


Please check the examination details below before entering your candidate information

Candidate surname					Other names				
<b>Pearson Edexcel</b>		Centre Number			Candidate Number				
<b>International GCSE</b>		<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>			<input type="text"/> <input type="text"/> <input type="text"/> <input type="text"/>				
Time 2 hours		Paper reference		<b>4PM1/02</b>					
<b>Further Pure Mathematics</b>									
<b>PAPER 2</b>									
Calculators may be used.								Total Marks	

### Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Without sufficient working, correct answers may be awarded no marks.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- You must **NOT** write anything on the formulae page.  
Anything you write on the formulae page will gain NO credit.

### Information

- The total mark for this paper is 100.
- The marks for **each** question are shown in brackets  
– *use this as a guide as to how much time to spend on each question.*

### Advice

- Read each question carefully before you start to answer it.
- Check your answers if you have time at the end.
- Good luck with your examination.

Turn over ►

**P66027RRA**  
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**Pearson**

## International GCSE in Further Pure Mathematics Formulae sheet

### Mensuration

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

**Curved surface area of cone**  $= \pi r \times \text{slant height}$

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

### Series

#### Arithmetic series

Sum to  $n$  terms,  $S_n = \frac{n}{2} [2a + (n - 1)d]$

#### Geometric series

Sum to  $n$  terms,  $S_n = \frac{a(1 - r^n)}{(1 - r)}$

Sum to infinity,  $S_\infty = \frac{a}{1 - r} \quad |r| < 1$

#### Binomial series

$$(1 + x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \dots + \frac{n(n-1)\dots(n-r+1)}{r!}x^r + \dots \quad \text{for } |x| < 1, n \in \mathbb{Q}$$

### Calculus

#### Quotient rule (differentiation)

$$\frac{d}{dx} \left( \frac{f(x)}{g(x)} \right) = \frac{f'(x)g(x) - f(x)g'(x)}{[g(x)]^2}$$

### Trigonometry

#### Cosine rule

In triangle  $ABC$ :  $a^2 = b^2 + c^2 - 2bc \cos A$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\sin(A + B) = \sin A \cos B + \cos A \sin B$$

$$\sin(A - B) = \sin A \cos B - \cos A \sin B$$

$$\cos(A + B) = \cos A \cos B - \sin A \sin B$$

$$\cos(A - B) = \cos A \cos B + \sin A \sin B$$

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$

### Logarithms

$$\log_a x = \frac{\log_b x}{\log_b a}$$

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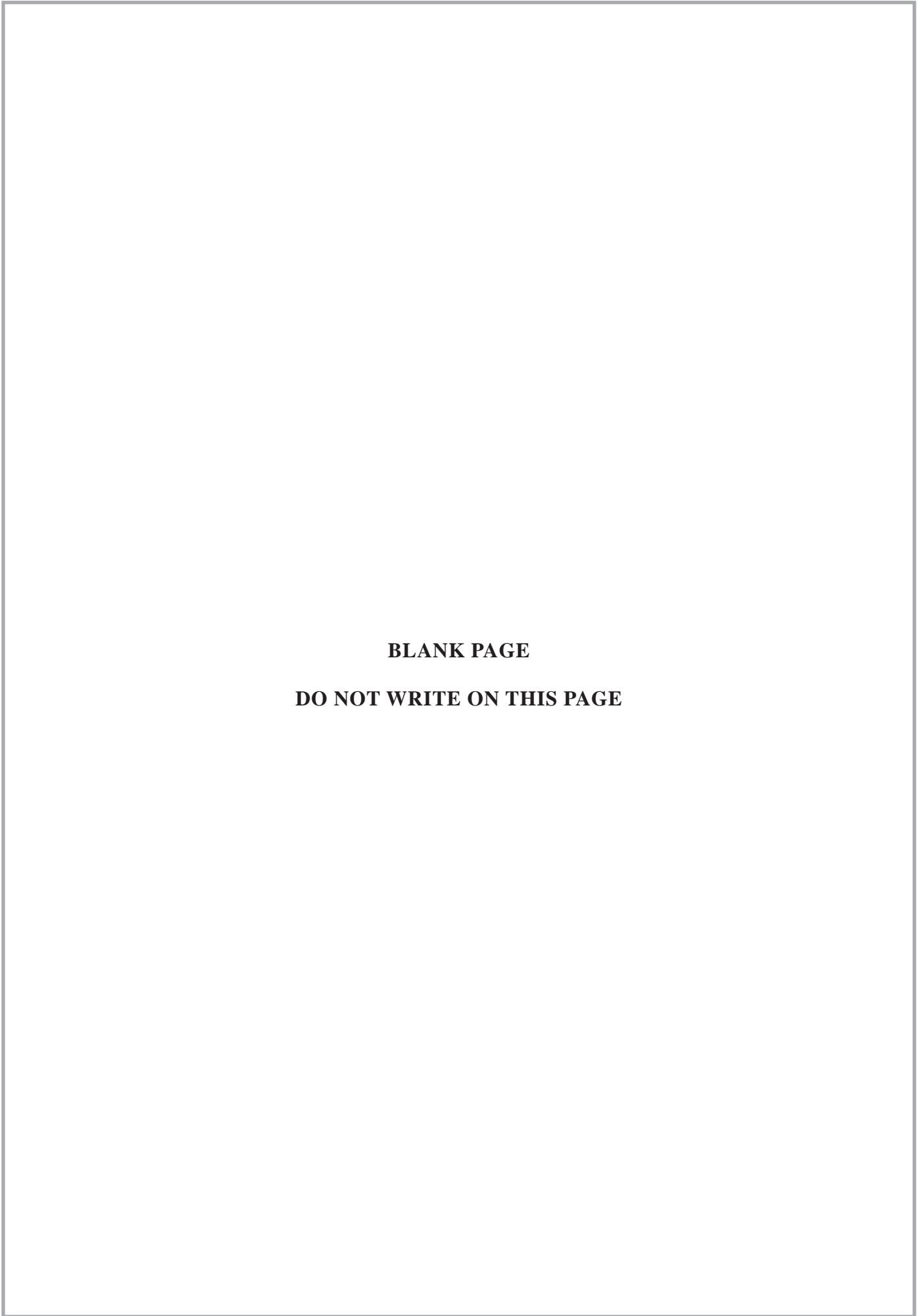
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**Question 1 continued**

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**(Total for Question 1 is 5 marks)**

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2 The finite region enclosed by the curve with equation  $y = 4 - x^2$  and the line with equation  $y = x + 2$  is rotated through  $360^\circ$  about the  $x$ -axis.

Use algebraic integration to find the exact volume of the solid formed.

(6)

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**Question 2 continued**

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**(Total for Question 2 is 6 marks)**

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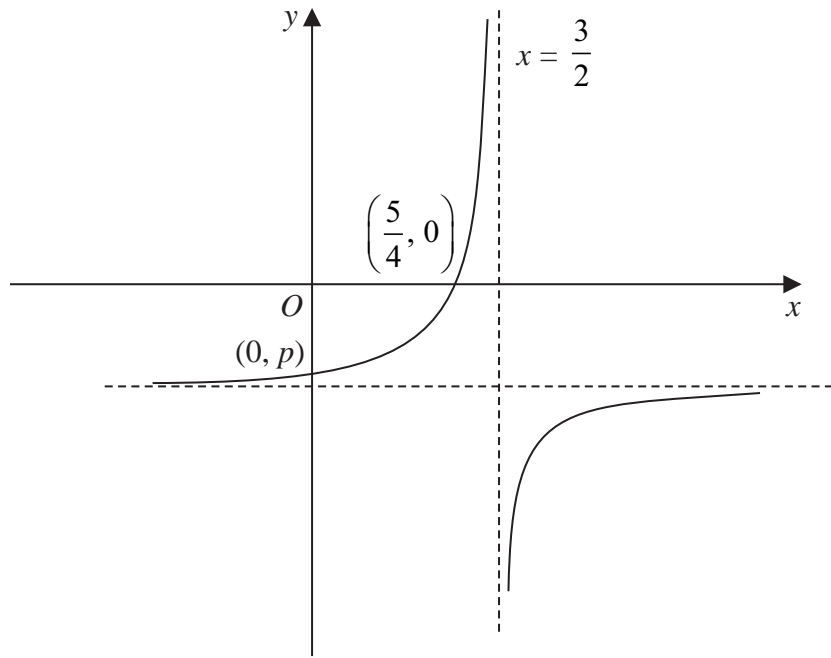


Diagram **NOT** accurately drawn

**Figure 1**

Figure 1 shows a sketch of the curve with equation

$$y = \frac{a - bx}{cx - d} \quad x \neq \frac{d}{c}$$

where  $a$ ,  $c$  and  $d$  are prime numbers and  $b$  is an integer.

The asymptote to the curve that is parallel to the  $y$ -axis has equation  $x = \frac{3}{2}$

(a) Write down the value of  $c$  and the value of  $d$  (2)

The curve crosses the  $x$ -axis at the point  $(\frac{5}{4}, 0)$

(b) Find the value of  $a$  and the value of  $b$  (2)

The curve crosses the  $y$ -axis at the point  $(0, p)$  where  $p$  is a rational number.

(c) Find the value of  $p$  (2)

(d) Find an equation of the asymptote to the curve that is parallel to the  $x$ -axis. (1)

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**Question 3 continued**

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**Question 3 continued**

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**Question 3 continued**

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**Question 4 continued**

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**(Total for Question 4 is 11 marks)**

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**Question 5 continued**

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**Question 6 continued**

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**Question 7 continued**

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**Question 7 continued**

Area with horizontal dotted lines for writing.

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**Question 7 continued**

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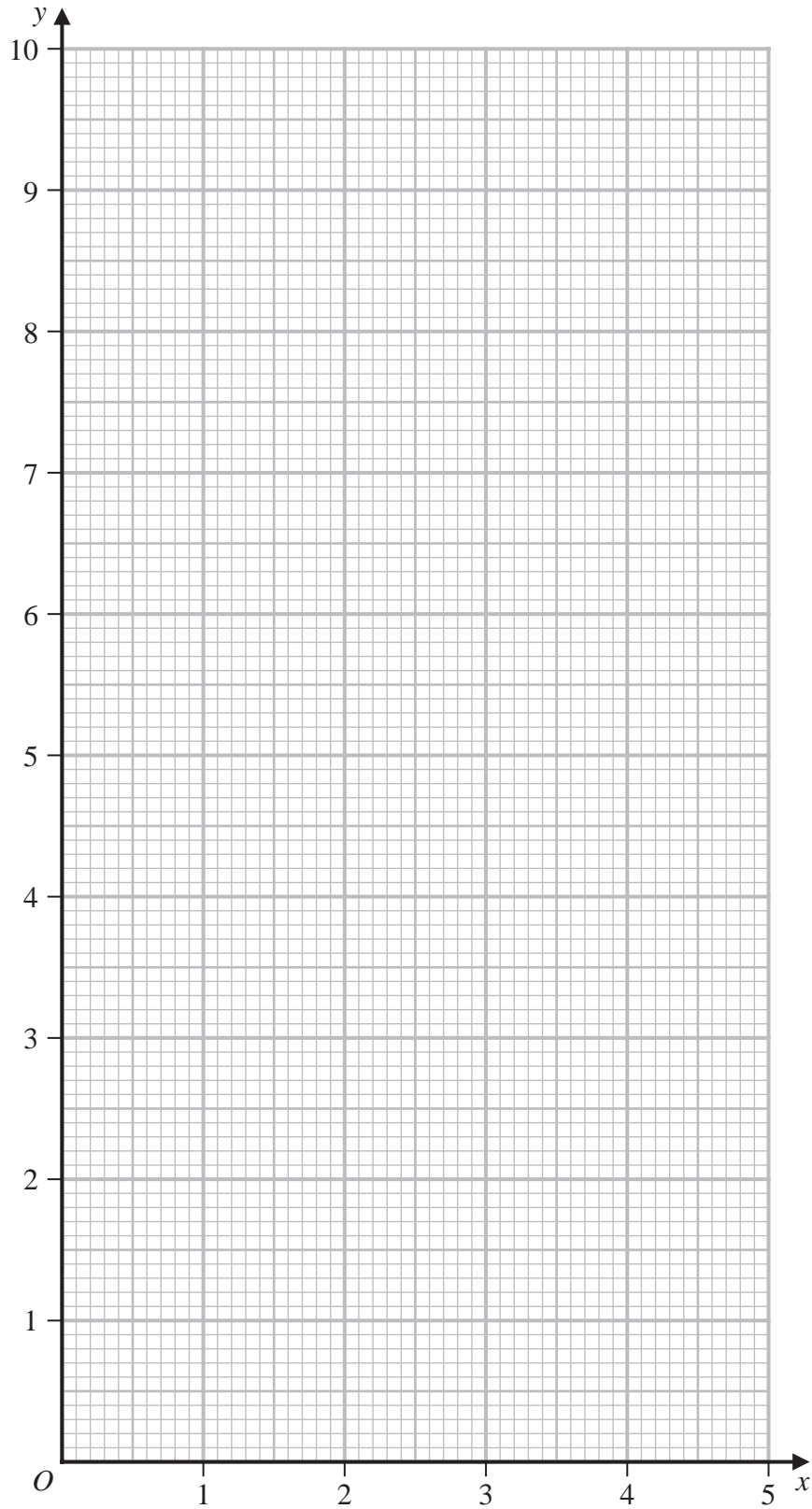
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**Question 8 continued**



**Turn over for a spare grid if you need to redraw your graph.**

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**Question 8 continued**

Handwriting practice area consisting of multiple horizontal dotted lines for writing.

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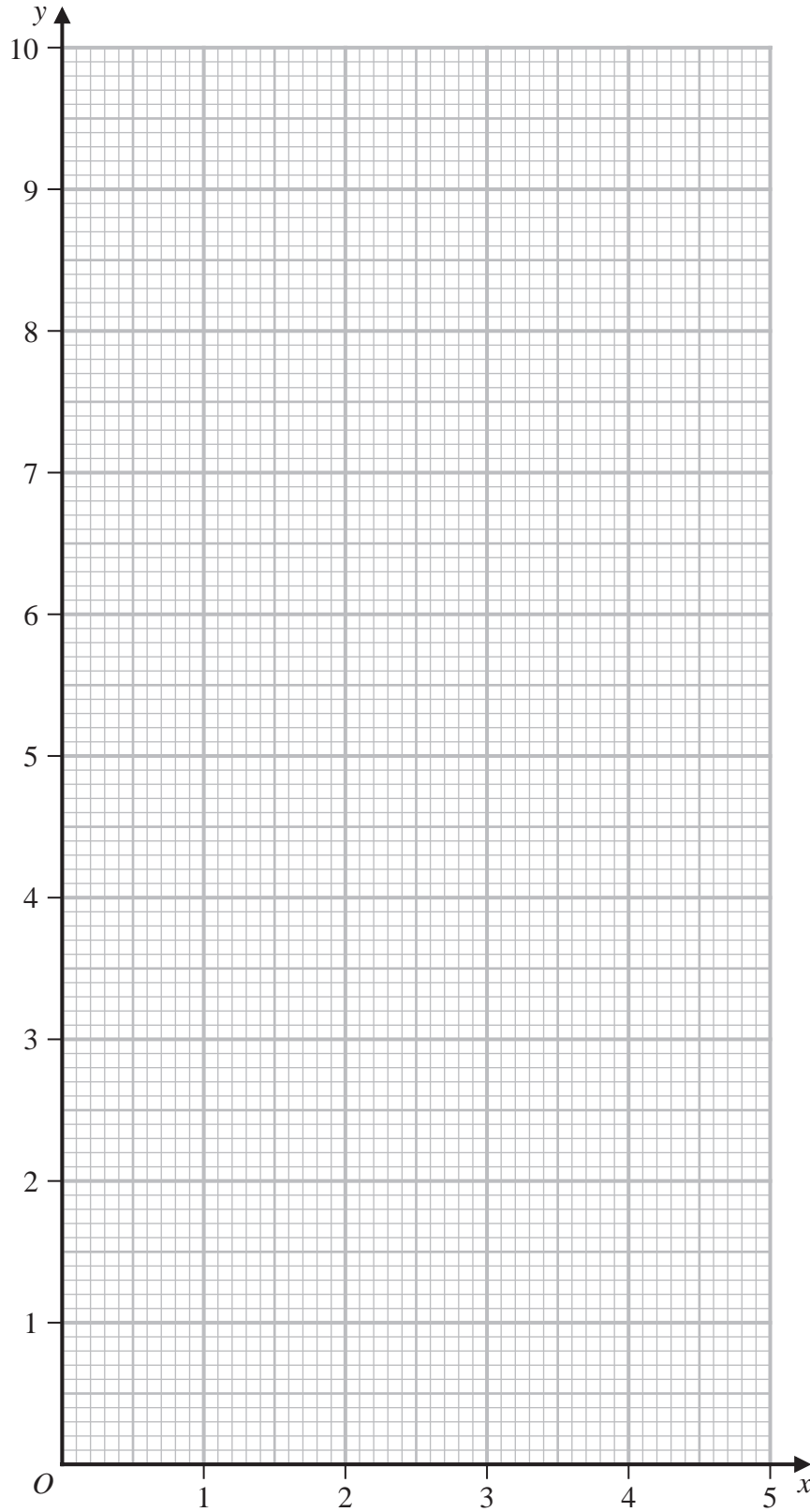
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**Question 8 continued**

**Only use this grid if you need to redraw your graph.**



**(Total for Question 8 is 9 marks)**

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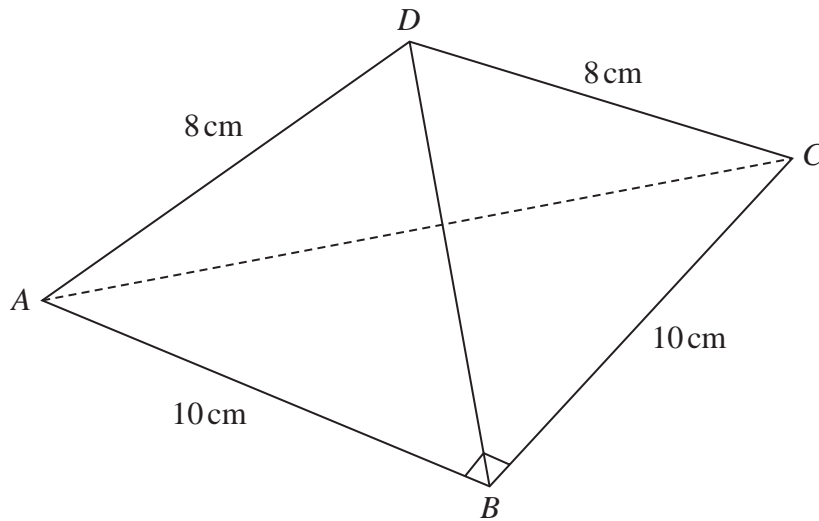


Diagram **NOT** accurately drawn

**Figure 2**

Figure 2 shows a triangular pyramid  $ABCD$  with base  $ABC$

$$AB = BC = 10 \text{ cm} \quad AD = CD = 8 \text{ cm} \quad \angle ABC = 90^\circ$$

(a) Find the exact length of  $AC$

Give your answer in the form  $p\sqrt{q}$  cm where  $p$  is an integer and  $q$  is a prime number.

(2)

The point  $M$  is the midpoint of  $AC$

(b) Find the exact length of  $BM$

Give your answer in the form  $m\sqrt{n}$  cm where both  $m$  and  $n$  are prime numbers.

(2)

Given that  $BD = 6$  cm,

(c) find, in degrees to one decimal place, the size of the acute angle between the plane  $ACD$  and the plane  $ABC$

(4)

The base  $ABC$  of the pyramid is placed on a horizontal plane.

(d) Find, in cm to 3 significant figures, the vertical height of  $D$  above the base.

(2)

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**Question 9 continued**

A large rectangular area containing horizontal dotted lines for writing answers.

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**Question 9 continued**

Handwriting practice area consisting of 20 horizontal dotted lines for writing answers.

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**Question 9 continued**

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**(Total for Question 9 is 10 marks)**

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**Question 10 continued**

A large rectangular area containing horizontal dotted lines for writing answers.

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**Question 10 continued**

Handwriting practice area with horizontal dotted lines.

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**Question 10 continued**

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**(Total for Question 10 is 13 marks)**

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**Question 11 continued**

Handwritten response area with horizontal dotted lines.

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