



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

CANDIDATE  
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CENTRE  
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**MATHEMATICS (SYLLABUS D)**

**4024/13**

Paper 1

**May/June 2010**

**2 hours**

Candidates answer on the Question Paper.

Additional Materials: Geometrical instruments

**READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams or graphs.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

If working is needed for any question it must be shown in the space below that question.

Omission of essential working will result in loss of marks.

**NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES MAY BE USED IN THIS PAPER.**

The number of marks is given in brackets [ ] at the end of each question or part question.

The total of the marks for this paper is 80.

For Examiner's Use

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This document consists of **20** printed pages.



NEITHER ELECTRONIC CALCULATORS NOR MATHEMATICAL TABLES  
MAY BE USED IN THIS PAPER.

For  
Examiner's  
Use

1 Evaluate

(a)  $1.5 - 0.2 \times 4$ ,

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

(b)  $4.2 \div 0.07$ .

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

---

2 Express as a single fraction

(a)  $\frac{5}{7} - \frac{2}{5}$ ,

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

(b)  $1\frac{1}{5} \div 2\frac{1}{3}$ .

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

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- 3 (a) In a town, 11 000 people out of the total population of 50 000 are aged under 18.

What percentage of the population is aged under 18?

For  
Examiner's  
Use

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

- (b) A company employing 1200 workers increased the number of workers by 15%.

How many workers does it now employ?

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

4 Evaluate

(a)  $9^1 + 9^0$ ,

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

(b)  $\left(\frac{1}{9}\right)^{\frac{1}{2}}$ .

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

5 By writing each number correct to 1 significant figure, estimate the value of

$$\frac{48.9 \times 0.207^2}{3.94}.$$

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Use

Answer ..... [2]

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6 (a) Solve  $\frac{3}{x-1} = 2$ .

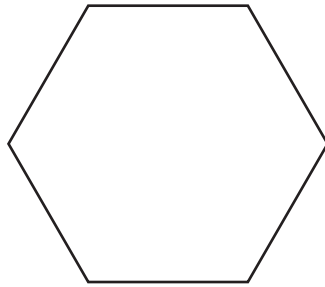
Answer (a)  $x =$  ..... [1]

(b) Given that  $p = 2t - r$ , express  $t$  in terms of  $p$  and  $r$ .

Answer (b)  $t =$  ..... [1]

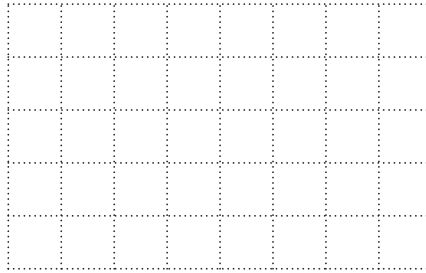
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7 (a) On the regular hexagon below, draw all the lines of symmetry.



[1]

(b) On the grid below, draw a quadrilateral with rotational symmetry of order 2.



[1]

8 The table shows the record minimum monthly temperatures, in °C, in Vostok and London.

| Month  | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sept | Oct | Nov | Dec |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|
| Vostok | -36 | -47 | -64 | -70 | -71 | -71 | -74 | -75 | -72  | -61 | -45 | -35 |
| London | -10 | -9  | -8  | -2  | -1  | 5   | 7   | 6   | 3    | -4  | -5  | -7  |

Find

(a) the difference between the temperatures in Vostok and London in July,

Answer (a) ..... °C [1]

(b) the difference between the temperatures in Vostok in February and June.

Answer (b) ..... °C [1]

9 Written as a product of prime factors,  $168 = 2^3 \times 3 \times 7$ .

(a) Express 140 as a product of its prime factors.

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

(b) Find the highest common factor of 168 and 140.

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

(c) Find the smallest positive integer,  $n$ , such that  $168n$  is a square number.

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

10 (a) Jane and Ken share some money in the ratio 5 : 3.  
Ken's share is \$16 less than Jane's share.

Find each person's share.

Answer (a) Jane \$ .....

Ken \$ ..... [2]

(b) The scale of a map is 1 : 25 000.  
The distance between two villages is 10 cm on the map.

Find the actual distance, in kilometres, between the villages.

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

11 Given that  $f(x) = \frac{5-2x}{3x}$ , find

(a)  $f(-2)$ ,

Answer (a)  $f(-2) = \dots\dots\dots$  [1]

(b)  $f^{-1}(x)$ .

Answer (b)  $f^{-1}(x) = \dots\dots\dots$  [2]

12 It is given that  $y$  is inversely proportional to the square of  $x$  and that  $y = 48$  when  $x = \frac{1}{2}$ .

Find

(a) the formula for  $y$  in terms of  $x$ ,

Answer (a)  $y = \dots\dots\dots$  [2]

(b) the values of  $x$  when  $y = 3$ .

Answer (b)  $x = \dots\dots\dots, \dots\dots\dots$  [1]

13 Solve the simultaneous equations.

$$\begin{aligned}3x + 2y &= 7 \\ x - 3y &= 17\end{aligned}$$

For  
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Use

Answer  $x =$  .....

$y =$  ..... [3]

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14 A straight line passes through the points  $P(-8, 10)$  and  $Q(4, 1)$ .

Find

(a) the coordinates of the midpoint of  $PQ$ ,

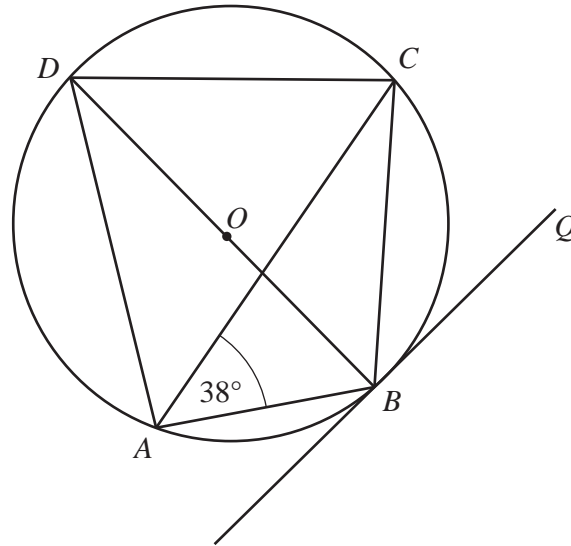
*Answer (a)* (....., .....) [1]

(b) the equation of  $PQ$ .

*Answer (b)* ..... [2]

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*For  
Examiner's  
Use*



The diagram shows a circle, centre  $O$ , passing through  $A$ ,  $B$ ,  $C$  and  $D$ .  
 $BOD$  is a straight line and  $\hat{BAC} = 38^\circ$ .  
 The line  $BQ$  is a tangent to the circle at  $B$ .

Find

(a)  $\hat{DAC}$ ,

Answer (a)  $\hat{DAC} = \dots\dots\dots$  [1]

(b)  $\hat{DBC}$ ,

Answer (b)  $\hat{DBC} = \dots\dots\dots$  [1]

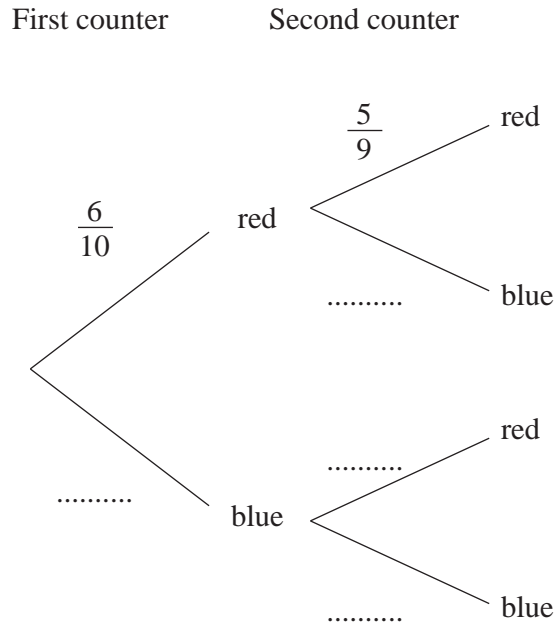
(c)  $\hat{CBQ}$ .

Answer (c)  $\hat{CBQ} = \dots\dots\dots$  [1]

- 16 A bag contains 6 red counters and 4 blue counters.  
Two counters are taken from the bag at random, without replacement.

(a) Complete the tree diagram below that represents these events.

Answer (a)

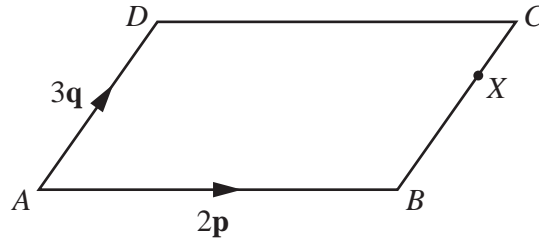


[1]

- (b) Expressing your answer as a fraction in its simplest form, calculate the probability that both counters are the same colour.

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

17



$ABCD$  is a parallelogram.

$X$  is the point on  $BC$  such that  $BX : XC = 2 : 1$ .

$\vec{AB} = 2\mathbf{p}$  and  $\vec{AD} = 3\mathbf{q}$ .

Find, in terms of  $\mathbf{p}$  and  $\mathbf{q}$ ,

(a)  $\vec{AC}$ ,

Answer (a)  $\vec{AC} = \dots\dots\dots [1]$

(b)  $\vec{AX}$ ,

Answer (b)  $\vec{AX} = \dots\dots\dots [1]$

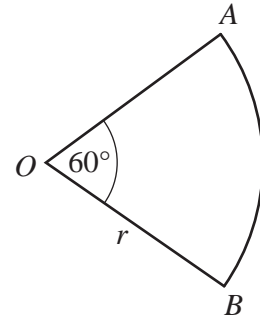
(c)  $\vec{XD}$ .

Answer (c)  $\vec{XD} = \dots\dots\dots [1]$

- 18  $OAB$  is the sector of a circle of radius  $r$  cm.  
 $\widehat{AOB} = 60^\circ$ .

Find, in its simplest form, an expression in terms of  $r$  and  $\pi$  for

- (a) the area of the sector,



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Use

Answer (a) ..... cm<sup>2</sup> [1]

- (b) the perimeter of the sector.

Answer (b) ..... cm [2]

- 19  $\mathbf{A} = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$  and  $\mathbf{B} = \begin{pmatrix} 0 & 2 \\ -1 & 3 \end{pmatrix}$ .

Find

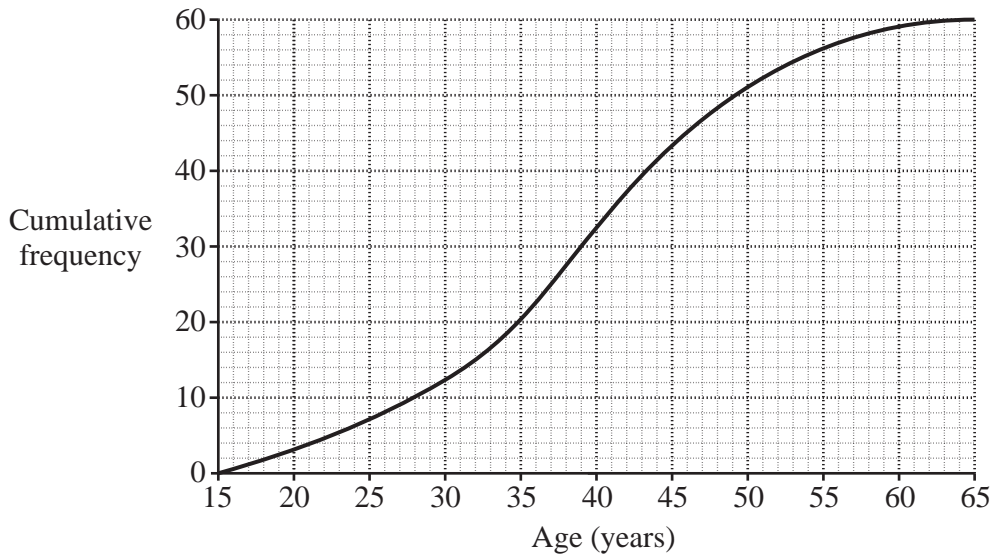
- (a)  $\mathbf{A} - \mathbf{B}$ ,

Answer (a)  $\begin{pmatrix} & \\ & \end{pmatrix}$  [1]

- (b)  $\mathbf{B}^{-1}$ .

Answer (b)  $\begin{pmatrix} & \\ & \end{pmatrix}$  [2]

20 The graph shows the cumulative frequency curve for the ages of 60 employees.



Use the graph to estimate

(a) the median,

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

(b) the interquartile range,

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

(c) the number of employees aged over 50.

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

21 (a) Factorise completely

(i)  $3x^2 - 12x$ ,

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

(ii)  $x^2 - xy - 2y^2$ .

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

(b) Simplify  $\frac{x^2 + 4x}{x^2 - 16}$ .

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

---

- 22 (a) A box has volume  $2.5 \text{ m}^3$ .  
Express this volume in  $\text{cm}^3$ .

Answer (a) .....  $\text{cm}^3$  [1]

- (b) John has a length of string.  
The string is 4 m long, correct to the nearest 10 cm.

- (i) Write down the lower bound of the length of the string.  
Give your answer in centimetres.

Answer (b)(i) ..... cm [1]

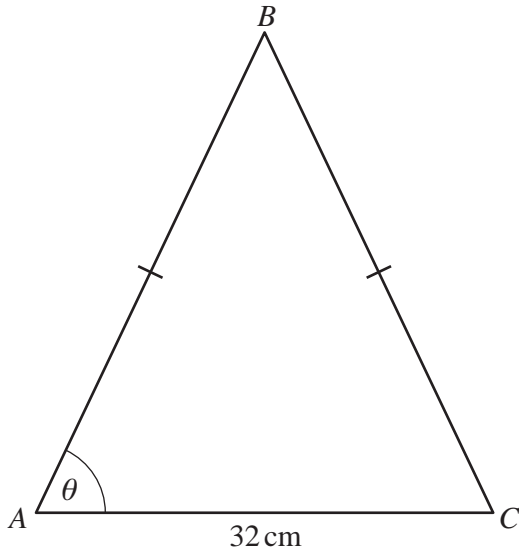
- (ii) John cuts off ten pieces of string.  
Each piece is 5 cm long, correct to the nearest centimetre.

Find the minimum possible length of string remaining.  
Give your answer in centimetres.

Answer (b)(ii) ..... cm [2]

---





|               |                 |
|---------------|-----------------|
| $\sin \theta$ | $\frac{15}{17}$ |
| $\cos \theta$ | $\frac{8}{17}$  |
| $\tan \theta$ | $\frac{15}{8}$  |

$ABC$  is an isosceles triangle with  $AB = BC$  and  $AC = 32$  cm.

Using as much information from the table as is necessary, calculate

(a)  $AB$ ,

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

(b) the area of triangle  $ABC$ .

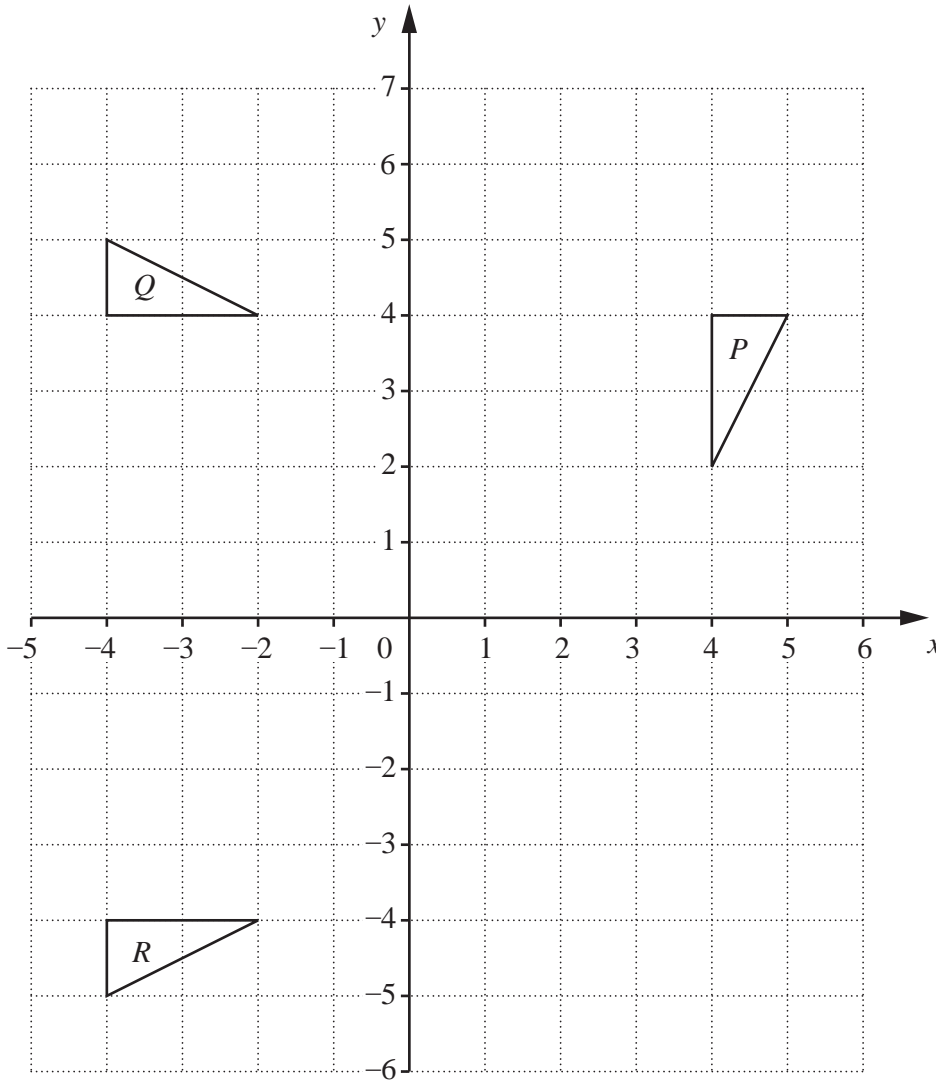
Answer (b) ..... c m<sup>2</sup> [2]

24 The diagram below shows three triangles,  $P$ ,  $Q$  and  $R$ .

- (a) Triangle  $T$  is the image of triangle  $P$  under an enlargement with centre  $(5, 2)$  and scale factor 2.

Draw and label triangle  $T$  on the diagram.

Answer (a)



[2]

- (b) Describe fully the **single** transformation that maps triangle  $P$  onto triangle  $Q$ .

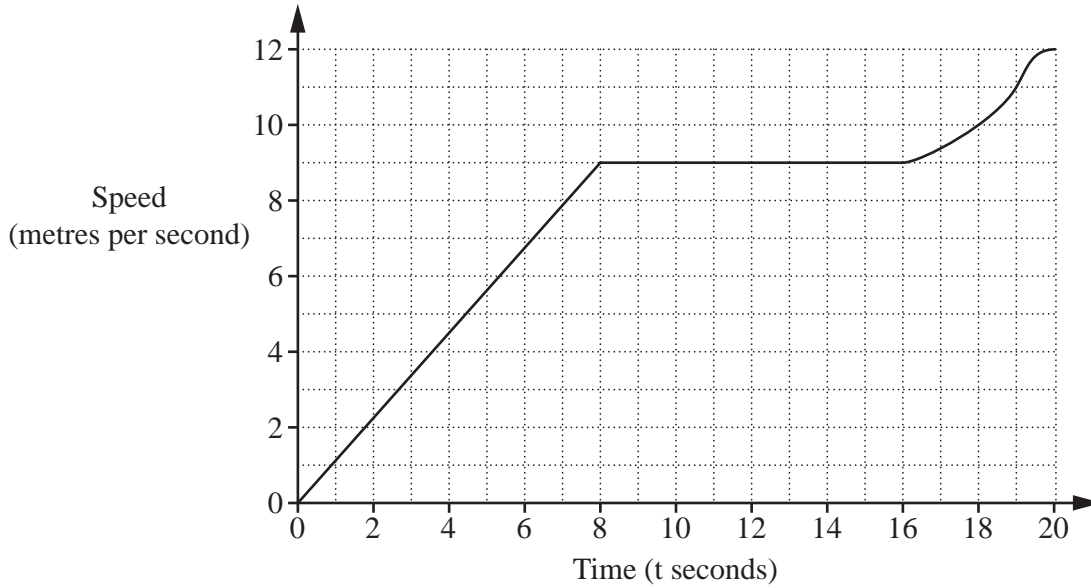
Answer (b) .....

..... [2]

- (c) Find the matrix representing the transformation that maps triangle  $Q$  onto triangle  $R$ .

Answer (c)  $\left( \begin{array}{cc} & \\ & \end{array} \right)$  [1]

25 The diagram is the speed-time graph for the first 20 seconds of a cyclist's journey.



(a) Calculate the distance travelled in the first 16 seconds.

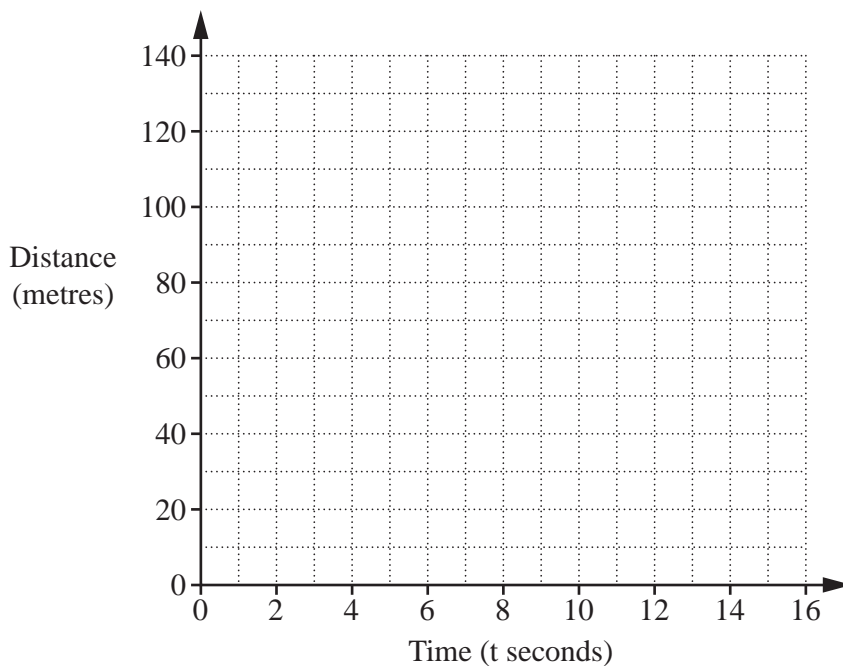
Answer (a) ..... m [1]

(b) By drawing a tangent, find the acceleration of the cyclist when  $t = 18$ .

Answer (b) .....  $\text{m/s}^2$  [2]

(c) On the grid in the answer space, sketch the distance-time graph for the first 16 seconds of the cyclist's journey.

Answer (c)



[2]

- 26 A map is drawn to a scale of 1 cm to 5 km.  
The diagram below shows the positions of two radio masts  $A$  and  $B$  on the map.

For  
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Use

Answer (a), (b)



- (a) A third radio mast,  $C$ , is north of the line  $AB$ .  
It is 40 km from  $A$  and 50 km from  $B$ .

Using ruler and compasses, construct triangle  $ABC$ . [2]

- (b) A house  $D$ , inside the triangle, is more than 35 km from  $B$  and closer to  $B$  than to  $A$ .

Shade the region on your diagram that represents the possible positions of the house  $D$ . [3]

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