



General Certificate of Secondary Education  
2019

Centre Number

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Candidate Number

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## Mathematics

Unit M8 Paper 1  
(Non-Calculator)

Higher Tier



<b>MV24</b>
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[GMC81]

THURSDAY 6 JUNE, 9.15am–10.30am

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### Time

1 hour 15 minutes, plus your additional time allowance.

### Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

**You must answer the questions in the spaces provided.**

**Do not write on blank pages or tracing paper.**

Complete in black ink only.

Answer **all twelve** questions.

All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.

You **must not** use a calculator for this paper.

## **Information for Candidates**

The total mark for this paper is 50.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

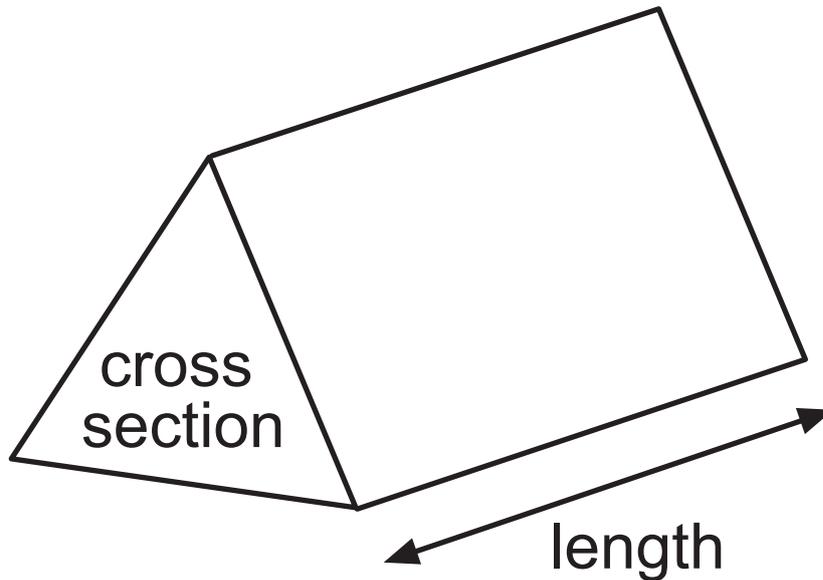
You should have a ruler, compasses and a protractor.

The Formula Sheet is on pages 4 and 5.

**Blank Page**  
**(Formula sheet overleaf)**

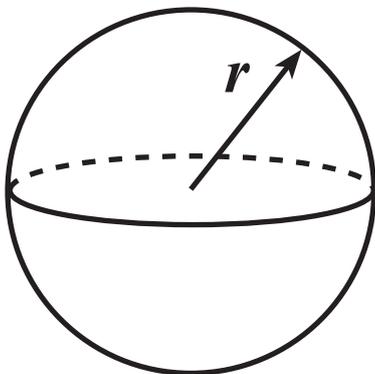
## Formula Sheet

**Volume of prism = area of cross section  $\times$  length**



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

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



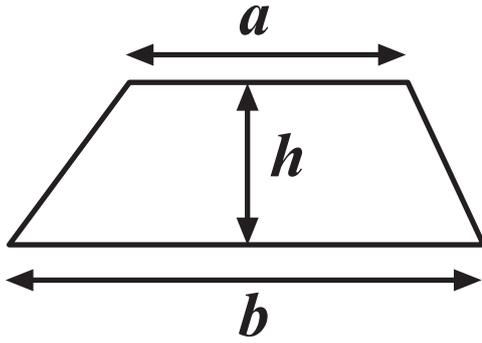
## Quadratic Equation

The solutions of  $ax^2 + bx + c = 0$

where  $a \neq 0$ , are given by

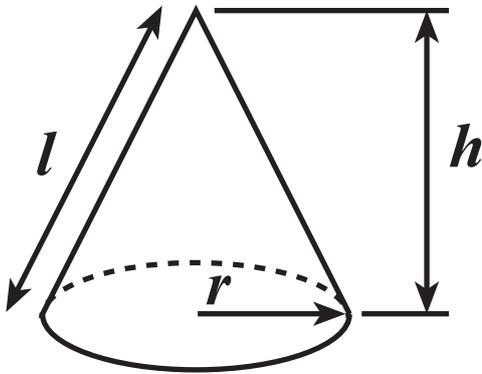
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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

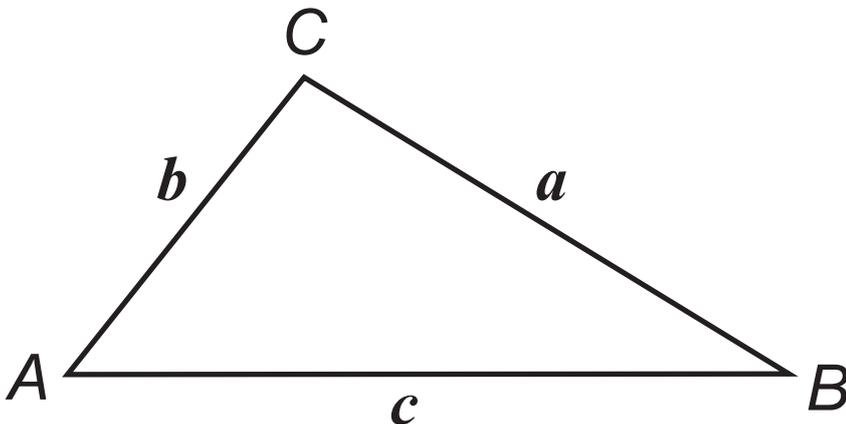


$$\text{Volume of cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Curved surface area of cone} = \pi r l$$



In any triangle  $ABC$

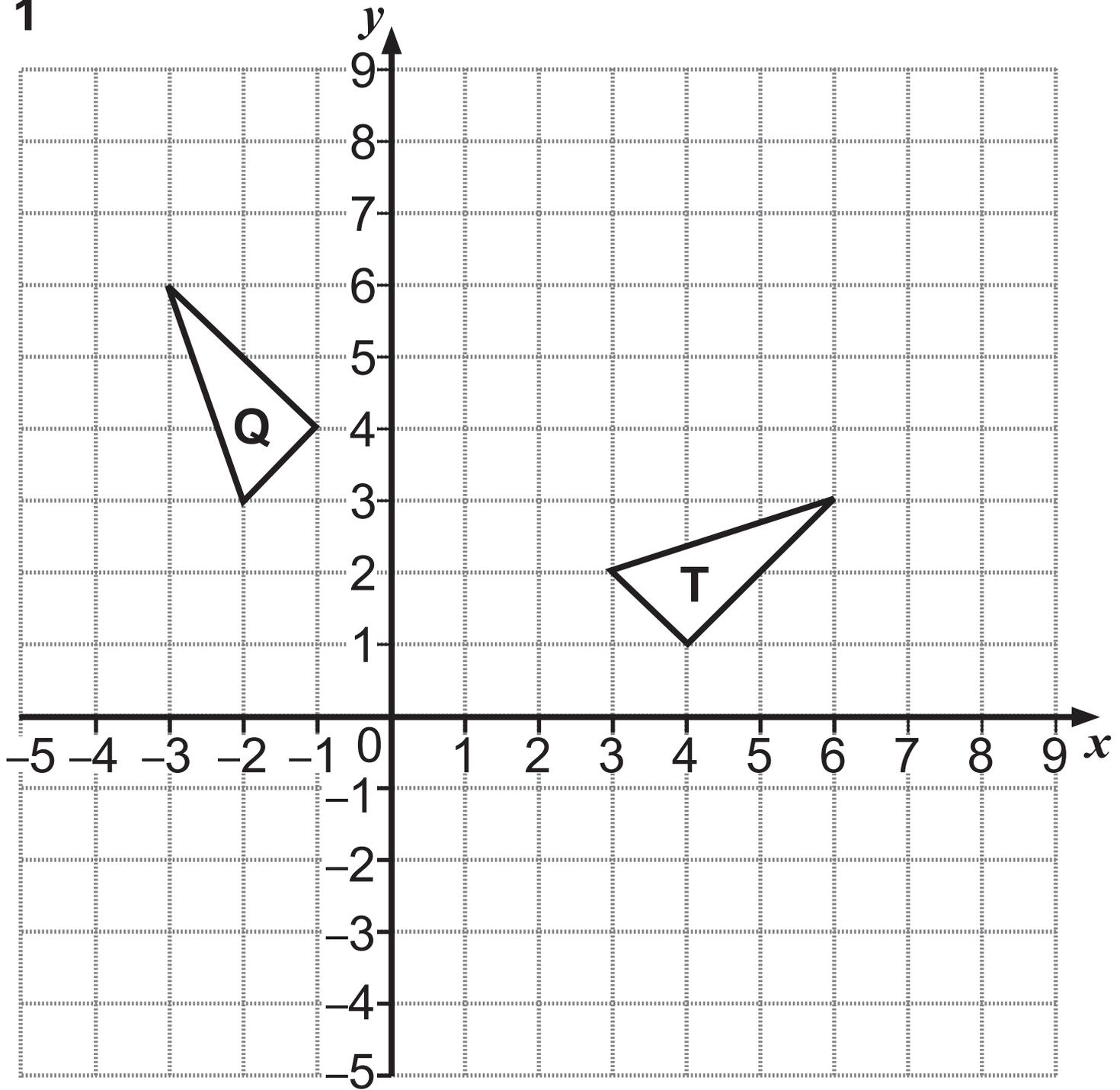


$$\text{Cosine Rule: } a^2 = b^2 + c^2 - 2bc \cos A$$

$$\text{Sine Rule: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

1



- (a) Describe fully the **single** transformation which maps triangle **T** onto triangle **Q**.  
[3 marks]

Answer \_\_\_\_\_

- (b) On the grid, draw the image of triangle **T** after a translation  $\begin{pmatrix} 2 \\ -5 \end{pmatrix}$ . [2 marks]

2 A six-sided dice is rolled 800 times.

The table below shows the relative frequency of scoring a six after different numbers of rolls.

Number of rolls	Relative frequency of a six
100	0.3
200	0.26
300	0.27
500	0.23
800	0.25

(a) How many times was a six scored after 300 rolls?

Show how you obtained your answer.  
[2 marks]

Answer \_\_\_\_\_

**(b)** Which relative frequency from the table gives the best estimate of the probability of scoring a six when this dice is rolled?

Explain your answer. [2 marks]

Answer \_\_\_\_\_

Reason \_\_\_\_\_

**(c)** How many sixes would you expect to get if a **fair** six-sided dice was rolled 300 times? [2 marks]

Answer \_\_\_\_\_

**3** John has six shirts, eight ties and five cravats.

John is going out to dinner and he must choose a shirt **and** either a tie or a cravat to wear.

How many different combinations has John got to choose from? [3 marks]

Answer \_\_\_\_\_

- 4 (a) (i) Write the binary number 10101 as a decimal number. [1 mark]

Answer \_\_\_\_\_

- (ii) Write the decimal number 26 as a binary number. [1 mark]

Answer \_\_\_\_\_

- (b) Find the value of  $3^0 + 4^0$  [1 mark]

Answer \_\_\_\_\_

**5** A one gram bag of seed contains half a million seeds.

If each seed weighs the same, calculate the weight, in grams, of one seed.

Give your answer in standard form.

[3 marks]

Answer \_\_\_\_\_ g

**6** Tom bought shares costing **£4 000**

The value,  $V$ , of the shares depreciated by 0.05% each year.

Circle the formula which gives the value,  $V$ , of the shares after two years. [1 mark]

$$V = (4000 - 0.05)^2$$

$$V = 4000 (1.05)^2$$

$$V = 4000 (0.9995)^2$$

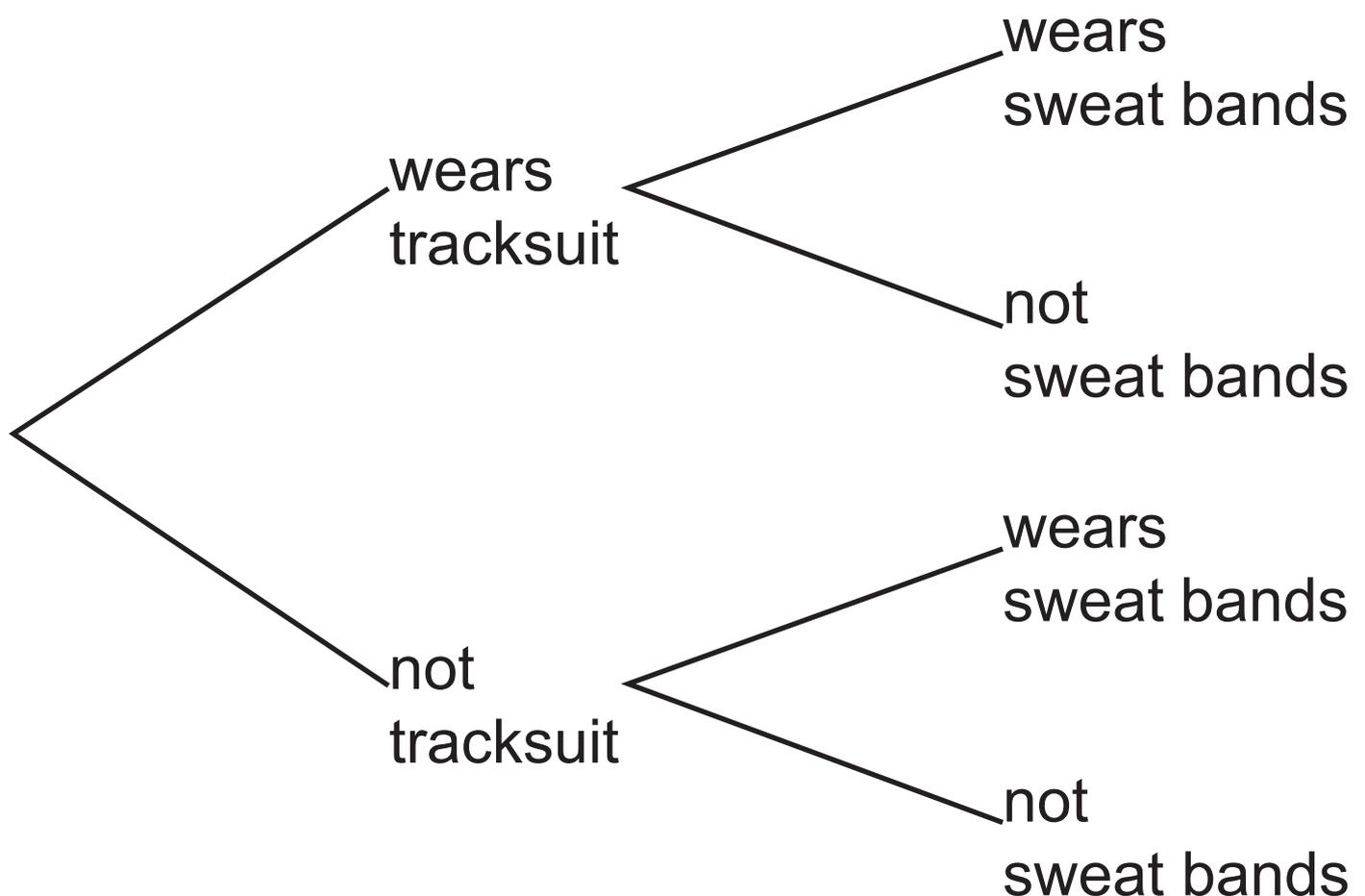
$$V = 4000 (0.95)^2$$

7 When Jan goes to the gym, the probability that she wears a tracksuit is  $\frac{3}{4}$

When she wears a tracksuit, the probability that she wears sweat bands is  $\frac{4}{5}$

When she does not wear a tracksuit, the probability that she wears sweat bands is  $\frac{3}{5}$

(a) Complete the tree diagram. [3 marks]



**(b)** Calculate the probability that Jan does not wear sweat bands. [2 marks]

Answer \_\_\_\_\_

- 8 Change the recurring decimal  $0.561561 \dots$  into a fraction in its simplest form.  
[2 marks]

Answer \_\_\_\_\_

## 9 Evaluate

(a)  $16^{\frac{3}{4}}$  [1 mark]

Answer \_\_\_\_\_

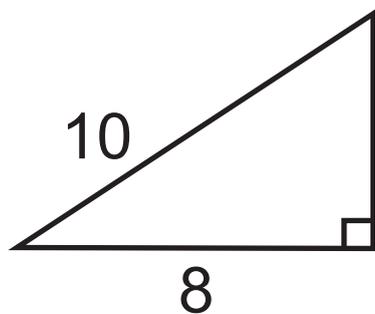
(b)  $\frac{81^{\frac{1}{2}} - 125^{\frac{1}{3}}}{100^{-0.5}}$  [3 marks]

Answer \_\_\_\_\_

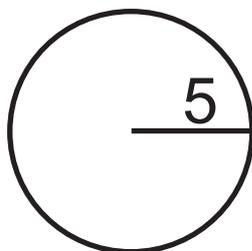
**10** For each shape, decide whether the area is a rational or an irrational number.

Give a reason for each answer.

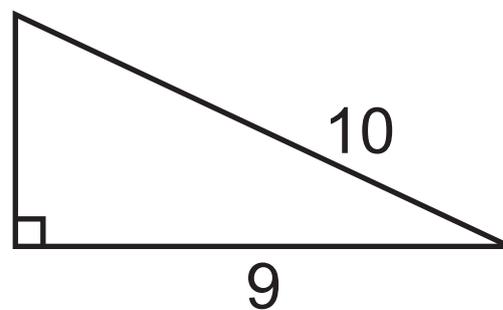
[1 mark for each]



Shape A



Shape B



Shape C

Area of Shape A is \_\_\_\_\_ because

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Area of Shape B is \_\_\_\_\_ because

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Area of Shape C is \_\_\_\_\_ because

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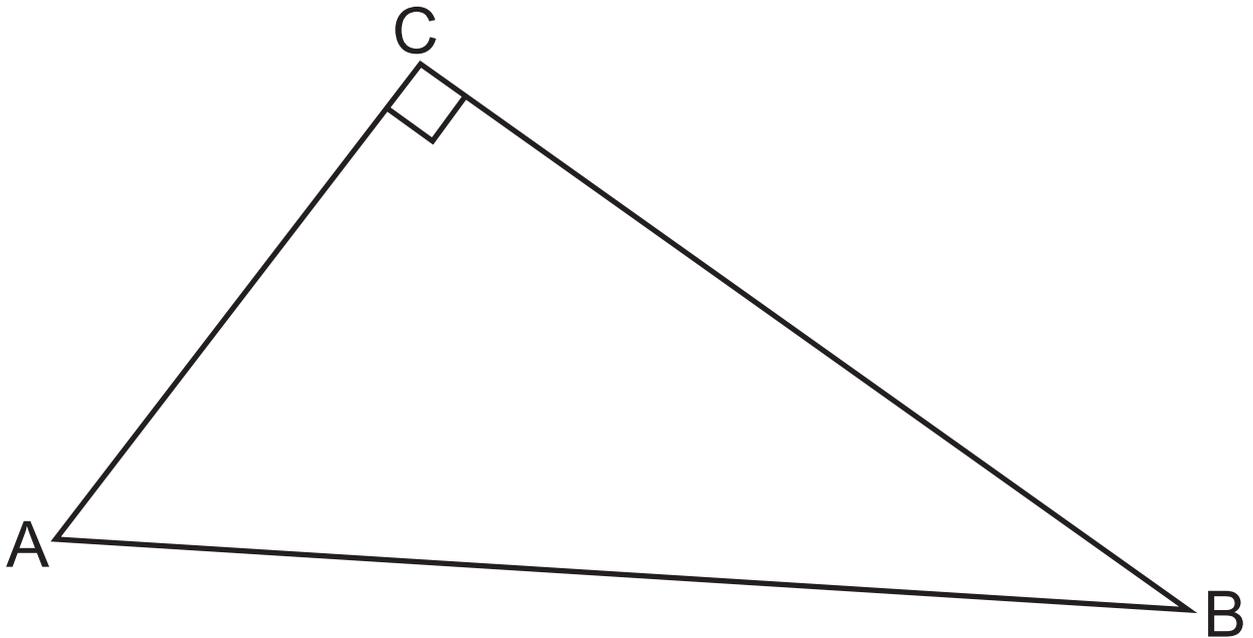
**11**  $(-3, 4)$  is a point on the circle  $x^2 + y^2 = 25$

**(a)** Show that the equation of the tangent to the circle at this point is  $4y = 3x + 25$   
[4 marks]

**(b)** Find the coordinates of the points of intersection of this tangent and the curve  $y = x^2 + 6$  [6 marks]

Answer \_\_\_\_\_

12



$$BC = 3\sqrt{5} - 1 \quad \text{and} \quad AC = 3 + \sqrt{5}$$

Find AB.

Give your answer in the form  $p\sqrt{q}$   
[5 marks]

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**This is the end of the question paper**

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For Examiner's use only	
Question Number	Marks
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	

<b>Total Marks</b>	
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Examiner Number

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