UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

MATHEMATICS

Paper 3 (Core)

0580/03 0581/03

Candidates answer on the Question Paper.
Additional Materials: Electronic calculator
Geometrical instruments
Mathematical tables (optional)
Tracing paper (optional)

October/November 2006

2 hours

Candidate Name

Centre Number

Candidate Number

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 in the spaces provided on the Question Paper.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN THE BARCODE.
DO **NOT** WRITE IN THE GREY AREAS BETWEEN THE PAGES.

Answer **all** questions.
If working is needed for any question it must be shown below that question.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use

The total of the marks for this paper is 104.
Electronic calculators should be used.
If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.
For π, use either your calculator value or 3.142.

This document consists of **13** printed pages and **3** blank page.

For Examiner's Use

1 (a)

$\frac{2}{3}$ 2 3 3.14 $\sqrt{35}$ 10 24 37 45 88

From the list of numbers above choose one that is

(i) an irrational number, *Answer(a)* (i) ..... [1]

(ii) the cube root of 27, *Answer(a)* (ii) ..... [1]

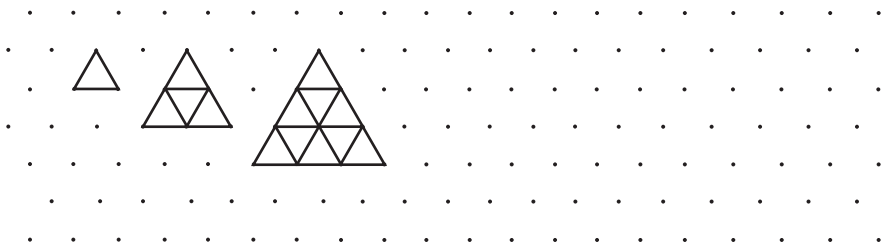
(iii) a multiple of 9, *Answer(a)* (iii) ..... [1]

(iv) a prime number, *Answer(a)* (iv) ..... [1]

(v) a factor of 44, *Answer(a)* (v) ..... [1]

(vi) the product of 6 and 4. *Answer(a)* (vi) ..... [1]

(b) The diagram below shows a sequence of patterns made with small triangular tiles.



(i) Draw the next pattern in the sequence. [1]

(ii) Complete the table below.

Pattern number	1	2	3	4	5	6
Number of tiles	1	4	9			

[2]

(iii) How many tiles will be in the 100th pattern?

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

(iv) How many tiles will be in the *n*th pattern?

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

(v) What is the special name given to the numbers in the second row of the table?

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

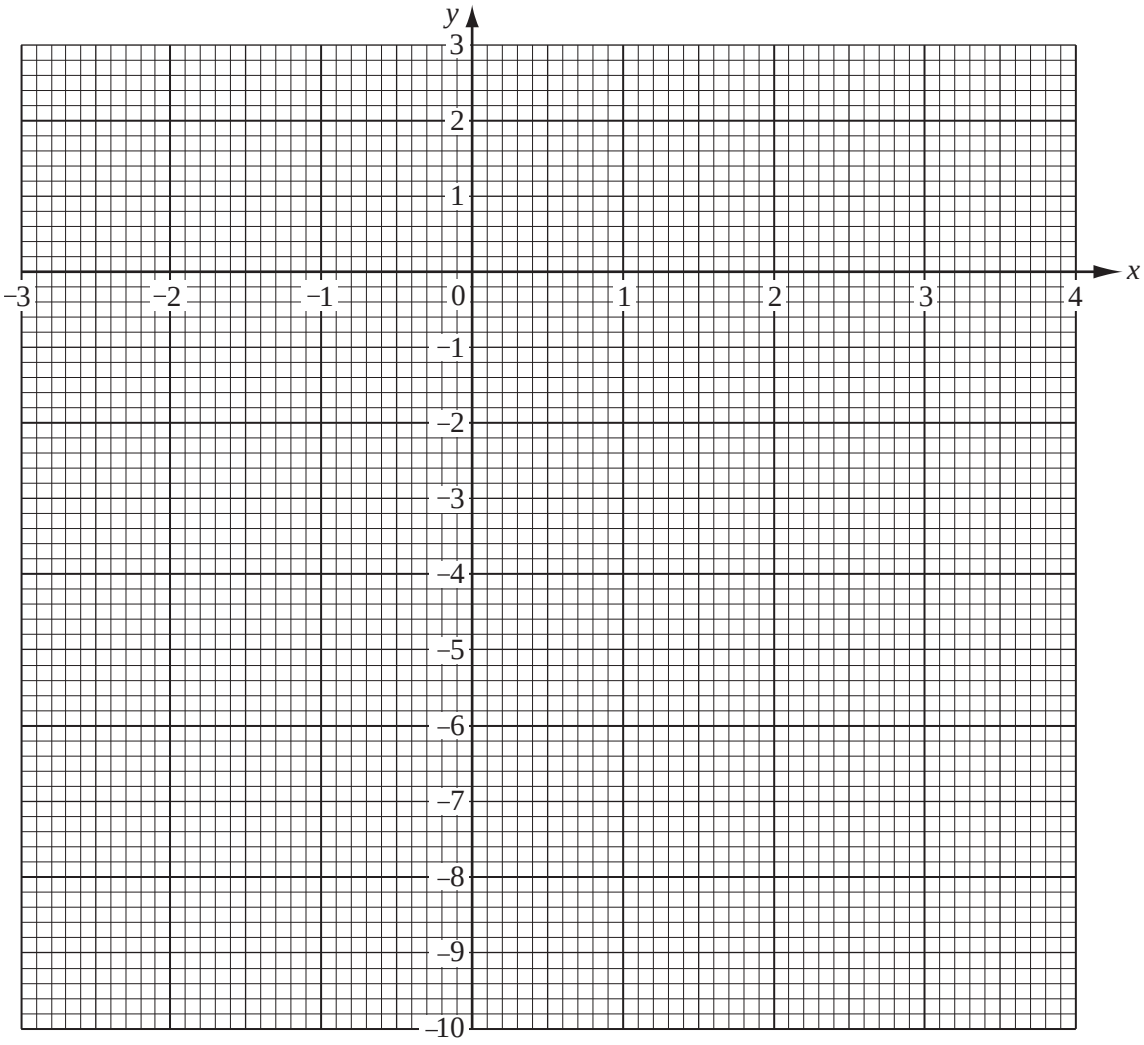
For Examiner's Use

2 **(a)** Complete the table for the equation $y = -x^2 + x + 2$.

x	−3	−2	−1	0	1	2	3	4
y	−10		0	2	2	0		

[3]

(b) On the grid below draw the graph of $y = -x^2 + x + 2$.



[4]

(c) On the grid, draw the line of symmetry of your graph. [1]

(d) Use your graph to find the maximum value of y.

Answer(d) $y =$ ..... [1]

(e) Draw the line $y = 1$ on the grid. [1]

(f) Write down the two values of x for which $-x^2 + x + 2 = 1$.

Answer(f) $x =$ ..... or $x =$ ..... [2]

For Examiner's Use

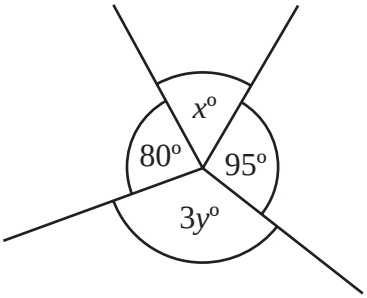
3 **(a)** **(i)** Calculate the **interior** angle of a regular heptagon (seven-sided polygon).
Write down all the figures on your calculator display.

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

(ii) Round your answer to **part (a)(i)** to 1 decimal place.

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

(b)



NOT TO SCALE

The diagram shows four angles around a point.

(i) Write down an equation in x and y.

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

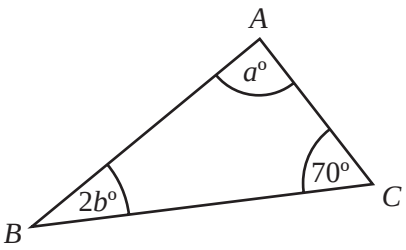
(ii) Simplify your equation.

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

(iii) Find y when $x = 65$.

Answer(b) (iii) y = ... [2]

(c) (i)

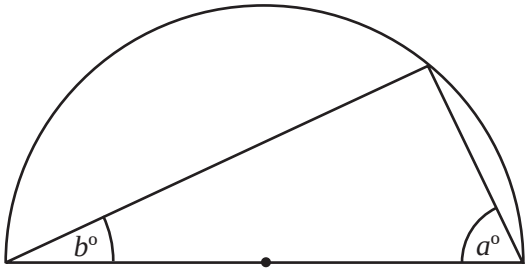


NOT TO SCALE

Explain why $a + 2b = 110$ in the triangle above.

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

(ii)



NOT TO SCALE

Explain why $a + b = 90$ in the semi-circle above.

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

(iii) Solve the equations

$$a + 2b = 110,$$
$$a + b = 90.$$

Answer(c) (iii) a = ...

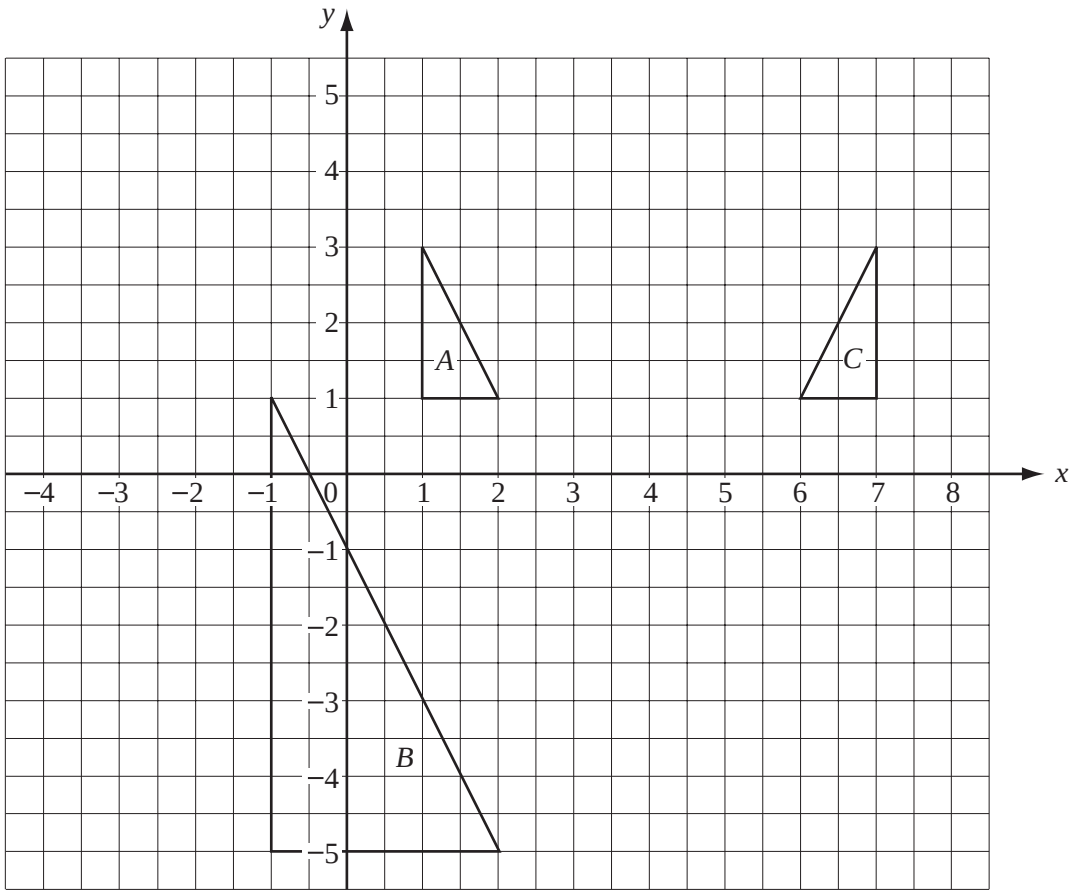
b = ... [2]

(iv) Work out the size of angle ABC in the triangle in **part (c)(i)**.

Answer(c) (iv) Angle ABC = ... [1]

4

For Examiner's Use



(a) Describe fully the **single** transformation that maps

(i) triangle *A* onto triangle *B,*

Answer(a) (i) ..... [3]

(ii) triangle *A* onto triangle *C*.

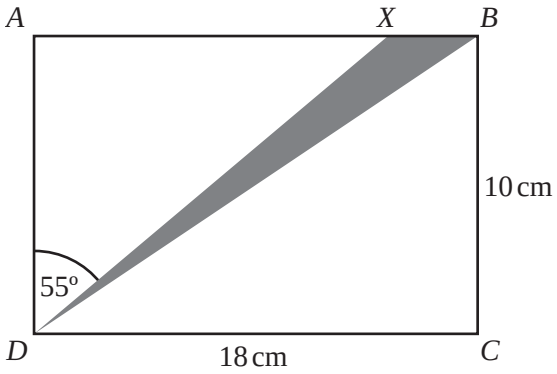
Answer(a) (ii) ..... [2]

(b) On the grid above draw

(i) the translation of *A* by the vector $\begin{pmatrix} 2 \\ -3 \end{pmatrix}$, [2]

(ii) the rotation of *B* through 180° about the point (−1, −2). [2]

5



NOT TO SCALE

The diagram shows a rectangular tile *ABCD* which has a shaded triangle *DXB*.
DC = 18 centimetres, *BC* = 10 centimetres and angle *ADX* = 55°.

(a) Calculate the area of triangle *BDC*.

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

(b) Calculate the length of *AX*.

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

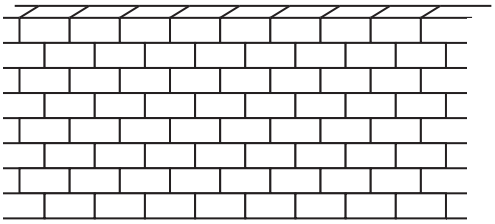
(c) Calculate the shaded area.

Answer(c) .....cm^2 [3]

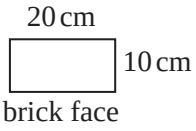
(d) Calculate the length of *BD*.

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

6



Part of the wall



NOT TO SCALE

For Examiner's Use

(a) A builder estimates the number of bricks in a wall by dividing the area of the wall by the area of the face of a brick.
A brick wall is 10 **metres** long and 1.5 **metres** high.
Each brick is 20 **centimetres** long and 10 **centimetres** high.
Calculate how many bricks the builder estimates are in the wall.
Show all your working.

Answer(a) ..... bricks [3]

(b) Another wall will need 720 bricks.
The builder adds an extra 5% to this number to allow for mistakes.

(i) Calculate how many bricks the builder needs to buy.

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

(ii) Bricks are sold in packs of 100 which can not be split.
How many packs should the builder buy?

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

(c) The builder mixes sand and cement in the ratio 5:2 to make mortar.
He wants 14 buckets of mortar.

(i) How many buckets of sand and how many buckets of cement does he need?

Answer(c) (i) He needs ..... buckets of sand and ..... buckets of cement. [2]

(ii) One bag of cement fills 3.5 buckets.
How many bags of cement must the builder buy?

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

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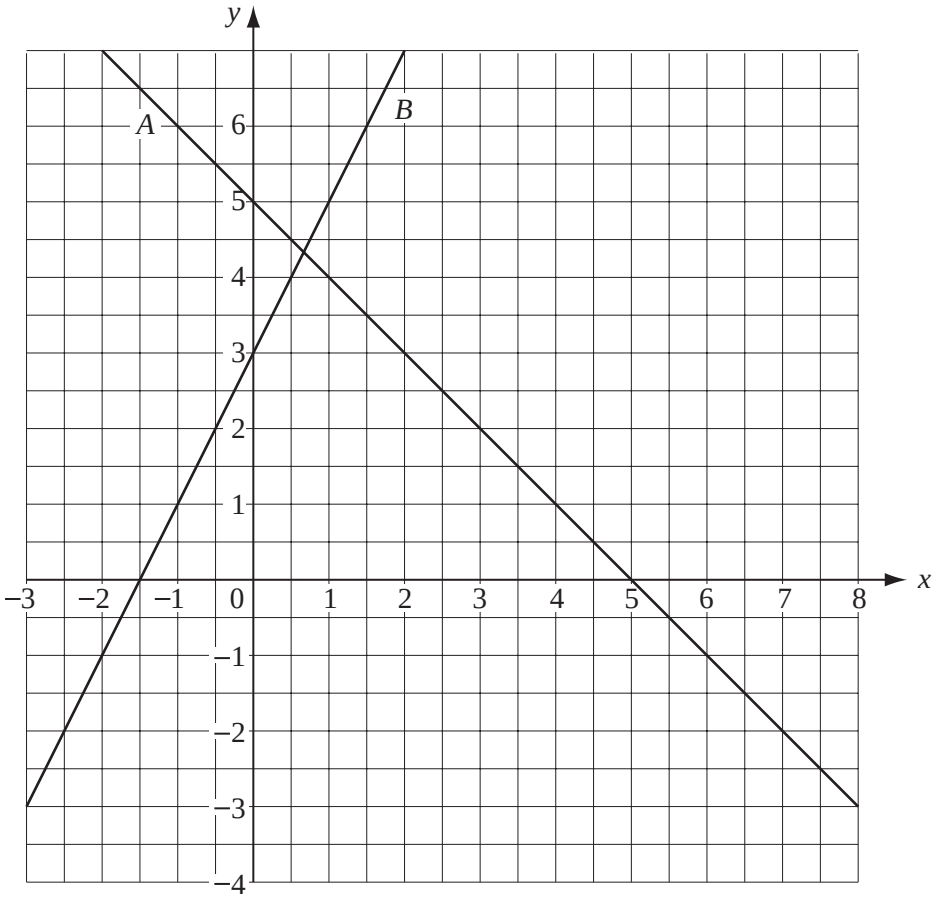
For Examiner's Use



Two straight lines labelled A and B are shown on the grid above.

(a) Find the gradient of line A.

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

(b) The equation of line B can be written as $y = mx + c$.
Find the values of m and c.

Answer(b) m = ...

c = ... [2]

(c) **(i)** On the diagram draw the line which is parallel to B and passes through the point $(1,-1)$. [1]

(ii) Write down the equation of this line.

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

For Examiner's Use

8 **(a)** Naomi records the sizes of the 34 pairs of shoes that her shop sells in one day.

4	10	5	6	4	8	6	4	7	3	9	7	4
7	3	5	4	6	5	10	7	5	5	6	4	7
7	6	6	5	5	3	5	6					

(i) Using the list above complete the frequency table.

Shoe size	3	4	5	6	7	8	9	10
Frequency								

[3]

(ii) Calculate the mean of these shoe sizes.

Answer(a) (ii) ..... [3]

(iii) Find the range of these sizes.

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

(iv) Find the mode of these sizes.

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

(v) Work out the median shoe size.

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

(vi) Calculate the percentage of all the pairs of shoes that are size 7.

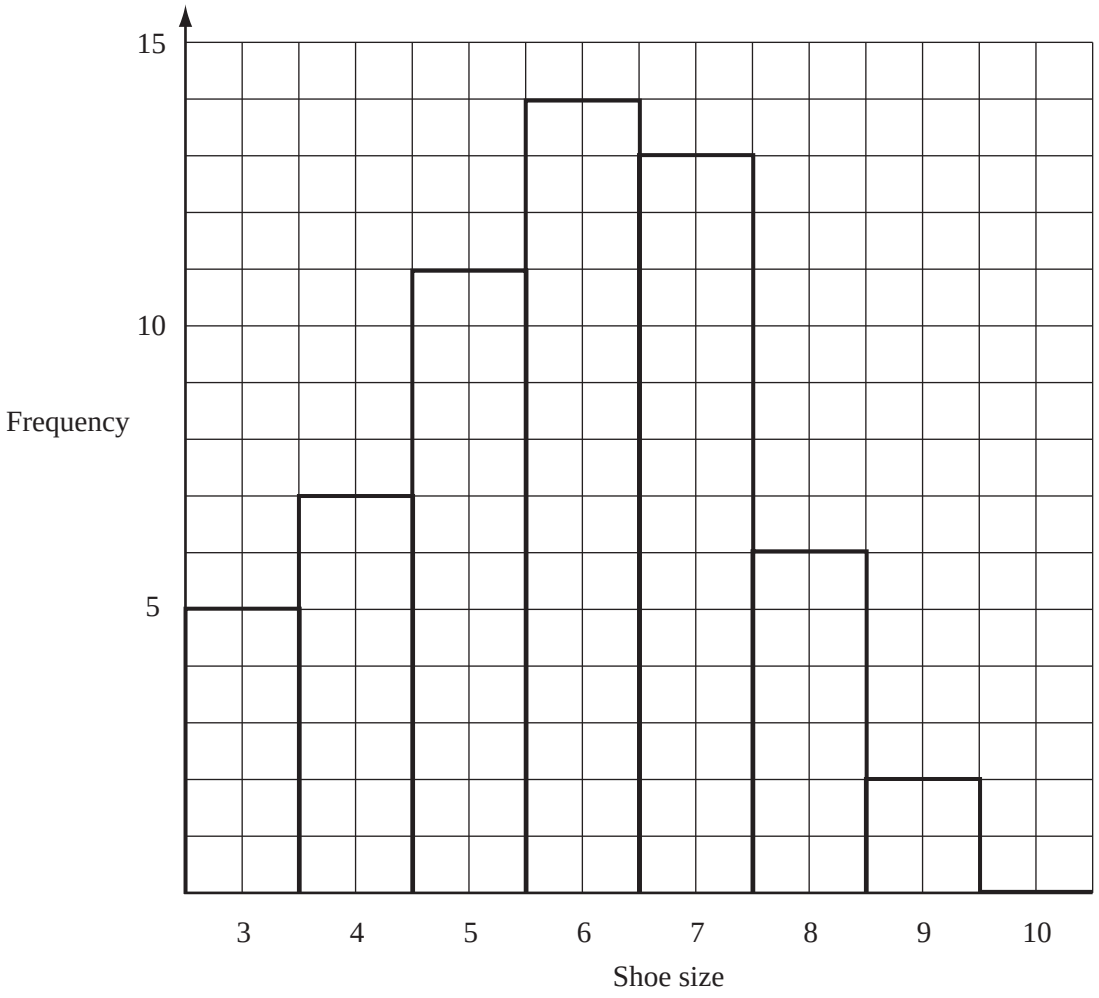
Answer(a) (vi) ..... %. [2]

(vii) Naomi orders 306 pairs of shoes to sell in her shop.
Estimate how many of these pairs of shoes should be size 7.

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

For Examiner's Use

(b) Findlay draws a bar chart to show how many pairs of shoes he has sold in his shop in one week.



(i) Use the information in the bar chart to complete the frequency table below.

Shoe size	3 and 4	5 and 6	7 and 8	9 and 10
Frequency				

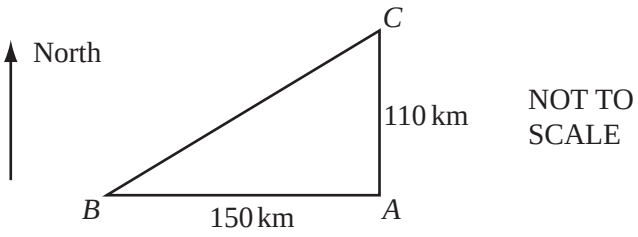
[2]

(ii) Which is the modal class in the frequency table?

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

For Examiner's Use

9 The sketch shows the positions of three islands *A*, *B* and *C*.
B is 150 kilometres due West of *A*.
C is 110 kilometres due North of *A*.



(a) Using a scale of 1 centimetre to represent 20 kilometres draw accurately the triangle *ABC*.
A is marked for you.

× *A*

[3]

(b) A boat sets out from *B* to sail directly to *C*.

(i) Use your protractor to find the three-figure bearing of *B* from *C*.

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

(ii) Measure *BC* on your diagram and hence find the distance in kilometres of *B* from *C*.

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

(iii) The boat sails at 20 knots.
[1 knot is 1.85 kilometres per hour.]

How long will the boat take for the first 100 kilometres of the journey?
Give your answer in hours and minutes, to the nearest minute.

Answer(b) (iii) ..... hours ..... min [4]

(iv) The boat takes 45 minutes for the next 18 kilometres.
Calculate this speed in kilometres per hour.

Answer(b) (iv) ..... km/h [2]

(v) A radio beacon at *A* has a range of 100 kilometres.
On your diagram in **part (a)** draw accurately the locus of points that are 100 kilometres from *A*.

[2]

(vi) For how many kilometres is the boat within range of the beacon?

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

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