

Please check the examination details below before entering your candidate information

Candidate surname	Other names
<b>Pearson Edexcel</b>	Centre Number
<b>International GCSE</b>	Candidate Number
<b>Monday 17 June 2019</b>	
Afternoon (Time: 2 hours)	Paper Reference <b>4PM1/01</b>
<b>Further Pure Mathematics</b> <b>Paper 1</b>	
	
<b>Calculators may be used.</b>	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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## International GCSE in Further Pure Mathematics Formulae sheet

**Mensuration**Surface area of sphere =  $4\pi r^2$ Curved surface area of cone =  $\pi r \times$  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,  $S_\infty = \frac{a}{1-r}$   $|r| < 1$ **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 3 marks)**





DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**Question 3 continued**

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

**(Total for Question 3 is 6 marks)**





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DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

**Question 4 continued**

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

**(Total for Question 4 is 6 marks)**





**Question 5 continued**

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DO NOT WRITE IN THIS AREA

A large rectangular area with horizontal dotted lines for writing, intended for the student's answer to Question 5.

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





**Question 6 continued**

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DO NOT WRITE IN THIS AREA

A large rectangular area with horizontal dotted lines for writing.



**Question 6 continued**

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

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DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



**Question 6 continued**

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DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing answers.

**(Total for Question 6 is 11 marks)**





**Question 7 continued**

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DO NOT WRITE IN THIS AREA

A large rectangular area with horizontal dotted lines for writing, intended for the answer to Question 7.



**Question 7 continued**

Handwriting practice area consisting of 25 horizontal dotted lines for writing answers.

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DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



**Question 7 continued**

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DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

Area with horizontal dotted lines for writing answers.

**(Total for Question 7 is 12 marks)**





**Question 8 continued**

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DO NOT WRITE IN THIS AREA

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



**Question 8 continued**

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

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DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



**Question 8 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 answer to Question 8.

**(Total for Question 8 is 10 marks)**





**Question 9 continued**

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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 answer to Question 9.



**Question 9 continued**

Handwritten area with horizontal dotted lines for writing.

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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 9 continued**

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

**(Total for Question 9 is 12 marks)**





**Question 10 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 10.



**Question 10 continued**

Area for writing the answer to Question 10, consisting of multiple horizontal dotted lines.

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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 10 continued**

Area with horizontal dotted lines for writing answers.

**(Total for Question 10 is 14 marks)**





**Question 11 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 11.





**Question 11 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 dotted grid pattern, intended for writing the answer to Question 11.



