

Please check the examination details below before entering your candidate information

Candidate surname

Other names

**Pearson Edexcel**  
**International**  
**Advanced Level**

Centre Number

Candidate Number

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**Thursday 9 January 2020**

Afternoon (Time: 1 hour 30 minutes)

Paper Reference **WME03/01**

**Mathematics**

**International Advanced Subsidiary/Advanced Level**  
**Mechanics M3**

**You must have:**

Mathematical Formulae and Statistical Tables (Blue), calculator

Total Marks

**Candidates may use any calculator permitted by Pearson regulations. Calculators must not have the facility for symbolic algebra manipulation, differentiation and integration, or have retrievable mathematical formulae stored in them.**

### Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions and ensure that your answers to parts of questions are clearly labelled.
- Answer the questions in the spaces provided  
– *there may be more space than you need.*
- You should show sufficient working to make your methods clear.  
Answers without working may not gain full credit.
- Whenever a numerical value of  $g$  is required, take  $g = 9.8 \text{ m s}^{-2}$ , and give your answer to either 2 significant figures or 3 significant figures.

### Information

- A booklet 'Mathematical Formulae and Statistical Tables' is provided.
- There are 7 questions in this question paper. The total mark for this paper is 75.
- 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.
- Try to answer every question.
- Check your answers if you have time at the end.
- If you change your mind about an answer, cross it out and put your new answer and any working underneath.

Turn over ►

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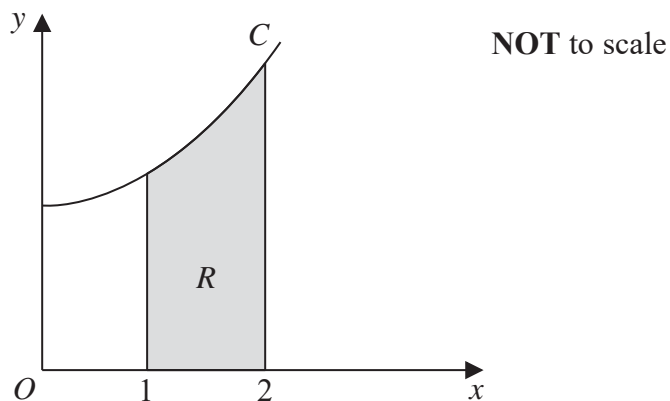


Figure 3

Figure 3 shows part of the curve  $C$  with equation  $y = x^2 + 4$ . The shaded region  $R$  is bounded by  $C$ , the line with equation  $x = 1$ , the  $x$ -axis and the line with equation  $x = 2$

The unit of length on each axis is one centimetre.

A uniform wooden solid,  $S$ , is made in the shape formed by rotating the region  $R$  through  $360^\circ$  about the  $x$ -axis.

(a) Using algebraic integration,

(i) show that the volume of  $S$  is  $\frac{613\pi}{15} \text{ cm}^3$

(ii) find, to 3 significant figures, the distance of the centre of mass of  $S$  from  $O$ .

(8)

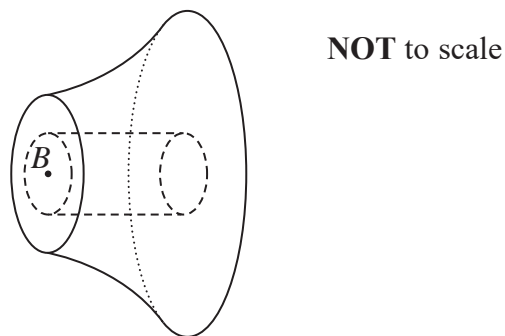


Figure 4

A solid,  $S_1$ , is formed by removing a solid cylinder of radius 3 cm and length 1 cm from  $S$ . A metal cylinder, of radius 3 cm and length 1 cm is placed in the resulting hole to form a new solid  $T$ , as shown in Figure 4. The axis of the metal cylinder coincides with the axis of symmetry of  $S_1$ . The point  $B$  is the centre of the smaller plane face of  $T$ . The mass per unit volume of  $S_1$  is  $M$  and the mass per unit volume of the metal cylinder is  $5M$ .

(b) Find the distance of the centre of mass of  $T$  from  $B$ .

(5)

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