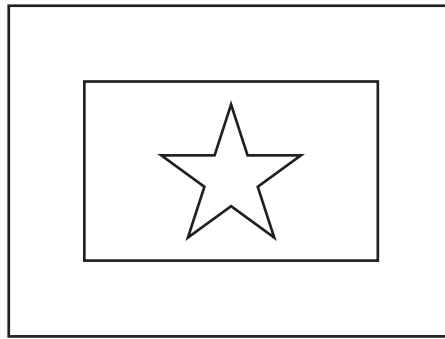




1



For the **diagram**, write down

(a) the order of rotational symmetry,

*Answer(a)* ..... [1]

(b) the number of lines of symmetry.

*Answer(b)* ..... [1]

2 Calculate  $3\sin 120^\circ - 4(\sin 120^\circ)^3$ .

*Answer* ..... [2]

3 Write the following in order of size, **smallest** first.

$$\frac{2}{\sqrt{3}}$$

$$2 - \sqrt{3}$$

$$\sqrt{3}$$

$$2 - \frac{\sqrt{3}}{2}$$

*Answer* ..... < ..... < ..... < ..... [2]

4 Write as a single fraction  $\frac{3a}{8} + \frac{4}{5}$ .

Answer ..... [2]

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5 Write  $2^8 \times 8^2 \times 4^{-2}$  in the form  $2^n$ .

Answer ..... [2]

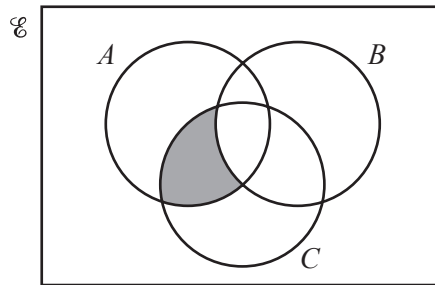
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6 Change 64 square metres into square millimetres.  
Give your answer in standard form.

Answer .....  $\text{mm}^2$  [2]

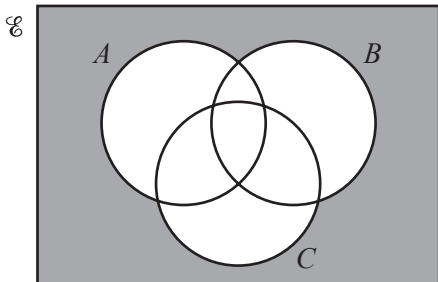
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7

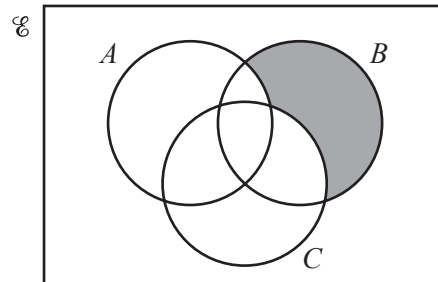


The shaded area in the diagram shows the set  $(A \cap C) \cap B'$ .

Write down the set shown by the shaded area in each diagram below.



.....

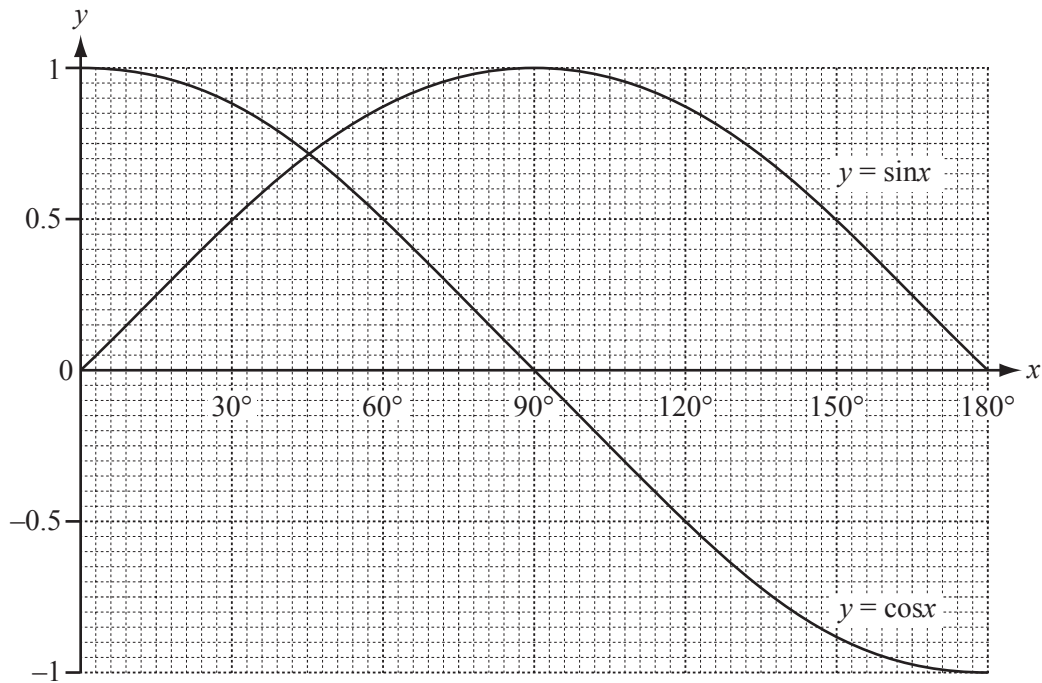


.....

[2]

---

8



The diagram shows accurate graphs of  $y = \sin x$  and  $y = \cos x$  for  $0^\circ \leq x \leq 180^\circ$ .

Use the graph to solve the equations

(a)  $\sin x - \cos x = 0$ ,

Answer(a)  $x = \dots\dots\dots$  [1]

(b)  $\sin x - \cos x = 0.5$ .

Answer(b)  $x = \dots\dots\dots$  [2]

- 9 A fence is made from 32 identical pieces of wood, each of length 2 metres correct to the nearest centimetre.

Calculate the lower bound for the total length of the wood used to make this fence.

Write down your full calculator display.

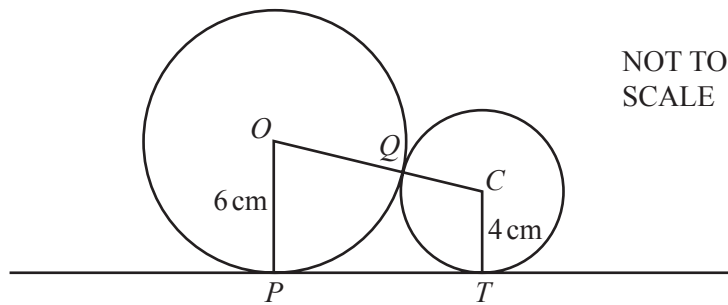
Answer  $\dots\dots\dots$  m [3]

10 Make  $x$  the subject of the formula.

$$P = \frac{x+3}{x}$$

Answer  $x =$  [4]

11



Two circles, centres  $O$  and  $C$ , of radius 6 cm and 4 cm respectively, touch at  $Q$ .  
 $PT$  is a tangent to both circles.

(a) Write down the distance  $OC$ .

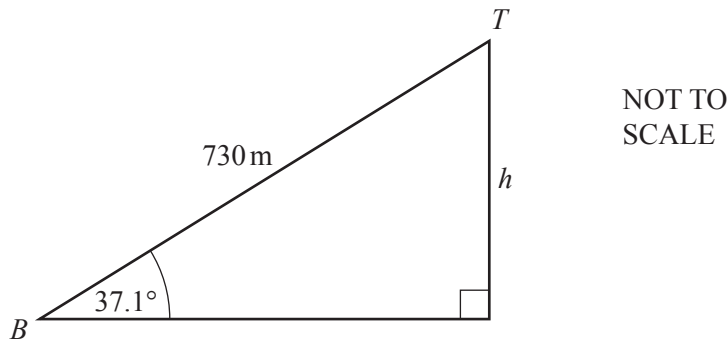
Answer(a)  $OC =$  ..... cm [1]

(b) Calculate the distance  $PT$ .

Answer(b)  $PT =$  ..... cm [3]

12 The diagram represents the ski lift in Queenstown New Zealand.

For  
Examiner's  
Use



(a) The length of the cable from the bottom,  $B$ , to the top,  $T$ , is 730 metres.

The angle of elevation of  $T$  from  $B$  is  $37.1^\circ$ .

Calculate the change in altitude,  $h$  metres, from the bottom to the top.

Answer(a) ..... m [2]

(b) The lift travels along the cable at 3.65 metres per second.

Calculate how long it takes to travel from  $B$  to  $T$ .

Give your answer in minutes and seconds.

Answer(b) ..... min ..... s [2]

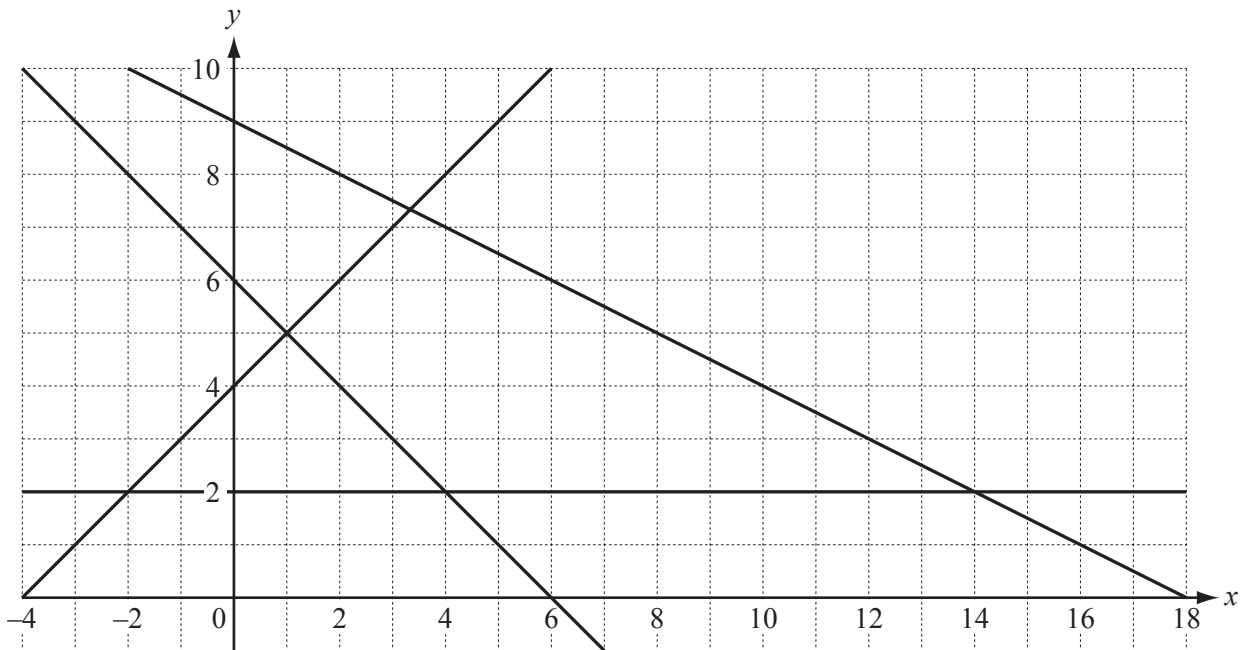
13

$$\mathbf{M} = \begin{pmatrix} 6 & -3 \\ 4 & 5 \end{pmatrix} \begin{pmatrix} x \\ 1 \end{pmatrix}.$$

(a) Find the matrix  $\mathbf{M}$ .Answer(a)  $\mathbf{M} =$  [2](b) Simplify  $(x \ 1) \mathbf{M}$ .

Answer(b) [2]

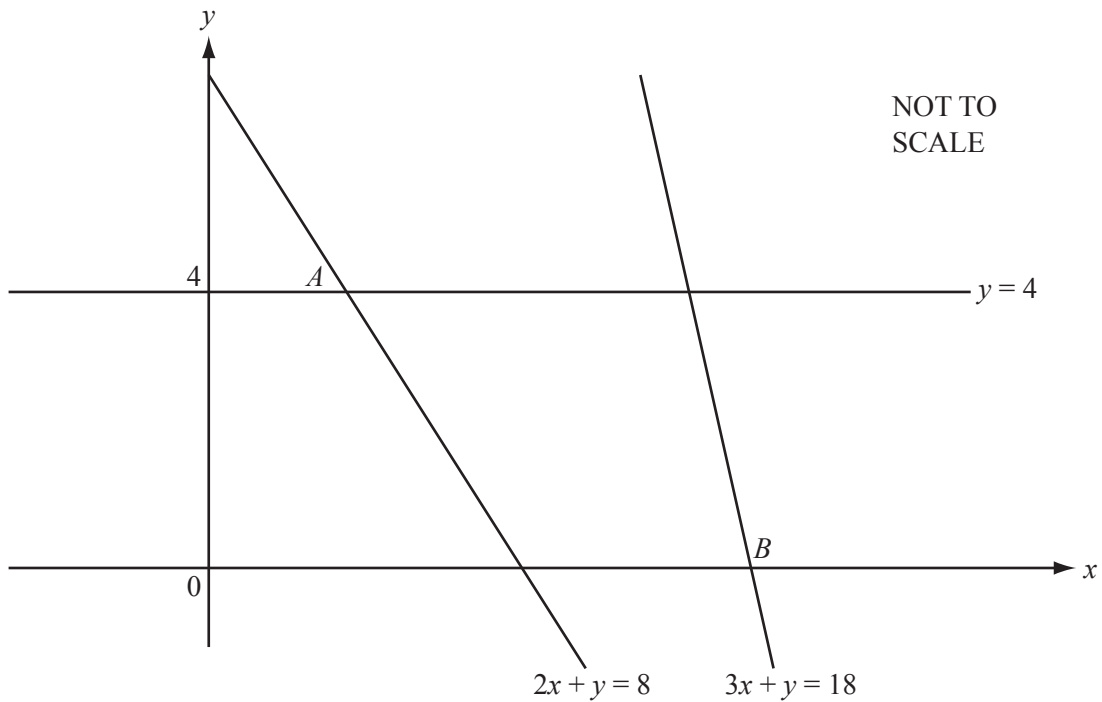
14



By shading the **unwanted** regions of the grid above, find and label the region  $R$  which satisfies the following four inequalities.

$$y \geq 2 \qquad x + y \geq 6 \qquad y \leq x + 4 \qquad x + 2y \leq 18 \qquad [4]$$

15



- (a) The line  $y = 4$  meets the line  $2x + y = 8$  at the point  $A$ .  
Find the co-ordinates of  $A$ .

Answer(a)  $A$  ( ..... , ..... ) [1]

- (b) The line  $3x + y = 18$  meets the  $x$  axis at the point  $B$ .  
Find the co-ordinates of  $B$ .

Answer(b)  $B$  ( ..... , ..... ) [1]

- (c) (i) Find the co-ordinates of the mid-point  $M$  of the line joining  $A$  to  $B$ .

Answer(c)(i)  $M$  ( ..... , ..... ) [1]

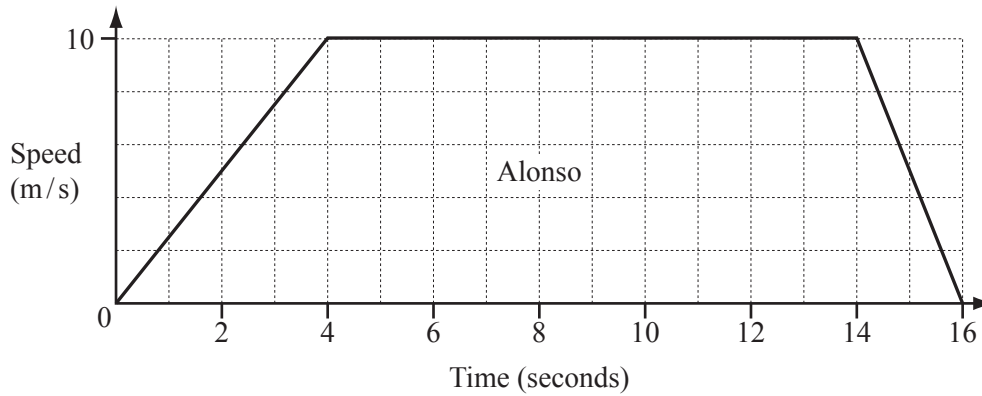
- (ii) Find the equation of the line through  $M$  parallel to  $3x + y = 18$ .

Answer(c)(ii) ..... [2]

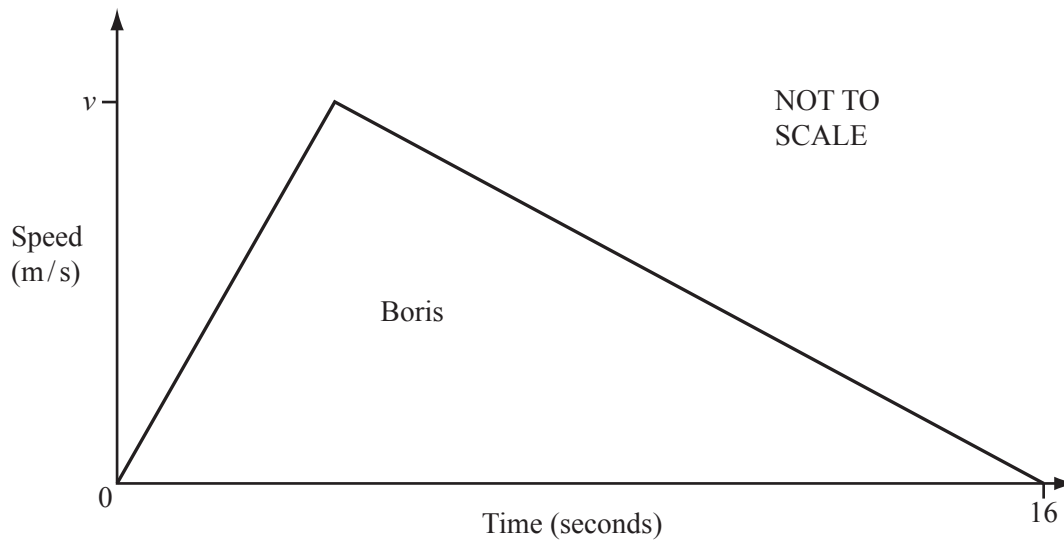


16 The graphs show the speeds of two cyclists, Alonso and Boris.

Alonso accelerated to 10 m/s, travelled at a steady speed and then slowed to a stop.



Boris accelerated to his maximum speed,  $v$  m/s, and then slowed to a stop.



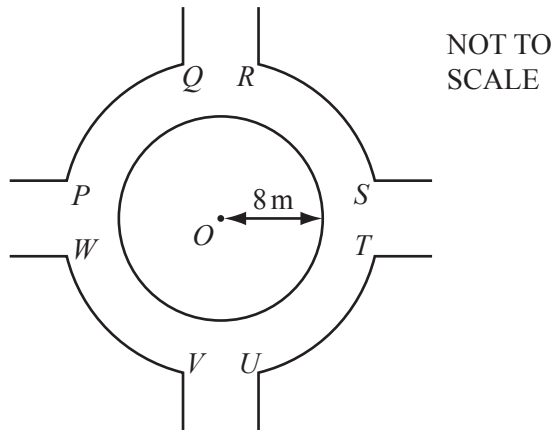
Both cyclists travelled the same distance in the 16 seconds.

Calculate the maximum speed for Boris.  
Show all your working.

Answer ..... m/s [5]

17

For  
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Use

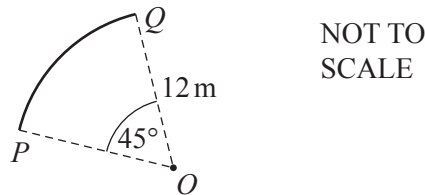


The diagram shows the junction of four paths.  
In the junction there is a circular area covered in grass.  
This circle has centre  $O$  and radius 8 m.

(a) Calculate the area of grass.

Answer(a) ..... m<sup>2</sup> [2]

(b)



The arc  $PQ$  and the other three identical arcs,  $RS$ ,  $TU$  and  $VW$  are each part of a circle, centre  $O$ , radius 12m.  
The angle  $POQ$  is  $45^\circ$ .  
The arcs  $PQ$ ,  $RS$ ,  $TU$ ,  $VW$  and the circumference of the circle in **part(a)** are painted white.  
Calculate the total length painted white.

Answer(b) ..... m [4]

**18 (a)**  $f(x) = 1 - 2x$ .

**(i)** Find  $f(-5)$ .

*Answer(a)(i)* ..... [1]

**(ii)**  $g(x) = 3x - 2$ .

Find  $gf(x)$ . Simplify your answer.

*Answer(a)(ii)* ..... [2]

**(b)**  $h(x) = x^2 - 5x - 11$ .

Solve  $h(x) = 0$ .

Show all your working and give your answer correct to 2 decimal places.

*Answer(b)*  $x =$  ..... or  $x =$  ..... [4]

**Question 19 is printed on the next page.**

19 The braking distance,  $d$  metres, for Alex's car travelling at  $v$  km/h is given by the formula

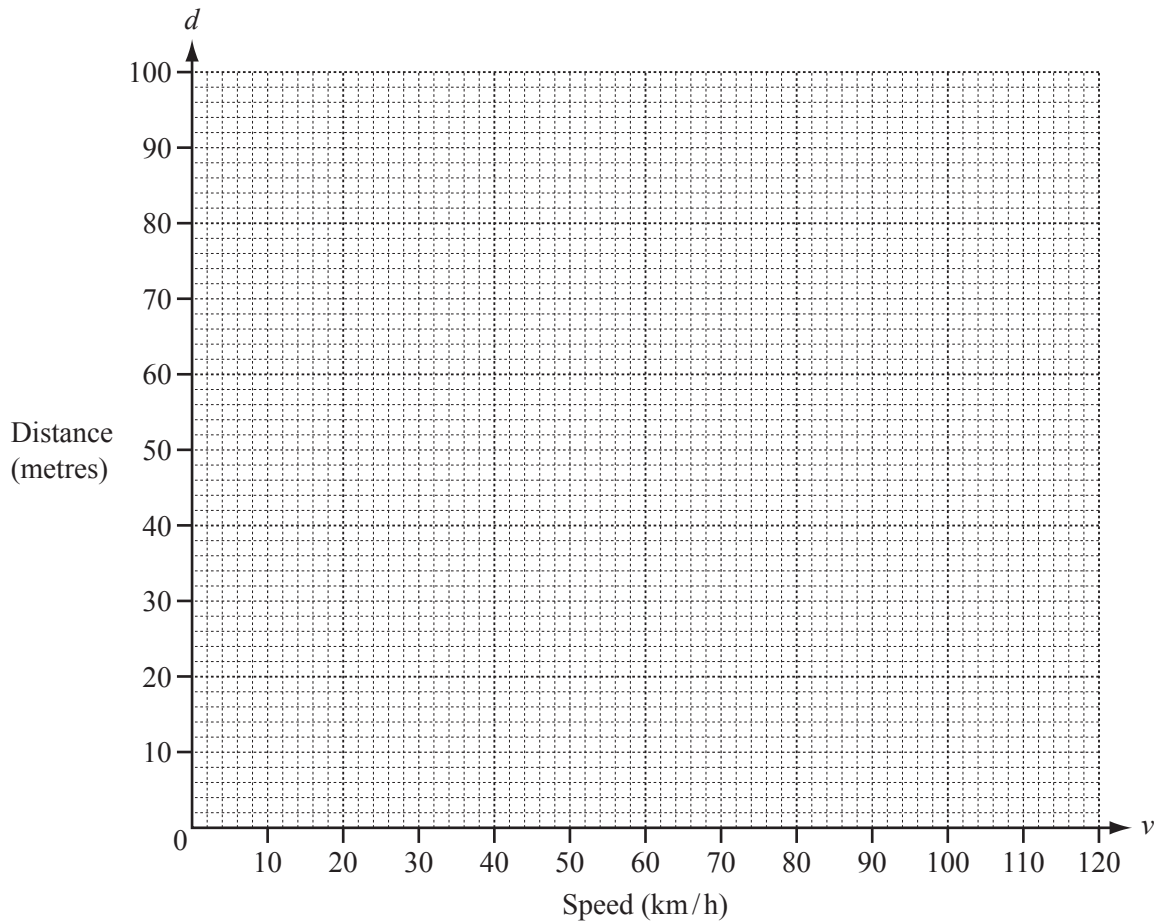
$$200d = v(v + 40).$$

(a) Calculate the missing values in the table.

$v$ (km/h)	0	20	40	60	80	100	120
$d$ (metres)	0		16		48		96

[2]

(b) On the grid below, draw the graph of  $200d = v(v + 40)$  for  $0 \leq v \leq 120$ .



[3]

(c) Find the braking distance when the car is travelling at 110 km/h.

Answer(c) ..... m [1]

(d) Find the speed of the car when the braking distance is 80 m.

Answer(d) ..... km/h [1]

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