UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

8144831256

MATHEMATICS (SYLLABUS D) **4024/12**

Paper 1 **October/November 2013**

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.

ELECTRONIC CALCULATORS MUST NOT 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.

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

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1 **(a)** Amy buys 3 drinks at \$1.86 each and 1 drink for \$2.04.
She pays for the 4 drinks with a \$10 note.

How much change should she receive?

Answer \$ ..... [1]

(b) \$180 is shared between Ali and Ben so that Ali's share : Ben's share = 4 : 5.

Find Ali's share.

Answer \$ ..... [1]

---

2 **(a)** Evaluate $3\frac{1}{4} - 1\frac{4}{5}$.

Answer ..... [1]

(b) Evaluate 3.01×0.02.

Answer ..... [1]

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3 $f(x) = 2x - 6$

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(a) Evaluate $f\left(-\frac{1}{2}\right)$.

Answer ..... [1]

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

Answer $f^{-1}(x) =$ ..... [1]

---

4 **(a)** A journey started at 07 44 and finished at 11 32.

How long, in hours and minutes, did the journey take?

Answer ..... hours ..... minutes [1]

(b) Arrange these values in order, starting with the smallest.

$\frac{4}{9}$ $\frac{2}{5}$ 44%

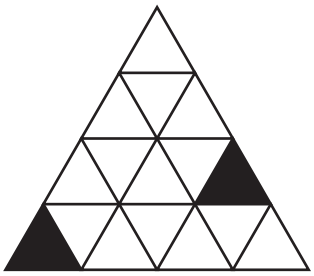
Answer ..... , ... , ... [1]
smallest

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5 **(a)** In the diagram, two small triangles are shaded.

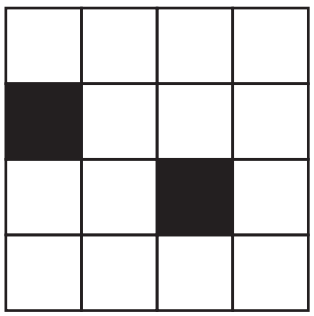
Shade one more small triangle, so that the diagram will then have one line of symmetry.



[1]

(b) In the diagram, two small squares are shaded.

Shade two more small squares, so that the diagram will then have rotational symmetry of order 2.



[1]

---

6 y is inversely proportional to x.

Given that $y = 20$ when $x = 2$, find y when $x = 5$.

Answer $y =$ ..... [2]

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7 **(a)** Write the number 35 000 000 in standard form.

Answer ..... [1]

(b) Giving your answer in standard form, evaluate $\frac{4.2 \times 10^{-2}}{3 \times 10^{4}}$.

Answer ..... [1]

---

8 Solve the equation $\frac{3x + 1}{2} - \frac{x}{3} = 1$.

Answer $x =$ ..... [2]

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9 **By making suitable approximations,** estimate the value of $\dfrac{\sqrt{35.78} \times \sqrt[3]{1005}}{0.3012}$.
Show clearly the approximate values you use.

Answer ..... [2]

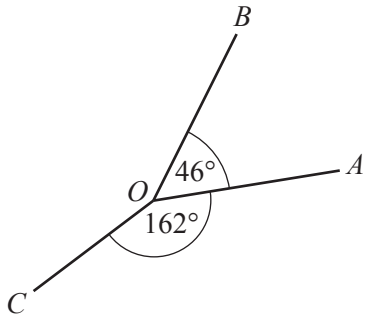
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10 Find **one** value of x that satisfies **both** $x > 4$ **and** $17 - 4x > 2 - x$.

Answer ..... [2]

---

11 In the diagram,
$A\hat{O}B = 46°$, correct to the nearest degree,
$A\hat{O}C = 162°$, correct to the nearest degree.



(a) Write down the lower bound for $A\hat{O}B$.

Answer ..... [1]

(b) Find the lower bound for $B\hat{O}C$.

Answer ..... [2]

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12 **(a)** Evaluate $\left(\frac{5}{3}\right)^{-2}$.

Answer ..... [1]

(b) Simplify $\left(\frac{9}{t^6}\right)^{\frac{1}{2}}$.

Answer ..... [1]

(c) Simplify $\frac{2x^3y}{6xy^2}$.

Answer ..... [1]

---

13 Solve the simultaneous equations.

$$4x - 3y = 14$$
$$2x + y = -3$$

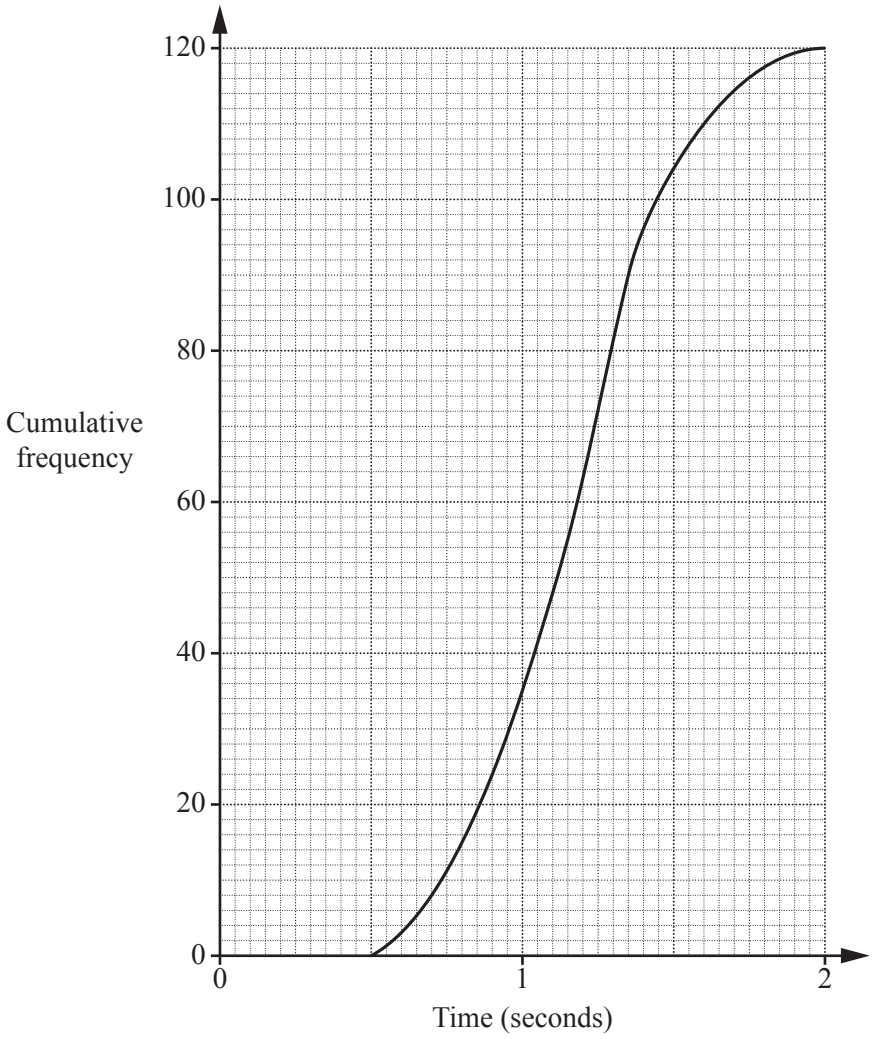
Answer $x =$ .....

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

---

14 The times taken by each of 120 runners to react to the starting gun were recorded. The cumulative frequency curve summarises the results.

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(a) Find the upper quartile.

Answer ..... s [1]

(b) Find the 40th percentile.

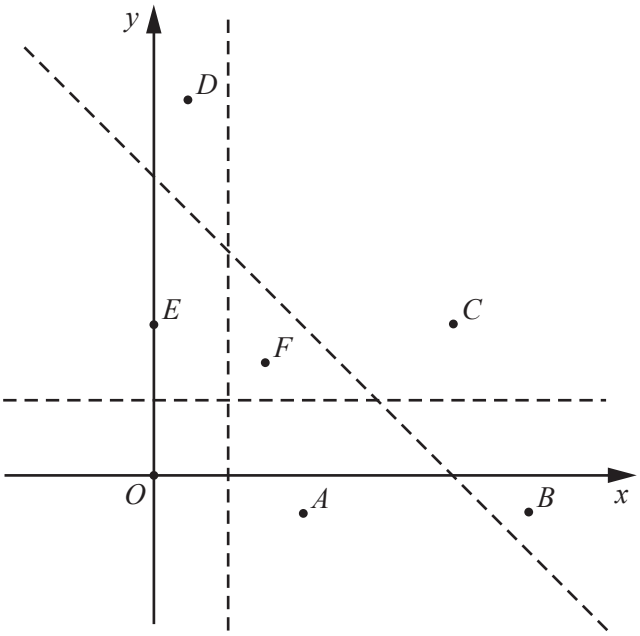
Answer ..... s [1]

(c) Find the number of students who took less than 1.5 seconds.

Answer ..... [1]

15

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The diagram shows the three lines $x = 1$, $y = 1$ and $x + y = 4$ and the seven points O, A, B, C, D, E and F.

(a) Which of these seven points lie in the region defined by $x + y > 4$?

Answer ..... [1]

(b) Which one of these seven points lies in the region defined by

$x < 1$, $y > 1$ and $x + y < 4$?

Answer ..... [1]

(c) Given that O is (0, 0) and C is (4, 2), find the inequality that defines the region below the line that passes through O and C.

Answer ..... [1]

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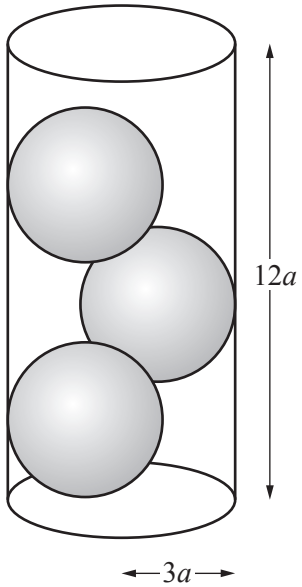
16 **[Volume of a sphere = $\frac{4}{3}\pi r^3$]**

Three spheres, each of radius $2a$ cm are placed inside a cylinder of radius $3a$ cm and height $12a$ cm.

Water is poured into the cylinder to fill it completely.

The volume of water is $k\pi a^3$ cm^3.

Find the value of k.



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Answer $k =$ ..... [3]

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17 **(a)** Factorise $25t^2 - 4$.

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Answer ..... [1]

(b) Factorise completely $6r^2H - 2r^2h$.

Answer ..... [1]

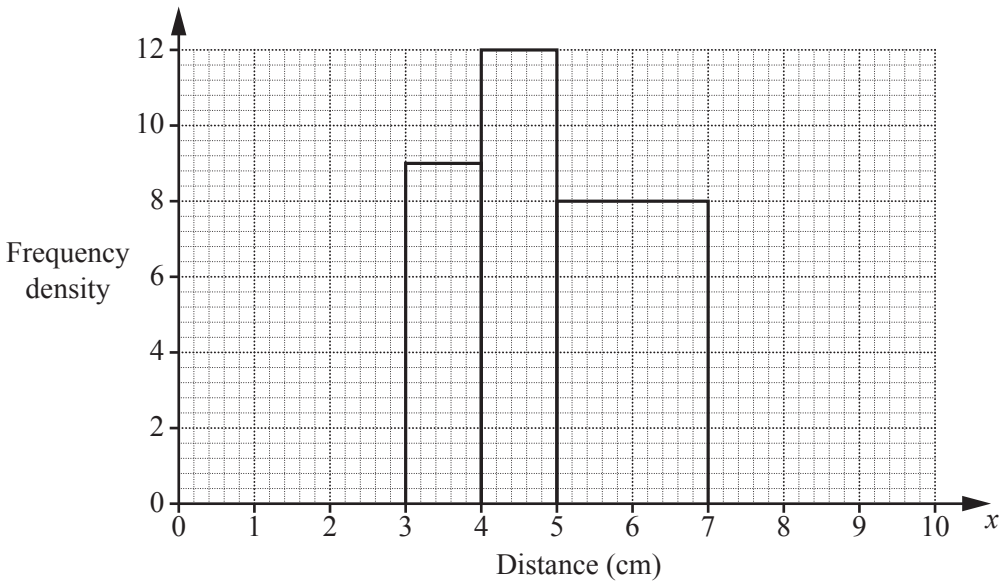
(c) Factorise completely $8xy + 4x - 6y - 3$.

Answer ..... [2]

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18 In an experiment with a group of snails, the distance moved in one minute by each snail was recorded.
Some of the results are shown in the table and illustrated in the histogram.

Distance (x centimetres)	$2 < x \leqslant 3$	$3 < x \leqslant 4$	$4 < x \leqslant 5$	$5 < x \leqslant 7$	$7 < x \leqslant 9$
Frequency	6	9	12	p	4



(a) Use the histogram to find the value of p.

Answer $p =$ ..... [1]

(b) Complete the histogram. [2]

(c) One snail is chosen at random.

Find the probability that this snail did not move more than 4 cm.

Answer ..... [1]

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19 P is $(-1, 3)$ and Q is $(5, -1)$.

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(a) Find the coordinates of the midpoint of PQ.

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

(b) Find the gradient of the line PQ.

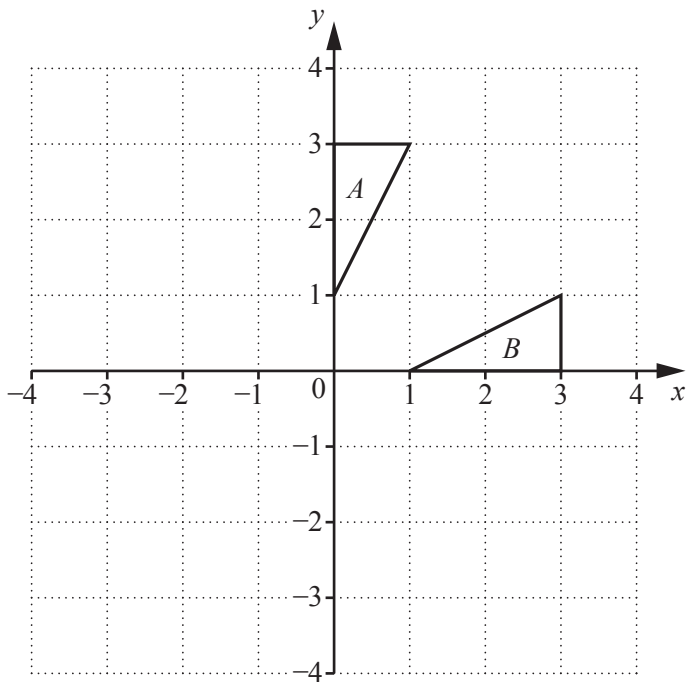
Answer ..... [1]

(c) Given that the length of $PQ = 2\sqrt{n}$ units, where n is an integer, find the value of n.

Answer $n =$ ..... [2]

20

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The diagram shows triangles A and B.

(a) Describe fully the **single** transformation that maps triangle A onto triangle B.

Answer .....

..... [2]

(b) Triangle A is mapped onto triangle C by the transformation **T**.
T is a rotation, centre the origin, through 270° clockwise.

(i) On the diagram, draw triangle C. [1]

(ii) Find the matrix that represents **T**.

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

21

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2	3	3	4	4	4

The numbers 2, 3, 3, 4, 4, 4 are written on six cards.
Two cards are chosen, at random, without replacement, to form a 2-digit number.
The first card chosen shows the number of Tens.
The second card chosen shows the number of Units.

First card	Second card
Tens	Units

Expressing each answer in its simplest form, find the probability that the two cards show

(a) a number greater than 20,

Answer ..... [1]

(b) the number 33,

Answer ..... [1]

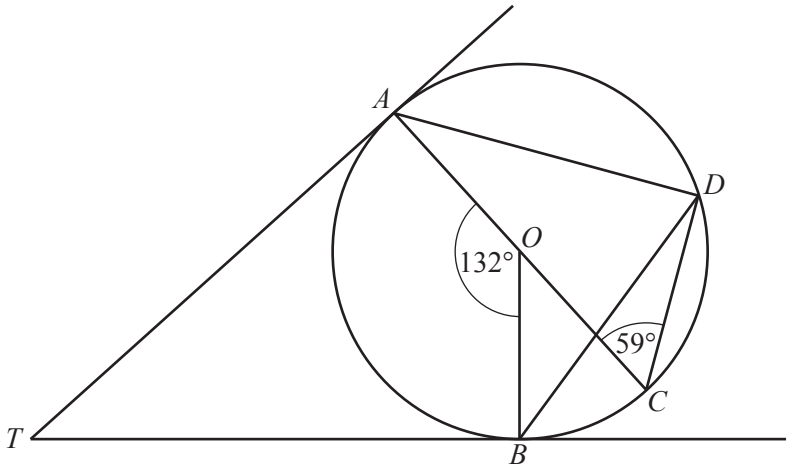
(c) the number 43 or the number 32.

Answer ..... [2]

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In the diagram, the points A, B, C and D lie on the circle centre O.
TA and TB are tangents touching the circle at A and B respectively.

$A\hat{O}B = 132°$, $A\hat{C}D = 59°$ and AOC is a straight line.

(a) Find $A\hat{T}B$.

Answer $A\hat{T}B =$ ..... [1]

(b) Find $B\hat{D}A$.

Answer $B\hat{D}A =$ ..... [1]

(c) Find $B\hat{D}C$.

Answer $B\hat{D}C =$ ..... [1]

(d) Find $O\hat{B}D$.

Answer $O\hat{B}D =$ ..... [1]

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23 The first four lines of a pattern of numbers are shown below.

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$$\begin{array}{lllll} \text{1st line} & 3^2 - 1^2 & = & 8 \times 1 \\ \text{2nd line} & 5^2 - 1^2 & = & 8 \times (1 + 2) \\ \text{3rd line} & 7^2 - 1^2 & = & 8 \times (1 + 2 + 3) \\ \text{4th line} & 9^2 - 1^2 & = & 8 \times (1 + 2 + 3 + 4) \end{array}$$

(a) Write down the 7th line of the pattern.

Answer ..... [1]

(b) Write down an expression, in terms of n, to complete the nth line of the pattern.

Answer ..... $= 8 \times (1 + 2 + 3 + 4 + \ldots + n)$ [1]

(c) **Using the *n*th line of the pattern**, show that $1 + 2 + 3 + 4 + \ldots + n = \dfrac{n(n+1)}{2}$.

[2]

24 The diagram at the bottom of the page shows triangle ABC.

(a) Measure $B\hat{A}C$.

Answer ..... [1]

(b) On the diagram, construct the locus of points, **inside** the triangle ABC, that are

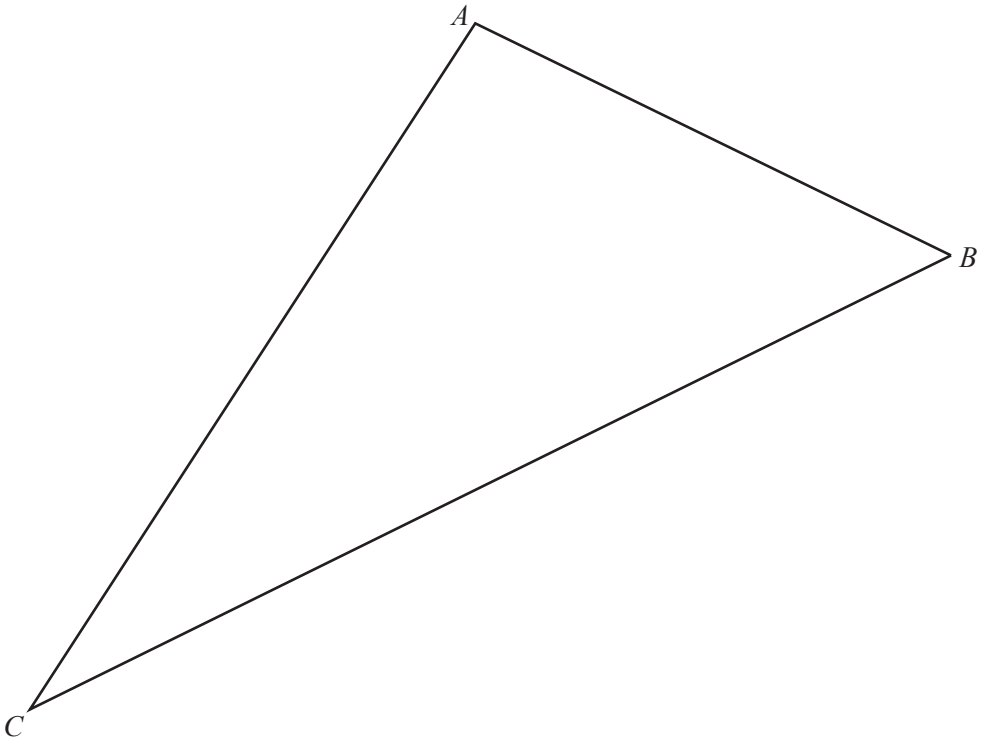
(i) equidistant from A and B, [1]

(ii) equidistant from AB and BC. [1]

(c) These two loci meet at the point P.

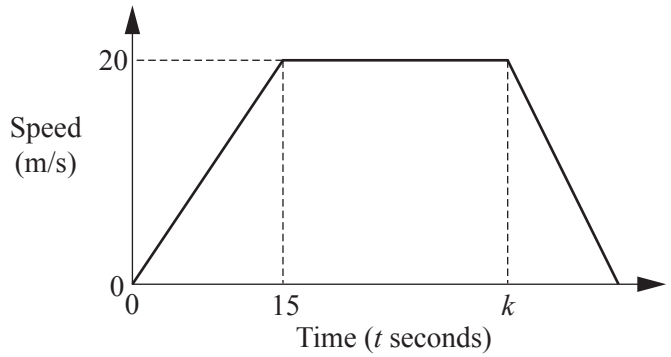
Label the point P on the diagram and measure CP.

Answer $CP =$ ..... cm [1]



25 The diagram is the speed-time graph of a car's journey.

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(a) Find the speed when $t = 12$.

Answer ..... m/s [1]

(b) Find the distance travelled by the car from $t = 0$ to $t = 15$.

Answer ..... m [1]

(c) The distance travelled by the car from $t = 0$ to $t = k$ is 750 m.

Find k.

Answer $k =$ ..... [2]

(d) The retardation of the car is $2\,m/s^2$.

Find the number of seconds it takes to slow down and stop.

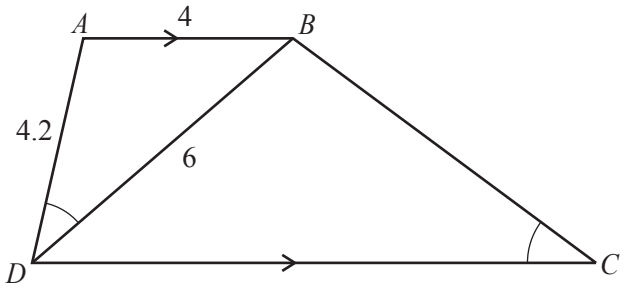
Answer ..... s [1]

Question 26 is printed on the following page.

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26 In the diagram, AB is parallel to DC and $A\hat{D}B = B\hat{C}D$.

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(a) Explain why triangles ABD and BDC are similar.

[2]

(b) $AB = 4\,\text{cm}$, $BD = 6\,\text{cm}$ and $AD = 4.2\,\text{cm}$.

(i) Calculate BC.

Answer ..... cm [2]

(ii) Write down the value of $\dfrac{\text{area of triangle } ABD}{\text{area of triangle } BDC}$.

Answer ..... [1]

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