How to use short division (*dividing by a single digit*)

- **SHORT DIVISION** is used when we want to divide a large number by a single digit number.

Supporting Information

- We know that **division** is the **inverse of** *(opposite to)* **multiplication** and so the number facts are related.
  For example: **6×3=18** *so* **18÷3=6** *and* **18÷6=3**

- When we **divide** one number by another number, it is the **divisor** that tells us which times table knowledge we will need to use.
  For example: **116÷4 =**
  4 is the **divisor** in this number sentence.
  We will need to use our **4 times table** knowledge to work out the answer.

  TOP TIP: *If you know your **MULTIPLICATION TABLES** (**times tables**) well, it will give you great confidence when doing **division**, allowing you to complete answers speedily.*
  Practise for division by playing the TOPMARKS Times Tables Game: 'Hit The Button', choosing 'Hit the Answer' and 'Division Facts'.

Example 1: Dividing a 2-digit number by a one-digit number
(with no exchanges)

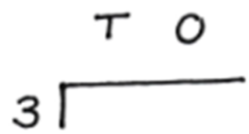
- Read the number sentence:

69÷3=

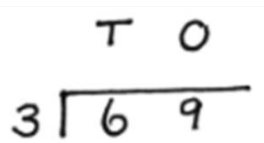
Sixty-nine divided by three equals

- The **divisor** (in this case **3**) tells us that we are going to be using our **3 times table knowledge** to answer this question.

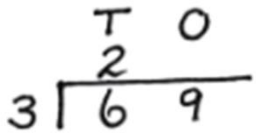
- Rewrite the number sentence using a layout that is sometimes called **'The Bus Stop Method'.** The layout looks similar to a bus shelter and the **divisor** (in this case **3**) is placed to the left (a bit like a bus collecting its passengers!).



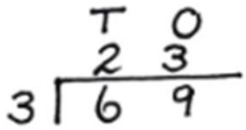
- The 2-digit number we are dividing (in this case **69**) is now written into the 'bus shelter'.



- This layout of division reminds us that we need to deal with the highest value number first, in this case **6** ***tens*** (6̲9), with a value of **60**. Because it is recorded as **6** in the ***tens*** column and the answer will also be written in the ***tens*** column, we can treat it as **6** when we divide it by **3**.
  So we ask ourselves, **"What is 6÷3=?"** (*If we fairly share 6 items between 3 people, how many will each person have?*). Or, **"How many 3s are there in 6?"** or, **"3 times *what* makes 6?"**
  Our **3 times table knowledge** tells us that **3×2=6**, so the answer is **2**.
  We must write the answer **2** in the ***tens*** column to show the true value (**20**).



- Now we move to the next number, in this case **9** ***ones*** (**69**), with a value of **9**.
  So we ask ourselves, **"What is 9÷3?"** (*If we fairly share 9 items between 3 people, how many will each person have?*). Or, **"How many 3s are there in 9?"** or, **"3 times *what* makes 9?"**
  Our **3 times table knowledge** tells us that **3×3=9**, so the answer is **3**.
  We must add the answer **3** to the ***ones*** column.



- We now have our answer, on the top row of our calculation:

69÷3=23

Example 2: Dividing a 2-digit number by a one-digit number
(with exchanging)

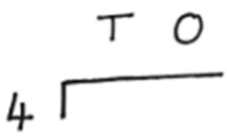
- Read the number sentence:

92÷4=

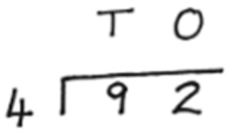
Ninety-two divided by four equals

- The **divisor** (in this case **4**) tells us that we are going to be using our **4 times table knowledge** to answer this question.

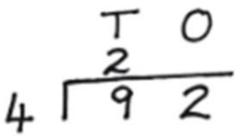
- Rewrite the number sentence using **'The Bus Stop Method'**. Place the **divisor** (in this case **4**) to the left.



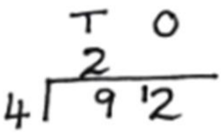
- The 2-digit number we are dividing (in this case **92**) is now written into the 'bus shelter'.



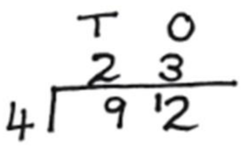
- This layout of division reminds us that we need to deal with the highest value number first, in this case **9** ***tens*** (**9**2), with a value of **90.** Because it is recorded as **9** in the ***tens*** column and the answer will also be written in the ***tens*** column, we can treat it as **9** when we divide it by **4**.
  So we ask ourselves, **"What is 9÷4?"** or, **"How many 4s are there in 9?"** or, **"4 times *what* makes 9?"**
  Our **4 times table knowledge** tells us that **4×2=8**, so the answer is **2, with 1 *ten*** left over because we started with **9** ***tens***.
  We must now write the answer **2** in the ***tens*** column to show the true value (**20**).



- How then do we deal with the spare **1** ***ten*** that was left over? How many ***ones*** can we **exchange** **1** ***ten*** for? The answer is **10** ***ones*.** So **exchange** **1** ***ten*** for **10** ***ones*** and **regroup** them in the ***ones*** column.



- Now we move to the ***ones*** column. At the start, there were **2** ***ones*** but how many are there now? The answer is **12** ***ones*.**
  So we ask ourselves, **"What is 12÷4?"** or, **"How many 4s are there in 12?"** or, **"4 times *what* makes 12?"**
  Our **4 times table knowledge** tells us that **4×3=12**, so the answer is **3**.
  We must add the answer **3** to the ***ones*** column.



- We now have our answer, on the top row of our calculation:

92÷4=23

Example 3: Dividing a 3-digit number by a one-digit number
(with exchanges)

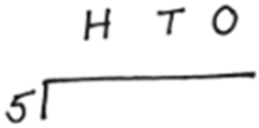
- Read the number sentence:

675÷5=

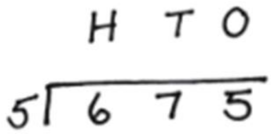
Six hundred and seventy-five divided by five equals

- The **divisor** (in this case **5**) tells us that we are going to be using our **5 times table knowledge** to answer this question.

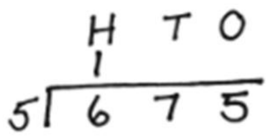
- Rewrite the number sentence using **'The Bus Stop Method'.** Place the **divisor** (in this case **5**) to the left.



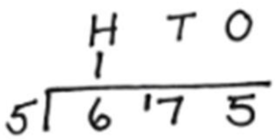
- The 3-digit number we are dividing (in this case **675**) is now written into the 'bus shelter'.



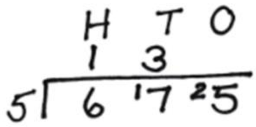
- This layout of division reminds us that we need to deal with the highest value number first, in this case **6 *hundreds*** (**6**75), with a value of **600.** Because it is recorded as **6** in the ***hundreds*** column and the answer will also be written in the ***hundreds*** column, we can treat it as **6** when we divide it by **5**.
  So we ask ourselves, **"What is 6÷5?"** or, **"How many 5s are there in 6?"** or, **"5 times *what* makes 6?"**
  Our **5 times table knowledge** tells us that **5×1=5**, so the answer is **1, with 1 *hundred*** left over because we started with **6 *hundreds***.
  We must now write the answer **1** in the ***hundreds*** column to show the true value (**100**).



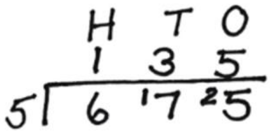
- To deal with the **1 *hundred*** that was left over, we work out how many ***tens*** we canexchange **1 *hundred*** for. The answer is **10 *tens*.** So regroup the exchanged **10 *tens*** in the ***tens*** column.



- Now we move to the ***tens*** column. At the start, there were **7 *tens*** (6**7**5) but how many are there now? The answer is **17 *tens*.**
  So we ask ourselves, **"What is 17÷5?"** or, **"How many 5s are there in 17?"** or, **"5 times *what* makes 17?"**
  Our **5 times table knowledge** tells us that **5×3=15**, so the answer is **3, with 2 *tens*** left over because we had **17 *tens*** altogether.
  We must add the answer **3** to the ***tens*** column to show the true value (**30**).
  Now we must deal with the **2 *tens*** that were left over. How many ***ones*** can we exchange **2 *tens*** for? The answer is **20 *ones*.** So now regroup the exchanged **20 *ones*** into the ***ones*** column.



- Now we move to the ***ones*** column. At the start, there were **5** ***ones*** (**675**) but how many are there now? The answer is **25** ***ones*.**
  So we ask ourselves, **"What is 25÷5?"** or, **"How many 5s are there in 25?"** or, **"5 times *what* makes 25?"**
  Our **5 times table knowledge** tells us that **5×5=25**, so the answer is **5**.
  We must add the answer **5** to the ***ones*** column.



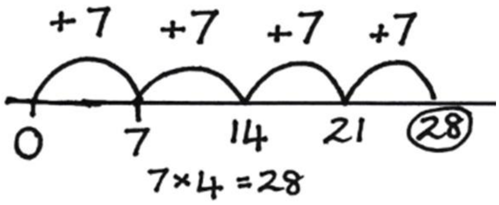
- We now have our answer, on the top row of our calculation:

675÷5=135

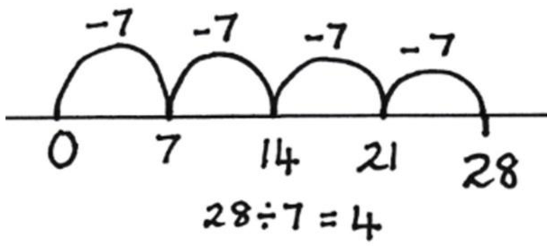
TOP TIP

*If you are **dividing** by a number and you are not confident with the times tables you need to use, it is important to remember that **division is the inverse operation** to **multiplication**.*

*When we **multiply** by a number, we can **use repeated addition**.*
For example: 7×4 = is the same as 0+7+7+7+7= (adding 7, 4 times)



*When we **divide** by a number, we can **use repeated subtraction**.*
For example: 28÷7 = is the same as the number of times you can subtract 7 from 28, to get to zero (0).



Using a number-line to work out the answer may be helpful, until you are confident with a particular times table.

Example 4: Dividing a 3-digit number by a one-digit number
(with exchanges and a remainder)

- Read the number sentence:

749÷8=

Seven hundred and forty-nine divided by eight equals

- The **divisor** (in this case **8**) tells us that we are going to be using our **8 times table knowledge** to answer this question.

- Rewrite the number sentence using **'The Bus Stop Method'.**

$$8\overline{)\,7\quad 4\quad 9}$$

- This layout of division reminds us that we need to deal with the highest value number first, in this case **7** ***hundreds*** (**749**), with a value of **700.** Because it is recorded as **7** in the ***hundreds*** column and the answer will also be written in the ***hundreds*** column, we can treat it as **7** when we divide it by **8**.
  So we ask ourselves, **"What is 7÷8?"** or, **"How many 8s are there in 7?"** or, **"8 times *what* makes 7?"**
  Our **8 times table knowledge** tells us that **7** is not large enough to be divided by **8**, so we now write the answer **0** in the ***hundreds*** column; it is a ***holding zero*** used to keep the correct place value.

$$\begin{array}{l}\ \ \ 0\\ 8\overline{)\,7\quad 4\quad 9}\end{array}$$

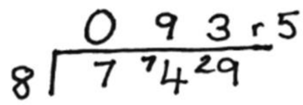
- **7** ***hundreds*** are left over so how many ***tens*** can we **exchange** **7** ***hundreds*** for? The answer is **70** ***tens***. **Regroup** the **exchanged** **70** ***tens*** in the ***tens*** column.

$$\begin{array}{l}\ \ \ 0\\ 8\overline{)\,7\quad {}^{7}4\quad 9}\end{array}$$

- Now we move to the ***tens*** column. At the start, there were **4** ***tens*** (**749**) but how many are there now? The answer is **74** ***tens***.
  So we ask ourselves, **"What is 74÷8?"** or, **"How many 8s are there in 74?"** or, **"8 times *what* makes 74?"**
  Our **8 times table knowledge** tells us that **8×9=72**, so the answer is **9**, with **2** ***tens*** left over because we had **74** ***tens*** altogether.
  We must add the answer **9** to the ***tens*** column to show the true value (**90**).
  2 ***tens*** were left over so how many ***ones*** can we **exchange** **2** ***tens*** for? The answer is **20** ***ones***. **Regroup** the **exchanged** **20** ***ones*** in the ***ones*** column.

$$\begin{array}{l}\ \ \ 0\quad\ 9\\ 8\overline{)\,7\quad {}^{7}4\,{}^{2}9}\end{array}$$

- Now we move to the ***ones*** column. At the start, there were **9** ***ones*** (74**9**) but how many are there now? The answer is **29** ***ones*.**
  So we ask ourselves, **"What is 29÷8?"** or, **"How many 8s are there in 29?"** or, **"8 times *what* makes 29?"**
  Our **8 times table knowledge** tells us that **8×3=24**, so the answer is **3** with **5** ***ones*** left over because we had **29** ***ones***.
  We must add the answer **3** to the ***ones*** column and the **5** ***ones*** left over are shown as the **remainder**.



- We now have our answer, on the top row of our calculation:

749÷8= 93 r5

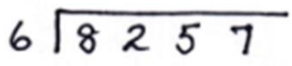
Example 5: Dividing a 4-digit number by a one-digit number
(with exchanges and the remainder expressed as a fraction or with decimal numbers)

- Read the number sentence:

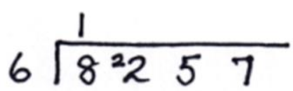
8257÷6=

Eight thousand, two hundred and fifty-seven divided by six equals

- The **divisor** (in this case **6**) tells us that we are going to be using our **6 times table knowledge** to answer this question. Rewrite the number sentence, using **'The Bus Stop Method'.**



- This layout of division reminds us that we need to deal with the highest value number first, in this case **8** ***thousands*** (**8**257), with a value of **8000.** Because it is recorded as **8** in the ***thousands*** column and the answer will also be written in the ***thousands*** column, we can treat it as **8** when we divide it by **6**.
  So we ask ourselves, **"What is 8÷6?"** or, **"How many 6s are there in 8?"** or, **"6 times *what* makes 8?"**
  Our **6 times table knowledge** tells us that **6×1=6** so **1** must be written in the ***thousands*** column and there will be **2** ***thousands*** left over.
  How many ***hundreds*** can we **exchange** **2** ***thousand*** for? The answer is **20** ***hundreds*** and they must be **regrouped** in the hundreds column.



- Now we move to the ***hundreds*** column where there are **22** ***hundreds*** altogether.
  So we ask ourselves, **"What is 22÷6?"** or, **"How many 6s are there in 22?"** or, **"6 times *what* makes 22?"**
  Our **6 times table knowledge** tells us that **6×<u>3</u>=18**, so the answer is **3**, with **4** ***hundreds*** left over because we had **22 hundreds** in this column.
  We must add the answer **3** to the ***hundreds*** (**300**).
  The **4** ***hundreds*** left over must be **<u>exchanged</u>** for how many ***tens***? The answer is **40** ***tens*** and they must now be **<u>regrouped</u>** in the ***tens column***.

$$\begin{array}{l} \quad\;\; 1\;\;3 \\ 6\,\overline{)\,8\;\;{}^{2}2\;\;{}^{4}5\;\;7} \end{array}$$

- Now we move to the ***tens*** column where there are **45** ***tens*** altogether.
  So we ask ourselves, **"What is 45÷6?"** or, **"How many 6s are there in 45?"** or, **"6 times *what* makes 45?"**
  Our **6 times table knowledge** tells us that **6×<u>7</u>=42**, so the answer is **7**, with **3** ***tens*** left over because we had **45 tens in this column**.
  We must now add **7** to the answer in the ***tens*** column (worth **70**).
  The **3** ***tens*** left over must be **<u>exchanged</u>** for how many ***ones***? The answer is **30** ***ones*** and they must now be **<u>regrouped</u>** in the ***ones column***.

$$\begin{array}{l} \quad\;\; 1\;\;3\;\;7 \\ 6\,\overline{)\,8\;\;{}^{2}2\;\;{}^{4}5\;\;{}^{3}7} \end{array}$$

- There are now **37** ***ones*** in the ***ones*** column, so we ask ourselves, **"What is 37÷6?"** or, **"How many 6s are there in 37?"** or, **"6 times *what* makes 37?"**
  Our **6 times table knowledge** tells us that **6×<u>6</u>=36**. The answer is **6** with **1** ***one*** left over because we had **37** ***ones*** altogether.
  We must add the answer **6** to the ***ones*** column and the **1** ***one*** left is the **<u>remainder</u>**.

$$\begin{array}{l} \quad\;\; 1\;\;3\;\;7\;\;6\;\mathrm{r}\;1 \\ 6\,\overline{)\,8\;\;{}^{2}2\;\;{}^{4}5\;\;{}^{3}7} \end{array}$$

<u>Expressing a remainder as a fraction</u>

- The **divisor** in this number sentence was **6** so the remainder can be expressed in **sixths**. As the **remainder** was **1**, when expressed as a **fraction**, it is **one sixth** (1/6).

$$\begin{array}{l} \quad\;\; 1\;\;3\;\;7\;\;6\tfrac{1}{6} \\ 6\,\overline{)\,8\;\;{}^{2}2\;\;{}^{4}5\;\;{}^{3}7} \end{array}$$

- If the **divisor** had been **4** and the **remainder** had been **3**, then the **remainder** expressed as a **fraction** would have been **three-quarters**. **($\frac{3}{4}$)**.

Expressing a remainder as a decimal

- If there is a remainder, then place a decimal point at the end of the number being divided, followed by a zero. Then add a decimal point to exactly the same place in the answer:

$$\begin{array}{r} 1\;3\;7\;6. \\ 6\,\overline{)\,8\;{}^{2}2\;{}^{4}5\;{}^{3}7.0} \end{array}$$

- How many ***tenths*** can be ***<u>exchanged</u>*** for **1** ***one*** (which is the value of the ***<u>remainder</u>***)? The answer is **10** ***tenths*** and these should now be placed in the ***tenths*** column.

$$\begin{array}{r} 1\;3\;7\;6.\phantom{{}^{1}0} \\ 6\,\overline{)\,8\;{}^{2}2\;{}^{4}5\;{}^{3}7.{}^{1}0} \end{array}$$

- In the ***tenths*** column there are now **10** ***tenths*** so, **"What is 10÷6?"** or, **"How many 6s are there in 10?"** or, **"6 times *<u>what</u>* makes 10?"** Our **6 times table knowledge** tells us that **6×<u>1</u>=6**, so the answer is **1**, with **4** ***tenths*** left over, which can be ***exchanged*** for **40** ***hundredths*** and moved into the ***hundredths*** column. The calculation continues to a maximum of 3 decimal places:

$$\begin{array}{r} 1\;3\;7\;6.1\;6\;6 \\ 6\,\overline{)\,8\;{}^{2}2\;{}^{4}5\;{}^{3}7.{}^{1}0\;{}^{4}0\;{}^{4}0} \end{array}$$

- We have three possible correct answers now:

8257÷6= 1,376 r1

8257÷6= 1,376 1/6

8257÷6= 1,376·166