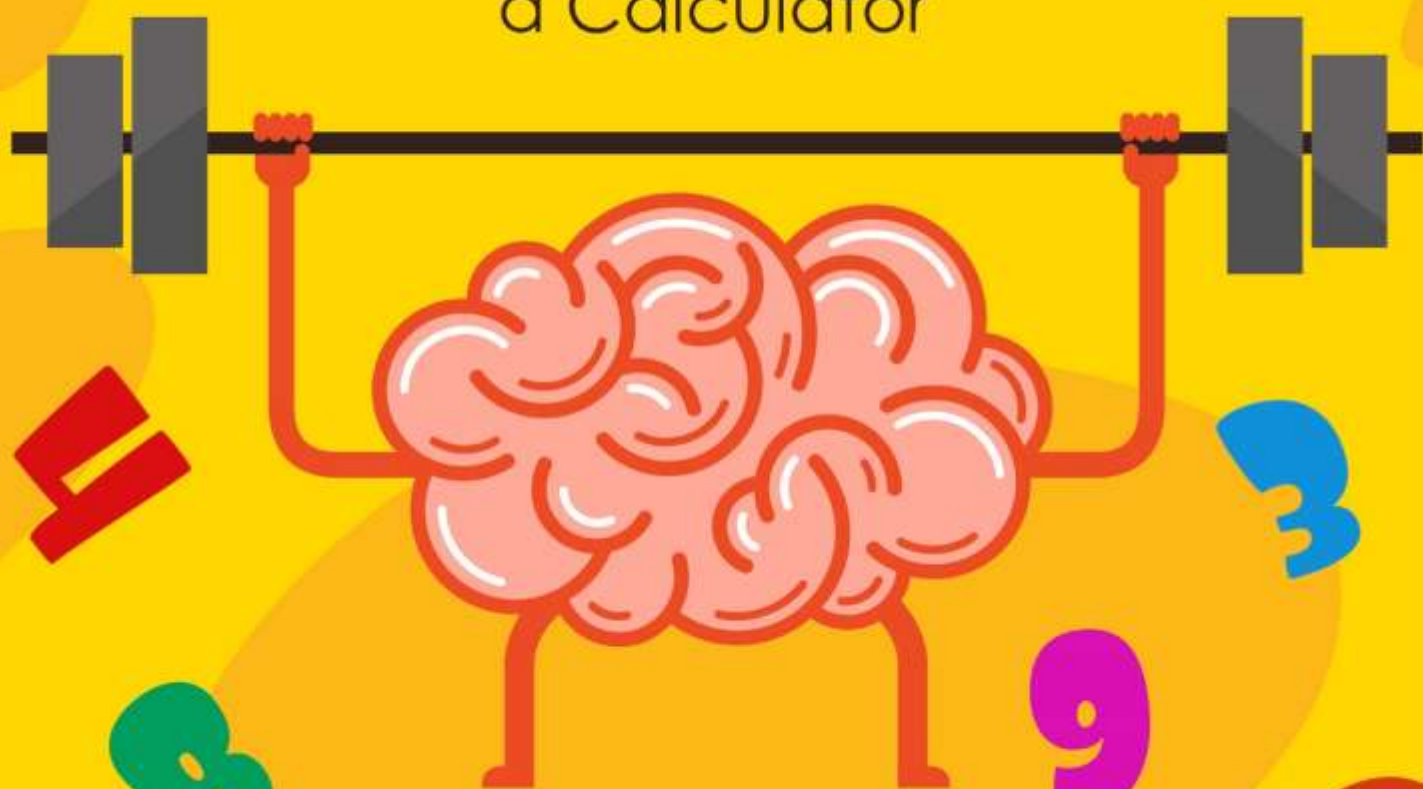


MENTAL SHORTCUTS FOR FASTER CALCULATION

How to Calculate Faster than
a Calculator



JIMMY LING

About the Author



Jimmy Ling graduated from NUS with a degree in Applied Mathematics and has been teaching Mathematics after graduation.

He is the co-founder and director of Grade Solution Learning Centre, a leading tuition centre in Singapore with more than 100+ students enrolled monthly.

He is also the founder and director of Jimmy Maths, which has more than 10,000 students learning Math online through our online courses.

He is the author of the following books:

- Your Complete Guide to Math Concepts
- 80 Useful Tricks to Solve Math Problems Easily
- PSLE Maths Specimen Papers (You can buy this in Popular bookstores)
- Math Revision Notes for Secondary Students
- Real-World Applications of Math Concepts

He was featured on the radio and Straits Times on how to do well in Math.

His YouTube channel which shares Math videos regularly has more than 4k subscribers. You can watch his videos here >>

https://www.youtube.com/channel/UC5RoF52CtQLYH_W8iX1FrwQ

You can check out his testimonials and reviews here >> [Testimonials](#)

Foreword

Thank you for downloading this eBook.

If you want your child to:

- Calculate Faster with Less Careless Mistakes
- Develop a better number sense
- Score more marks in Paper 1,

I am confident that your child can benefit from this book.

We have compiled different useful shortcuts for faster calculation and reducing careless mistakes, which many of our students have found them useful.

And many of these shortcuts are not taught in school!

These shortcuts do not require any special ability in Mathematics.

As long as your child can do simple arithmetic, your child will have no problems understanding and applying them.

Let your child read this book and let him select the ones which are of special interest to him.

You do not need to “force” your child to adopt the shortcuts in this eBook as your child may have his own preferred way.

Examples are given under each shortcut to show how it works.

However, your child needs to practice and use them regularly in order to produce speed and accuracy in his calculations.

As your child uses these shortcuts, he will probably see other ways to calculate faster and easier.

Letting your child make discoveries of his own will add excitement and brings his learning to a whole new level.

Keep in mind that these shortcuts are not intended to fully replace the calculator.

For long and complicated computations, it is better to use a calculator (provided your child is allowed to use them).

But for simpler questions, applying shortcuts can probably give the correct answer faster than punching into the calculator.

Shortcuts also enable your child to estimate the answers in advance.

Then your child can use a calculator to check the answers.

I hope that this book will assist your child in a better understanding of the basics and have fun working with numbers!

Sincerely Yours,
Jimmy Ling



How Can Your Child Improve in Math?

Many parents have approached me to coach their child.

If your child needs help too, feel free to enrol in my online courses or any of our tuition classes. (Sorry, I don't do one-to-one tuition)

Here are a few things to note:

- We don't drill your child on calculation questions for faster calculation. Instead, we focus on simplifying concepts in ways which your child can understand easily. It is important to know the WHY and not just the HOW.
- We don't do drilling of problem sums. Instead, we classify questions carefully to their heuristic or concepts, and let your child master each of them. We will also do revision constantly to revise the concepts again.
- We don't teach students to stick to one method of solving problem sums. We will teach a variety of methods so that your child has more tools to use during exams.

Here are 2 ways which you can seek help from us...



Does your child need help in his or her studies?

1) Live Zoom Lessons at Grade Solution Learning Centre



At Grade Solution Learning Centre, we are a team of dedicated educators whose mission is to guide your child to academic success.

Here are the services we provide:

- Live Zoom lessons
- Adaptably™, a smart learning platform that tracks your child's progress, strengths and weaknesses through personalised digital worksheets.
- 24/7 Homework Helper Service

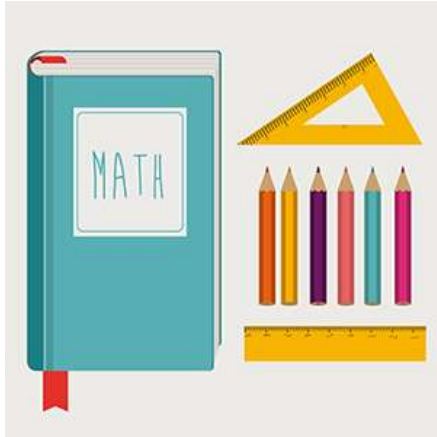
We provide all these services above at a very affordable monthly fee to allow as many students as possible to access such learning opportunities.

We specialise in English, Math, Science, and Chinese subjects.

You can see our fees and schedules here >>

<https://gradesolution.com.sg/schedule/>

2) Pre-recorded Online courses on Jimmymaths.com



If you are looking for something that fits your budget, or prefer your child learn at his or her own pace, you can join our pre-recorded online Math courses.

Your child can:

- Learn from recorded videos
- Get access to lots of common exam questions to ensure sufficient practice
- Get unlimited support and homework help

You can see the available courses here >>

<https://jimmymaths.com/our-courses/>

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1) Addition

a. Grouping to form 10s

We can break up the numbers into tens and ones for faster addition. We add up the tens together and the ones together before adding the two results.

Example 1:

$$\begin{array}{r} 28 + 46 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ 20 \quad 8 \quad 40 \quad 6 \end{array}$$

$$\begin{aligned} &= 20 + 40 + 8 + 6 \\ &= 60 + 14 \\ &= 74 \end{aligned}$$

This method works the same way as the vertical working which most of us commonly use. If the added value in the ones place is more than 10, we put the digit "1" at the top of the tens column, as shown below.

$$\begin{array}{r} 1 \\ 28 \\ + 46 \\ \hline 74 \end{array}$$

Alternatively, we can also regroup one of the numbers directly into tens for faster addition.

Example 2:

$$\begin{array}{r} 28 + 46 \\ \swarrow \quad \searrow \quad \swarrow \quad \searrow \\ 28 \quad 2 \quad 44 \end{array}$$

$$\begin{aligned} &= (28 + 2) + (46 - 2) \\ &= 30 + 44 \\ &= 74 \end{aligned}$$

b. Adding a series of numbers

To find the sum of a series of consecutive numbers, we divide the product of the last number and its next consecutive number.

For instance,

$$1 + 2 + 3 + \dots + 9 + 10$$

$$= \frac{10 \times 11}{2}$$

$$= \frac{110}{2}$$

$$= 55$$

The logic of this formula is actually to find the number of pairs of numbers in the series multiply by the value of each pair. In the above series, there are 10 numbers, which gives 5 pairs of numbers when we do pairing. This can be demonstrated below:



$$1 + 2 + 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10$$

Number of pairs $\times$ value of each pair

$$= \frac{10}{2} \times 11$$

$$= 55$$

Example 1:

$$1 + 2 + 3 + \dots + 19 + 20$$

$$= \frac{20 \times 21}{2}$$

$$= \frac{420}{2}$$

$$= 210$$

Example 2:

$$2 + 4 + 6 + \dots + 18 + 20$$

$$= 2 (1 + 2 + \dots + 10)$$

$$= 2 \left(\frac{10 \times 11}{2} \right)$$

$$= 2 \left(\frac{110}{2} \right)$$

$$= 110$$

c. Adding decimals

When adding decimals with different number of decimal places, we add zeroes behind so that they will have the same number of decimal places for easy addition. Use vertical working to avoid mistakes of adding digits of different place value.

Example 1:

$$\begin{aligned} 12 + 1.08 \\ = 12.00 + 1.08 \\ = 13.08 \end{aligned}$$

$$\begin{array}{r} 12.00 \\ + 1.08 \\ \hline 13.08 \end{array}$$

Example 2:

$$\begin{aligned} 0.5 + 2.56 \\ = 0.50 + 2.56 \\ = 3.06 \end{aligned}$$

$$\begin{array}{r} 0.50 \\ + 2.56 \\ \hline 3.06 \end{array}$$

Adding decimals with and without carrying a ten over is very similar to adding whole numbers. The only difference is having the decimal point placed correctly at the same column.

d. Adding fractions

When adding 2 fractions, we usually make the denominator common before adding them. Let's learn a faster way - Butterfly method.

Note: This applies for adding only 2 fractions each time.

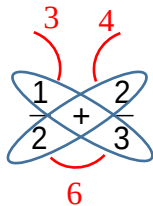
Step 1: Cross multiply numerator and denominator diagonally.

Step 2: Write both answers at the top and add them. This will be the numerator for your answer.

Step 3: Multiply the 2 original denominators. This will be the denominator for your answer.

Step 4: Simplify the fraction if necessary.

For instance,



$$\frac{1}{2} + \frac{2}{3}$$

$$= \frac{3+4}{6}$$

$$= \frac{7}{6}$$

$$= 1\frac{1}{6}$$

Example:

$$\frac{1}{8} + \frac{3}{5}$$

$$= \frac{5+24}{40}$$

$$= \frac{29}{40}$$

2) Subtraction

a. Subtraction without borrowing

We can break up the numbers into hundreds, tens and ones for faster subtraction. The digit in the hundreds, tens and ones place of the larger number will subtract the digit in the same place value of the smaller number.

For instance:

$$\begin{array}{r} 38 - 12 \\ \text{30} \quad \text{8} \quad \text{10} \quad \text{2} \end{array}$$

$$\begin{aligned} &= (30 - 10) + (8 - 2) \\ &= 20 + 6 \\ &= 26 \end{aligned}$$

This method works the same way as the vertical working we always use.

$$\begin{array}{r} 38 \\ - 12 \\ \hline 26 \end{array}$$

Example 1:

$$\begin{aligned} &46 - 15 \\ &= (40 - 10) + (6 - 5) \\ &= 30 + 1 \\ &= 31 \end{aligned}$$

Example 2:

$$\begin{aligned} &289 - 152 \\ &= (200 - 100) + (80 - 50) + (9 - 2) \\ &= 100 + 30 + 7 \\ &= 137 \end{aligned}$$

b. Subtraction with borrowing

If the ones digit is not enough to subtract, we can borrow a ten from the tens place and add 10 to the ones place.

For instance:

$$\begin{array}{r} 35 - 9 \\ \hline \end{array}$$

Diagram showing the decomposition of 35 into 20 and 15. A red line connects the 3 in 35 to the 20 below it. A blue oval encircles the 5 in 35 and the 15 below it, indicating that the 5 is being replaced by 15 by borrowing from the 30.

$$\begin{aligned} &= 20 + (15 - 9) \\ &= 20 + 6 \\ &= 26 \end{aligned}$$

The vertical working will look like this:

$$\begin{array}{r} 2 \quad 15 \\ \cancel{3} \quad \cancel{5} \\ - \quad 9 \\ \hline 2 \quad 6 \end{array}$$

Example 1:

$$\begin{aligned} &42 - 8 \\ &= 30 + (12 - 8) \\ &= 30 + 4 \\ &= 34 \end{aligned}$$

Example 2:

$$\begin{aligned} &101 - 7 \\ &= 90 + (11 - 7) \\ &= 90 + 4 \\ &= 94 \end{aligned}$$

c. Splitting numbers into easy parts

In addition to the method above, we can also split numbers into parts such as 10 for easy subtraction.

Example 1:

$$\begin{array}{r} 25 - 8 \\ 15 \quad 10 \end{array}$$

(Diagram showing 25 split into 15 and 10, and 8 subtracted from 10 to get 2. The 10 and 2 are circled together.)

$$\begin{aligned} &= 15 + (10 - 8) \\ &= 15 + 2 \\ &= 17 \end{aligned}$$

Example 2:

$$\begin{array}{r} 15 - 8 \\ 5 \quad 3 \end{array}$$

(Diagram showing 15 split into 10 and 5, and 8 subtracted from 10 to get 2. The 10 and 2 are circled together.)

$$\begin{aligned} &= (15 - 5) - 3 \\ &= 10 - 3 \\ &= 7 \end{aligned}$$

d. Subtracting decimals

Similar to adding decimals, when subtracting decimals with different number of decimal places, we add zeroes behind so that they will have the same number of decimal places for easy subtraction. Use vertical working to avoid mistakes of subtracting digits of different place value.

Example 1:

$$\begin{aligned} 3.45 - 1.2 \\ = 3.45 - 1.20 \\ = 2.25 \end{aligned}$$

$$\begin{array}{r} 3.45 \\ - 1.20 \\ \hline 2.25 \end{array}$$

Example 2:

$$\begin{aligned} 3.3 - 0.56 \\ = 3.30 - 0.56 \\ = 2.74 \end{aligned}$$

$$\begin{array}{r} \\ \cancel{3}. \cancel{3} \cancel{0} \\ - 0.56 \\ \hline 2.74 \end{array}$$

Subtracting decimals with and without borrowing is very similar to subtracting whole numbers. The only difference is having the decimal point placed correctly at the same column.

e. Subtracting fractions

When subtracting fractions, we usually make the denominator common before subtracting them. Similarly to addition fractions, we can also use the Butterfly method to subtract.

Note: This applies for subtracting only 2 fractions each time.

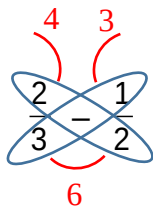
Step 1: Cross multiply numerator and denominator diagonally.

Step 2: Write both answers at the top and subtract them. This will be the numerator for your answer.

Step 3: Multiply the 2 original denominators. This will be the denominator for your answer.

Step 4: Simplify the fraction if necessary.

For instance,



$$= \frac{4 - 3}{6}$$

$$= \frac{1}{6}$$

Example 1:

$$\begin{aligned} & \frac{3}{4} - \frac{1}{5} \\ &= \frac{15 - 4}{20} \\ &= \frac{11}{20} \end{aligned}$$

Example 2:

$$\begin{aligned}
 & 2\frac{1}{4} - \frac{5}{8} \\
 &= \frac{9}{4} - \frac{5}{8} \\
 &= \frac{72-20}{32} \\
 &= \frac{52}{32} \\
 &= 1\frac{20}{32} \\
 &= 1\frac{5}{8}
 \end{aligned}$$

In Example 2, the mixed fraction is changed to improper fraction before using the Butterfly method to solve. We can also solve it by changing to the same denominator and then **borrowing** from the whole number to subtract, as shown below:

$$\begin{aligned}
 & 2\frac{1}{4} - \frac{5}{8} \\
 &= 2\frac{2}{8} - \frac{5}{8} \\
 & \quad \begin{array}{c} \text{1} \quad \text{1} \\ \text{2} \quad \text{2} \end{array} \\
 &= 1\frac{8+2}{8} - \frac{5}{8} \\
 &= 1\frac{10}{8} - \frac{5}{8} \\
 &= 1\frac{5}{8}
 \end{aligned}$$

When mixed fraction is involved, especially when borrowing is required, the above method can solve more quickly compared to the Butterfly method.

3) Multiplication

a. Multiplying by 10, 100, 1000 and their multiples

To multiply a number by 10 or 100 quickly, we can simply add 1 or 2 zeroes respectively at the back of the number. This applies to 1000 (add 3 zeroes) and so on as well.

Example 1a: Multiply by 10

$$13 \times 10 = 130$$

Example 1b: Multiply by 10

$$420 \times 10 = 4200$$

Example 2a: Multiply by 100

$$92 \times 100 = 9200$$

Example 2b: Multiply by 100

$$1201 \times 100 = 120100$$

To multiply a number by multiples of 10 or 100, we can do grouping. For instance, if we multiply a number N by 30, we can express it as $N \times 3 \times 10$ since $30 = 3 \times 10$. If we multiply a number N by 200, we can express it as $N \times 2 \times 100$ since $200 = 2 \times 100$.

Example 1: Multiply by multiple of 10

$$\begin{aligned} 15 \times 20 \\ &= 15 \times 2 \times 10 \\ &= 30 \times 10 \\ &= 300 \end{aligned}$$

Example 2: Multiply by multiple of 100

$$\begin{aligned} 25 \times 500 \\ &= 25 \times 5 \times 100 \\ &= 125 \times 100 \\ &= 12500 \end{aligned}$$

b. Multiplying by grouping

Understanding what a multiplication statement means can help us to multiply quickly by grouping.

For instance,

$$\begin{aligned} &13 \times 9 \\ &= (10 \times 9) + (3 \times 9) \\ &= 90 + 27 \\ &= 117 \end{aligned}$$

13×9 means 13 groups of 9. We can split the 13 groups into 10 and 3 groups, helping us to multiply with smaller numbers and then adding up to get the final answer.

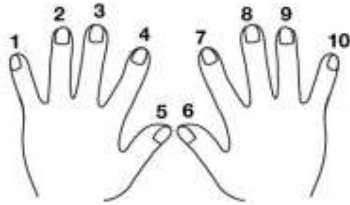
Example:

$$\begin{aligned} &14 \times 25 \\ &= (10 \times 25) + (4 \times 25) \\ &= 250 + 100 \\ &= 350 \end{aligned}$$

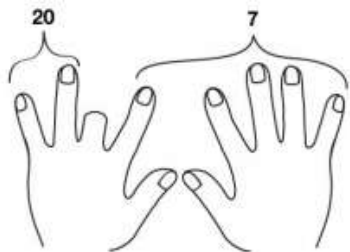
c. Multiplying by 9 using your hands

A very fast method of doing multiplication of 9 is this finger trick.

Step 1: Hold up all 10 of your fingers. Imagine they are numbered 1 through 10, as you see in the picture.



Step 2: Hold down the finger of the number that you want to multiply by 9. In this example, we are going to multiply by 3, so the 3rd finger is held down.

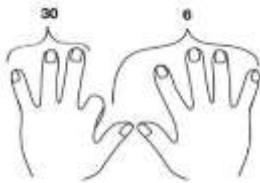


Step 3: The fingers to the left are the tens while the fingers to the right are the ones. Add up the tens and the ones to get the answer. In this case, it will be $20 + 7 = 27$.

This is how we get $9 \times 3 = 27$ using this finger trick!

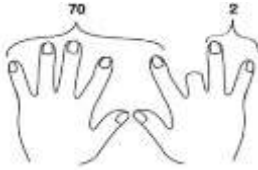
Example 1:

$$9 \times 4 = 36$$



Example 2:

$$9 \times 8 = 72$$



d. Multiplying with numbers ending with 9

To find multiplication with numbers ending with 9, we can apply grouping in order to get the answer quickly.

For instance,

$$\begin{aligned} 23 \times 9 \\ &= (23 \times 10) - (23 \times 1) \\ &= 230 - 23 \\ &= 207 \end{aligned}$$

In this case, we are using $9 = 10 - 1$ to do grouping and use the same way to multiply with smaller numbers and then adding up to get the final answer.

Example 1:

$$\begin{aligned} 14 \times 19 \\ &= (14 \times 20) - (14 \times 1) \\ &= 280 - 14 \\ &= 266 \end{aligned}$$

Example 2:

$$\begin{aligned} 50 \times 29 \\ &= (50 \times 30) - (50 \times 1) \\ &= 1500 - 50 \\ &= 1450 \end{aligned}$$

e. Multiplying by 11

Multiplying by 11 is one of the easiest tricks to learn because we do not have to do any multiplication. We just have to how to add.

The logic to this trick is actually multiplying by grouping, which is covered in the earlier section.

For instance,

$$\begin{aligned} 24 \times 11 \\ = (24 \times 10) + (24 \times 1) \\ = 240 + 24 \\ = 264 \end{aligned}$$

To get the answer quickly, we just have to add the numbers this way below:

$$\begin{array}{r} 24 \\ + \quad 24 \\ \hline 264 \end{array}$$

Example 1:

$$49 \times 11 = 539$$

$$\begin{array}{r} 49 \\ + \quad 49 \\ \hline 539 \end{array}$$

Example 2:

$$321 \times 11 = 3531$$

$$\begin{array}{r} 321 \\ + \quad 321 \\ \hline 3531 \end{array}$$

f. Multiplying square numbers that end with 5

There is a trick to multiply square numbers that end with 5 so quickly that you probably can get the answer faster than using a calculator.

Step 1: Take the digit(s) before 5 and multiply it by the next consecutive number.

Step 2: Place the answer in front of '25' and you will get the answer.

For instance,
 $25 \times 25 = 625$

Step 1: The digit before 5 is 2. Take 2 multiply by the next consecutive number which is 3. $(2 \times 3) = 6$

Step 2: Place the answer 6 in front of '25'. We get the answer 625.

Example 1:
 $75 \times 75 = 5625$

Step 1: $(7 \times 8) = 56$
Step 2: 5625

Example 2:
 $105 \times 105 = 11025$

Step 1: $(10 \times 11) = 110$
Step 2: 11025

g. Multiplying decimals

To multiply decimals, use vertical multiplication working where we always start from the ones place. We can ignore the decimal points when multiplying and then just add it in at the end. Do note that the **number of decimal places** in the final **answer** is the **sum of the number of decimal places** in the 2 decimals you multiply with.

Example 1:

$$3.6 \times 2 = 7.2 \text{ (answer has 1 decimal place)}$$

$$\begin{array}{r} \textcolor{red}{1} \\ 3.6 \\ \times \quad 2 \\ \hline 7.2 \end{array}$$

Example 2:

$$1.24 \times 2.3 = 2.852 \text{ (answer has 3 decimal places)}$$

$$\begin{array}{r} 1.24 \\ \times 2.3 \\ \hline 372 \\ 2480 \\ \hline 2852 \end{array}$$

When we multiply a decimal by 10, 100 or 1000 and so on, we can simply move the decimal point to the right with the number of times according to the number of zeroes.

Example 1: Multiply by 10 (Move the decimal point to the right once)

$$1.4 \times 10 = 14.0$$



Example 2: Multiply by 100 (Move the decimal point to the right twice)

$$1.432 \times 100 = 143.2$$



h. Multiplying fractions and whole numbers

When we multiply a fraction by another fraction, we can simply take the first numerator to multiply by second numerator and the first denominator to multiply by the second denominator.

For instance,

$$\begin{aligned} \frac{1}{2} \times \frac{2}{3} \\ = \frac{1 \times 2}{2 \times 3} \\ = \frac{2}{6} \\ = \frac{1}{3} \end{aligned}$$

To work it out more quickly, we can simplify first by dividing one numerator and one denominator by their common factor (can be diagonally or up and down) before multiplying, like this:

$$\begin{aligned} \frac{1}{\cancel{2}} \times \frac{\cancel{2}}{3} \quad \text{Divide by 2 gives 1} \\ = \frac{1 \times 1}{1 \times 3} \\ = \frac{1}{3} \end{aligned}$$

Example 1: Fraction multiply by fraction

$$\begin{aligned} \frac{1}{\cancel{3}} \times \frac{\cancel{6}^2}{7} \\ = \frac{1 \times 2}{1 \times 7} \\ = \frac{2}{7} \end{aligned}$$

Example 2: Fraction multiply by whole number or vice versa

$$\frac{2}{5} \times 100$$

$$= \frac{2}{\cancel{5}} \times \frac{\cancel{100}^{20}}{1}$$

100 can be written as $\frac{100}{1}$ to make it a fraction.

$$\begin{aligned} = \frac{2 \times 20}{1 \times 1} \\ = 40 \end{aligned}$$

i. Finding percentage of a value

In order to find percentage of a value quickly, we first convert the percentage to fraction, simplify and then multiply. To convert, simply divide it by 100.

For instance, to find 20% of 250, convert 20% to $\frac{20}{100} = \frac{1}{5}$ first. Then we take this fraction and multiply by 250, which gives $\frac{1}{5} \times 250 = 50$. Recall how we multiply fractions and whole numbers earlier.

Example 1:

40% of 300

$$= \frac{40}{100} \times 300$$

$$= \frac{2}{5} \times 300$$

$$= 120$$

Example 2:

120% of 60

$$= \frac{120}{100} \times 60$$

$$= \frac{6}{5} \times 60$$

$$= 72$$

j. Conversion of fraction to percentage

In order to convert fraction to percentage, we change the denominator to 100.

For instance,

$$\frac{1}{4} = \frac{25}{100} = 25\%$$

Example 1:

$$\frac{4}{5} = \frac{80}{100} = 80\%$$

Example 2:

$$3\frac{1}{5} = 3\frac{20}{100} = 320\%$$

Example 3:

$$\frac{1}{8} = \frac{125}{1000} = 12.5\%$$

Alternatively, we can simply multiply by 100% in order to convert a fraction to percentage.

For instance,

$$\frac{1}{4} \times 100\% = \frac{100}{4}\% = 25\%$$

Example 1:

$$\frac{2}{5} \times 100\% = 40\%$$

Example 2:

$$2\frac{1}{2} \times 100\% = 250\%$$

4) Division

a. Dividing by 10, 100 and their multiples

To divide a number by 10 or 100 quickly, we can simply remove the last 1 or 2 zeroes respectively. This applies to 1000 (remove 3 zeroes) and so on as well.

Example 1a: Divide by 10

$$24\textcolor{red}{0} \div 1\textcolor{red}{0} = 24$$

Example 1b: Divide by 10

$$350\textcolor{red}{0} \div 1\textcolor{red}{0} = 350$$

Example 2a: Divide by 100

$$89\textcolor{red}{00} \div 1\textcolor{red}{00} = 89$$

Example 2b: Divide by 100

$$120\textcolor{red}{00} \div 1\textcolor{red}{00} = 120$$

To divide a number by multiples of 10 or 100, we can do grouping. For instance, if we divide a number N by 20, we can express it as $N \div 10 \div 2$ since $20 = 10 \times 2$. If we divide a number N by 400, we can express it as $N \div 100 \div 4$ since $400 = 100 \times 4$.

Example 1: Divide by multiple of 10

$$\begin{aligned} 350 \div 50 \\ &= 35\textcolor{red}{0} \div 1\textcolor{red}{0} \div 5 \\ &= 35 \div 5 \\ &= 7 \end{aligned}$$

Example 2: Divide by multiple of 100

$$\begin{aligned} 4800 \div 400 \\ &= 48\textcolor{red}{00} \div 1\textcolor{red}{00} \div 4 \\ &= 48 \div 4 \\ &= 12 \end{aligned}$$

b. Long division

A standard way to divide without using calculators is to use long division.

Dividend $\div$ divisor = quotient and remainder (if any)

Step 1: Starting from the first digit of the dividend, divide by the divisor and write the quotient at the top.

Step 2: Multiply the quotient by the divisor and subtract it from the dividend.

Step 3: Bring down the next digit in the dividend.

Step 4: Repeat the cycle from Step 1 until no more digits to bring down.

For instance,
 $300 \div 7 = 106$

$$\begin{array}{r}
 106 \\
 7 \overline{) 300} \\
 \underline{-7} \\
 0 \\
 \underline{-0} \\
 0 \\
 \underline{-0} \\
 0
 \end{array}$$

Example:

$$521 \div 3 = 173 \text{ R}2$$

$$\begin{array}{r}
 173 \text{ R}2 \\
 3 \overline{) 521} \\
 \underline{-3} \\
 2 \\
 \underline{-2} \\
 0 \\
 \underline{-0} \\
 0
 \end{array}$$

Important: $521 = 173 \times 3 + 2$

This is a good way to check your answer!

c. Dividing decimals

To divide decimals, we simply use long division just like how we do for whole numbers. However, note that the **decimal point** in the **quotient** must be at the **same position** as it is in the **dividend**.

Example:

$$7.21 \div 7 = 1.03$$

$$\begin{array}{r}
 1.03 \\
 7 \overline{) 7.21} \\
 \underline{-7} \\
 02 \\
 \underline{-0} \\
 21 \\
 \underline{-21} \\
 0
 \end{array}$$

When we divide a decimal by 10, 100 or 1000 and so on, we can simply move the decimal point to the left with the number of times according to the number of zeroes.

Example 1: Divide by 10 (Move the decimal point to the left once)

$$12.4 \div 10 = 1.24$$



Example 2: Divide by 100 (Move the decimal point to the left twice)

$$143.2 \div 100 = 1.432$$



d. Dividing by 5 and 25

We can divide any number by 5 quickly by multiplying by 2 and then dividing by 10. When dividing by 10, we can simply move the decimal point to the left once.

For instance,

$$\begin{aligned} 32 \div 5 \\ &= (32 \times 2) \div 10 \\ &= 64.0 \div 10 \\ &\quad \downarrow \\ &= 6.4 \end{aligned}$$

Example:

$$\begin{aligned} 44 \div 5 \\ &= (44 \times 2) \div 10 \\ &= 88 \div 10 \\ &= 8.8 \end{aligned}$$

We can divide any number by 25 quickly by multiplying by 4 and then dividing by 100. When dividing by 100, we can simply move the decimal point to the left twice.

For instance,

$$\begin{aligned} 16 \div 25 \\ &= (16 \times 4) \div 100 \\ &= 64.0 \div 100 \\ &\quad \downarrow \downarrow \\ &= 0.64 \end{aligned}$$

Example:

$$\begin{aligned} 30 \div 25 \\ &= (30 \times 4) \div 100 \\ &= 120 \div 100 \\ &= 1.2 \end{aligned}$$

e. Divisibility test for 2, 3, 4, 5, 6, 9, 10

A divisibility test is a rule for determining whether a whole number is divisible by another. It is a quick way to find factors of large numbers.

A number is divisible by	If	Example(s)
2	The last digit is even (ends with 0, 2, 4, 6, 8)	120 (ends with 0) 824 (ends with 4)
3	The sum of the digits is divisible by 3	195 (sum of digits = $1+9+5=15$, which is divisible by 3)
4	The number formed by the last 2 digits is divisible by 4	128 (the last 2 digits form 28, which is divisible by 4)
5	The last digit is 0 or 5	110 (ends with 0) 365 (ends with 5)
6	The number is divisible by both 2 and 3	120 (divisible by 2 and 3) 390 (divisible by 2 and 3)
9	The sum of the digits is divisible by 9	297 (sum of digits = $2+9+7=18$, which is divisible by 9)
10	The last digit is 0	230 (ends with 0) 1150 (ends with 0)

f. Dividing fractions and whole numbers

When we do division involving fractions, we use a mnemonic “KCF” where “K” is for “Keep”, “C” for “Change”, and “F” for “Flip” so we can remember the steps more easily.

K - “Keep” the first fraction as it is

C - “Change” the division sign to multiplication sign

F - “Flip” the numerator and denominator for the second fraction

Example 1: Fraction divide by fraction

$$\frac{1}{5} \div \frac{1}{3} = \frac{1}{5} \times \frac{3}{1} = \frac{3}{5}$$

Example 2: Fraction divide by whole number

$$\frac{1}{5} \div 4 = \frac{1}{5} \times \frac{1}{4} = \frac{1}{20}$$

4 can be written as $\frac{4}{1}$, hence it will become $\frac{1}{4}$ after “flipping” the numerator and denominator.

Example 3: Whole number divide by fraction

$$3 \div \frac{2}{7} = \frac{3}{1} \times \frac{7}{2} = \frac{21}{2} = 10\frac{1}{2}$$

3 can be written as $\frac{3}{1}$. Then using “KCF”, we can get the answer without using a calculator.

g. Conversion of fractions to decimals

In order to express a fraction as a decimal without using a calculator, we use long division to get the answer.

Note: If we are required to leave in 1 decimal place, we write the dividend in 2 decimal places. For instance, if we need to express $\frac{3}{5}$ as a decimal with 1 decimal place, we will write 3.00 (2 decimal place) divided by 5 in our long division working. This is so that we can round off the second decimal place. Similarly, if we are required to leave our answer in 2 decimal places, we write the dividend in 3 decimal places.

Example 1:

Express $\frac{2}{7}$ as a decimal corrected to 1 decimal place.

$$\begin{array}{r}
 0. \quad 2 \quad 8 \\
 7 \overline{) 2. \quad 0 \quad 0} \\
 \underline{-0} \\
 2 \quad 0 \\
 \underline{-1} \quad 4 \\
 6 \quad 0 \\
 \underline{-5} \quad 6 \\
 4
 \end{array}$$

$$\frac{2}{7} \approx 0.2\bar{8} \approx 0.3 \text{ (1 d.p.)}$$

Example 2:

Express $\frac{2}{7}$ as a decimal corrected to 2 decimal places.

$$\begin{array}{r}
 0. \quad 2 \quad 8 \quad 5 \\
 7 \overline{) 2. \quad 0 \quad 0 \quad 0} \\
 \underline{-0} \\
 2 \quad 0 \\
 \underline{-1} \quad 4 \\
 6 \quad 0 \\
 \underline{-5} \quad 6 \\
 4 \quad 0 \\
 \underline{-3} \quad 5 \\
 5
 \end{array}$$

$$\frac{2}{7} \approx 0.28\bar{5} \approx 0.29 \text{ (2 d.p.)}$$

How We Teach Math at Jimmy Maths & Grade Solution

KCA Math Teaching Methodology: A Comprehensive Approach to Mastering Math Problems

At our core, we believe in empowering your child to not only understand math concepts but also to apply them confidently and efficiently.

Our KCA (Keywords, Concepts, Applications) methodology is designed to guide your child through each step of the problem-solving process, ensuring mastery of the subject.

1. **Keywords**

The first step in solving any math problem is identifying and understanding the keywords.

We teach your child how to spot these critical terms and, more importantly, how to translate them into correct mathematical operations. Many students grasp the meaning behind the words but struggle to convert that understanding into proper math workings.

For example, when a problem states, "A has 20% more than B," "A has $\frac{1}{5}$ as many as B," or "A has $\frac{1}{3}$ of B," we guide your child on how to accurately express these relationships in mathematical terms.

2. **Concepts**

Once the keywords are identified, the next step is linking them to the correct mathematical concept. A concept is the foundational idea or strategy needed to solve the problem. To ensure your child masters these concepts, we provide a step-by-step framework for each one. This structured approach helps your child to build a deep understanding and confidence in applying these concepts to various problems.

Additionally, we utilize our **Concept Mastery Method**, where practice questions are grouped by concept, allowing your child to focus on and master one idea at a time.

Below are some examples of how we train students to link to the right concept:

Keywords	Concepts
More than, Less than	Comparison Model
Transfer	Constant Total
Age, both items increase/decrease by same amount	Constant Difference
One item unchanged	Constant Part
Given total items and value of each item	Assumption
Given ratio of items and value of each item	Number x Value
Given final amount and find starting amount	Working Backwards
Given difference in each unit and final difference	Gap and Difference

3. Applications

Understanding the concept is crucial, but applying it efficiently is where true mastery lies. In this phase, we teach your child the most effective methods to solve different types of problems. While there may be multiple ways to arrive at a solution, some methods are **more efficient** than others.

For instance, using an assumption might be quicker than guess and check, or algebra could be more efficient than model drawing in certain scenarios. By learning the most efficient strategies, your child can tackle problems more quickly and accurately.

When it comes to formulas and methods, we do not just teach students to memorise them. Instead, we use stories, diagrams, and videos to ensure students have a **full understanding** of how they work.

To reinforce these skills, we use a **Confidence-Building Approach** in our worksheets. This approach arranges questions in increasing order of difficulty, allowing your child to build confidence with easier questions before progressing to more challenging ones.

Initially, we guide your child through the first few steps of solving a problem, providing clear explanations and support. This helps them understand the process and feel secure in their abilities.

As your child becomes more comfortable, we gradually reduce the level of guidance, allowing them to take on more responsibility for solving the problems on their own. This step-by-step reduction in assistance is carefully calibrated to ensure that your child remains confident while developing the skills needed to tackle challenges independently.

To make students aware of the common mistakes, we use an **Inversion Approach** which we show the incorrect solutions in class and get students to spot the errors.

Lastly, we believe that learning should be engaging and fun. That's why we incorporate a **Gamified-Learning Approach** which we use interactive games in class to test and reinforce your child's understanding of the concepts. These games not only make learning enjoyable but also provide a dynamic way to assess and strengthen your child's grasp of the material.

Check Out Some of Our Success Stories Below!



Wynne Lee
 1 review

★★★★★ 2 hours ago

Thankful to Mr Jimmy Ling and team at Grade Solution. Their lessons help to develop a strong foundation in maths. Thanks to their patience, passionate and knowledgeable teaching, my girl was the highest scorer in her class for the most recent math WA.



Nicole L Zhang
 2 reviews

★★★★★ 42 minutes ago

My son has been attending Math lessons with Mr. Jimmy since Primary 5. At the end of P5, he achieved an A3 for his year-end exam. Most recently, in a P6 Paper 2, he scored 33 out of 34—a remarkable improvement!

This progress is all thanks to Mr. Jimmy's patient guidance and engaging teaching methods. My son genuinely enjoys every lesson and has even expressed interest in continuing beyond the current level.

Thank you, Mr. Jimmy, for making Math both fun and rewarding!

 Press and hold to react



Daphne Phoeng
 2 reviews

★★★★★ 21 hours ago

My child scored full marks in his latest P5 Maths paper thanks to the lessons taught by Mr Jimmy. He thoroughly enjoyed these lessons as they are fun and engaging. He's always looking forward to the lessons and being prepared for the lessons which I believe helps him a lot in his own preparation for the school papers.

Does your child need help in his or her studies?

1) Live Zoom Lessons at Grade Solution Learning Centre



At Grade Solution Learning Centre, we are a team of dedicated educators whose mission is to guide your child to academic success.

Here are the services we provide:

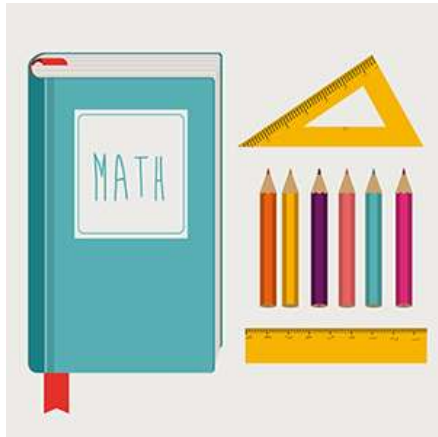
- Live Zoom lessons
- Adaptably™, a smart learning platform that tracks your child's progress, strengths and weaknesses through personalised digital worksheets.
- 24/7 Homework Helper Service

We provide all these services above at a very affordable monthly fee to allow as many students as possible to access such learning opportunities.

You can see our fees and schedules here >>

<https://gradesolution.com.sg/schedule/>

2) Pre-recorded Online courses on Jimmymaths.com



If you are looking for something that fits your budget, or prefer your child learn at his or her own pace, you can join our pre-recorded online Math courses. Your child can:

- Learn from recorded videos
- Get access to lots of common exam questions to ensure sufficient practice
- Get unlimited support and homework help

You can see the available courses here >>

<https://jimmymaths.com/our-courses/>