A-Level
Further Maths
Information Booklet

I hope you are looking forward to delving into the Further Maths A-level course. I am sure you will find some of the topics and new ways of tackling problems in maths both intriguing and exciting.

The Further Maths course supplements the standard A-Level Mathematics course, so please read the information booklet for Maths in addition to this for more guidance on how to get your study off to the best start.

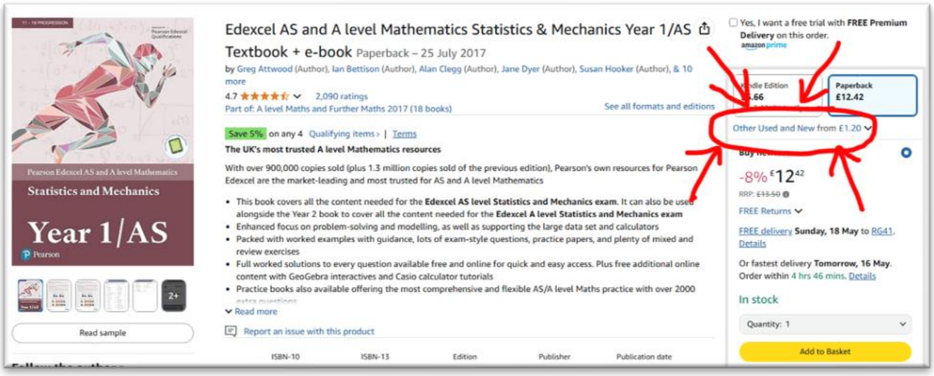
If you have any questions, please do get in touch by email.

KS5 Maths Coordinator: Mr R Green r.green@holt.wokingham.sch.uk

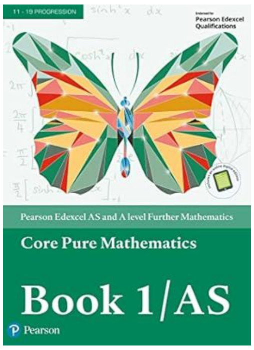
Required Textbooks

We are following the *Pearson Edexcel* A-Level Further Maths course.

New textbooks usually include a digital copy too, but second hand is fine. You may be able to find a Year 13 student wanting to sell these on. I recommend checking the **"Other used and New"** tab on Amazon for some cheap second-hand copies.



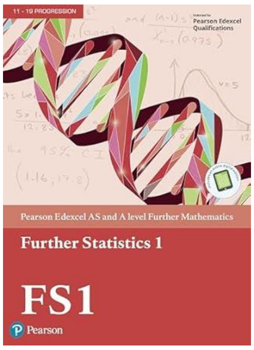
In Year 13 we will also require Book 2 of Core Pure Mathematics, but the Statistics and Decision Maths Textbooks will be used throughout Year 12 and Year 13.



Pearson Edexcel AS and A level Further Mathematics

Core Pure Mathematics Book 1/AS

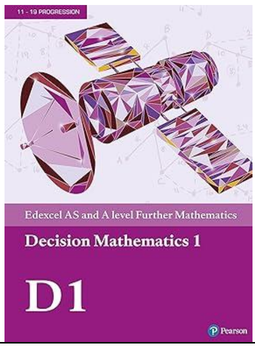
ISBN-13: 978-1292183336



Pearson Edexcel AS and A level Further Mathematics

Further Statistics 1 (FS1)

ISBN-13: 978-1292183374



Pearson Edexcel AS and A level Further Mathematics

Decision Mathematics 1 (D1)

ISBN-13: 978-1292183336

Bridging Task 1:
Measuring Angles in Radians.

The fact that there are 90 degrees in a right angle will have been familiar to you since primary school, but this number is an arbitrary one which has been passed down to us from the Babylonian civilisation. There was an attempt to introduce 100 degrees in a right angle soon after the French revolution, but this was later dropped and in 1983 a similar attempt was made by the Germans.

But degrees are not the only way to measure angles. The other common measurement for angles is radians, which is much more useful for many applications in mathematics.

If we consider a circle of radius r then the arc length r will subtend an angle of 1 radian at the centre. This means that:

$$180^\circ = \pi \text{ radians}$$

And so

degrees	Radians
30°	π/6
45°	π/4
60°	π/3

To convert radians to degrees: $$\text{degrees} = \text{radians} \times \frac{180}{\pi}$$

To convert degrees to radians: $$\text{radians} = \text{degrees} \times \frac{\pi}{180}$$

Examples to try:

1. Convert to radians giving your answers to 2 decimal places

Angle in degrees	17	51	243	- 131	- 596
Angle in radians					

2. Convert to radians giving your answer in term of π

Angle in degrees	360	315	- 300	- 630	18
Angle in radians					

3. Convert to degrees giving an exact answer

Angle in degrees					
Angle in radians	$\frac{3\pi}{4}$	$-\frac{7\pi}{6}$	$\frac{2\pi}{5}$	$-\frac{3\pi}{20}$	$\frac{11\pi}{4}$

4. Convert to degrees giving your answer to one decimal place

Angle in degrees					
Angle in radians	0.76	- 1.13	- 11.38	6.42	- 0.032

Degrees and Radians: Solutions

1. Convert to radians giving your answers to 2 decimal places

Angle in degrees	17	51	243	- 131	- 596
Angle in radians	0.30	0.89	4.24	- 2.29	- 10.40

2. Convert to radians giving your answer in term of π

Angle in degrees	360	315	- 300	- 630	18
Angle in radians	2π	$\frac{7\pi}{4}$	$-\frac{5\pi}{3}$	$-\frac{7\pi}{2}$	$\frac{\pi}{10}$

3. Convert to degrees giving an exact answer

Angle in degrees	135	- 210	72	- 27	495
Angle in radians	$\frac{3\pi}{4}$	$-\frac{7\pi}{6}$	$\frac{2\pi}{5}$	$-\frac{3\pi}{20}$	$\frac{11\pi}{4}$

4. Convert to degrees giving your answer to one decimal place

Angle in degrees	43.5	- 64.7	- 652.0	367.8	- 1.83
Angle in radians	0.76	- 1.13	- 11.38	6.42	- 0.032

Bridging Task 2: Matrices

A Matrix is a rectangular array of numbers arranged in rows and columns.

The individual numbers in a matrix are called elements.

The order of dimensions of a matrix describes the matrix in terms of the number and rows and columns it has.

Eg $\begin{pmatrix} 36 & 21 & 43 \\ 27 & 56 & 35 \end{pmatrix}$ has 2 rows and 3 columns so has order 2 x 3

Addition and subtraction of matrices:

Matrices of the same order can be added or subtracted by adding or subtracting the corresponding elements.

Multiplication of a matrix by a number:

Each element of a matrix is multiplied by the multiplying number.

Multiplication of two matrices:

Matrices can be multiplied only if they are compatible. The number of columns in the left hand matrix must be the same as the number of rows in the right hand matrix.

You may find it useful to do an internet search for you tube clips that demonstrate matrix operations.

Questions to try:

3. $\mathbf{A} = \begin{pmatrix} 2 & -3 \\ -1 & 5 \end{pmatrix}$ $\quad \mathbf{B} = \begin{pmatrix} -3 & -1 \\ 2 & 7 \end{pmatrix}$ $\quad \mathbf{C} = \begin{pmatrix} 2 & 3 & -4 \\ -1 & 2 & 5 \end{pmatrix}$ $\quad \mathbf{D} = \begin{pmatrix} -1 & -4 & 2 \\ -3 & 5 & 6 \end{pmatrix}$

   Calculate, if possible,

   (i) $\mathbf{A} + 2\mathbf{B}$ (ii) $\mathbf{C} - \mathbf{D}$ (iii) $3\mathbf{A} - 2\mathbf{C}$ (iv) $3\mathbf{D} - \mathbf{C}$

4. $\mathbf{A} = \begin{pmatrix} 2 & 1 \\ -3 & 4 \end{pmatrix}$ $\quad \mathbf{B} = \begin{pmatrix} -1 & 3 & 2 \\ 5 & 1 & -2 \end{pmatrix}$ $\quad \mathbf{C} = \begin{pmatrix} 3 & -1 \\ 1 & 2 \end{pmatrix}$ $\quad \mathbf{D} = \begin{pmatrix} 4 & -1 \\ 2 & 5 \\ -3 & 1 \end{pmatrix}$

   Calculate, if possible, the following

   (i) $\mathbf{AB}$ (ii) $\mathbf{AC}$ (iii) $\mathbf{BC}$ (iv) $\mathbf{BD}$

Answers

3. (i) $A+2B=\begin{pmatrix}2 & -3\\ -1 & 5\end{pmatrix}+2\begin{pmatrix}-3 & -1\\ 2 & 7\end{pmatrix}=\begin{pmatrix}2 & -3\\ -1 & 5\end{pmatrix}+\begin{pmatrix}-6 & -2\\ 4 & 14\end{pmatrix}$

$=\begin{pmatrix}-4 & -5\\ 3 & 19\end{pmatrix}$

(ii) $C-D=\begin{pmatrix}2 & 3 & -4\\ -1 & 2 & 5\end{pmatrix}-\begin{pmatrix}-1 & -4 & 2\\ -3 & 5 & 6\end{pmatrix}$

$=\begin{pmatrix}3 & 7 & -6\\ 2 & -3 & -1\end{pmatrix}$

(iii) cannot be done as A and C do not have the same order

(iv) $3D - C = 3\begin{pmatrix} -1 & -4 & 2 \\ -3 & 5 & 6 \end{pmatrix} - \begin{pmatrix} 2 & 3 & -4 \\ -1 & 2 & 5 \end{pmatrix}$

$$= \begin{pmatrix} -3 & -12 & 6 \\ -9 & 15 & 18 \end{pmatrix} - \begin{pmatrix} 2 & 3 & -4 \\ -1 & 2 & 5 \end{pmatrix}$$

$$= \begin{pmatrix} -5 & -15 & 10 \\ -8 & 13 & 13 \end{pmatrix}$$

4. (i) $AB = \begin{pmatrix} 2 & 1 \\ -3 & 4 \end{pmatrix}\begin{pmatrix} -1 & 3 & 2 \\ 5 & 1 & -2 \end{pmatrix} = \begin{pmatrix} 3 & 7 & 2 \\ 23 & -5 & -14 \end{pmatrix}$

(ii) $AC = \begin{pmatrix} 2 & 1 \\ -3 & 4 \end{pmatrix}\begin{pmatrix} 3 & -1 \\ 1 & 2 \end{pmatrix} = \begin{pmatrix} 7 & 0 \\ -5 & 11 \end{pmatrix}$

(iii) BC cannot be calculated as the matrices are not conformable (the number of columns in B is not the same as the number of rows in C)

(iv) $BD = \begin{pmatrix} -1 & 3 & 2 \\ 5 & 1 & -2 \end{pmatrix}\begin{pmatrix} 4 & -1 \\ 2 & 5 \\ -3 & 1 \end{pmatrix} = \begin{pmatrix} -4 & 18 \\ 28 & -2 \end{pmatrix}$