

Centre Number						Candidate Number				
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Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Pages	Mark
3	
4–5	
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12–13	
14–15	
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18–19	
20–21	
22	
TOTAL	



General Certificate of Secondary Education
Higher Tier
June 2010

Mathematics (Specification A)

4306/1H

Paper 1 Non-calculator

H

Monday 7 June 2010 1.30 pm to 3.30 pm

<p>For this paper you must have:</p> <ul style="list-style-type: none"> mathematical instruments. <p>You may not use a calculator.</p>	
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Time allowed

- 2 hours

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces 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 you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 100.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer booklet.

Advice

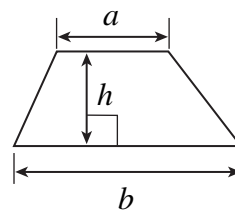
- In all calculations, show clearly how you work out your answer.



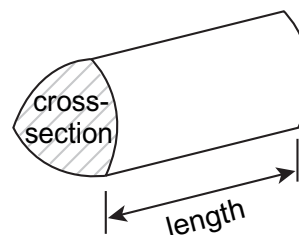
J U N 1 0 4 3 0 6 1 H 0 1

Formulae Sheet: Higher Tier

Area of trapezium = $\frac{1}{2}(a+b)h$

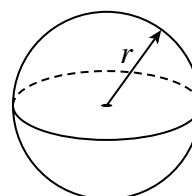


Volume of prism = area of cross-section \times length



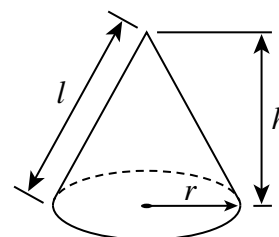
Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

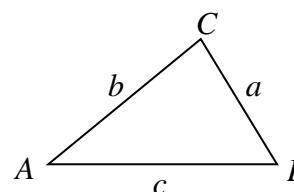


In any triangle ABC

Area of triangle = $\frac{1}{2}ab \sin C$

Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$



The Quadratic Equation

The solutions of $ax^2 + bx + c = 0$, where $a \neq 0$, are given by

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



Answer **all** questions in the spaces provided.

1 $A = -9$ and $B = 12$

Work out the value of $\frac{4(A + 3)}{B}$

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Answer (3 marks)

2 Jack has a box of 100 coloured discs.
The discs are Red, Blue, Green and Yellow.
The table shows some of the probabilities of choosing a colour.

Colour	Red	Blue	Green	Yellow
Probability	0.6	0.1		0.1

2 (a) Jack chooses a disc at random from the box.
Work out the probability that he chooses a Green disc.

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.....

Answer (2 marks)

2 (b) Jack says: 'There must be 60 Red discs in the box.'

Is Jack correct?
Tick the correct box.

Yes

No

Give a reason for your answer.

Reason

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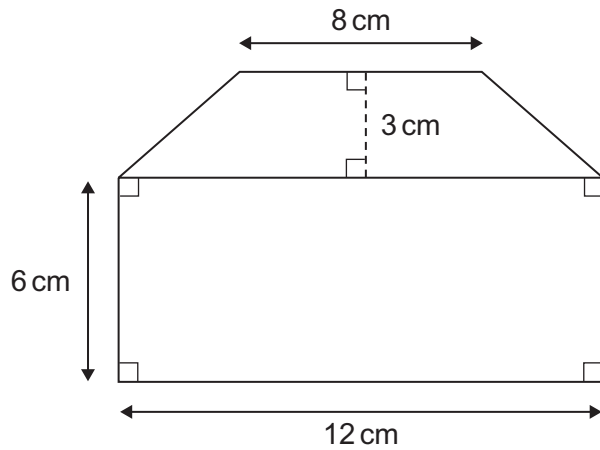
(2 marks)

7

Turn over ►



3 The shape is a drawing of a house.



Not drawn accurately

Work out the area of this shape.
State the units of your answer.

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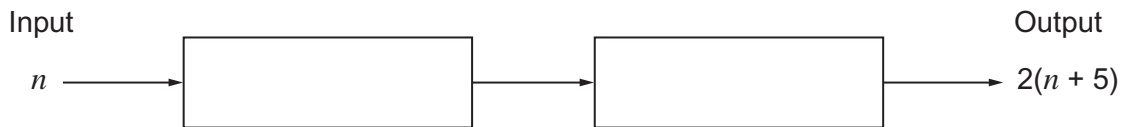
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Answer (4 marks)

4 A flow diagram for a two-stage operation is shown.



4 (a) Fill in the boxes of the flow diagram so that they represent this two-stage operation. (2 marks)

4 (b) When the input is -1, what is the output?

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Answer (1 mark)



5 You are given that $46 \times 137 = 6302$

Write down the answers to these calculations.

5 (a) 46×1.37

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Answer (1 mark)

5 (b) $\frac{6302}{460}$

.....

Answer (1 mark)

5 (c) $\frac{63020}{46 \times 137}$

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Answer (1 mark)

Turn over for the next question



6 (a) Solve $\frac{28}{w} = 7$

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Answer $w =$ (1 mark)

6 (b) Solve $7x - 2 = 3x + 8$

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Answer $x =$ (3 marks)

6 (c) Solve $\frac{3y + 11}{4} = 2$

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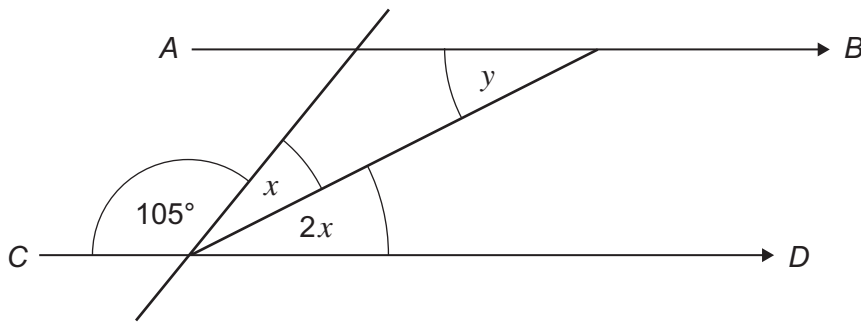
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Answer $y =$ (3 marks)



7 In the diagram AB is parallel to CD .



Not drawn accurately

7 (a) Work out the value of x .

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Answer degrees (2 marks)

7 (b) Work out the value of y .
Give a reason for your answer.

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Answer degrees

Reason

(2 marks)



8 (a) Work out $\frac{5}{6} \div \frac{3}{4}$

Give your answer in its simplest form.

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Answer (3 marks)

8 (b) Work out $4\frac{2}{5} - 1\frac{1}{3}$

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Answer (3 marks)

9 Pam wants to collect information about the total number of hours of homework the students in her class did last week.

Design a suitable question she could use to find out this information.
Remember to include response boxes.

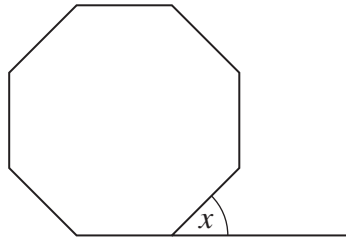
Question
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Response

(2 marks)



10 The diagram shows a regular octagon.



Not drawn accurately

10 (a) Explain why the exterior angle of a regular octagon, marked x on the diagram, is 45°

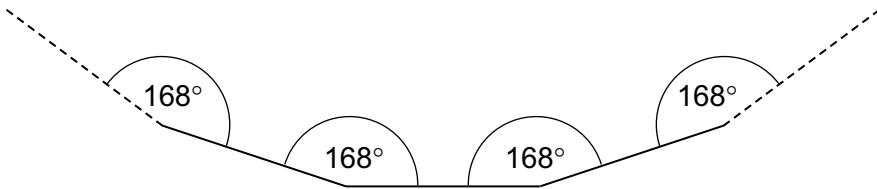
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(1 mark)

10 (b) The diagram shows part of a regular polygon. Each interior angle is 168° .



Not drawn accurately

Calculate the number of sides of this regular polygon.

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Answer (3 marks)



11 A restaurant offers a family discount.
 The Taylor family have a meal at this restaurant.
 Before the discount the meal costs £140
 After the discount the cost is £112

Calculate the percentage discount.

.....

Answer % (3 marks)

12 (a) Complete the table of values for $y = x^2 - 4x + 2$

x	-1	0	1	2	3	4	5
y		2	-1		-1	2	7

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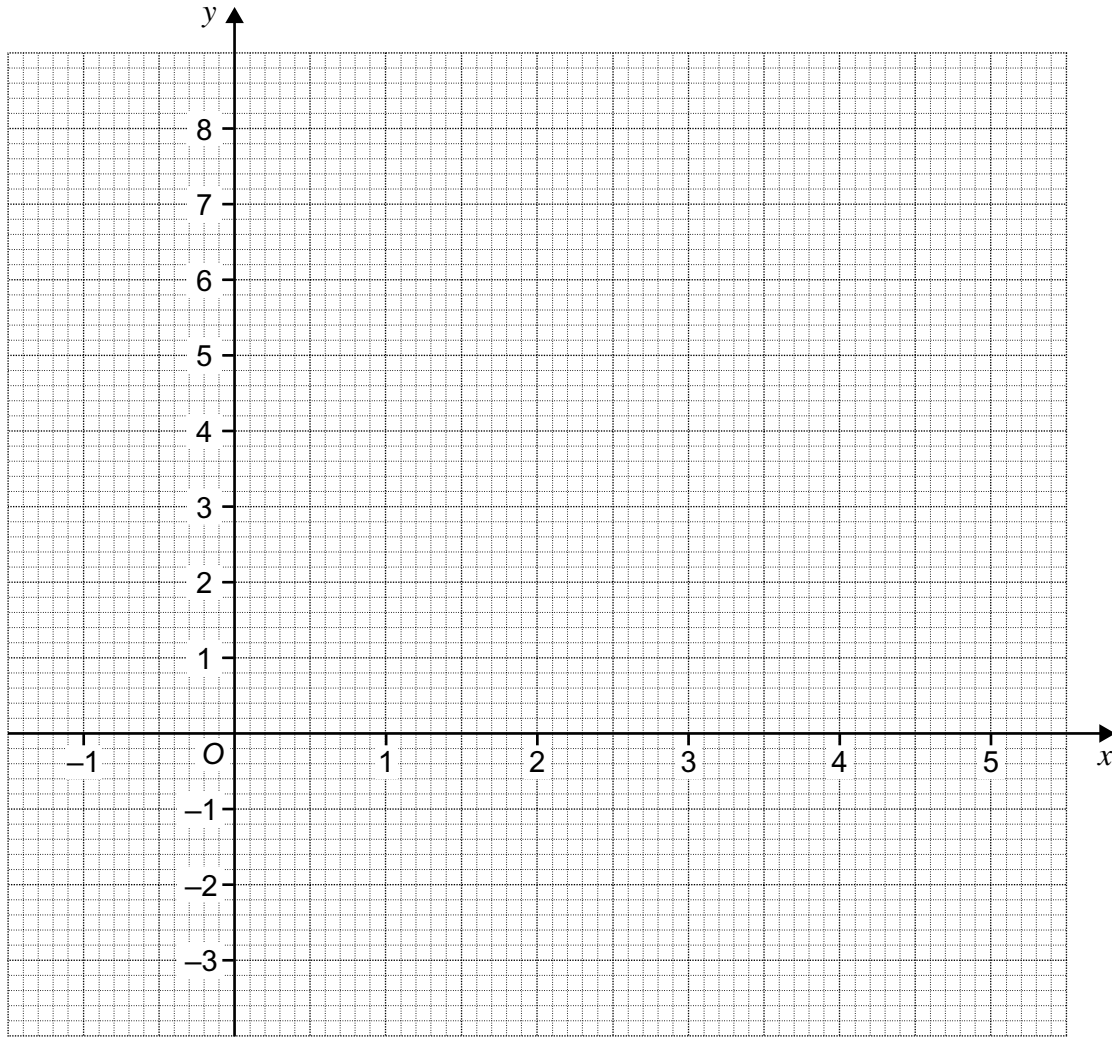
 (2 marks)

12 (b) On the grid opposite, draw the graph of $y = x^2 - 4x + 2$ for values of x from -1 to 5 (2 marks)

12 (c) Use the graph to solve the equation $x^2 - 4x + 2 = 0$

.....
 Answer $x =$ or $x =$ (1 mark)





Turn over for the next question

8

Turn over ►



13 These five numbers are written in standard form.

4.5×10^5 8.7×10^0 6.9×10^{-3} 3.2×10^6 1.8×10^{-1}

13 (a) Write down the smallest number.

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Answer (1 mark)

13 (b) Write down the largest number.

.....

Answer (1 mark)

13 (c) Write 1.8×10^{-1} as an ordinary number.

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Answer (1 mark)

13 (d) Work out $4.5 \times 10^5 \times 0.01$
Give your answer in standard form.

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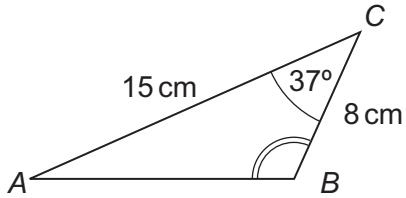
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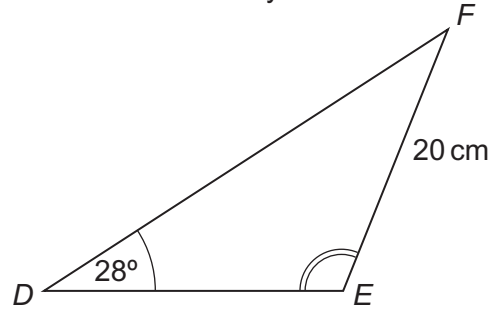
Answer (2 marks)



14 Triangles ABC and DEF are similar.
Angle $ABC =$ angle DEF .



Not drawn accurately



14 (a) Work out the size of angle DEF .

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Answer degrees (2 marks)

14 (b) Calculate the length of DF .

.....

Answer cm (3 marks)



15 The table shows the profits of a small business during each quarter from March 2008 to June 2009. The March 2009 entry is missing from the table.

Date	Mar 08	June 08	Sept 08	Dec 08	Mar 09	June 09
Profits	38 000	29 000	25 000	34 000		21 000

15 (a) Calculate the first four-point moving average.

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Answer £ (2 marks)

15 (b) The second four-point moving average is £28 000
Calculate the missing entry for March 2009.

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Answer £ (2 marks)



16 (a) Show clearly that $(x + 5)(x - 2) + 3(x + 1) \equiv x^2 + 6x - 7$

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(2 marks)

16 (b) Factorise $x^2 + 6x - 7$

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Answer (2 marks)

16 (c) Hence, or otherwise, solve $(x + 5)(x - 2) + 3(x + 1) = 0$

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Answer (2 marks)



17 (a) Factorise fully $6x^2 - 10xy$

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Answer (2 marks)

17 (b) Simplify $(5a^4b)^3$

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Answer (2 marks)

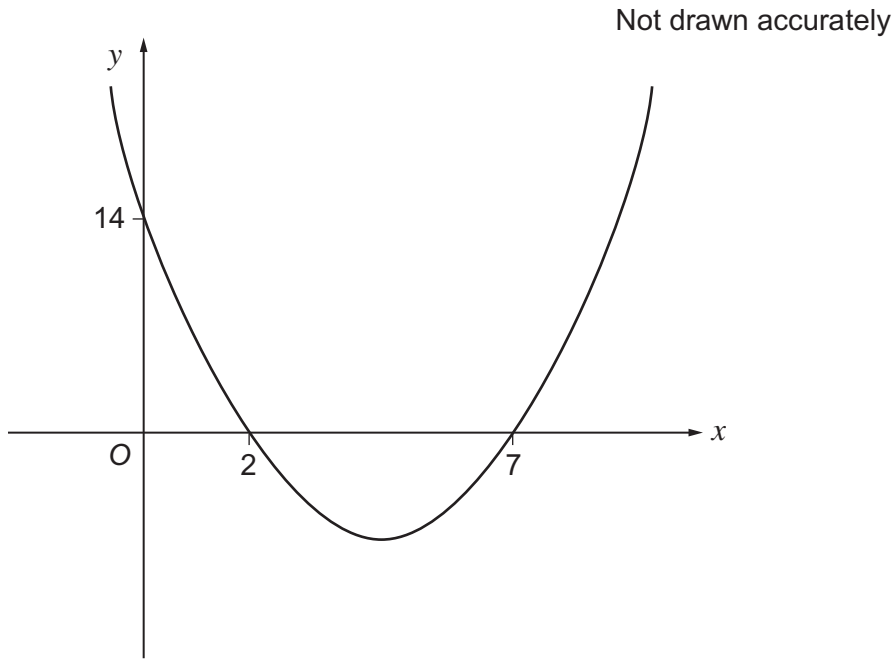
18 Evaluate $81^{0.5} \times 6^{-2}$
Give your answer in its simplest form.

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Answer (3 marks)



19 The diagram shows the graph of $y = x^2 + bx + c$



Find the values of b and c .
You **must** show all your working.

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Answer $b = \dots\dots\dots$, $c = \dots\dots\dots$ (3 marks)



20 A data logging machine in a car park records the length of time that cars are parked. Here are Monday's results, along with the parking charges.

Length of time (hours)	Number of cars	Charge (£)
0 – 1	90	1.20
1 – 2	130	2.00
2 – 3	80	3.50
more than 3	60	5.00

Monday's results are equivalent to a 20% sample for the whole week, stratified by the four time intervals.

Work out the car park takings for the whole week.

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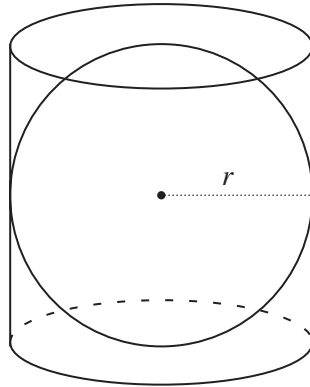
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Answer £ (3 marks)



21

A tennis ball of radius r is packaged in a cylindrical box.
The ball touches the sides, top and base of the box.



What fraction of the volume of the box is empty space?
You **must** show all your working.

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Answer (4 marks)

7

Turn over ►



22 Find the value of w if $\frac{\sqrt{w} \times \sqrt{8}}{\sqrt{3}} = 2\sqrt{3}$

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Answer (3 marks)

23 Solve the equation $x^2 - 4x - 15 = 0$

Give your answers in surd form in their simplest form.

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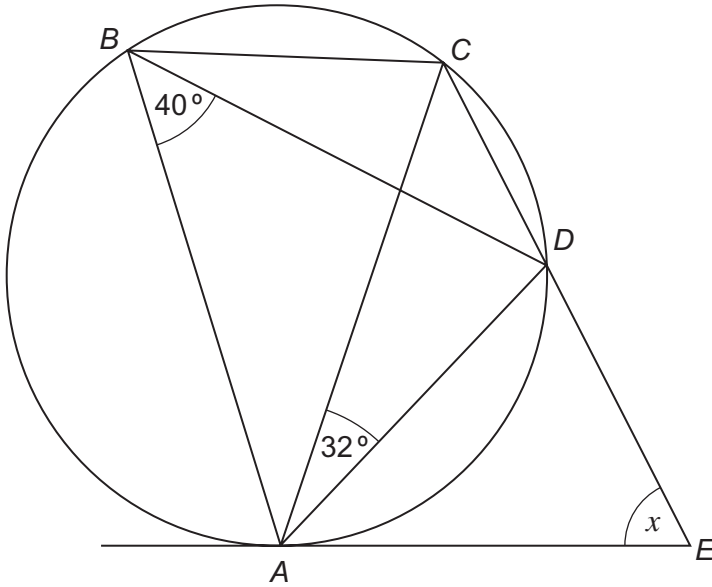
Answer (3 marks)



24

$ABCD$ is a cyclic quadrilateral.
 AE is a tangent at A .
 CDE is a straight line.
 Angle $CAD = 32^\circ$
 Angle $ABD = 40^\circ$

Not drawn accurately



Work out the size of angle AED , marked x , on the diagram.
 You **must** show your working.
 Give reasons for any angles you work out.

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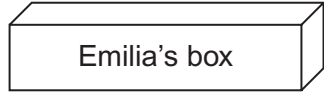
Answer degrees (5 marks)



25 Emilia picks a chocolate at random from a box.
 All the chocolates in the box are identically wrapped.
 The probability that she picks a caramel is $\frac{5}{8}$

Sophie picks a chocolate at random from a different box.
 All the chocolates in Sophie's box are identically wrapped.
 The probability that she picks a caramel is denoted by p .

The probability that **both** Emilia and Sophie pick a caramel is $\frac{1}{4}$



$P(\text{Emilia picks a caramel}) = \frac{5}{8}$



$P(\text{Sophie picks a caramel}) = p$

25 (a) Work out the value of p .

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Answer (2 marks)

25 (b) Calculate the probability that **neither** Emilia **nor** Sophie picks a caramel.

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Answer (2 marks)

END OF QUESTIONS

4



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