



Secondary

Tutor

Maths

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A Guide to this Workbook

- Welcome to your Action Tutoring workbook! The following pages give you some information about how the workbook is structured and how to get the most out of your sessions with your pupils.

Structure of the workbook

- This workbook is not tied to a specific exam board, but focuses on skills all pupils sitting any exam board will need to improve their maths.
- You may have some topics you think you and your pupils must cover after looking at their baseline questions or from feedback their teacher has given. The 'I must cover' column of the contents page is for you and pupils to tick these topics.
- Give your pupils an opportunity to look at the contents page and see if there are topics within this workbook they would like to cover that you have not identified. Tick these topics in the 'I want to cover' column in your workbook.
- There is a page of exam tips which gives some hints of what to encourage your pupils to think about each time they are answering a question or trying a past paper. Look through these with your pupils – there may be specific ones they know they tend to forget, they may want to highlight these.
- Each chapter focuses on a different skill or set of skills around a topic. The start of each chapter lists the skills and gives a skill description. There are then some key words that pupils will need to know related to the topic. Check if your pupil understands what some of these key words mean. If they don't you can encourage them to use the glossary at the back of the book to look the word up. It can be worth keeping a list of words they were unsure about, you can then recap them in following weeks and make sure they can recall the meanings. Getting them to explain the meanings in their own words is also very valuable.
- After the key words section, there are some questions to try which will help work out if the pupils are ready to start the topic, or if there is some prior knowledge you will need to recap with them first. It is important to let them have a go at these questions independently to start with. Sometimes as tutors we are so keen for pupils to do well we jump in too quickly and give them the answer. Pupils will work out if they stay quiet you will do the work for them and they can sit back! Obviously, there is a balance not to let the pupils struggle for too long. Waiting for a minute to see if they are able to get started is usually long enough. Even if they are attempting the questions and making mistakes you and they can learn from this. It is important the pupils feel able

to make mistakes as learning why it is a mistake and how not to make it next time is a crucial learning opportunity.

- Skills practice is a section that allows the pupils to try some questions, have you work through a model answer with them and show the different ways in which questions on the topic will be asked. This is a great time for pupils to ask you questions about the topic. It is important to try and avoid asking “do you understand that?” or “does that make sense?”. These closed questions are easy for the pupils to answer “yes” to – even when they don’t fully understand. Questions such as “how could you get started with a question like this?” or “how could you check your answer?” are more open and will give you a better idea of how the pupils are understanding the topic. This article has some good tips on using questioning to stimulate mathematical thinking: <https://nrich.maths.org/2473>
- It is very important to create an environment where pupils are not afraid of getting things wrong and are willing to have a go. This is easier said than done! It is a significant part of developing a growth mindset and will enable pupils to make more progress in future. Praising pupils’ effort rather than the answer will go some way in encouraging this. Searching the internet for “Growth Mindset Inner Drive” will give you some links to more articles and suggestions on how to encourage a growth mindset with your pupils.
- Exam consolidation is a section which shows what questions will look like in an exam and gives pupils a chance to try some independently before being checked by you. If pupils need some help getting started with questions that is fine but remember in the exam they won’t have someone to prompt them – so it is important they also have some chance to attempt full questions independently.



Extra questions

- It is impossible for us to create workbooks that have enough questions in for everyone. Some pupils will need more questions on percentages, others on expanding brackets and there is a limit to how much we can print. This doesn’t mean you can’t use other questions to consolidate or review topics. Some websites you can use to find extra questions are:
 - <http://www.mathedup.co.uk/gcse-maths-takeaway/>
 - <http://justmaths.co.uk/free-stuff/> (the blog also has some useful resources although **check with a school before using any questions from specimen papers** – they may be used for mocks, <http://justmaths.co.uk/blog/>)
 - <http://www.mathsmadeeasy.co.uk/>

Reflection and consolidation

- It is important to allow pupils to reflect on whether they are confident in the topic, or need to go back and do a little more work before moving on. Asking pupils to explain how to approach questions or teaching another pupil is often a useful way to check understanding. Even if you and the pupils decide you are ready to move on, it is essential to review the topic in future weeks. Even if it is just one question at the start of a session, this can help consolidate the work you've done.

Split of topic areas

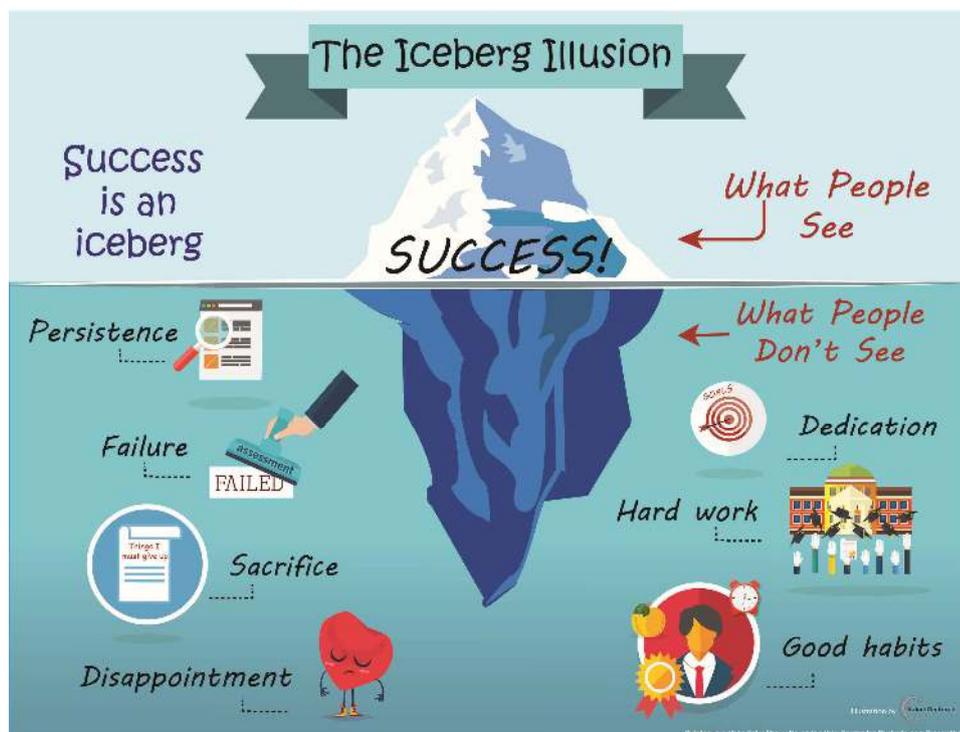
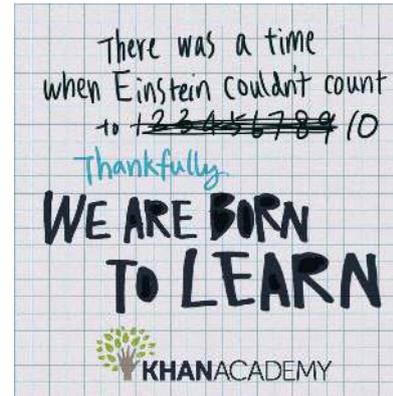
- In maths, it is important to have a secure understanding of more basic topics before moving on to the more complex ones. These earlier topics will often be important in more challenging work. For example, dealing with negative numbers correctly can be applied in a simple multiplication question or solving an equation using the quadratic formula. Therefore, mastering negative numbers will gain your pupils marks in multiple questions. Search for 'Sal Khan Let's Teach For Mastery' to watch a TED talk on the importance of mastering topics before rushing on to the next one.
- The different areas in maths (number; ratio proportion and rates of change; algebra; geometry and measure and probability and statistics) are not divided equally in the exam.
- The split is the same for all exam boards. The table below shows the split between topics:

Topic area	Foundation	Higher
Number	25%	15%
Algebra	20%	30%
Ratio, proportion and rates of change	25%	20%
Geometry & measures	15%	20%
Probability & statistics	15%	15%

- This workbook contains topics related to number, algebra and ratio, proportion and rates of change. There are other Action Tutoring workbooks you may move on to which have a larger focus on further algebra, geometry and measures and probability and statistics.

Growth mindset

- Search for 'You can learn anything' on YouTube to watch a video by Khan Academy illustrating that everyone starts off not being able to do anything but slowly learns from the basics.
- Do you or your pupils think maths is a subject where you have a fixed amount of ability? Do you think people are born good at maths? Whatever level of maths pupils are coming to us with, if they decide to engage in the process and work with you, we believe they can get better. Search for 'Khan Academy John Legend' on YouTube to watch a video looking at the links between success, failure and effort.
- Your pupils are getting some extra help in maths, but there may be something you are trying to improve and learn as well. Why don't you share this with your pupils? Showing them that learning how to learn is an important life skill could be very valuable. Encourage them that they don't have to think they will use all the maths in real life for it to be worth learning.
- There is no shortcut to learning and the cliché 'practice makes perfect' does have truth to it. The best way to improve your maths is by trying questions. Pupils won't learn by reading through this workbook but by doing the questions.
- Pupils may think they are the only ones who have to put a lot of hard work in to get results. It may be that they are not seeing the hard work others put in but the results and success that comes from the hard work. There may be some people who want to appear as if their success is effortless but often even if the effort has not been seen by everyone, they still put it in. The diagram below shows some of the aspects of success we might not see:



- Encourage your pupils to think about a time they learnt a new skill or achieved something. Ask them if they can think of examples for all the building blocks to success shown on the diagram. It doesn't have to be a new skill unique to them. Learning to walk is a good example of persistence and something almost everyone succeeds at.
- Pupils may want to see instant results and it is useful to show at the end of each session what they have done well and the progress they've made. It might not be mastering a new topic, but understanding a topic better – that is still progress! Talking to your pupils about the importance of turning up each week and explaining that the more sessions pupils do with us, the better chance they have of succeeding in their maths GCSE.
- Remember tutoring may well be a learning process for you as well! All the advice we give to pupils about having a growth mindset, being resilient and reflecting on sessions to ensure they can improve holds true for you as well!
- We hope this workbook will help you in your tutoring, but remember there are other ways in which we can support you. Please ask if you would like extra guidance and support. Thank you for your time and hard work in supporting young people improve their confidence, study skills and maths!

Exam tips

Here are some valuable exam tips that you should practice every time you answer a question or work through an exam. These tips are designed to make you feel more confident about approaching the Maths exam, as it can be a scary prospect! By following these simple steps, you will be ready to tackle that exam with confidence!

- Make sure you **show all working out** as in most questions, this will be worth marks even if the answer is incorrect.
- Reread each question and make sure you have answered **exactly what the question asked**, especially on multi-step questions.
- Always give the **correct units** in your answer (m^2 , cm, kg etc). Check whether the answer requires a length, area or volume as an answer and choose the appropriate unit. In some cases where there are no units given, you will **gain one mark** for a correct unit!
- If a calculator is allowed, **push the reset button** before the exam begins. It should be in 'DEG' mode. Try a simple sum to make sure the calculator is working properly.
- Always read over your working out in Algebra, as working out is a huge part of your marks!
- Check to see if a question asked for an Expression or Equation as an Equation involves an equals sign!

Finally, make sure you have **answered every question** and check your **rounded answers** for accuracy mistakes

Calculations



Skill Practice

- 1) **Explain** to your tutor how you would try to work out 12.3×8.2

Pupil explanation

Answer 100.86

Top tip

The method given below is the 'correct' mathematical way to think about it. If pupils struggle with this you can use the following method:

1. Start by Ignoring Decimal Points. Do the Multiplication of Whole Numbers.
2. Count the Total number of digits after the Decimal Point in the Original Numbers.
3. Make the Answer have the Same Number of Decimal Places.

- 2) Work out 39.6×14.5

Multiply both numbers by 10

$$396 \times 145$$

Do long multiplication to get 57420

Then divide by 10 twice at the end (to undo the multiplying by 10 twice at the start).

574.2

$$396 \times 145$$

$$= 57420$$

39.6 (one decimal place), 14.5 (one decimal place)/

Total two decimal places

57420 with two decimal places

$$574.20$$

- 3) Work out 6.85×35

Multiply 6.85 by 100

$$685 \times 35$$

Do long multiplication to get 23975

Then divide by 10 twice at the end (to undo the multiplying by 10 twice at the start).

239.75

Calculations

Skills practice (continued.....)

Calculate:

$$\begin{aligned} 9 \div 0.3 & \quad \text{Multiply both sides by 10.} \\ 90 \div 3 & \\ = 30 & \end{aligned}$$

$$\begin{aligned} 15 \div 0.2 & \quad \text{Multiply both sides by 10.} \\ 150 \div 2 & \\ = 75 & \end{aligned}$$

$$\begin{aligned} 3.6 \div 0.4 & \quad \text{Multiply both sides by 10.} \\ 36 \div 4 & \\ = 9 & \end{aligned}$$

$$\begin{aligned} 4.9 \div 0.7 & \quad \text{Multiply both sides by 10.} \\ 49 \div 7 & \\ = 7 & \end{aligned}$$

$$\begin{aligned} 240 \div 1.2 & \quad \text{Multiply both sides by 10.} \\ 2400 \div 12 & \\ = 200 & \end{aligned}$$

Round the following numbers to 1 decimal place

13.846	224.671	0.4269
13.8	224.7	0.4

Round the following to 2 decimal places

29.487	3.0197	0.3347
29.49	3.02	0.33

Round the following to 1 significant figure

149	5478	8972
100	5000	9000

Round the following to 2 significant figures

149	5478	8972
150	5500	9000

Top tip



Pupils often get confused when dividing by decimals why they don't need to divide by 10, 100 or 1000 at the end, like they do when multiplying with decimals.

It can be useful to use a simple example

$$\text{e.g. } 10 \div 5 = 2.$$

If you multiply both sides by 10 you get

$$100 \div 50 = 2.$$

Draw out the idea we don't need to undo it as we have made the number we're dividing 10 times bigger, as well as the number we're dividing by.

Calculations

It can be useful to add zeros so the numbers have the same number of decimal places and can be more easily compared.

Skills practice (continued.....)

Put these numbers in order, starting with the smallest:

7.200	7.100	7.010	7.015	7.110
7.2	7.1	7.01	7.015	7.11
7.01	7.015	7.1	7.11	7.2

What is the value of the digit 5 in the number 84.356? Circle your answer.

$\frac{1}{2}$	$\frac{5}{1000}$	$\frac{1}{20}$	$\frac{7}{125}$
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Using the information that $3.8 \times 42 = 159.6$

Write down the value of:

$$38 \times 42$$

1596

$$3.8 \times 4.2$$

15.96

$$159.6 \div 42$$

3.8

Using the information that $547 \times 67 = 36649$

Write down the value of:

$$5.47 \times 6.7$$

36.649

$$0.547 \times 0.67$$

0.36649

$$36649 \div 6.7$$

5470

Calculations

Exam Consolidation



1) Fatima bought 48 teddy bears at £9.55 each.

a) Work out the total amount she paid.

Multiply 9.55 by 100

$$\begin{array}{r}
 955 \\
 \times 48 \\
 \hline
 7640 \\
 38200 \\
 \hline
 45840
 \end{array}$$

[M2 for a full method to calculate 48×9.55 – if pupil makes 1 error then 1 mark deducted]

Divide by 100

£ 458.40 [A1]
£(3 marks)

Fatima sold all the teddy bears for a total of £696.

She sold each teddy bear for the same price.

b) Work out the price at which Fatima sold each teddy bear.

** This question has two different methods to find the answer - Repeated subtraction method and bus stop method. Ask your pupil which they use! For both methods, it is useful for them to write out a few multiples of 48.

<p>Bus stop</p> $ \begin{array}{r} 014.5 \\ 48 \overline{) 692.40} \\ \underline{48} \\ 216 \\ \underline{192} \\ 240 \\ \underline{240} \\ 0 \end{array} $	<p>Repeated subtraction</p> $ \begin{array}{r} 48 \quad \quad 696 \\ - 480 \quad \quad \underline{10} \\ \hline 216 \\ - 192 \quad \quad \underline{4} \\ \hline 24 \quad \quad \underline{0.5} \\ \hline 5 \end{array} $	<p>For repeated subtraction, you calculate a multiple of 48 and subtract it from the total, until you can't any more. You then add up the number of times you have multiplied by 48. In this example, we have multiplied by 10, then 4 then 0.5 so the total is $10+4+0.5 = 14.50$</p>	<p>48 96 144 192 240</p>
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£ 14.50(3 marks)

2) Enzo makes pizzas.
 One day he makes 36 pizzas.
 He charges £2.45 for each pizza.



Work out the total amount he charges for 36 pizzas.

$$\begin{array}{r}
 245 \quad (2.45 \times 100) \\
 \times 36 \\
 \hline
 1470 \\
 7350 \\
 \hline
 8820 \quad \div 100 =
 \end{array}$$

[M2 for a full method to calculate 48×9.55 – if pupil makes 1 error then 1 mark deducted]

They may use the grid method – see skill practice for an example of this method.

88.20 [A1]
 £ (3 marks)

3) The cost of a book is £2.80
 Mrs Brown has £60 to spend.
 Work out the greatest number of these books that Mrs Brown can buy.

** This question has two different methods to find the answer - Repeated subtraction method and bus stop method. Ask your pupil which they use!
 For both methods it will be useful to multiply both parts by 10 and do the calculation $600 \div 28$. It may then be useful to list multiples of 28.

Bus stop

$$\begin{array}{r}
 021.4 \dots \\
 28 \overline{) 604.120}
 \end{array}$$

Repeated subtraction

$$\begin{array}{r}
 28 \quad \overline{600} \\
 - 560 \quad \underline{20} \\
 40 \\
 - 28 \quad \underline{1} \\
 12
 \end{array}$$

- 28
- 56
- 84
- 112
- 140

They don't have to work out an exact answer as we are working out the greatest number of books. As soon as we get to the decimal part of the answer we can stop.

..... 21 books (2 marks)

4) Mario delivers pizzas.
 He is paid 65p for each pizza he delivers.
 One day he was paid £27.30 for delivering pizzas.



How many pizzas did Mario deliver?

** This question has two different methods to find the answer - Repeated subtraction method and bus stop method. Ask your pupil which they use!

For both methods, it is easiest to convert both parts into pence so you have the calculation $2730 \div 65$. It may then be useful to list multiples of 65.

Bus stop

$$\begin{array}{r}
 0042 \\
 65 \overline{) 2730} \\
 \underline{130} \\
 130 \\
 \underline{130} \\
 0
 \end{array}$$

Repeated subtraction

$$\begin{array}{r}
 48 \overline{) 2730} \\
 \underline{-2600} \quad \underline{40} \\
 130 \quad \underline{2} \\
 0
 \end{array}$$

- 65
- 130
- 195
- 260
- 325

.....42..... pizzas (3 marks)

5) There are 4.54609 litres in a gallon.

Round 4.54609 to

a) 3 decimal places

4.546

(1 mark)

b) 3 significant figures

4.55

(1 mark)

6) Using the information that $824 \times 19 = 15656$

Write down the value of:

a) 82.4×1.9

156.56

(1 mark)

b) 0.824×0.19

0.15656

(1 mark)

c) $15656 \div 8.24$

1900

(1 mark)

