Lesson - Short multiplication and division

Year: Year 4

Hello, I am Otto! In this chapter you learn to multiply and divide bigger numbers by a single digit in a short, tidy way. These methods are called short multiplication and short division. They build on your times tables, so make sure you know them well!

Starter activity

Four friends each have 237 stickers. How many stickers do they have altogether? You could add 237 four times, but that takes a long time. It is quicker to multiply: 237 × 4. First estimate: 237 is about 200, and 200 × 4 = 800. The exact answer should be a bit more than 800. Let us find it!

Multiplying by 10 and 100

Rule: multiplying by 10 and by 100

- To multiply by 10, move every digit one place to the left and put a zero in the ones place: 36 × 10 = 360.
- To multiply by 100, move every digit two places to the left: 36 × 100 = 3 600.
- To multiply by a multiple of 10, use the table fact and add zeros: 4 × 30 = 4 × 3 × 10 = 120 and 4 × 300 = 1 200.

Example 1

Work out 7 × 40 and 6 × 500.

7 × 4 = 28, so 7 × 40 = 28 × 10 = **280**. 6 × 5 = 30, so 6 × 500 = 30 × 100 = **3 000**.

Short multiplication

Definition: short multiplication

Short multiplication is a written method for multiplying a number with two, three or four digits by a number with one digit. You multiply each digit of the big number by the single digit, starting with the ones, and you **carry** when a product is 10 or more.

Method: short multiplication

1. Write the big number on top with the single digit underneath on the right, so that the ones are lined up.
2. Multiply the ones digit by the single digit. Write the ones of the answer and carry the tens.

3. Multiply the tens digit by the single digit and add the carried number. Write the ones and carry again if needed.
4. Do the same for the hundreds and the thousands.
5. Estimate first by rounding, and check the answer is close.

Example 2

Work out 436 × 7.

Estimate: 400 × 7 = 2 800. Ones: 6 × 7 = 42, write 2 and carry 4. Tens: 3 × 7 + 4 (carried) = 25, write 5 and carry 2. Hundreds: 4 × 7 + 2 (carried) = 30, write 30. Answer: **3 052**. The answer is a little more than the estimate, which makes sense because 436 is a little more than 400.

Example 3

A box holds 28 pencils. How many pencils are in 6 boxes?

Ones: 8 × 6 = 48, write 8 and carry 4. Tens: 2 × 6 + 4 (carried) = 16, write 16. Answer: **168**. So **168 pencils**. Check: 30 × 6 = 180, which is close to 168.

Watch out

The commonest mistake is to forget to add the carried number. Another one is to carry the wrong digit: for 7 × 6 = 42, you write the 2 and carry the 4, not the other way around. Write the carry in a small number above the next column and cross it out when you have used it.

Short division

Definition: short division

Short division (the "bus stop" method) is a written way to divide a number by a single digit. You write the number being divided (the **dividend**) inside the bus stop, and the number you divide by (the **divisor**) on the left. The answer (the **quotient**) goes on top. Any amount left over is called the **remainder**.

Method: short division

1. Start with the first (left) digit. Ask how many times the divisor goes into it. Write that number above.
2. If there is something left over, carry it to the next digit by writing it in front of that digit, for example 1 left over and next digit 5 makes 15.
3. Divide the new number by the divisor. Write the answer above and carry any remainder.
4. Continue to the ones digit. A remainder at the end is written as "r" or

"remainder".
5. Check by multiplying the answer by the divisor and adding the remainder.

Example 4

Work out 852 ÷ 4.

Hundreds: 8 ÷ 4 = 2 remainder 0. Tens: 5 ÷ 4 = 1 remainder 1. Ones: 12 (1 carried to the next digit 2) ÷ 4 = 3. Answer: **213**. Check: 213 × 4 = 852.

Example 5

Work out 157 ÷ 6.

Hundreds: 1 is less than 6, so there is no hundreds digit in the answer; carry 1 to the next column. Tens: 15 (1 carried to the next digit 5) ÷ 6 = 2 remainder 3. Ones: 37 (3 carried to the next digit 7) ÷ 6 = 6 remainder 1. Answer: **26 remainder 1**. Check: 26 × 6 = 156, and 156 + 1 = 157.

Remainders in real life

When a division does not come out exactly, you have to think about what the remainder means in the story. Sometimes you ignore it, sometimes you round the answer up, and sometimes the remainder is the answer. Read the question carefully and decide.

Key fact: what to do with a remainder

- **Round down** when you want the number of full groups: 29 sweets shared into bags of 6 gives 4 full bags (and 5 sweets left).
- **Round up** when everything must be taken: 29 children and cars that hold 6 need 5 cars, because 4 cars are not enough.
- **The remainder itself** when the question asks how many are left over: 29 ÷ 6 gives 5 left over.

Example 6

A coach holds 48 passengers. 130 pupils go on a trip. How many coaches are needed?

130 ÷ 48 is 2 remainder 34 (2 × 48 = 96 and 130 − 96 = 34). Two coaches carry 96 pupils, so 34 pupils are left without a seat. We must **round up**: **3 coaches** are needed.

Did you know?

The word "quotient" comes from a Latin word meaning "how many times". The long way of dividing was called the "galley method" in the Middle Ages because the layout

of the numbers looked like a ship, a galley, with its sails and oars!

Otto's tip

Multiplication and division undo each other. After you multiply, divide the answer by the single digit to see if you get back to the start. After you divide, multiply your answer by the divisor and add the remainder. Checking takes only a minute and it will save you marks!