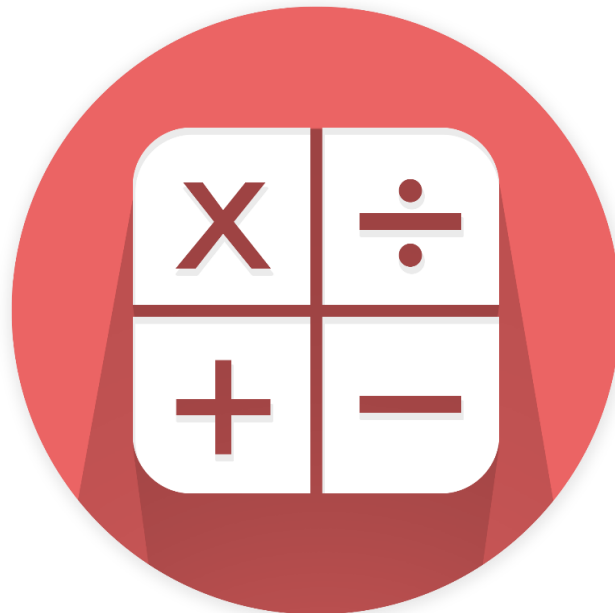




## Years 5 and 6 Mathematics

### Arithmetic Methods



This booklet has been prepared to provide parents and carers with the methods of calculation that pupils need to be confident with to meet the requirements of the Year 5 and 6 curriculum.

Knowledge of times tables up to 12 x 12 is essential.

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## Formal Written Method for Addition

The answer to an addition question is called the **sum**.

$$12,789 + 1,642$$

Step 1: Place the numbers one on top of the other, lining up the place value columns starting with the ones.

$$\begin{array}{r} 12789 \\ + 1642 \\ \hline 14431 \\ \hline \end{array}$$

Step 2: Add the ones and carry any tens to the tens column.

$$\begin{array}{r} 12789 \\ + 1642 \\ \hline 1 \\ \hline \end{array}$$

Step 3: Add the tens (including any tens you carried) and carry any hundreds to the hundreds column.

$$\begin{array}{r} 12789 \\ + 1642 \\ \hline 31 \\ \hline \end{array}$$

Step 4: Add the hundreds (including any hundreds you carried) and carry any thousands to the thousands column.

$$\begin{array}{r} 12789 \\ + 1642 \\ \hline 431 \\ \hline \end{array}$$

Step 5: Add the thousands (including any thousands you carried) and carry any ten thousands to the ten thousands column.

$$\begin{array}{r} 12789 \\ + 1642 \\ \hline 4431 \\ \hline \end{array}$$

Step 6: Add the ten thousands (including any ten thousands you carried).

$$\begin{array}{r} 1 \ 2 \ 7 \ 8 \ 9 \\ \underline{\phantom{1} \ 1 \ 6 \ 4 \ 2} \\ 1 \ 4 \ 4 \ 3 \ 1 \\ \phantom{1} \ + \phantom{1} \ + \phantom{1} \end{array}$$

Step 5: Write your answer.

$$12,789 + 1,642 = 14,431$$

Check your answer.

## Formal Written Method for Subtraction

The answer to a subtraction question is called the **difference**.

$$12,932 - 1,457$$

Step 1: Place the numbers one on top of the other, lining up the place value columns starting with the ones.

$$\begin{array}{r} 12932 \\ - 1457 \\ \hline \hline \end{array}$$

Step 2: Subtract the ones (note that 2 minus 7 is negative).

$$\begin{array}{r} 12932 \\ - 1457 \\ \hline \hline \end{array}$$

Step 3: Steal 10 from the 30 to make 12 ones. Subtract 7 from 12.

$$\begin{array}{r} 129\overset{2}{\cancel{3}}\overset{1}{2} \\ - 1457 \\ \hline \hline 5 \end{array}$$

Step 4: Subtract the tens (note that 2 minus 5 is negative).

$$\begin{array}{r} 129\overset{2}{\cancel{3}}\overset{1}{2} \\ - 1457 \\ \hline \hline 5 \end{array}$$

Step 5: Steal 100 from the 900 to make 12 tens. Subtract 5 from 12.

$$\begin{array}{r} 12\overset{8}{\cancel{9}}\overset{12}{\cancel{3}}\overset{1}{2} \\ - 1457 \\ \hline \hline 75 \end{array}$$

Step 6: Subtract the hundreds:  $800 - 400 = 400$ .





Step 9: Write your answer.

$$1,342 \times 7 = 9,394$$

Check your answer

### Long Multiplication

$$124 \times 26$$

Step 1: Place the numbers one on top of the other, lining up the hundreds, tens and ones. Put in a zero as a place holder for when you multiply by the number in the 10s column.

$$\begin{array}{r} \phantom{1} \phantom{2} \phantom{4} \\ X \phantom{2} \phantom{6} \\ \hline \phantom{0} \\ \hline \hline \end{array}$$

Step 2: Multiply the top number by the ones in the bottom number and write the product under the line.

$$\begin{array}{r} \phantom{1} \phantom{2} \\ X \phantom{2} \phantom{6} \\ \hline \phantom{7} \phantom{4} \phantom{4} \\ \hline \phantom{0} \\ \hline \hline \end{array}$$

Step 3: Multiply the top number with the tens in the bottom number (keeping the “zero” place holder in place) and write the product under the line.

$$\begin{array}{r} \phantom{1} \phantom{2} \\ X \phantom{2} \phantom{6} \\ \hline \phantom{7} \phantom{4} \phantom{4} \\ \hline \phantom{2} \phantom{4} \phantom{8} \phantom{0} \\ \hline \hline \end{array}$$

Step 4: Add the two products together to get your final answer.

$$\begin{array}{r} \phantom{1} \phantom{2} \\ X \phantom{2} \phantom{6} \\ \hline \phantom{7} \phantom{4} \phantom{4} \\ \hline \phantom{2} \phantom{4} \phantom{8} \phantom{0} \\ \hline \phantom{3} \phantom{2} \phantom{2} \phantom{4} \\ \hline \phantom{1} \phantom{1} \end{array}$$

$$124 \times 26 = 3224$$

Step 5: Check your answer.



## Short Division

The answer to a division question is called the **quotient**.

$432 \div 5$  becomes:

$$5 \overline{) 432}$$

Step 1: How many 5s in 4? (this is actually 400 but for this method we think of it as 4). This is less than 1 and so we carry the hundreds to the tens.

$$5 \overline{) 432}$$

Step 2: How many 5s in 43? (this is actually 430 but for this method we think of it as 43).  $43 \div 5 = 8r3$ . Carry the remaining 3 tens to the ones column to make 32.

$$\begin{array}{r} 8 \\ 5 \overline{) 432} \\ \underline{40} \phantom{0} \\ 32 \phantom{0} \\ \underline{30} \\ 2 \phantom{0} \end{array}$$

Step 3: How many 5s in 32?  $32 \div 5 = 6r2$ .

$$\begin{array}{r} 8 \ 6 \ r2 \\ 5 \overline{) 432} \\ \underline{40} \phantom{0} \\ 32 \phantom{0} \\ \underline{30} \\ 2 \phantom{0} \end{array}$$

Answer: 86 remainder 2

Step 4: Convert the remainder to a fraction or a decimal.

$$\frac{2}{5} \text{ OR } 0.4$$

$$432 \div 5 = 86 \frac{2}{5} \text{ OR } 86.4$$

Step 5: Check your answer.

## Long Division Using the Chunking Method

$432 \div 15$  becomes:

$$15 \overline{) 432}$$

Step 1: You know that  $15 \times 10$  is 150, so take this "chunk" away from 432.

$$\begin{array}{r} 15 \overline{) 432} \\ \underline{150} \quad (15 \times 10) \\ 282 \end{array}$$

Step 2: 282 is less than 150 and so take another 150 "chunk" away.

$$\begin{array}{r} 15 \overline{) 432} \\ \underline{150} \quad (15 \times 10) \\ 282 \\ \underline{150} \quad (15 \times 10) \\ 132 \end{array}$$

Step 3: You know that  $15 \times 5$  is 75, so take this "chunk" away.

$$\begin{array}{r} 15 \overline{) 432} \\ \underline{150} \quad (15 \times 10) \\ 282 \\ \underline{150} \quad (15 \times 10) \\ 132 \\ \underline{75} \quad (15 \times 5) \\ 57 \end{array}$$

Step 4: You know that  $15 \times 3$  is 45, so take this "chunk" away. This leaves a remainder of 12.

$$\begin{array}{r} 15 \overline{) 432} \\ \underline{150} \quad (15 \times 10) \\ 282 \\ \underline{150} \quad (15 \times 10) \\ 132 \\ \underline{75} \quad (15 \times 5) \\ 57 \\ \underline{45} \quad (15 \times 3) \\ 12 \quad (\text{remainder}) \end{array}$$

Step 5: Add together the number of 15's that you took away to get your answer (not forgetting the remainder).

$$\begin{array}{r}
 15 \overline{) 432} \\
 - \underline{150} \quad (15 \times 10) \\
 282 \\
 - \underline{150} \quad (15 \times 10) \\
 132 \\
 - \underline{75} \quad (15 \times 5) \\
 57 \\
 - \underline{45} \quad (15 \times 3) \\
 12 \quad (\text{remainder}) \\
 10 + 10 + 5 + 3 = 28
 \end{array}$$

Answer is 28 remainder 12

Step 6: Convert the remainder to a fraction. Check if it can be simplified.

$$\frac{12}{15}$$

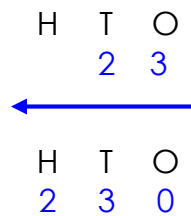
$$432 \div 15 = 28 \frac{12}{15} \quad 432 \div 15 = 28 \frac{4}{5}$$

Step 7: Check your answer.

## Multiplying by 10, 100 and 1,000

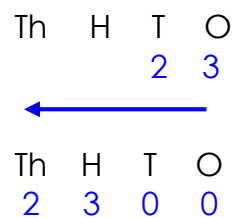
To multiply by 10 move the digits one place to the left.

$$23 \times 10 = 230$$



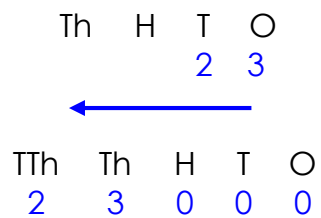
To multiply by 100 move the digits two places to the left.

$$23 \times 100 = 2300$$



To multiply by 1,000 move the digits three places to the left


$$23 \times 1000 = 23,000$$



## Dividing by 10, 100 and 1,000

To divide by 10 move the digits one place to the right.

$$23 \div 10 = 2.3$$

H	T	O	.	t
	2	3	.	0
				
H	T	O	.	t
	2		.	3

To divide by 100 move the digits two places to the right.

$$23 \div 100 = 0.23$$

H	T	O	.	t	h
	2	3	.	0	
					
H	T	O	.	t	h
		0	.	2	3

To divide by 1000 move the digits three places to the right.

$$2300 \div 1000 = 2.3$$

Th	H	T	O	.	t	
	2	3	0	0	.	0
						
Th	H	T	O	.	t	
			2	.	3	

## Fractions

A **unit fraction** is a fraction where the numerator is "1".

$$\frac{1}{8}$$

A **proper fraction** is a fraction where the numerator is smaller than the denominator.

$$\frac{3}{8}$$

An **improper fraction** is a fraction where the numerator is larger than the denominator (top heavy).

$$\frac{8}{3}$$

A **mixed number** is made up of a whole number and a fraction.

$$2 \frac{8}{3}$$

## Simplifying Fractions

To simplify a fraction means to convert it to its lowest form.

$$\frac{24}{108}$$

Step 1: Divide the numerator (number above the line) and the denominator (number below the line) by the same amount.

$$\frac{24}{108} \div 2 = \frac{12}{54}$$

Step 2 Continue to divide the numerator and denominator evenly until you can't go any further, until you reach your answer.

$$\frac{24}{108} \div 2 = \frac{12}{54} \div 2 = \frac{6}{27} \div 3 = \frac{2}{9}$$

$$\frac{24}{108} \text{ in its simplest form is } \frac{2}{9}$$

Step 3 Check your answer.

## Equivalent Fractions

Equivalent fractions are fractions that look different but show exactly the same amount.

Equivalent fractions are found by evenly multiplying or dividing the numerator and denominator.

For example:

$$\frac{4}{18} \quad \begin{matrix} \times 3 \\ \times 3 \end{matrix} \quad \frac{12}{54} \quad \begin{matrix} \times 2 \\ \times 2 \end{matrix} \quad \frac{24}{108}$$

Or:

$$\frac{64}{136} \quad \begin{matrix} \div 4 \\ \div 4 \end{matrix} \quad \frac{16}{34} \quad \begin{matrix} \div 2 \\ \div 2 \end{matrix} \quad \frac{8}{17}$$



## Adding and Subtracting Fractions

Adding or subtracting fractions with the same denominator:

Step 1: Add the numerators keeping the denominator the same.

$$\frac{5}{8} + \frac{2}{8}$$

$$\frac{5 + 2}{8}$$

$$\frac{7}{8}$$

Step 2: Check your answer.

Step 1: Subtract the numerators from each other keeping the denominator the same.

$$\frac{5}{8} - \frac{2}{8}$$

$$\frac{5 - 2}{8}$$

$$\frac{3}{8}$$

Step 2: Check your answer.

Adding or subtracting fractions with the different denominators:

$$\frac{3}{8} + \frac{2}{6} \quad \text{OR} \quad \frac{3}{8} - \frac{2}{6}$$

Step 1: Make the denominators the same.

Find the lowest common multiple (the lowest number in both the 8 and the 6 times table). In this case the lowest common multiple is 24.

$$1 \times 8 = 8 \text{ (8 is not in the 6 times table)}$$

$$2 \times 8 = 16 \text{ (16 is not in the 6 times table)}$$

$$3 \times 8 = 24 \text{ (24 is in the 6 times table)}$$

24 is the lowest common multiple of 6 and 8.

Step 2: Convert both fractions so that their denominators are 24.

Remember to multiply the numerator and the denominator evenly.

$$\frac{3}{8} \times \frac{3}{3} = \frac{9}{24} \quad \frac{2}{6} \times \frac{4}{4} = \frac{8}{24}$$

Step 3: Add or subtract the numerators keeping the denominator the same.

$$\frac{9}{24} + \frac{8}{24} \quad \text{OR} \quad \frac{9}{24} - \frac{8}{24}$$

$$\frac{9+8}{24} \quad \text{OR} \quad \frac{9-8}{24}$$

$$\frac{17}{24} \quad \text{OR} \quad \frac{1}{24}$$

$$\frac{3}{8} + \frac{2}{6} = \frac{17}{24} \quad \text{OR} \quad \frac{3}{8} - \frac{2}{6} = \frac{1}{24}$$

Step 4: Check your answer.

## Multiplying Fractions

$$\frac{2}{3} \times \frac{3}{5}$$

Step 1: Multiply the numerators (the top numbers)

$$\frac{2}{3} \times \frac{3}{5} = \frac{6}{5}$$

Step 2: Multiply the denominators (the bottom numbers).

$$\frac{2}{3} \times \frac{3}{5} = \frac{6}{15}$$

Step 3: Simplify your answer using the method described above.

$$\frac{6}{15} \div 3 = \frac{2}{5}$$

$$\frac{2}{3} \times \frac{3}{5} = \frac{2}{5}$$

Step 4: Check your answer.

## Dividing Fractions by Whole Numbers Using the Keep, Change, Flip Method

$$\frac{3}{8} \div 2$$

Step 1: Re-write the whole number as a fraction (Note that 2 wholes is represented in fraction format as)

$$2 = \frac{2}{1}$$

Step 2: Re-write the number sentence using the **Keep, Change, Flip** method:

**Keep** the first fraction as it is.

**Change** the operator from  $\div$  to  $\times$

**Flip** the second fraction

$$\begin{array}{ccc} \frac{3}{8} & \div & \frac{2}{1} \\ \text{Keep} & \text{Change} & \text{Flip} \\ \frac{3}{8} & \times & \frac{1}{2} \end{array}$$

Step 3 Follow the method above for multiplying fractions.

$$\frac{3}{8} \times \frac{1}{2} = \frac{3 \times 1}{8 \times 2} = \frac{3}{16}$$

$$\frac{3}{8} \div 2 = \frac{3}{16}$$

Step 5 Check your answer.

## Dividing Fractions by Fractions Using the Keep, Change, Flip Method

$$\frac{3}{8} \div \frac{1}{2}$$

Step 1: Re-write the number sentence using the **Keep, Change, Flip** method:

**Keep** the first fraction as it is.

**Change** the operator from  $\div$  to  $\times$

**Flip** the second fraction

$$\begin{array}{ccc} \frac{3}{8} & \div & \frac{1}{2} \\ \text{Keep} & \text{Change} & \text{Flip} \\ \frac{3}{8} & \times & \frac{2}{1} \end{array}$$

Step 2 Follow the method above for multiplying fractions.

$$\frac{3}{8} \times \frac{2}{1} = \frac{3 \times 2}{8 \times 1} = \frac{6}{8}$$

Step 3 Simplify your answer using the method described above.

$$\begin{array}{ccc} \frac{6}{8} & \div 2 & \frac{3}{4} \\ & \div 2 & \\ \frac{3}{8} & \div \frac{1}{2} & = \frac{3}{4} \end{array}$$

Step 4 Check your answer.

## Converting Improper Fractions to Mixed Numbers

$$\frac{7}{3}$$

Step 1: Divide the numerator (the top number) by the denominator (the bottom number)

$$7 \div 3 = 2 \text{ remainder } 1$$

Step 2: The whole number becomes the whole number part of your answer.  
The remainder becomes the numerator of the fraction part of the mixed number.

The denominator stays the same.

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

$$\frac{7}{3} = 2 \frac{1}{3}$$

Step 3 Check your answer.

## Converting Mixed Numbers to Improper Fractions

$$5 \frac{1}{6}$$

Step 1: Multiply the whole number by the denominator (the bottom number) to calculate how many "parts" in the whole number

$$\frac{5}{6} \times 6 = \frac{30}{6}$$

Step 2: Add this to the numerator (top number) to calculate how many "parts" in total.

$$\frac{30}{6} + \frac{1}{6} = \frac{31}{6}$$

Step 3 Put the total number of "parts" over the denominator (the bottom number) to make your improper fraction.

The denominator does not change.

$$\frac{31}{6}$$

$$5 \frac{1}{6} = \frac{31}{6}$$

Step 4 Check your answer.

### Finding a Percent of a Number – Method 1

17% of 220

Step 1: Find 10% of the number, by dividing the number by 10.

$$10\% \text{ of } 220 = 22$$

$$220 \div 10 = 22$$

Step 2: Find 5% of the number, by halving 10% of the number.

$$5\% \text{ of } 220 = 11$$

$$22 \div 2 = 11$$

Step 3: Find 1% of the number, by dividing the number by 100.

$$1\% \text{ of } 220 = 2.2$$

$$220 \div 100 = 2.2$$

Step 4: Find 17% of the number by adding together 10% + 5% + 1% + 1% of the number.

$$17\% = 10\% + 5\% + 1\% + 1\%$$

$$17\% \text{ of } 220 = 22 + 11 + 2.2 + 2.2 = 37.4$$

$$17\% \text{ of } 220 = 37.4$$

Step 5: Check your answer.



## Finding a Percent of a Number – Method 2

17% of 220

Step 1: Convert 17% to a fraction by putting it over 100.

$$\frac{17}{100}$$

Step 2: Divide 220 by 100.

$$220 \div 100 = 2.2$$

Step 3: Multiply the result by 17.

$$2.2 \times 17 = 37.4$$

$$17\% \text{ of } 220 = 37.4$$

Step 4: Check your answer.

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