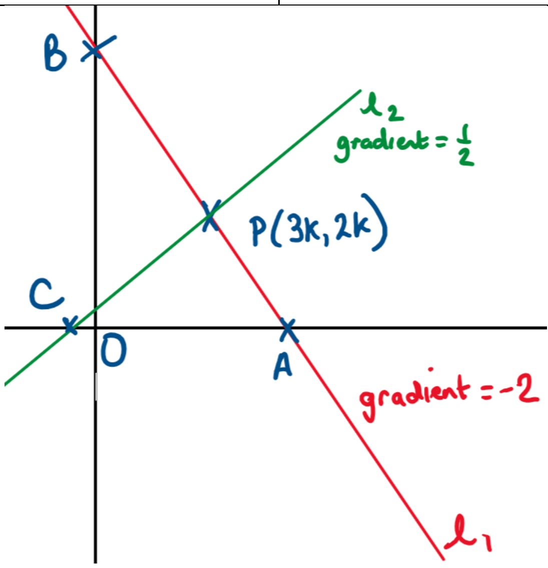
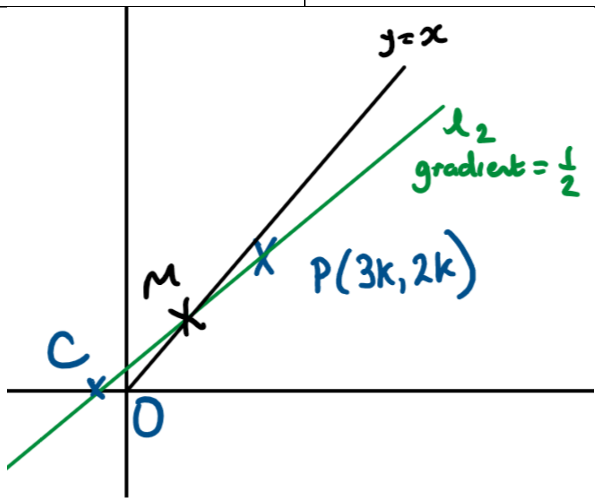
$$B(0,8k)$$

You can also work this out from the fact that the gradient of the line is -2

b)



Area $= \frac{1}{2} \times 4k \times 8k = 16k^2$

c)	
	
l_2 passes through $(3k\ ,\ 2k)$ with gradient $= \frac{1}{2}$	
	$y - 2k = \frac{1}{2}(x - 3k)$
	$2y - 4k = x - 3k$
	$y = \frac{1}{2}x + \frac{k}{2}$
d) Let M be the midpoint of PC	
	
At point C, y=0	$y = \frac{1}{2}x + \frac{k}{2}$

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	$0 = \frac{1}{2}x + \frac{k}{2}$
	$0 = x + k$
	$x = -k$
	$C(-k, 0)$
Find midpoint of PC	
	$M\left(\frac{-k+3k}{2}, \frac{0+2k}{2}\right)$
	$M(k, k)$
Since, x and y coordinates are equal, then M lies on the line $y = x$	