

# Welcome to Mathematics at Brunel

Discover  
Brunel

## Congratulations on securing your place at Brunel

We're looking forward to meeting you - either in person or online - and introducing you to life at Brunel.

To help us get started, we've put together a short activity and some further information to help you prepare for your course - including a snapshot of the topics you'll cover and useful resources.

The below activity is for our undergraduate Mathematics programmes. If you are studying Foundation Economics and Mathematics (FoEaM) or Foundation of Mathematics and computing (FoMaC) you can find your pre-arrival activity [here](#).

If you have any questions please email [claire.lines@brunel.ac.uk](mailto:claire.lines@brunel.ac.uk)

## Pre-arrival activity

We'd like you to complete a short activity before you join us on Monday 21 September. We can discuss your answers in one of your first personal tutor sessions. Your work will not be officially assessed however it will allow your tutor to get to know you better.

Before attempting the activity below it would be beneficial to brush up on your A-level maths skills via our '[Get Maths Fit](#)' questions, this will help you to answer your pre-arrival activity.

### Task A:

In mathematics it is often helpful to find a simple approximation to a complicated function. Now,  $x^n$  gets smaller as  $n$  gets larger if  $|x| < 1$ . If  $x$  is small enough then you can sometimes ignore large powers of  $x$  to approximate a function or estimate its value.

- Find the first 4 terms of the binomial expansion, in ascending powers of  $x$  of

$$\left(1 - \frac{x}{10}\right)^{10}.$$

- Use your approximation to estimate  $0.98^{10}$ .

### Task B:

Circle geometry is used in many applications e.g. meteorologists use geostationary satellites to look at the Earth. Geostationary orbits are circular orbits.

The points  $A(0, 2)$ ,  $B(6, 2)$  and  $C(4, 2 - \sqrt{8})$  lie on the circumference of a circle.

- Show that  $AB$  is the diameter of the circle.
- Find the equation of the circle

### Task C:

Log functions and exponential functions are used to model all kinds of physical phenomenon like population growth, interest rates and radioactive decay, to name but a few.

A radioactive isotope decay is modelled by the following formula

$$R = 180 \exp kt, \quad t \geq 0,$$

where  $R$  is the measure of radioactive decay (counts per minute) at  $t$  days, and  $k$  is a constant.

- Explain why  $k$  is negative.
- Sketch the graph of  $R$  against  $t$ .
- After 50 days the radioactive count is 100 counts per min. Find the value of  $k$ .
- The rate of decay can be modelled by a simple differential equation, can you write it down?
- Find the half-life of the radioactive isotope.

## MATLAB and Octave

MATLAB is a programming language for mathematics that is able to plot functions and data, manipulate matrices, implement algorithms and various other things. It is a very powerful tool for mathematics and once you have registered on your course you will have access to it.

[Octave](#) is able to do much of what MATLAB can do and is available free. Dr Simon Shaw has produced a [video introducing how Octave can be used](#) to help answer your A-level Maths questions and much more.

## Reading list

- James Stewart, "Calculus", 8th edition (International Metric Version), Thomson Brooks/Cole, 2016. The 6th and 7th editions of this book are equally suitable.
- Howard Anton and Chris Rorres, "[Elementary Linear Algebra: With Supplemental Applications](#)", 11th edition, Wiley, 2015. The 8th, 9th and 10th editions of this book are equally suitable.
- Dennis D. Wackerly, William Mendenhall, Richard L. Scheaffer, "Mathematical Statistics with Applications", 7th Edition, Thomson Brooks/Cole, 2008.
- Brian D. Hahn, Daniel T. Valentine, "Essential MATLAB for Engineers and Scientists", 6th Edition, Academic Press, 2017. The 3rd, 4th and 5th editions of this book are all suitable. This will be available as an e-book at Brunel library once you are a registered student.
- Kenneth Rosen, "Discrete Mathematics and its Applications", 8th edition, McGraw-Hill, 2019. The 6th and 7th editions of this book are equally suitable.

We look forward to meeting you in Welcome Week (Monday 21 – Friday 25 September).

Mathematics Team

Find out more about Welcome Week  
[brunel.ac.uk/welcome-week](http://brunel.ac.uk/welcome-week)

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