

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

FSMQ

ALGEBRA AND GRAPHS

Level 2

Tuesday 17 May 2016

Afternoon

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:

- a clean copy of the Data Sheet (enclosed)
- a calculator
- mathematical instruments.



Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer each question in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- You may **not** refer to the copy of the Data Sheet that was available prior to this examination. A clean copy is enclosed for your use.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 50.
- You are expected to use a calculator where appropriate.

Advice

- In all calculations, show clearly how you work out your answer.



Section AAnswer **all** questions.

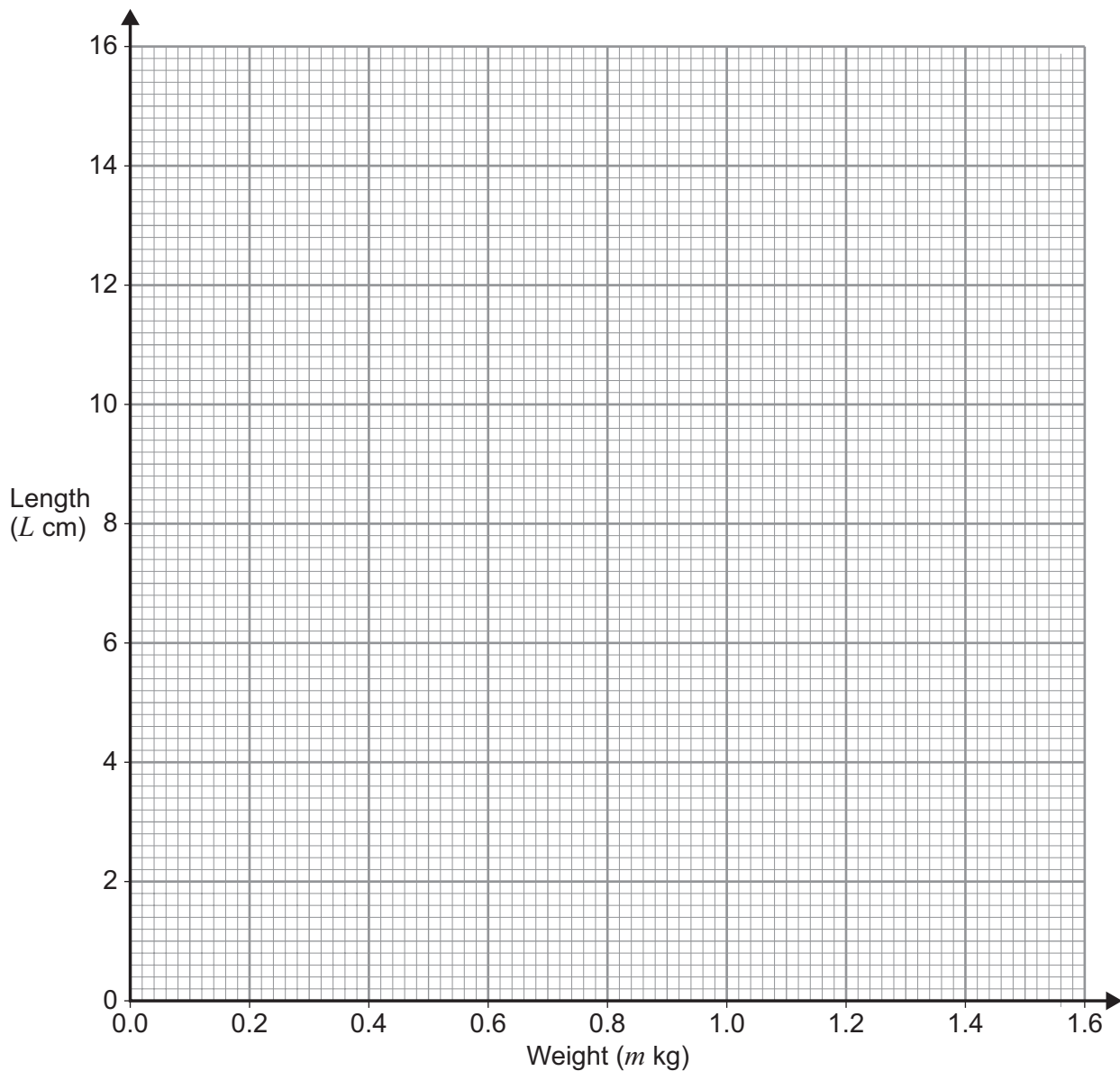
Answer each question in the space provided for that question.

Use Physics experiment on page 2 of the Data Sheet.

- 1** The table below shows the results of Sandie's experiment.

Weight (m kg)	0.2	0.4	0.8	1.0	1.2
Length (L cm)	7.5	8.9	11.3	12.7	14.1

- 1 (a)** On the grid below, plot these points.
Draw a line of best fit on your graph.

[3 marks]

1 (b) (i) Write down the intercept of your graph. [1 mark]

Answer _____

1 (b) (ii) Interpret the meaning of this intercept. [1 mark]

1 (c) Work out the equation of your line of best fit. [3 marks]

Answer _____

1 (d) If your equation is still valid for larger values of m and L , estimate the weight required to make the length of the spring equal 20 cm [3 marks]

Answer _____



Section BAnswer **all** questions.

Answer each question in the space provided for that question.

Use CO₂ emissions on page 3 of the Data Sheet.

- 2** The table below shows some of the data on carbon dioxide emissions in 2010 for three countries.

Country	Population	Total CO ₂ emissions (tonnes)	CO ₂ emissions per capita (tonnes)
Algeria	37 063 000		3.3
Guinea-Bissau	1 587 000	238 000	
Ethiopia		6 494 000	0.0746

- 2 (a)** Work out the total CO₂ emissions for Algeria in 2010.
Give your answer in **standard form** to two significant figures.

[2 marks]

- 2 (b)** Work out the CO₂ emissions per capita for Guinea-Bissau in 2010.
Give your answer in **standard form** to two significant figures.

[2 marks]



- 2 (c) Work out the population of Ethiopia in 2010.
Give your answer in **standard form** to two significant figures.

[2 marks]

6

Turn over for the next question

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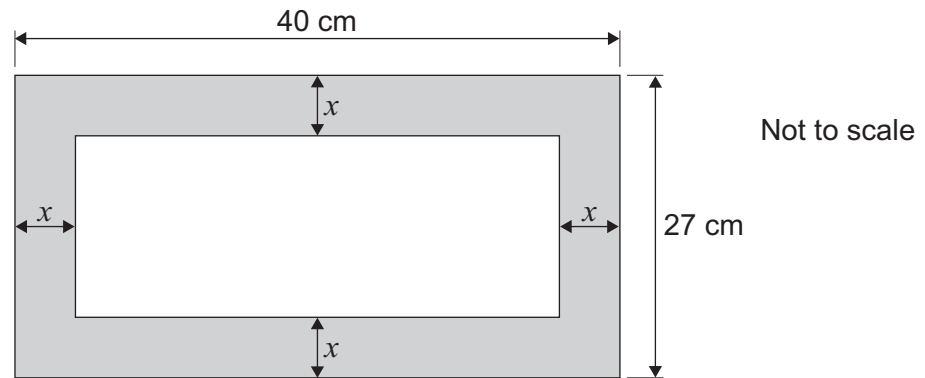


Section DAnswer **all** questions.

Answer each question in the space provided for that question.

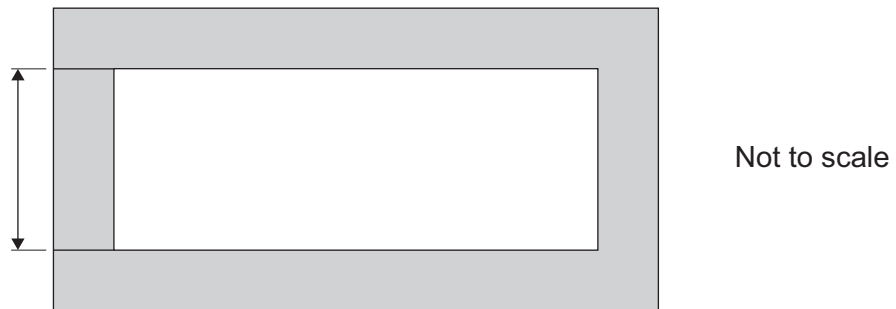
Use **Birthday cake** on page 3 of the Data Sheet.

4



The cake measures 40 cm by 27 cm, including the border.

4 (a)



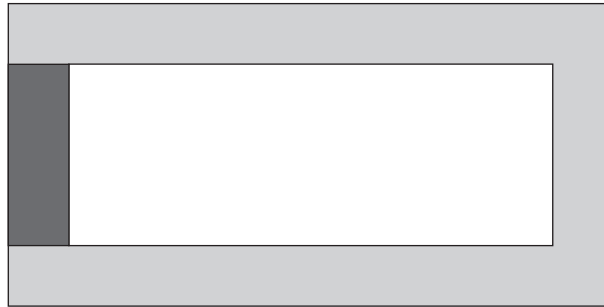
Find an expression for the length shown by the arrow in the diagram.

[1 mark]

Answer _____



4 (b)



Not to scale

Find an expression for the area with darker shading in the diagram.

[1 mark]

Answer _____

4 (c)

The total area of the border is 300 cm^2 Use your answer to part (b) to show that x satisfies the quadratic equation

$$2x^2 - 67x + 150 = 0$$

[4 marks]

Question 4 continues on the next page

Turn over ►



4 (d) The formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

can be used to solve a quadratic equation.

Solve the equation in part (c), by the formula or otherwise, to find the value of x to one decimal place.

[3 marks]

Answer _____

9



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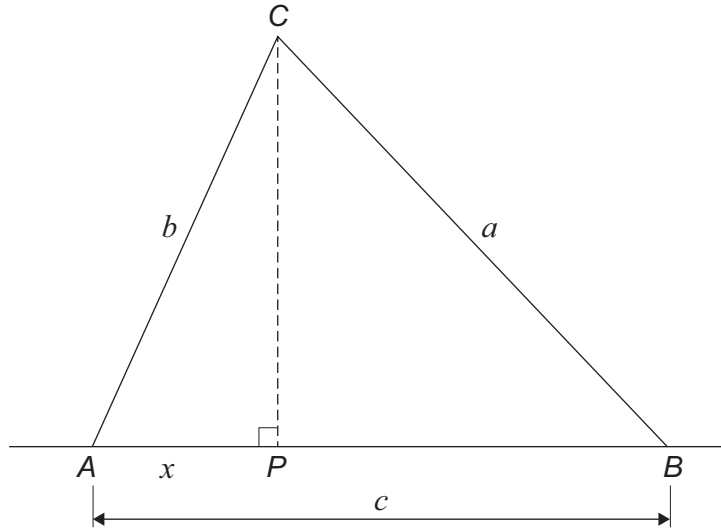
Section E

Answer **all** questions.

Answer each question in the space provided for that question.

Use **Landscape gardener** on page 4 of the Data Sheet.

5



Rachel explains to Steve that

$$a^2 - (c - x)^2 = b^2 - x^2$$

where $BC = a$, $AC = b$, $AB = c$, $AP = x$ and angle APC is a right angle.

5 (a) Show that the equation

$$a^2 - (c - x)^2 = b^2 - x^2$$

simplifies to the formula

$$x = \frac{b^2 + c^2 - a^2}{2c}$$

[3 marks]



- 5 (b)** Steve measures a straight line AB so that B is 30 metres from A . He then uses his new laser distance measurer at a point C , which is not on the line AB . He finds that the point C is 51 metres from A and 57 metres from B . P is the point on the line AB such that CP is at right angles to AB .

Use the formula given in part (a) to calculate the distance from A to P .

[3 marks]

Answer _____

- 5 (c)** Another time, Steve uses a different set of values of a , b and c in the formula

$$x = \frac{b^2 + c^2 - a^2}{2c}$$

and gets the result $x = 0$

What can you say about the angle CAB in this case?
Circle your answer.

[1 mark]

It is an acute angle

It is a right angle

It is an obtuse angle

7

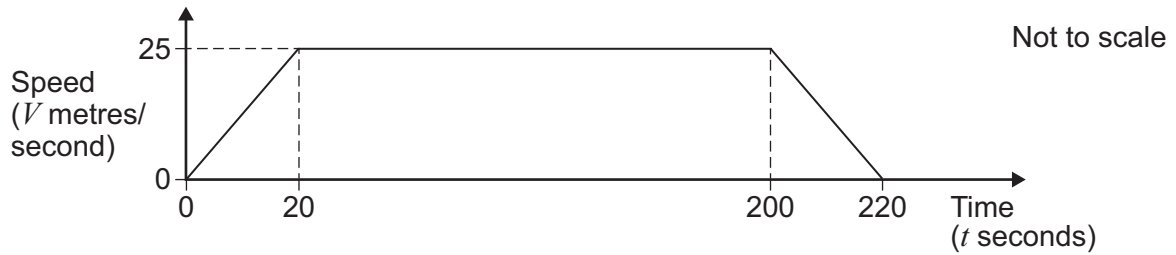
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Section FAnswer **all** questions.

Answer each question in the space provided for that question.

*Use School trip on page 4 of the Data Sheet.***6****First coach**The first coach leaves at time $t = 0$

It accelerates steadily for 20 seconds to a speed of 25 metres/second.
It continues at this speed for another 180 seconds, then decelerates steadily for 20 seconds until it stops.

6 (a) Work out the acceleration of the coach in the first 20 seconds.**[2 marks]**

Answer _____

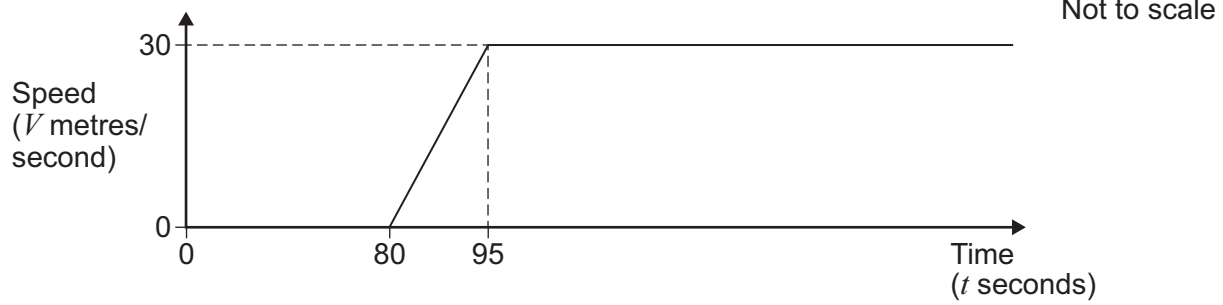
6 (b) Work out the total distance travelled by the coach in these 220 seconds.**[3 marks]**

Answer _____



6 (c)

Second coach



The second coach leaves the cafe 80 seconds after the first one.
It accelerates steadily for 15 seconds to a speed of 30 metres/second.
The second coach continues at this speed and passes the first coach, which has stopped.

For how much time does the second coach travel at 30 metres/second before it passes the first coach?

[4 marks]

Answer _____

9

END OF QUESTIONS



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