

Please check the examination details below before entering your candidate information

Candidate surname

Other names

Pearson Edexcel
International GCSE

Centre Number

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Candidate Number

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Monday 20 January 2020

Morning (Time: 2 hours)

Paper Reference **4PM1/02**

Further Pure Mathematics

Level 2
Paper 2



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.

Turn over ►

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Pearson

International GCSE in Further Pure Mathematics Formulae sheet

MensurationSurface area of sphere = $4\pi r^2$ Curved surface area of cone = $\pi r \times$ slant heightVolume 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** $(1+x)^n = 1 + nx + \frac{n(n-1)}{2!}x^2 + \dots + \frac{n(n-1)\dots(n-r+1)}{r!}x^r + \dots$ 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

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

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 2 continued

Area for writing answers, consisting of multiple horizontal dotted lines.

(Total for Question 2 is 6 marks)



3

Diagram **NOT** accurately drawn

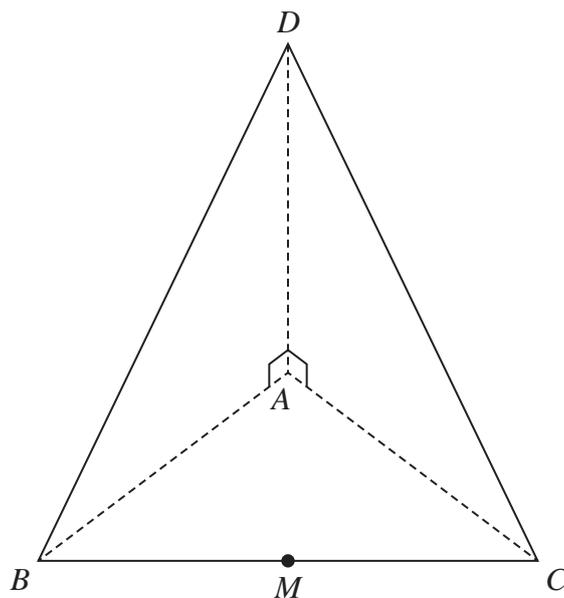


Figure 1

Figure 1 shows a triangular pyramid $ABCD$.

The base, ABC , of the pyramid is a horizontal isosceles triangle with $AB = AC = 10\text{ cm}$ and $BC = 16\text{ cm}$. The midpoint of BC is M .

The face BCD of the pyramid is an isosceles triangle with $BD = CD = 26\text{ cm}$ and D is vertically above A .

$$\angle BAD = \angle CAD = 90^\circ$$

- (a) Calculate the length, in cm, of AM . (2)

Calculate, in degrees to the nearest degree,

- (b) the size of $\angle BCD$, (3)

- (c) the size of the angle between the planes BCA and BCD . (4)

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6

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

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



Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area for writing answers, consisting of multiple horizontal dotted lines.

(Total for Question 3 is 9 marks)



Question 4 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

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



Question 4 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

A large rectangular area with horizontal dotted lines for writing, intended for the student's answer to Question 4.

(Total for Question 4 is 7 marks)



Question 5 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 5 is 8 marks)



Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

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



Question 6 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 6 is 8 marks)



Question 7 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

A large rectangular area with a rounded top-left corner, containing numerous horizontal dotted lines for writing.



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 7 continued

Area with horizontal dotted lines for writing answers.

(Total for Question 7 is 12 marks)



Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.



Question 8 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 8 is 8 marks)

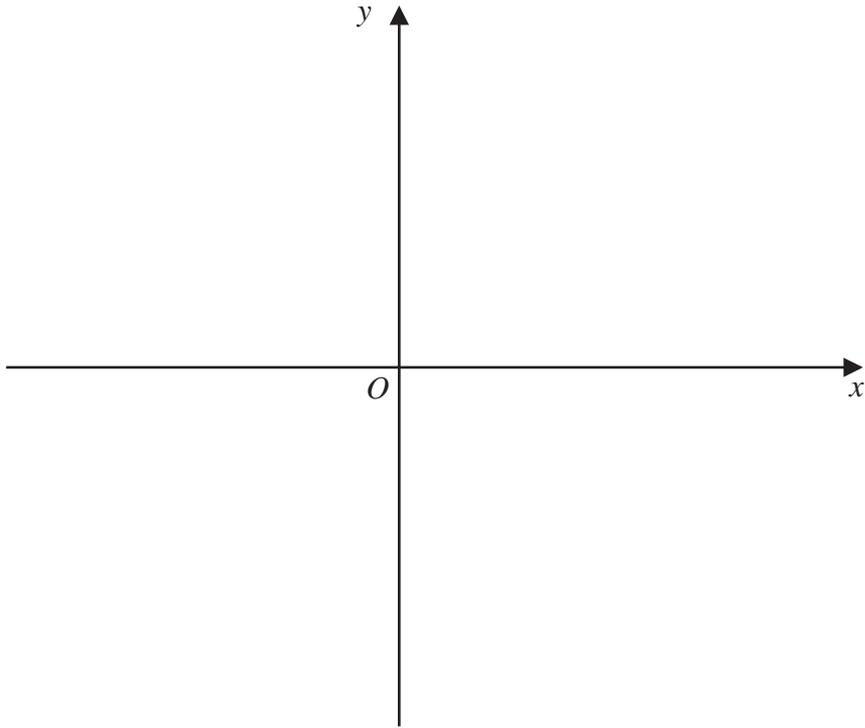


DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Question 9 continued



A series of horizontal dotted lines for writing the answer.

Question 9 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing.

(Total for Question 9 is 16 marks)



Question 10 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing answers.

(Total for Question 10 is 9 marks)



Question 11 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area for writing answers, consisting of multiple horizontal dotted lines.



