Lesson - Written addition and subtraction to 4 digits

Year: Year 4

Hello, I am Otto! When numbers get big, you cannot do every sum in your head. Written methods let you add and subtract numbers with up to four digits in a tidy, reliable way. In this chapter you learn the column method for addition and subtraction, and how to check that your answers make sense.

Starter activity

A shop sold 2 348 pencils in January and 1 765 pencils in February. How many pencils did it sell altogether? Before you start, round both numbers to the nearest 1000 and make a quick guess: about 2 000 + 2 000 = 4 000. Now work out the exact answer with the column method and see how close your guess was.

Adding with the column method

Definition: column addition

Column addition means writing the numbers one under the other so that the ones are under the ones, the tens under the tens, the hundreds under the hundreds and the thousands under the thousands. You add the columns one at a time, starting on the right.

Method: adding in columns

1. Write the larger number on top and the other number underneath. Line up the columns carefully.
2. Add the ones. If the total is 10 or more, write the ones digit and carry the tens digit to the tens column (write a small 1 underneath).
3. Add the tens, including any carried digit. Carry again if the total is 10 or more.
4. Do the same for the hundreds and then the thousands.
5. Write the answer and check it with an estimate.

Example 1

Work out 3 456 + 2 978.

Ones: 6 + 8 = 14, write 4 and carry 1. Tens: 5 + 7 + 1 (carried) = 13, write 3 and carry 1. Hundreds: 4 + 9 + 1 (carried) = 14, write 4 and carry 1. Thousands: 3 + 2 + 1 (carried) = 6, write 6. Answer: **6 434**. Estimate check: 3 500 + 3 000 = 6 500, which is close to 6 434.

Example 2

Work out 1 249 + 586.

Ones: 9 + 6 = 15, write 5 and carry 1. Tens: 4 + 8 + 1 (carried) = 13, write 3 and carry 1. Hundreds: 2 + 5 + 1 (carried) = 8, write 8. Thousands: 1 + 0 = 1, write 1. Answer: **1 835**. Notice that 586 has only three digits, so the thousands column of 586 is empty.

Watch out

The most common mistake is to line the numbers up on the left instead of the right. Always line up by the ones. Another mistake is forgetting to add the carried digit, so write it in small figures under the line and add it in the next column.

Subtracting with the column method

Definition: column subtraction

Column subtraction means writing the bigger number on top and the smaller number underneath, with the columns lined up. You subtract the columns one at a time, starting on the right. When the top digit is smaller than the bottom digit you **exchange** (also called "borrow" or "decompose"): you take 1 from the next column and add 10 to the column you are working in.

Method: subtracting in columns

1. Write the bigger number on top and the smaller number underneath, with the ones under the ones.
2. Start with the ones. If the top digit is smaller than the bottom digit, exchange 1 ten for 10 ones, then subtract.
3. Move to the tens and repeat. If you need to, exchange 1 hundred for 10 tens.
4. Do the same for the hundreds and the thousands.
5. Check by adding your answer to the number you took away. You should get the top number again.

Example 3

Work out 5 203 − 2 748.

Ones: 3 is less than 8, so exchange across the zero (the next digit is 0): take 1 from the hundreds column (2 becomes 1); each zero on the way becomes 9 and the ones column gains 10. Now 13 − 8 = 5. Tens: 9 − 4 = 5. Hundreds: 1 is less than 7, so exchange 1 thousand for 10 hundreds (the thousands digit changes from 5 to 4). Now 11 − 7 = 4. Thousands: 4 − 2 = 2. Answer: **2 455**. Check: 2 455 + 2 748 = 5 203.

When there is a zero in the column you need to exchange from, you have to look further left. In 5 203 the tens digit is 0, so you cannot take a ten from it. Take 1 from the hundreds (2 becomes 1), give 10 to the tens, then take 1 from the tens (10 becomes 9) and give 10 to the ones. This is called exchanging twice.

Did you know?

The column method is hundreds of years old. Merchants in medieval Europe learned it from Arabic books, because the Hindu-Arabic numerals (0 to 9) made it possible to write numbers in columns. Roman numerals could not be added in columns, because they have no place value!

Estimating and checking

Rule: estimate first, then check

- Round each number to the nearest 100 or 1000 and do the sum with the rounded numbers. This gives an estimate.
- Your exact answer should be close to the estimate. If it is not close, look for a mistake.
- To check a subtraction, add: if 5 203 − 2 748 = 2 455 then 2 455 + 2 748 should equal 5 203.
- To check an addition, subtract: if 3 456 + 2 978 = 6 434 then 6 434 − 2 978 should be 3 456.

Example 4

Estimate and then work out 4 862 − 1 937.

Estimate: 4 900 − 1 900 = 3 000. Exact: Ones: 2 is less than 7, so exchange 1 ten for 10 ones (the tens digit changes from 6 to 5). Now 12 − 7 = 5. Tens: 5 − 3 = 2. Hundreds: 8 is less than 9, so exchange 1 thousand for 10 hundreds (the thousands digit changes from 4 to 3). Now 18 − 9 = 9. Thousands: 3 − 1 = 2. Answer: **2 925**. The answer 2 925 is close to the estimate of 3 000, so it makes sense.

Solving word problems

Method: word problems

1. Read the question twice and underline the important numbers.
2. Decide which operation you need. "Altogether", "total" and "more" mean add; "left", "fewer" and "difference" mean subtract.
3. Write the calculation in columns and work it out.
4. Check with an estimate and write the answer with the correct unit, for example pounds, metres or people.

Example 5

A train carries 1 456 passengers on Monday and 1 879 on Tuesday. How many passengers is that altogether, and how many more travelled on Tuesday?

Altogether: Ones: 6 + 9 = 15, write 5 and carry 1. Tens: 5 + 7 + 1 (carried) = 13, write 3 and carry 1. Hundreds: 4 + 8 + 1 (carried) = 13, write 3 and carry 1. Thousands: 1 + 1 + 1 (carried) = 3, write 3. Answer: **3 335**. That is 3 335 passengers. How many more on Tuesday: 1 879 − 1 456. Ones: 9 − 6 = 3. Tens: 7 − 5 = 2. Hundreds: 8 − 4 = 4. Thousands: 1 − 1 = 0. Answer: **423**. So **423 more** passengers travelled on Tuesday.

Example 6

A school has 2 000 books. It lends out 1 345. How many are left?

2 000 − 1 345. There are zeros in the ones, tens and hundreds columns, so we exchange from the thousands and the answer is 655. Check: 655 + 1 345 = 2 000. **655 books** are left.

Otto's tip

Before you start any written sum, ask yourself, "About how big should my answer be?" A quick estimate takes ten seconds and catches most mistakes. Also, always line up the ones first. Neat columns make neat answers!