

**Paper Reference 4PM1/01R**  
**Pearson Edexcel International GCSE**

# **Further Pure Mathematics**

**PAPER 1R**  
**(Calculator)**

## **Formulae Pages**

**DO NOT RETURN THIS  
FORMULAE BOOKLET WITH THE  
QUESTION PAPER.**

## MENSURATION

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

**Curved surface area of cone =  $\pi r \times$  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

$$(1 + x)^n = 1 + nx +$$

$$\frac{n(n-1)}{2!}x^2 + \dots + \frac{n(n-1)\dots(n-r+1)}{r!}x^r + \dots$$

for  $|x| < 1, n \in \mathbb{Q}$

Turn over

# CALCULUS

## Quotient rule (differentiation)

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

Turn over

# 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

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