Chapter 1

Getting Started

In This Chapter
▶ Realising you can already do maths
▶ Working with whole numbers
▶ Fathoming fractions, percentages and the like (with added pizza)
▶ Measuring up
▶ Making sense of data

Before you read any more of this book, take a big, deep breath. I know what taking on something difficult or frightening feels like – I feel just the same about dance classes, and I still have to steel myself a bit when I go into a supermarket.

I start this chapter by saying thanks – thanks for giving maths a try and thanks for listening to me. I’m not the kind of maths teacher who wears tweed jackets with leather patches and yells at you when you don’t pick up on his mumbles straight away. I want to help you get past the fear and the mind blanks and show you not just that you can do maths well, but that you already do maths well and can use that base to build upon. I show you how, with a bit of work, you can master the bits and pieces of maths you don’t have down to a tee. You’re smart. I believe in you.

Perhaps you find the maths you do in day-to-day life so easy you don’t even notice you’re doing sums. I spend some time in this chapter showing you what you already know and then introduce the topics I cover in the rest of the book.
You're Already Good at Maths

Put your hand up if you’ve ever said something like ‘I’m no good at maths.’ I promise I won’t yell at you. Now imagine saying ‘I’m no good at talking’ or ‘I’m no good at walking.’ Those things may be true at times – I get tongue-tied once in a while, and I’ve been known to trip over invisible objects – but most of the time my mumbling and stumbling are perfectly adequate to get by. I bet the same thing applies with your maths. Maybe you freeze up when you see a fraction or just nod and smile politely when someone shows you a pie chart. This doesn’t mean you’re bad at maths, just that you trip up once in a while.

If you can shift your thoughts on maths from ‘I’m no good at this’ to ‘I’m still getting to grips with this’, you'll create a self-fulfilling prophecy and begin to understand maths.

Part of the problem may be that you don’t realise how much of what you do every day involves doing maths in your head. You may not think you’re doing maths when you judge whether to cross the road on a red light, but your brain is really doing a series of complex calculations and asking questions such as:

- How fast is that bus going, and how far away is it? How long will the bus take to get here?
- How wide is the road, and how long will it take for me to get across?
- What’s the probability of that driver slowing down to avoid me if I’m in the road?
- How badly do I want to avoid being honked at or run over?
- What are the survival and recovery rates for my local hospital?
- How soon do I need to be where I’m going?
- How much time will crossing now save over waiting for the light to change?

You do all of these calculations – very roughly – in your head, without a calculator, and without freezing up and saying ‘I’m no good at maths.’ If you regularly got any of those sums wrong – the speed–distance–time analysis, the probability or the game theory – you’d be reading this in hospital and trying to figure out what the jagged line graph at the end of the bed means. (Turn to Chapter 16 if this really is the case – and get well soon!)

So before you cross the road on your way to work, you solve as many as six ‘impossible’ sums in your head, maybe before you’ve even had breakfast.
Your First Homework Assignment

I’m not a big one for setting homework, but I’m going to ask you to do one thing for me (and, more importantly, for yourself): if you ever find yourself in a situation where you feel like saying ‘I’m no good at maths’, catch yourself and say something else. Try ‘I used to struggle with maths, but I’m discovering that maths is easier than I thought’, or ‘I’m fine with day-to-day maths’, or ‘I really recommend Basic Maths For Dummies: this book turned me into a mathematical genius.’

Although mathematicians traditionally wear rubbish clothes, thick glasses and a bad comb-over, this fashion isn’t compulsory. The tweed generation is dying out, and most of the maths geeks I know are now just a bit scruffy. So, don’t worry: being good at maths won’t turn you into a fashion disaster with no friends.

I appreciate my homework assignment is tremendously difficult – asking you to change your entire way of thinking is a big ask. To assist you I enlist the help of an elastic band and ask you to treat yourself with something I call Dunford Therapy, after the genius who told me about it:

1. **Find an elastic band big enough to go around your wrist comfortably.**
   
   Put the elastic band around one of your wrists – either one, it doesn’t matter.

2. **Every time you catch yourself thinking anything along the lines of ‘I’m no good at maths’, snap the elastic band really hard against the bony bit of your wrist.**

   This will hurt. That’s the idea.

3. **After you catch yourself a few times, your brain will start to rewire itself to avoid thinking such filthy and disgusting thoughts, and you’ll find yourself capable of extraordinary feats of mathematics.**

   If you have particularly fragile wrists or any inkling that you might do yourself more damage with an elastic band than swearing and shaking your hand in pain, don’t use Dunford Therapy. The elastic band is supposed to hurt just enough to help you change your way of thinking, not to injure you.

   Getting the odd maths sum wrong doesn’t mean you are stupid – far from it in fact, because you’re immediately and obviously smarter than someone who doesn’t even try the sum.
Talking Yourself Up

Encouraging yourself is a recurring theme in this book – the more you give yourself credit for the things you can do, the easier the things you’re still working on become. Be sensible about things: don’t rush to the library and check out the Journal of Differential Equations (at least, not until you’ve bought and devoured Differential Equations For Dummies). But when you see something that’s a bit tricky-looking, try to avoid saying ‘I can’t do that’ or ‘I haven’t been taught that’ as a response. Maybe say ‘I can’t do that yet’ or ‘I need to do some work on this.’ Better still, say ‘What would I need to find out to be able to solve this?’

Chapter 2 is all about ways to build your confidence and set yourself up to get on top of your maths studies quickly, effectively, and with a great big goofy grin. Best of all, Dunford Therapy isn’t part of Chapter 2.

Whole Numbers: Party Time!

Everyone likes parties. Balloons! Silly hats! Cheese-and-pineapple sticks arranged in a potato to look like a hedgehog! But these things don’t spring into existence on their own. If you want to plan a party, you may need to put your maths skills to work to make sure you prepare enough vol-au-vents for everyone.

Maybe you want to bake a cake for 12 people coming to celebrate your birthday. But disaster! Your recipe book only has a recipe for four people. What can you possibly do?

I’m sure you can come up with a few solutions. I’ve also got a few ideas, which I explain here in excruciating detail:

- **Let people go hungry**: You have 12 guests and only enough cake for four. How many will have to forgo your delicious Victoria sponge? Twelve people take away four lucky cake-eaters leaves eight guests, who probably need to go on a diet anyway.

- **Make extra cakes**: One cake feeds four people and you want to feed 12. How many cakes do you need? Twelve people divided by four per cake gives you three cakes.

- **Cut your slices into smaller pieces**: If you cut four slices each into three smaller bits, you have 4 times 3 equals 12.

- **Make a bigger cake**: This is the kind of approach that you typically get asked about in an exam. You need to figure out how much bigger to make the cake – just like before, \(12 \div 4 = 3\) times as big. To make the cake three times bigger, you multiply all of the ingredients in the recipe by three.
My suggestion above is a bit of a ‘don’t try this at home’ moment: although the last option is the most ‘mathsy’, it may not work out quite as well in real life. Unless the recipe in your cookery book gives instructions on how to adjust the cooking time of your humungous new cake, the physics of cake-baking may conspire against you and leave you with something inedible. Try my idea if you like, but don’t blame me if your cake doesn’t rise.

Forgive me if you already knew how to do all of that. That’s actually a good sign. The point wasn’t to bamboozle you with tricky maths but to say that sometimes you do maths without even thinking about what you’re doing.

One of the points from my example above is to think about which sum is appropriate for each idea, so you can adapt the concept to different situations. What if your cake recipe serves six people? What if you’re expecting 48 guests? What if the recipe is for casserole instead of cake?

In Part I of this book I look at exactly this kind of question. What kind of sum is the right one to do? How can you figure out roughly what the answer should be? How do you work out the arithmetic to get a precise answer? I look at the ‘big four’ operations – adding, taking away, multiplying and dividing – along with estimating and rounding to get rough answers.

**Parts of the Whole: Fractions, Decimals, Percentages and More**

Public speaking . . . death . . . spiders . . . fractions. Are you scared? Boo! Are you scared now?

I understand. Seeing how whole numbers fit together is relatively easy, but then suddenly the evil maths guys start throwing fractions at you – and then things aren’t so intuitive. Fractions (at least, proper fractions) are just numbers that are smaller than whole numbers – they follow the same rules as regular numbers but sometimes need a bit of adjusting before you can apply them to everyday situations.

I have two main aims in this section: to show you that fractions, decimals, percentages and ratios are nothing like as fearsome as you may believe; and to show you that fractions, decimals, percentages and ratios are all different ways of writing the same thing – therefore, if you understand one of them, you can understand all of them.

I won’t promise that you’ll emerge from this section deeply in love with fractions, but I hope I can help you make peace with fractions so you can work through the questions likely to come up in exams and in real life.
Mmmm, pizza! Everyday fractions

You use fractions and decimals in real life all the time – any time you slice a pizza into smaller bits . . . any time you say you’ll be somewhere at quarter past six . . . any time you say or read the price of a product in the supermarket and, in fact, any time at all when you use money.

A fraction is really just two numbers, one on top of the other, that describe an amount (usually, anyway) between zero and one. A fraction is a part of a whole one. The bottom number tells you how finely you’ve divided the whole thing (the bigger the number, the finer or smaller the ‘slice’) and the top number tells you how many slices you have.

For example, think about a quarter of an hour. A quarter is written as $\frac{1}{4}$: the 4 says ‘Split your hour into four equal bits’, and the 1 says ‘Then think about one of the bits.’ A quarter of an hour is a whole hour (or 60 minutes) divided into four parts, making 15 minutes. Three-quarters of an hour ($\frac{3}{4}$) is three times as long: 45 minutes.

You already use decimals all the time as well. When you write down an amount of money using pounds and pence, you use a decimal point to show where the whole number (of pounds) ends and where the parts of a pound (pence) begin. If you look at your phone bill or your shopping receipt, you see decimal points all over the place. Don’t be afraid of decimals: as far as you’re concerned, decimal points are just dots in a number that you can leave in place and otherwise ignore. For example, you work out a sum like $5.34 \div 2$ (with a dot) in exactly the same as the way you work out $534 \div 2$ (without a dot) – the only difference is that you have to remember to put the dot back in, in the same place, when you finish the sum.

Percentages are easier than you think: Introducing the Table of Joy

What if I told you I had a simple, reliable method for working out the sums you need to do in somewhere between a quarter and a half of questions in a typical numeracy exam? Such a method exists – the Table of Joy. I go into serious detail about this table in Chapter 8, but I also dot it about here and there in other chapters.

You can use the Table of Joy in all of the following topics:

- **Converting imperial to metric units**: Working in either direction, and finding the conversion rate.

- **Currency conversion**: Converting to and from any currency, and working out the exchange rate.
✓ Finding a fraction of a number: Without making you cry.
✓ Percentages: Both regular and reverse percentages.
✓ Pie charts: How big a slice should be, the value a slice represents, and what the total value of the slices in the chart should be.
✓ Ratios: Pretty much any ratio sum you can imagine, and more besides.
✓ Recipe scaling: How much you need to adjust your recipe by, and how many people it now feeds.
✓ Scale drawing: Finding the size of the real thing, or the sketch, or the scale.
✓ Speed/distance/time questions: And pretty much anything you could possibly want to do (at least, that isn’t A-level or harder).

Those are just the topics I can think of off the top of my head that are in the numeracy curriculum. You can also use the Table of Joy for things like stratified surveys, histograms, density, gradients, circle theorems and trigonometry.

The idea of the Table of Joy is simple: write down the information you need to use in a labelled table, and do a simple sum to work out the answer to your question. Follow these steps to use the Table of Joy:

1. Draw out a noughts-and-crosses grid, with squares big enough to label.
2. Put the units of what you’re dealing with in the top-middle and top-right squares.
   For example, if you want to convert currencies, your units may be ‘pounds’ and ‘dollars’. If you want to work out a sale percentage, your units may be ‘pounds’ and ‘per cent’.
3. Put the contexts of the information you have down the left side.
   Again, with currencies, you may have ‘exchange rate’ and ‘money changed’. With percentages, you may have ‘full price’ and ‘sale price’.
   Each time the Table of Joy comes up in this book I show you how to label the relevant table, but after a while you’ll probably do it instinctively.
4. Put the relevant numbers in the correct cells, with reference to the labels.
   For example, 100 per cent is the same as the full price, so 100 goes in the square with ‘per cent’ at the top and ‘full price’ at the side.
5. Put a question mark in the remaining square, and write out the Table of Joy sum.
   In the Table of Joy you always have three numbers and then work out the fourth.
The sum is the other number in the same row as the question mark, multiplied by the other number in the same column as the question mark, divided by the remaining number.

6. **After you work out the sum, you have your answer.**

This may seem like a lot of work, but after you get into the routine of using the Table of Joy, you’ll work out your sums quite quickly. In Figure 1-1 I show how to create an example Table of Joy to answer the following question:

$1 is worth $1.50. I want to buy trainers on sale in America for $75. How much is that in pounds?

Don’t worry if the calculation in the Table of Joy looks tricky. In Chapter 7 I take you through decimal sums in detail. I just want to show you here how easily you can figure out what sum you need to do.

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**Figure 1-1:**

The steps of the Table of Joy.

(a) Draw a big noughts-and-crosses grid.
(b) Label the rows and columns.
(c) Fill in the numbers.
(d) Do the Table of Joy sum.

The answer is £50.

<table>
<thead>
<tr>
<th>Rate</th>
<th>£</th>
<th>$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>1.50</td>
</tr>
<tr>
<td>Price</td>
<td>?</td>
<td>75</td>
</tr>
</tbody>
</table>

\[
\frac{1 \times 75}{1.50} = 75 \div 1.5 = 50
\]

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**Sizing Up Time, Weights, Measures and Shapes**

I bet you’re perfectly comfortable with at least one of the following topics: telling the time, taking a temperature, weighing yourself or other objects,
counting money, measuring distances, or playing with shapes. You may even be comfortable with all of them.

Even if you just feel okay with one of these topics, you can build on your knowledge with the other subjects. For example, if you know how to use a thermometer, you can use exactly the same skills to read a scale or a ruler.

This is all useful, day-to-day stuff – and the reason I’m confident you know something about these topics is that they’re all around us, all the time. On the way to the supermarket, you may check the bus timetable to see when you need to leave or the weather forecast to see whether you need to wrap up warm. At the shop, you weigh your bananas to see how much they cost, decide between 5 and 10 metres of tinfoil, and then pay the bill at the checkout – before packing the whole lot into your car and making sure it fits nicely.

All of that is maths. And I bet you do most of it without really thinking. Similarly, a lot of students freeze up when I ask them to work out the change from £20 on paper, but given Monopoly money they do the same sum without any trouble. All I want you to do is make sure you link your everyday experiences with the numbers you juggle on the page.

Weights and measures you already know

You have four topics to master that are to do with measuring things other than distance:

- **Time:** You need to be able to work with a clock, read timetables, fill in timesheets and work with speed – which, after you appreciate the pitfalls, are all pretty easy.

- **Money:** You’re probably already familiar with money sums. You need to be able to do regular arithmetic with money and change one currency into another (the Table of Joy can help).

- **Weight:** Even if you don’t use scales regularly, you’ve probably seen somebody else use them. I take you through using and reading the various types of scales, and I show you how to convert between different units of weight.

- **Temperature:** You’re probably quite happy with most aspects of temperature, although I do introduce a few tricky bits that you may not get straight away – converting between temperature scales and using negative numbers are two areas where some people end up scratching their heads. Don’t worry: I take things slowly.
Getting yourself into shape

You need to understand how to deal with lengths, areas, volumes and shapes. Some people find visualising shapes really easy – if you’re one of those people, you’ll find the shape chapters pretty straightforward. If not, don’t worry – I explain things as simply as possible.

The shape topics are split into two groups: measuring (where I talk about how big a shape is) and the actual shapes (where I help you with angles, symmetry and so on). I also have a quick look at maps and plans. You can measure an object in several different ways. For example, you can measure how tall or wide or deep the object is (length), how much floor space it takes up or how much paper you need to cover it up (area), and how much room space it takes up or how much stuff it holds (volume).

Statistically Speaking

If mathematicians have a bad reputation, then statisticians have it ten times worse (on average). I’d like to let it be known that statisticians’ glasses are no thicker, nor their elbows more leather-patched, than those of their mathematical counterparts. Some statisticians – it is alleged – are well-adjusted members of society, although evidence is scant. Understanding graphs and tables, and being able to deal with averages and probability, will not turn you into Statto. In fact, you’ll be in a much better place to deal with the statistics that life bombards you with all the time, in the news and maybe at work. You don’t need to tell anyone you’re studying stats – we can keep it our little secret.

Why bother with charts and tables?

In my back room I have a shoebox full of receipts, bills, statements and handwritten notes saying things like ‘8.75 on curry’ and ‘Class with Jenny, £35’. This box is a shambles of an accounting system, and if anyone wants to exchange a few hours of sorting it out for a few hours of maths tuition, please get in touch with me.

But if I want to understand my financial position better, I don’t want a shoebox of randomly arranged bits of paper. I want my numbers neatly arranged on a few pages of paper or – better yet – in a graph so I can see at a glance how long I need to work before I pay off my loans and can afford a holiday.
The strength of tables and graphs is that they take a mess of numbers and make them tidier or easier to understand, or both. At the start of Part IV, I show you how to read and make tables and graphs, and help you see which is best to use in which situation.

**The man in the middle: Describing data**

Another way of tidying up certain data is to describe the data with a statistic – a number that tells you something about the data. Examples of a statistic are ‘the biggest value’ and ‘the number of numbers in the data set’. In Chapter 18, I show you how to use four of the most common statistics.

The *mode* is the most common number in a data set and the *median* is the most moderate (half of the numbers are bigger and half of them are smaller). The *mean* is probably what you think of as the average: you get the mean when you divide the total up evenly. The *range* is a measure of how spread out the data are.

**What are the chances?**

I finish Part IV by looking at probability – a measure of how much you think something will or won’t happen. For example, you’re more likely to throw a double six on a pair of dice than you are to pull the ace of diamonds out of a pack of shuffled cards. The question is: how do I know that?

I look at what probability means (as best I can – philosophy is a slippery slope) and how you can work out how likely some events are by using straightforward sums.

**The Tools You Need**

You don’t need much stuff to get going with Basic Maths For Dummies – you can do an awful lot with just a pen and paper. But you may want to pick up a few extra bits and pieces along the way. Here are the things I strongly recommend you buy the next time you’re in a stationery shop or online:
The Adult Numeracy exam

This bit is about registering to take an Adult Numeracy exam. If you study maths at an adult education centre, you don’t need to worry about this section: your centre will probably enrol you for the test. Likewise, if you don’t plan to take an exam, skip this bit.

Registering for the test

If you want to register for Qualified Teacher Status tests, go to www.tda.gov.uk/trainee-teacher/qts-skills-tests/registering-booking.aspx and register and book through their website. As far as I can see, this is a well-designed site that makes the process easy and quick.

If you want to register for the regular numeracy exam, go to www.move-on.org.uk/findatestcentre.asp. Tell the website where you are and it lists the nearest test centres to you. Alternatively, look for ‘Further Education’ in the Yellow Pages and make contact with your local centre directly – staff at the centre should tell you what you need to do to sit the test.

What to expect in the test

Adult numeracy tests are generally performed ‘on screen’. You go to a test centre and sit at a computer, and the questions come up on the screen. You answer the questions by clicking the mouse on (I hope) the right answer or by pressing the appropriate letter.

The website www.move-on.org.uk has sample tests you can try on your own computer to get used to how they work. I recommend trying them out.

After you finish the test, whether practice or for real, you receive immediate feedback about how you’ve done.

Look back over your practice tests and see where you went wrong – these are great areas to revise first.

Good luck!

✔️ A geometry set: A ruler, a set of compasses and a protractor are all useful – as is some of the other stuff that’s usually bundled in with those sets . . . although I’m pretty sure no one has used a stencil since about 1994. Some of the processes you need to be able to do to pass the numeracy exam require something from the geometry set, so maybe make this the first bit of equipment you buy.

✔️ A decent calculator: I recommend the Casio FX-85 – the one with a round button just under the screen, especially if you plan to study more maths after you have the basic stuff under your belt. For this book though, you can do everything on paper; the calculator is really just to check your answer and maybe save some time – any calculator that works will do the trick!
A notebook: I find having a single place to keep track of all the things I want to remember makes it easier to look them up when I want to remember them – otherwise you end up scrambling through reams of paper to find the brilliant idea you had three weeks ago but can’t remember now.

If you don’t have some of this stuff, don’t use that as an excuse not to get started! You can make a start on one of the chapters that doesn’t need any equipment. For example, in Chapter 10, where I talk about time, you don’t need anything more than a pen and paper.