

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

For Examiner's Use

General Certificate of Secondary Education
June 2007



MATHEMATICS (SPECIFICATION A)
Higher Tier
Paper 2 Calculator

3301/2H
H

Monday 11 June 2007 9.00 am to 11.00 am

<p>For this paper you must have:</p> <ul style="list-style-type: none"> • a calculator • mathematical instruments. 	
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For Examiner's Use	
Pages	Mark
3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
TOTAL	
Examiner's Initials	

Time allowed: 2 hours

Instructions

- Use blue or black ink or ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- Answer the questions in the spaces provided.
- Use a calculator where appropriate.
- Do all rough work in this book.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

Information

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

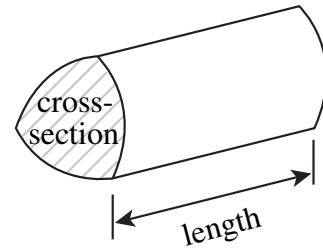
Advice

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

Formulae Sheet: Higher Tier

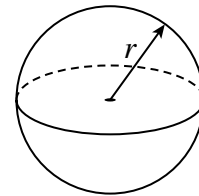
You may need to use the following formulae:

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



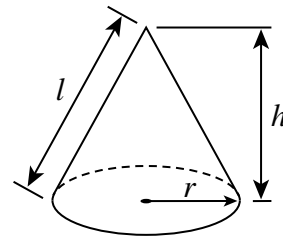
Volume of sphere = $\frac{4}{3} \pi r^3$

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



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

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

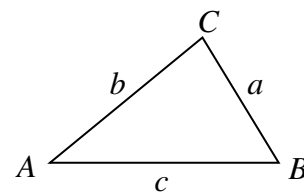


In any triangle ABC

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 Ali, Ben and Colin are aged 10, 12 and 16 years.
They share £96.90 in the ratio of their ages.
How much does each receive ?

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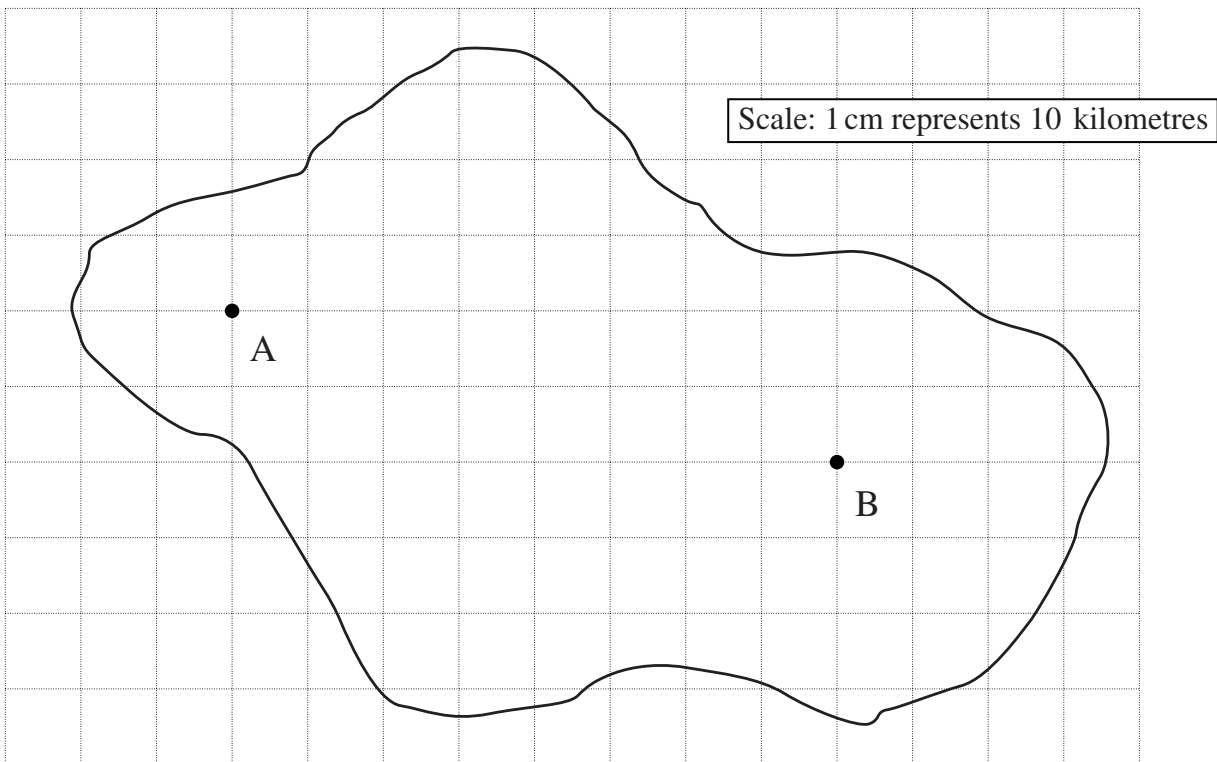
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Answer Ali £

 Ben £

 Colin £ (3 marks)

- 2 There are two TV transmitters on an island.
The transmitter at A has a range of 40 km.
The transmitter at B has a range of 60 km.



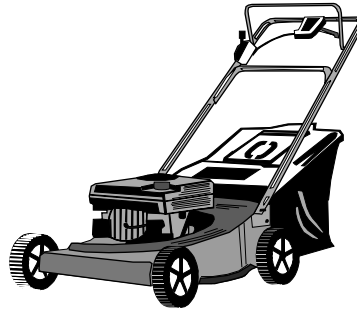
Show clearly the area in which the signal from both transmitters can be received.

(3 marks)

Turn over ►

3 (a)

Sale!
12% off
Power Mower
Normally
£249.99



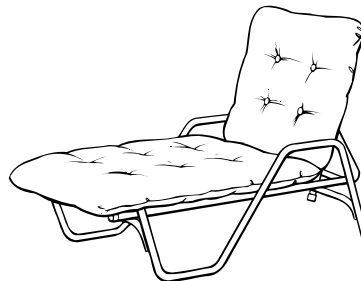
What is 12% of £249.99?

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Answer £ (2 marks)

(b)

Sale!
12% off
Garden Seat
Save £15



What is the normal price of the garden seat?

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Answer £ (3 marks)

4 Paul and Kelly each buy a can of drink.



Volume 500 ml
Sugar per can 35 g

Volume 330 ml
Sugar per can 28 g

Paul drinks 100 ml of the Blackcurrant juice.
Kelly drinks 100 ml of the Fizzy orange.

Who drinks more sugar?
You **must** show your working.

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Answer (3 marks)

5 Make x the subject of $w = \frac{x}{2} + 3$

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Answer $x =$ (2 marks)

Turn over ►

- 6 (a) Write down whether each of the following is an expression (X), an identity (I), an equation (E) or a formula (F).

	X, I, E or F
$v = u + at$	
$3n + 2n \equiv 5n$	
$3x + 2 = 7$	
$4x^2 + 2x - 3$	

(3 marks)

- (b) Show clearly that $(a + b)(a - b) \equiv a^2 - b^2$

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(2 marks)

- (c) Factorise $p^2 - 100$

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Answer (1 mark)

- 7 The following information is from a table on the side of a packet of biscuits.

NUTRITION INFORMATION		
AVERAGE VALUES	PER BISCUIT	PER 100 g
PROTEIN	0.7 g	5.5 g

Use this information to work out the weight of one biscuit.
Give your answer to an appropriate degree of accuracy.

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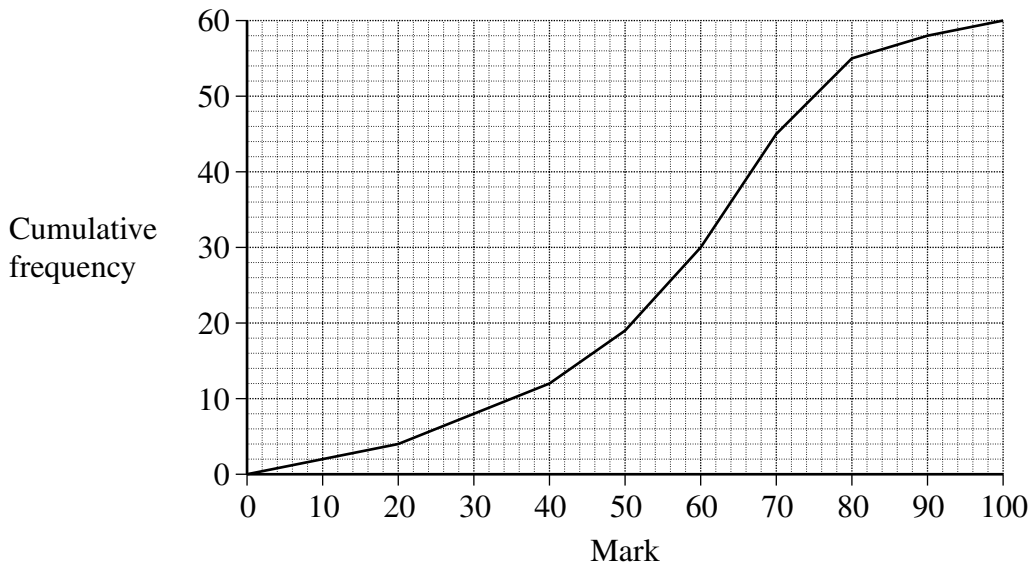
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Answer g (3 marks)

8 The cumulative frequency diagram shows the distribution of marks for 60 students in a science examination.



(a) Estimate

(i) the median mark

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Answer (1 mark)

(ii) the interquartile range of the marks.

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Answer (2 marks)

(b) The pass mark for the examination is 55 marks.

How many students passed the examination?

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Answer (2 marks)

9 (a) Expand and simplify $2(3x - 2) + 4(x + 5)$

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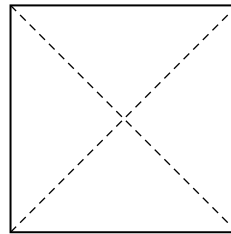
Answer (2 marks)

(b) Solve the equation $2(3x - 2) + 4(x + 5) = 4(x - 2)$

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Answer $x =$ (3 marks)

10 A square has diagonals of length 15 cm.
Calculate the area of the square.

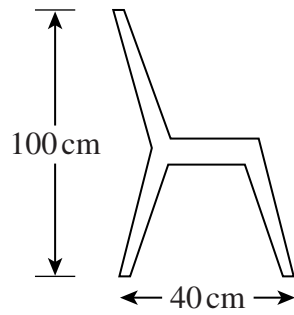


Not drawn
accurately

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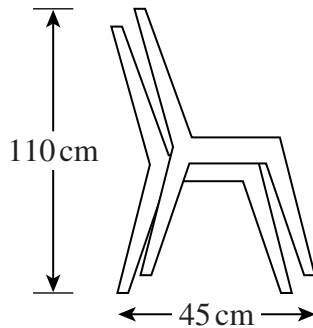
Answer cm^2 (3 marks)

11 A stacking chair is 100 cm high and 40 cm wide.



Not drawn accurately

When a chair is added to a stack it increases the height by 10 cm and the width by 5 cm.



Not drawn accurately

(a) Find an expression for the height of a stack of n chairs.

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Answer (2 marks)

(b) A rule for the maximum number of chairs that can be stacked before they fall over is

$$4n + 35 < 70$$

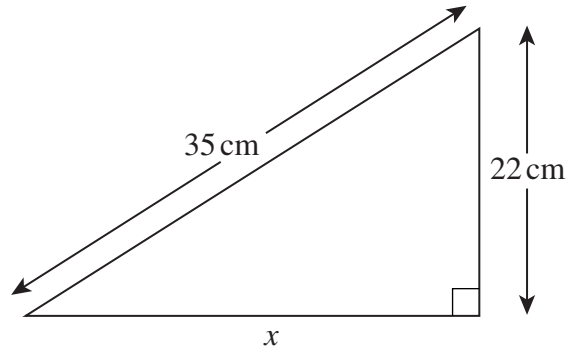
What is the maximum number of chairs that can be stacked?

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Answer (3 marks)

Turn over ►

12 (a)



Not drawn accurately

Calculate the length x .

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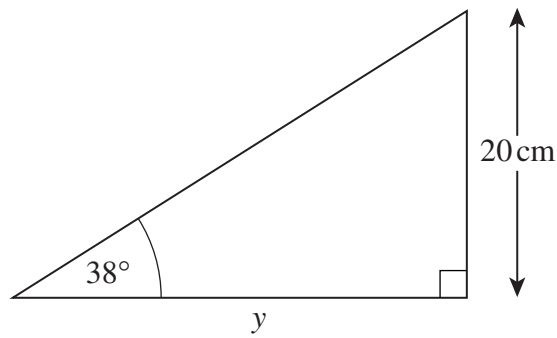
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Answer cm (3 marks)

(b)



Not drawn accurately

Calculate the length y .

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Answer cm (3 marks)

13 This table shows some corresponding values of x and y .

x	-2	-1	0
y	1	2	3

This table shows some relationships between x and y .

Relationship	True/False
$y = x + 3$	
$y = (x + 2)^3 + 1$	
$x^2y + 2y - 6 = 0$	

Put True in the last column if the relationship is true for all three pairs of values.
Put False in the last column if the relationship is **not** true for all three pairs of values.

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(3 marks)

14 Arnie saw a camera priced at £250 in London.
He saw the same camera priced at \$297.50 in New York.
This is a 30% saving on the London price.
How many dollars are there to the pound?

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Answer £1 = \$ (3 marks)

Turn over ►

- 15 A quiz has five questions.
The table shows the number of correct answers given by the people who took the quiz.

Number of correct answers	Number of people
0	6
1	10
2	13
3	21
4	49
5	1

- (a) Calculate the mean number of correct answers.
You **must** show your working.

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Answer (3 marks)

- (b) A mark of 4 is given for every correct answer.
A mark of -1 is given for every blank or incorrect answer.

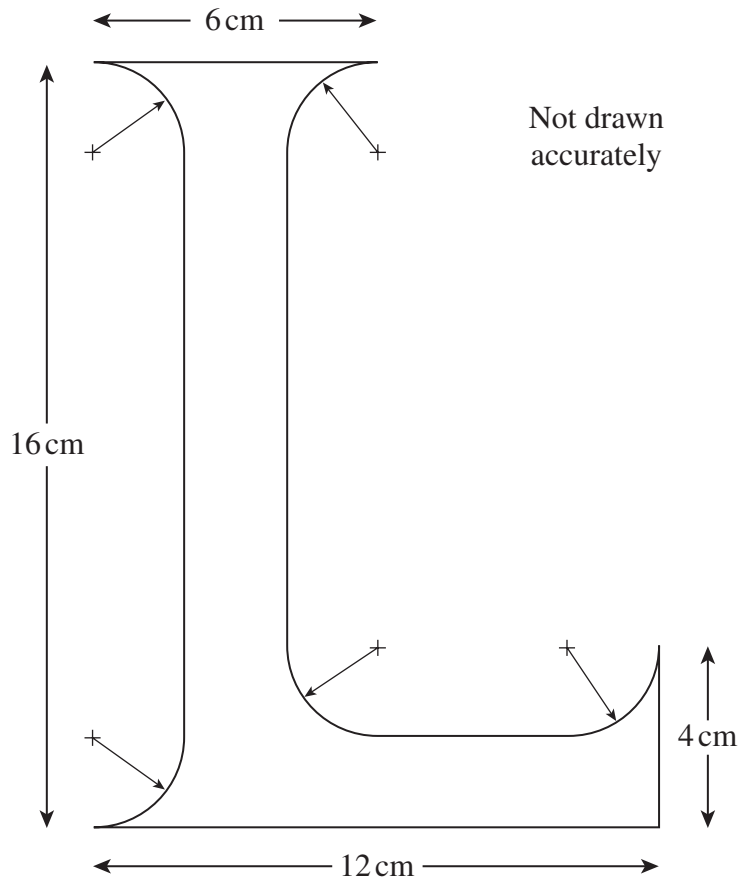
Find the mean mark.

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Answer (2 marks)

- 16** A sign maker designs a letter L.
All arcs are quarter circles of radius 2 cm.



Calculate the area of the L.

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Answer cm² (4 marks)

Turn over ►

17 Each term of a Fibonacci sequence is formed by adding the previous two terms.

1, 1, 2, 3, 5, 8, 13, 21,

A Fibonacci sequence starts $a, b, a + b, \dots$

(a) Use algebra to show that the 6th term of this Fibonacci sequence is $3a + 5b$

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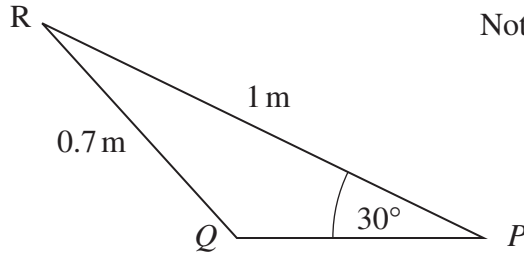
(2 marks)

(b) Use algebra to prove that the difference between the 9th term and 3rd term of this sequence is four times the 6th term.

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(3 marks)

- 18 PQR is a triangle.
 $PR = 1\text{ m}$ and $QR = 0.7\text{ m}$
 Angle $RPQ = 30^\circ$



Find the size of the obtuse angle RQP .

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Answer degrees (3 marks)

- 19 Solve the equation

$$2x^2 - 6x - 1 = 0$$

Give your answers to two decimal places.
 You **must** show your working.

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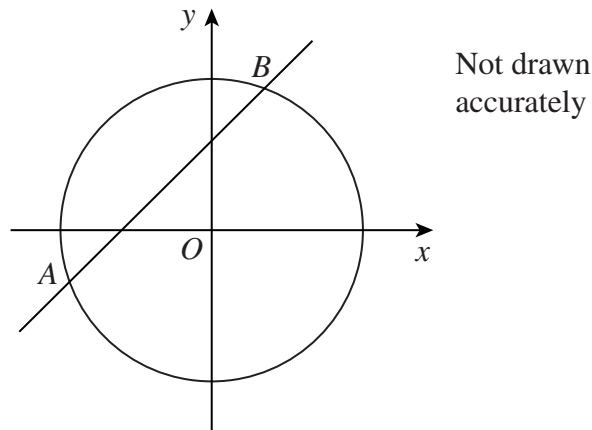
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Answer (3 marks)

Turn over ►

20 The circle $x^2 + y^2 = 29$ and the line $y = x + 3$ intersect at the points A and B .



(a) Show algebraically that the x -coordinates of the points A and B are the solutions of the equation

$$x^2 + 3x - 10 = 0$$

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(3 marks)

(b) Hence, or otherwise, find the coordinates of A and B .

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Answers A (..... ,) B (..... ,) (2 marks)

22 A Scottish regional park opens in the Summer (S) and Winter (W). It is closed in the Spring and Autumn for conservation reasons. The table shows the number of visitors to the park (in thousands) since it opened in Summer 2002.

Year	2002		2003		2004		2005		2006	
Season	S	W	S	W	S	W	S	W	S	W
Number of visitors (1000s)	12.7	8.6	13.2	9.5	14.8	10.3	16.3	12.0	18.1	14.2

Use a 2-point **moving average** and the grid opposite to predict the number of visitors in Summer 2007.

You **must** show your working.

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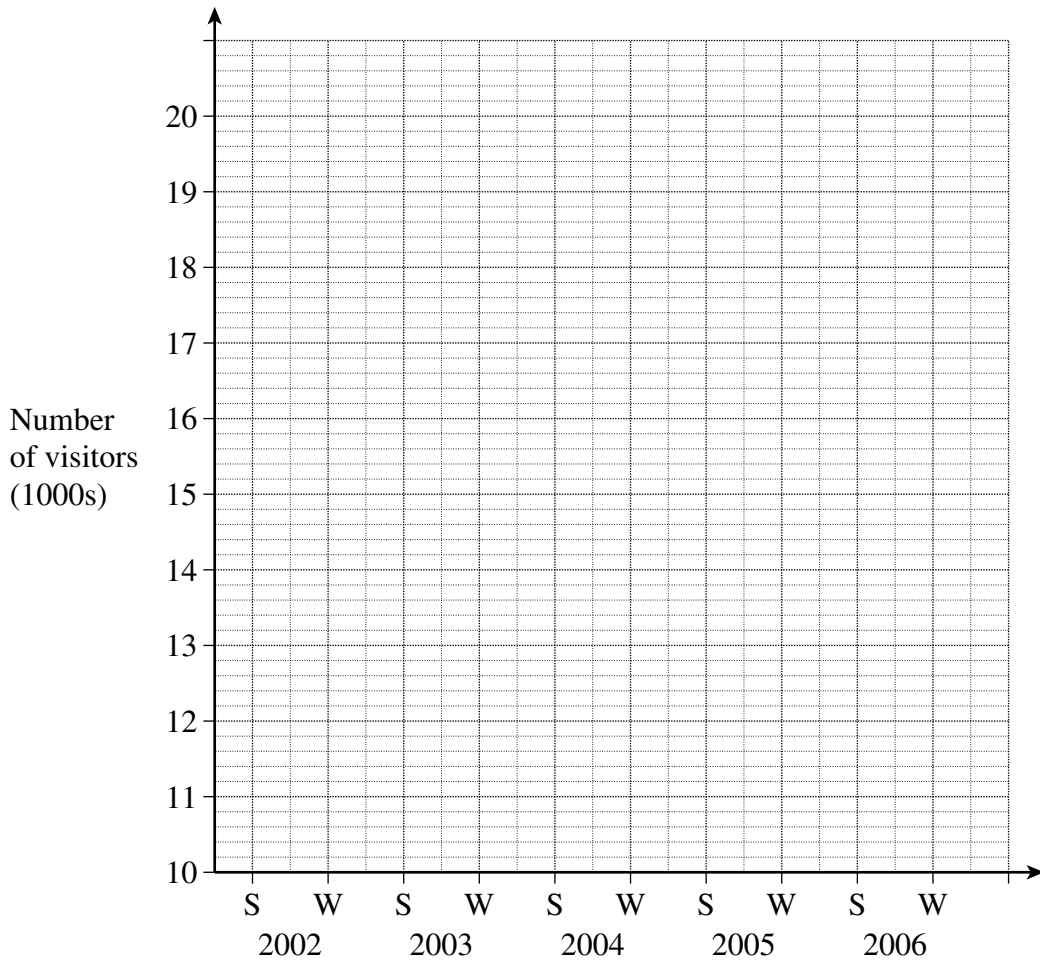
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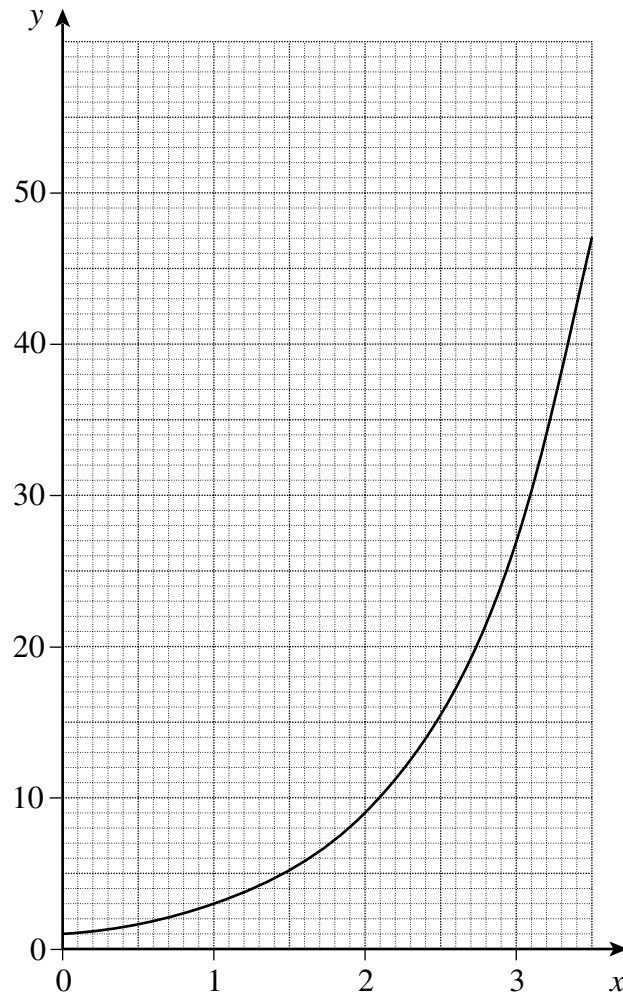
Answer thousands (6 marks)



Turn over for the next question

Turn over ►

23 The graph shows the function $y = a^x$



- (a) Write down the coordinates of the point where the graph intersects with the y-axis.

Answer (..... ,) (1 mark)

- (b) Find the value of a .

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Answer (2 marks)

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