Surname		Other Names	
Centre Number			Candidate Number									
Candidate Signature												

For Examiner's Use

General Certificate of Secondary Education
June 2008

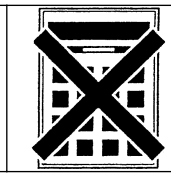
MATHEMATICS (SPECIFICATION A) **4301/1H**
Higher Tier
Paper 1 Non-calculator

H

Monday 19 May 2008 9.00 am to 11.00 am

For this paper you must have:
- mathematical instruments.

You must **not** use a calculator.



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. Answers written in margins or on blank pages will not be marked.
- Do all rough work in this book.

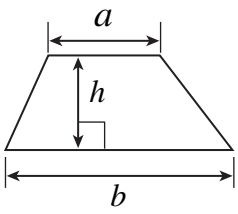
Information
- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- Additional answer paper, graph paper and tracing paper will be issued on request and must be tagged securely to this answer booklet.
- You **must** not use a calculator.

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

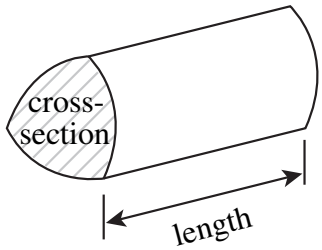
For Examiner's Use	
Pages	Mark
3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20	
TOTAL	
Examiner's Initials	

Formulae Sheet: Higher Tier

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

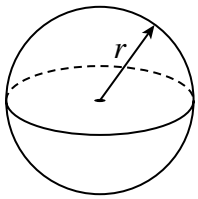


Volume of prism = area of cross-section × length



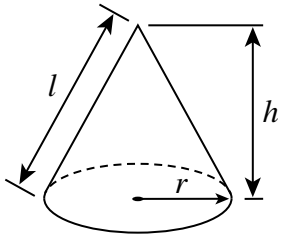
Volume of sphere = $\frac{4}{3}\pi r^3$

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



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

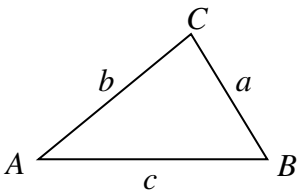
Curved surface area of cone = $\pi r l$



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 You are given that $58 \times 129 = 7482$

Work out the answer to these calculations.

1 (a) 58×0.129

.....

Answer ..... *(1 mark)*

1 (b) $\dfrac{7482}{5800}$

.....

Answer ..... *(1 mark)*

1 (c) $\dfrac{58 \times 129}{7482}$

.....

Answer ..... *(1 mark)*

2 One of the following is an equation, one is an expression and one is a formula.

State which is which.

A: $x^2 + 7x - 1$ B: $P = 2l + 2b$ C: $20 - 3x = 11$

Answer The equation is .....

The expression is .....

The formula is ..... *(2 marks)*

5

3 (a) The mountain, Coniston Old Man, is 803 m high, to the nearest metre.

What is its smallest possible height?

Answer ..... m *(1 mark)*

3 (b) The lake, Coniston Water, has an area of 4.9 km^2

Work out this area in m^2.

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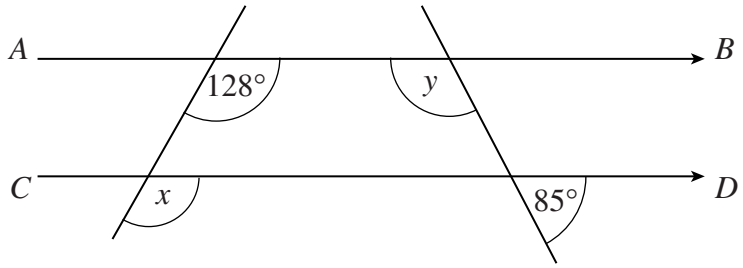
Answer ..... m^2 *(2 marks)*

4 In the diagram *AB* is parallel to *CD*.



Not drawn accurately

4 (a) Write down the value of *x*.
Give a reason for your answer.

Answer ..... degrees

Reason ..... *(2 marks)*

4 (b) Work out the value of *y*.

.....

.....

Answer ..... degrees *(2 marks)*

5 Work out 84 kg as a percentage of 120 kg.

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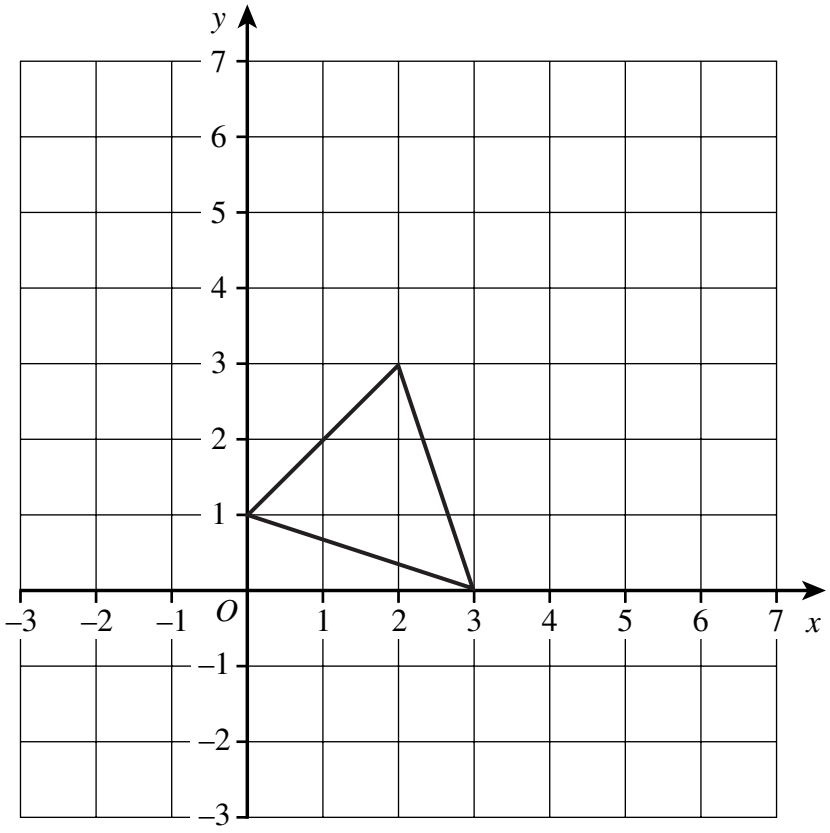
.....

Answer ..... % *(2 marks)*

6 The vertices of a triangle are at (0, 1), (2, 3) and (3, 0)

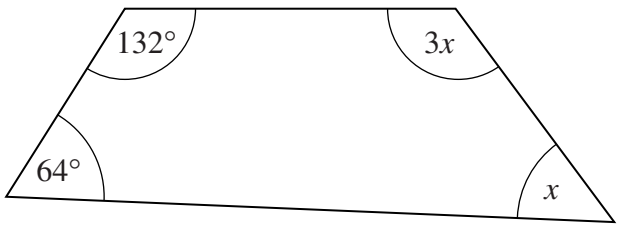


Enlarge the triangle by scale factor 2, with (0, 2) as the centre of enlargement.

(2 marks)

11

7 A quadrilateral has angles of x, $3x$, 64° and 132°.



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7 (a) Write down an equation in terms of x.

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(1 mark)

7 (b) Solve your equation to find the value of x.

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Answer x = ... degrees *(3 marks)*

8 (a) Work out $\frac{4}{5} \div \frac{6}{7}$

Give your answer in its simplest form.

.....

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Answer ..... *(3 marks)*

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

.....

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Answer ..... *(3 marks)*

8 (c) Calculate the reciprocal of 0.5

.....

Answer ..... *(2 marks)*

9 A team of 12 run a half-marathon.
Their times, to the nearest minute, are

72	87	65	85	91	76
67	70	80	84	70	82

Complete an ordered stem-and-leaf diagram to represent this data.
Remember to complete the key.

Key … | … represents …… minutes

6	
7	
8	
9	

(3 marks)

15

10 (a) Complete the table of values for $y = x^2 - x - 5$

x	–2	–1	0	1	2	3	4
y	1		–5	–5	–3	1	

.....

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(2 marks)

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

(2 marks)

10 (c) An approximate solution of the equation $x^2 - x - 5 = 0$ is $x = 2.8$

Explain how you can find this from the graph.

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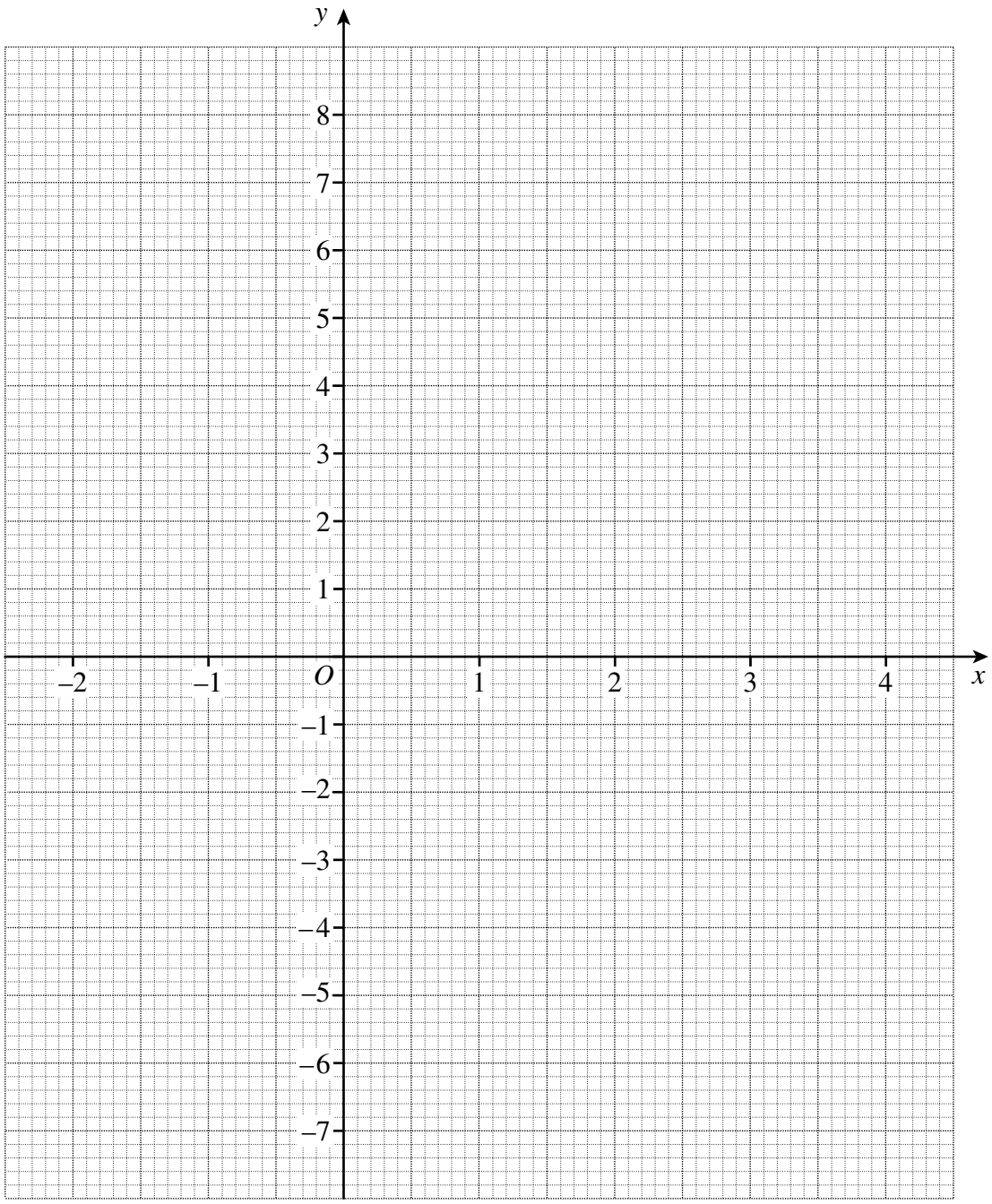
(1 mark)



5

Turn over ▶

11 Solve

11 (a) $\frac{x}{5} = 14$

.....

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

11 (b) $2(3y - 1) = 13$

.....

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Answer $y =$ ..... *(3 marks)*

11 (c) $\frac{16 - z}{4} = 7$

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Answer $z =$ ..... *(3 marks)*

11 (d) Simplify fully $\frac{2(x + 1)^2}{10(x + 1)}$

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Answer ..... *(2 marks)*

12 The house price index for a flat in Leeds was 190 in August 2006, compared with a base of 100 in April 2000.

12 (a) Write down the percentage increase in the price of flats in Leeds in that period.

.....

Answer ..... % *(1 mark)*

12 (b) A flat cost £80 000 in April 2000.

What was its likely value in August 2006?

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.....

Answer £ ..... *(2 marks)*

13 Work out the value of the following.
Give your answers in standard form.

13 (a) $(2.8 \times 10^9) \div (4 \times 10^5)$

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Answer ..... *(2 marks)*

13 (b) $(5 \times 10^{-3})^2$

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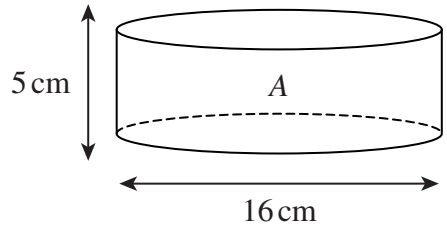
Answer ..... *(2 marks)*

16

14 (a) Cylinder *A* has a height of 5 cm and a diameter of 16 cm.



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Calculate the volume of the cylinder *A*.
Give your answer in terms of π.
State the units of your answer.

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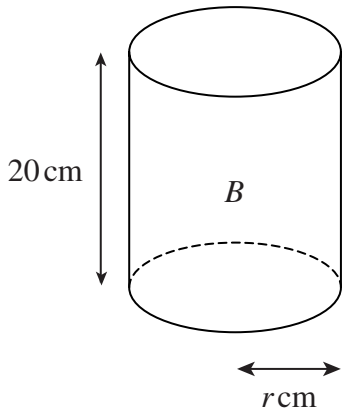
Answer ..... *(4 marks)*

14 (b) Cylinder *B* has a height of 20 cm and a radius of *r* cm.



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Cylinder *B* has the same volume as cylinder *A*.
Calculate the value of *r*.

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Answer ..... cm *(3 marks)*

15 The table shows Steve's electricity bills from March 2006 to June 2007.
The entry for December 2006 is missing.

Date	March 2006	June 2006	Sept 2006	Dec 2006	March 2007	June 2007
Amount (£)	34.70	23.80	19.40	……	37.60	27.00

15 (a) The value of the first four-point moving average is £28.50

Calculate Steve's electricity bill for December 2006.

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Answer £ ..... *(2 marks)*

15 (b) Will the second four-point moving average be greater or less than £28.50?
Give a reason for your answer.

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(1 mark)

16 Rearrange $3(a - b) = 2b + 7$ to make a the subject.

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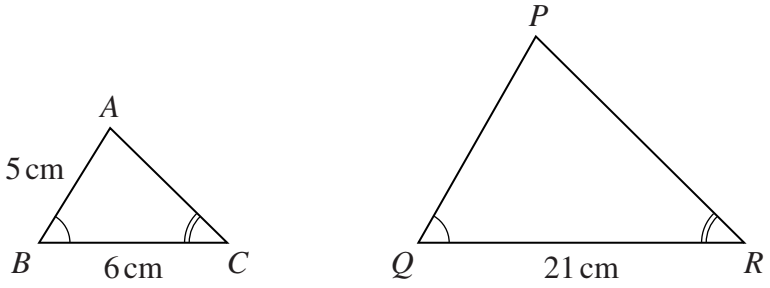
Answer a = ... *(3 marks)*

13

Turn over ▶

17 Triangles *ABC* and *PQR* are similar.
AB = 5 cm, *BC* = 6 cm and *QR* = 21 cm.



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Calculate the length of *PQ*.

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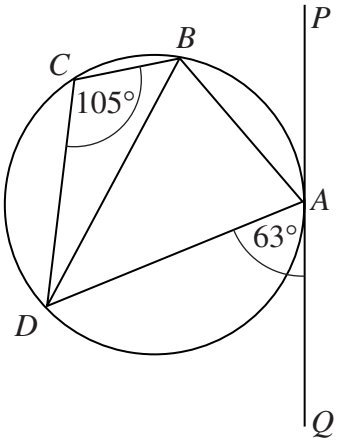
Answer *PQ* = ... cm *(3 marks)*

18 In the diagram, *ABCD* is a cyclic quadrilateral and *PAQ* is a tangent to the circle at *A*.
Angle *BCD* = 105° and angle *DAQ* = 63°.



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18 (a) Work out the size of angle *BAD*.
Give a reason for your answer.

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Answer ..... degrees *(1 mark)*

Reason ..... *(1 mark)*

18 (b) Work out the size of angle *ADB*.
You **must** show your working.

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Answer ..... degrees *(2 marks)*

19 (a) Write $\sqrt{28} + \sqrt{63}$ in the form $p\sqrt{7}$, where p is an integer.

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Answer ..... *(2 marks)*

19 (b) Simplify $\frac{30}{\sqrt{5}}$ by rationalising the denominator.

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Answer ..... *(2 marks)*

11

20 For a cone of fixed volume, the height, h, is inversely proportional to the square of the radius, r.
When the height is 4.5 cm, the radius is 4 cm.

20 (a) Express h in terms of r.

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Answer $h =$ ..... *(3 marks)*

20 (b) Find the radius when the height is 8 cm.

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Answer $r =$ ..... cm *(2 marks)*

21 Bill and Ben have been practising equations when revising for their Maths exam.
The probability that Bill gets an equation correct is 0.7
The probability that Ben gets an equation correct is 0.4

They both attempt another equation.

What is the probability that **exactly one** of them gets it correct?
You **must** show your working.

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Answer ..... *(4 marks)*

22 (a) Explain why $9^{\frac{3}{2}} = 27$

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(2 marks)

22 (b) Hence, or otherwise, solve the equation $9^x = 27^4$

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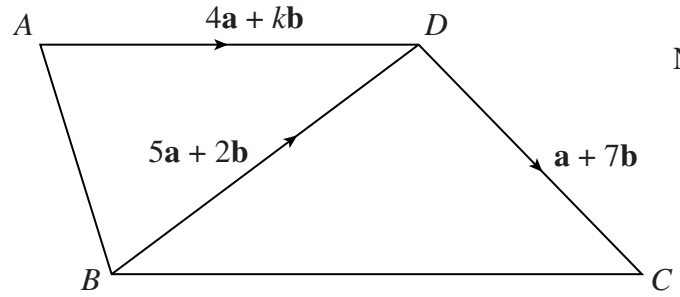
.....

Answer x = ... *(2 marks)*

13

23 *ABCD* is a trapezium.
BC is parallel to *AD*.

$\overrightarrow{BD} = 5\mathbf{a} + 2\mathbf{b}$, $\overrightarrow{DC} = \mathbf{a} + 7\mathbf{b}$ and $\overrightarrow{AD} = 4\mathbf{a} + k\mathbf{b}$, where k is a number to be determined.



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Find the value of k.
You **must** show your working.

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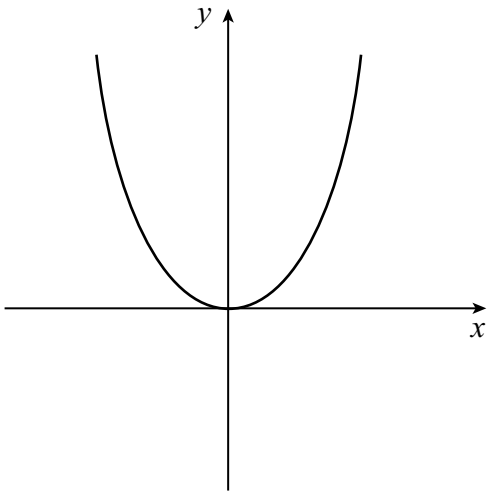
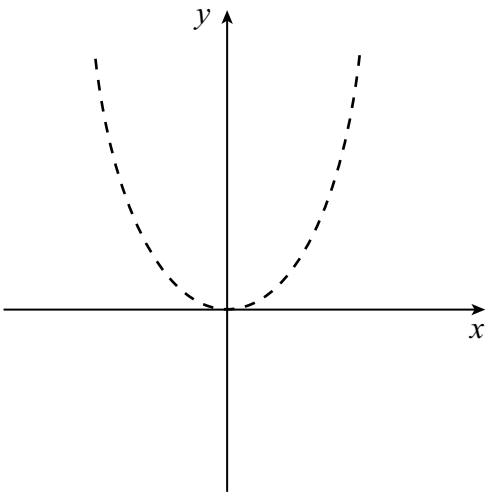
Answer k = ... *(4 marks)*

24 The sketch below is of the graph of $y = x^2$



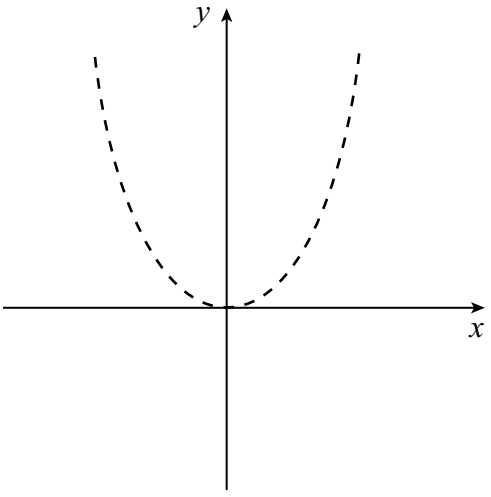
On the axes provided, sketch the following graphs.
The graph of $y = x^2$ is shown dotted on each set of axes to help you.

24 (a) $y = (x - 7)^2$



(1 mark)

24 (b) $y = 3x^2$

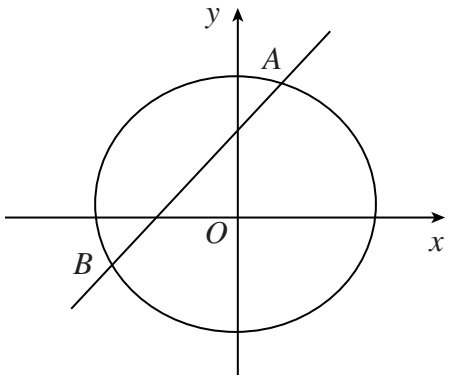


(1 mark)

Turn over for the next question

6

25 The diagram shows the circle $x^2 + y^2 = 26$ and the line $y = x + 4$
The line and the circle intersect at the points A and B.



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25 (a) Show that the x coordinates of A and B satisfy the equation $x^2 + 4x - 5 = 0$

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(3 marks)

25 (b) Hence find the coordinates of A and B.

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Answer $A = ($ ..... , ... $)$ $B = ($ ..... , ... $)$ *(2 marks)*

END OF QUESTIONS

5