



Working with positive and negative numbers

This task has **three** parts to it.

Part 1

In Part 1, you will find information and activities to help you work more confidently when you are dealing with negative numbers.

Part 2

In Part 2 you can find suggestions of other free resources you can use to practise your skills.

Part 3

In Part 3 you can try out your skills with some practical activities and check your progress with some typical questions from the National Test at Level 2. Part 3 also contains the answers to all the activities in Parts 1–3.

N2/L2.1

tutor notes



Thinking about negative numbers

Think about some typical examples of when you might come across negative numbers in everyday life.

- **Temperature** – when a temperature is ‘below freezing’ (less than 0°C), the temperature is expressed as a negative number; for example:

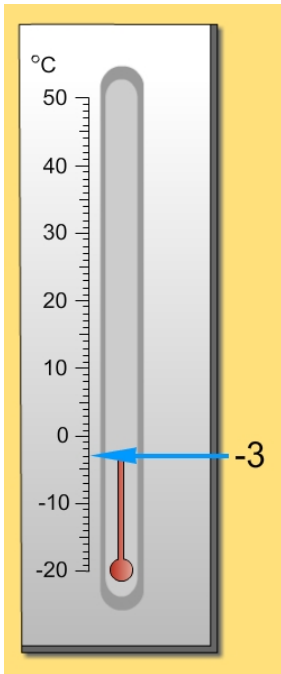
When storing food, it’s important to store different types of items at the right temperature to prevent issues with food safety, especially with chilled and frozen food.





Build your skills: Positive and negative numbers – Part 1

The weather forecast tells you that the temperature tomorrow will be -3°C .



- **Finance (debts)** – sometimes you might spend more money than you've actually got. Essentially the amount of money you have is now a negative amount. For example, '£50 overdrawn' means minus £50.
- **Profit (and loss)** – if you are in business, sometimes the amount of profit you've made over a period of time might be a negative amount. This would be a 'trading loss'.

The activities below will look at:

- how negative numbers work
- how to make calculations when negative numbers are involved.

The activities also include examples of how negative numbers apply in contexts like those described above.

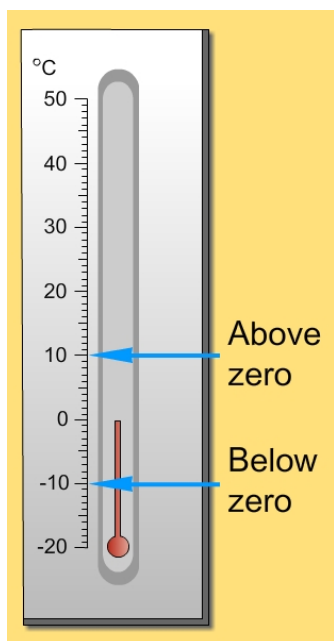
Activity 1

In the context of thinking about temperatures, 0°C is 'freezing point'. At temperatures below 0°C , water turns to ice. So, when the temperature outside falls below freezing point, the weather gets icy or snowy.

Numbers below zero (less than 0) are described using 'negative numbers': minus 1 (-1), minus 2 (-2), etc.



Thinking about negative numbers on a thermometer

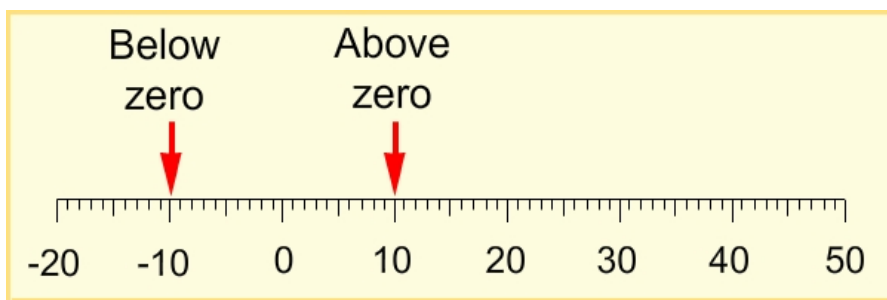


Note: Above zero, the (positive) numbers go 1, 2, 3, etc. as you move up. Below zero, the negative numbers go -1, -2, -3, etc. as you move down.

So for negative numbers, as the digit (the number part of the temperature) seems to get bigger, the temperature gets colder. For example: -8°C is colder than -2°C .

Thinking about negative numbers on a number line

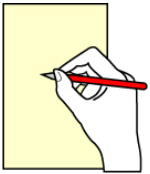
Sometimes you may also come across negative numbers represented on a number line. Imagine the thermometer illustrated above lying down. This is essentially what a number line represents.



Note: Above zero, the (positive) numbers go 1, 2, 3, etc. as you move to the right. Below zero, the negative numbers go -1, -2, -3, etc. as you move to the left.



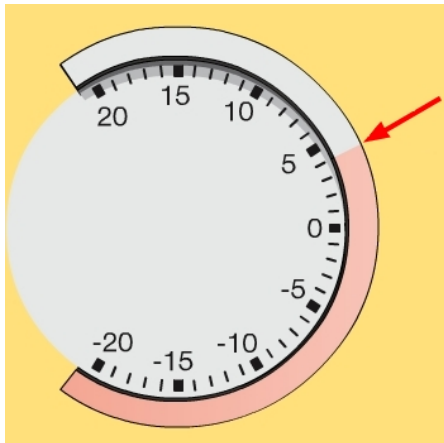
Build your skills: Positive and negative numbers – Part 1



What number does each arrow below show?

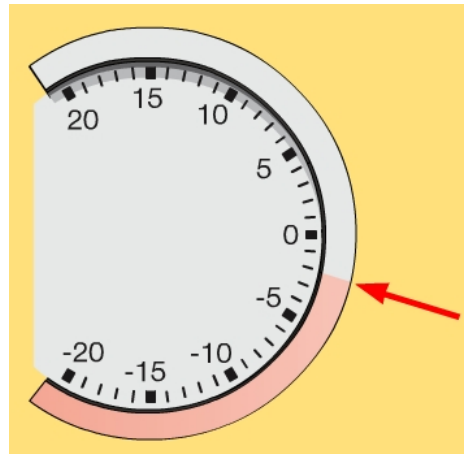
The first one has been done for you as an example.

1



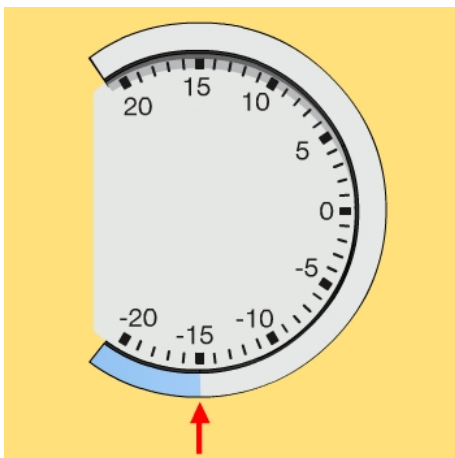
This thermometer shows 4 °C.

2



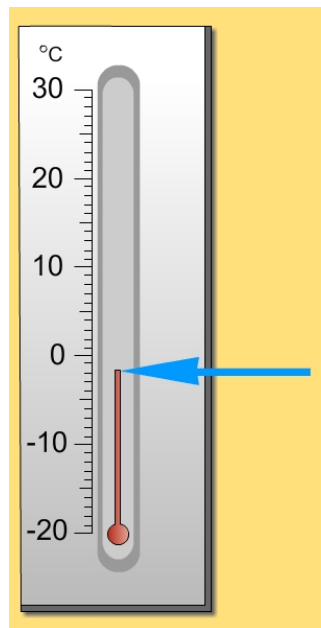
This thermometer shows ____.

3



This thermometer shows ____.

4

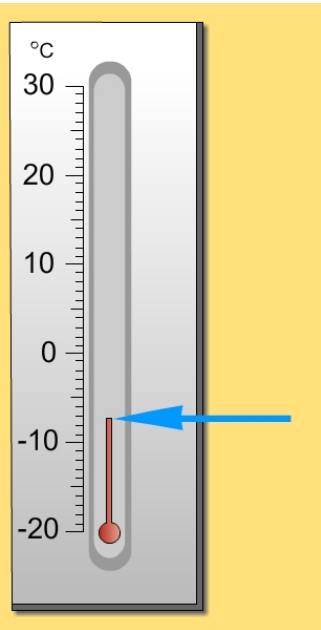


This thermometer shows ____.



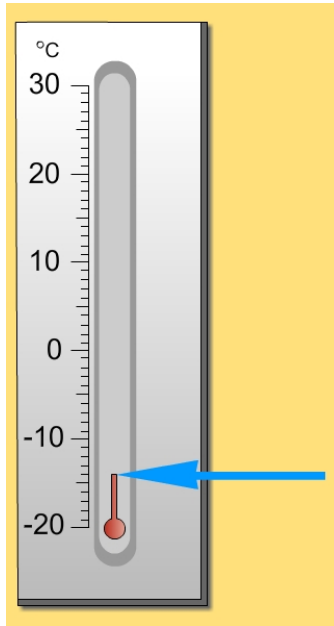
Build your skills: Positive and negative numbers – Part 1

5



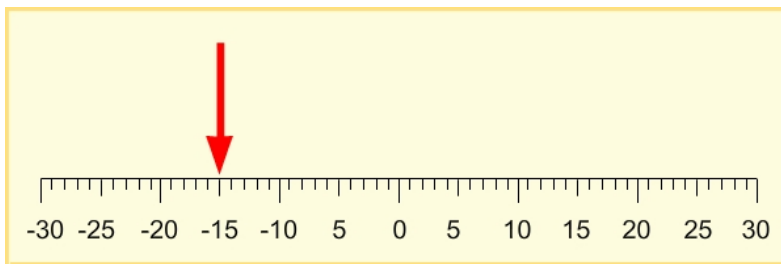
This thermometer shows ____.

6



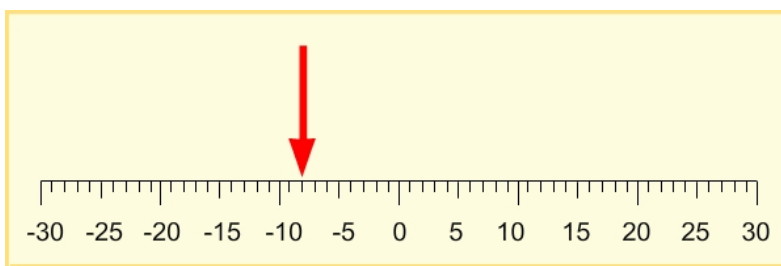
This thermometer shows ____.

7



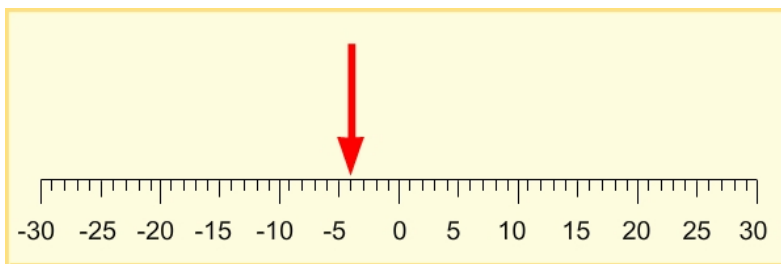
This thermometer shows ____.

8



This thermometer shows ____.

9



This thermometer shows ____.



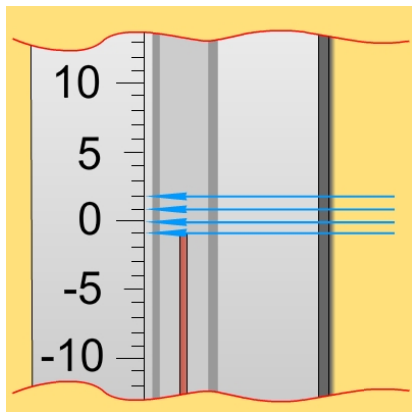
Activity 2

When you need to calculate with negative numbers, it can help to think of a thermometer.

Example 1: On one day in January, the temperature is 3°C . Overnight it **drops by** four degrees. What is the new temperature?



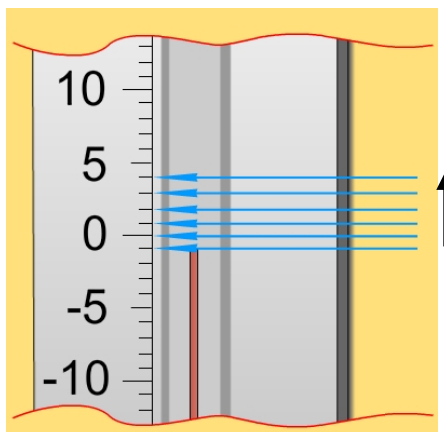
*'The temperature is going **down**, so it gets colder. I need to **take away** four degrees.'*



Example 2: In a week in December in 1908, the average temperature was -2°C . In 2008, the average temperature for the same week is six degrees **higher**. What is the average temperature for the week in 2008?



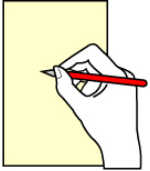
*'The temperature is **higher**, so it will be **warmer**. I need to **add on** six degrees.'*





Build your skills: Positive and negative numbers – Part 1

If it helps you to write something down, you can always sketch a number line to help you work out the answers to these types of questions.



Work out the temperature for each of these situations

- 1 On one day in January, the temperature is 4°C . The following day it is five degrees colder. What is the new temperature?
- 2 The temperature in the freezer compartment of my fridge is shown as -5°C . I turn it up by 2°C . What temperature is the freezer compartment now?
- 3 The average temperature in Britain in a week in December is 6°C . The average temperature in Russia in the same week is twelve degrees lower. What is the average temperature in Russia during that week?
- 4 On one day in February, the temperature is -1°C . The following day it is three degrees warmer. What is the new temperature?
- 5 I note the daytime temperature one day and see that it is 3°C . Overnight, it drops by six degrees. What is the night-time temperature?
- 6 A freezer temperature is -15°C . If I turn the temperature down by three degrees, what will the new freezer temperature be?



Activity 3

Think about the situation if you spend more money than you have. This can be described in several different ways. Informally you might talk about being '£200 in the red' or '£200 in debt'. On a bank statement, this amount might appear as £200 'in debit'.

TRANSACTION DETAILS					
Date	Payment type	Details	Paid out (£)	Paid in (£)	Balance (£)
8 Apr		Balance brought forward			51.26
8 Apr	Deposit	ATM		40.00	91.26
11 Apr	Bank giro credit	RT Employer		209.24	300.50
16 Apr	Direct debit	BT	49.50		251.00
16 Apr	Direct debit	EE Electrical Co	125.00		126.00
17 Apr	Debit card	ML Superstores	106.00		20.00
24 Apr	Debit card	SY Garages	60.00		40.00 DB
29 Apr	Counter transaction	ATM	5.00		45.00 DB
11 May	Bank giro credit	RT Employer		210.00	165.00

Example: Look at the statement above and check that you understand how it works. On **8 April**, the account had £51.26 in it (the 'balance brought forward'). Later that day, a deposit of £40.00 was made. This amount is shown in the 'paid in' column. This £40.00 is added to the previous balance (£51.26) to show the new balance of £91.26.

Now look at the part of the statement that shows negative numbers. On **17 April**, the account had £20.00 in it (the 'balance' in the final column for this date). On **24 April**, a withdrawal of £60.00 is made (money paid by debit card at a garage). This amount is shown in the 'paid out' column. This £60.00 is subtracted from the previous balance (£20.00) to show the new balance:

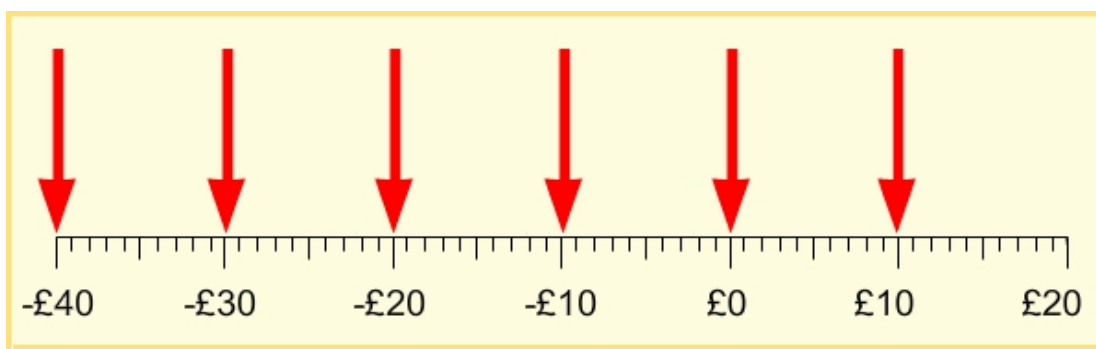


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$$£20.00 - £60.00 = \text{minus } £40.00$$

This time, as there is not this amount of money in the account, the answer is a negative number. This is shown on the statement as a debit (DB): £40.00 DB.

You can use the same techniques as you did in Activity 2 to help you think about calculations involving money that give you a negative number as the answer. You could think of counting forwards (or backwards) in batches of ten.



Try using this approach with a number line to work out the amounts you would have left after each of the following transactions

- 1 You have £25 in your account and then spend £40. What is the balance?
- 2 You have £70 in your account and then spend £100. What is the balance?
- 3 You have £350 in your account and then spend £420. What is the balance?
- 4 Your account is £50 overdrawn (the balance is minus £50). You then pay in £90. What is the balance?
- 5 Your account is £20 overdrawn (the balance is minus £20). You then pay in £80. What is the balance?



Activity 4

Another way to tackle working out a balance when the answer might be negative is to:

- think about whether the answer will be positive or negative, and then
- work out by how much.

Example: You have £16.50 and then spend £20. What is the balance?

Step 1: Positive or negative?



'I've only got £16.50. £20 is more than this, so I will be going into debit.'

£16.50 – £20.00 will give a **negative** number.

Step 2: How much is the 'extra amount'? By how much will it be negative (or positive)?



*'I've got enough for £16.50. How much **more** than this do I need?'*

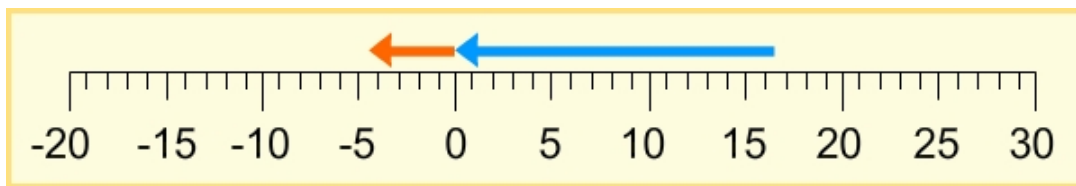
What's the difference between £16.50 and £20.00? **£4.50** (the money I haven't got!). So, the balance will be **minus £4.50**.

Thinking about a number line might help you to visualise how this works.

Note: We aren't using the number line to **count back** with this approach, like we did above, but it might help to understand step 2.



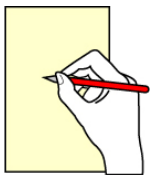
Build your skills: Positive and negative numbers – Part 1



I'm spending £20. This is made up of the £16.50 I have got, i.e. from £16.50 down to zero (shown by green arrow). Plus an extra £4.50 I need, but haven't actually got (shown by the orange arrow).

Another way to think about step 2 of this calculation is that what you are working out in your head is how much you are 'short' of the amount you want to spend:

$$\begin{array}{r} \text{£}16.50 \\ \underline{\quad ??} + \quad ?? \text{ is the amount of money you are 'short' of £}20.00 \\ \text{£}20.00 \end{array}$$



Try using this approach to work out the balances in these examples

- 1 You have £15.50 in your account and then spend £40. What is the balance?
- 2 You have £12.75 in your account and then spend £30. What is the balance?
- 3 You have £2.30 in your account and then spend £90. What is the balance?

Activity 5

It might be useful to think about some other typical examples of negative amounts in a financial context.

Trading losses

If you are running a business, you work out your annual profit. In simple terms, you would do this by working out the money you have received over the year (your income or 'turnover') and taking off your expenditure over the same period:

$$\text{Net profit} = \text{money received (or owed)} - \text{money spent (or due to be paid)}$$



Build your skills: Positive and negative numbers – Part 1

Sometimes the amount spent might be greater than the amount received. This will give you a negative number for your annual profit, i.e. a 'net loss'.

Example:

Expenditure		Income	
Office expenses	£1 000	Sales	£10 000
Cost of materials	£4 500		
Marketing costs	£1 700		
Premises costs	£3 200		
Total	£10 400		£10 000

The total expenditure is £10 400, but you only made £10 000 in sales money received. So your profit would be:

$$£10\,000 - £10\,400 = -£400 \text{ (i.e. a net loss of £400)}$$

Negative equity

If you borrow money by getting a mortgage to buy your house and the value of the house falls, you might owe the mortgage company more money than the house is now worth. This is called 'negative equity'.

Example: You want to buy a house at a cost of £150 000. You decide to borrow £140 000 of this by applying for a mortgage. Five years later, the value of your property has dropped. It is now valued at only £120 000. Assuming you have not yet paid off any of the mortgage, you still owe the mortgage company £140 000 (as this is what you borrowed).

So you are £20 000 in negative equity. This means that, even if you sold the house (for the £120 000 it is now worth), you would still owe £20 000 to the mortgage company. So you have a debt of £20 000 without a means to repay it.

Note: Sometimes in everyday life you may be working out calculations using a calculator, especially if you are working out balances, profit accounts, etc. It would therefore be useful, if you have a calculator, to note how negative numbers are shown on it. This varies with different makes and models. For example, some calculators show a negative number as:

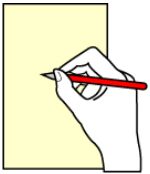
-5

On others, it might be shown in a different format, such as:

MINUS
5



Build your skills: Positive and negative numbers – Part 1



Work out these examples

- 1 What is the net profit for this business?

Expenditure	£	Income	£
Office expenses	600	Sales	12 000
Cost of materials	3 500		
Marketing costs	1 200		
Premises costs	5 200		

- 2 What is the net profit or loss for this business?

Expenditure	£	Income	£
Venue expenses	1 200	Ticket sales	2 600
Band fee	700	Drink sales	1 700
Marketing costs	1 400		
Staff costs	1 500		

- 3 By how much are these home owners in negative equity?

They bought their house for £220 000 and borrowed £210 000 of this.
The house is currently worth £180 000.

- 4 By how much are these home owners in negative equity?

They bought their house for £180 000 and borrowed £175 000 of this.
The house is currently worth £150 000.

Now print out Part 2 of this task to find suggestions of other free resources you might want to use to practise these skills.