N1.1 Positive and negative numbers

objectives

- Extend beyond zero when counting back in steps of constant size.

- Understand negative numbers as positions on a number line; order negative integers.

- Calculate temperature differences across 0°C.

starter

Vocabulary
negative
positive
less than (<)
more than (>)
lies between
difference

Resources
OHP calculator
mini-whiteboards
ITP *Number line*
  (optional)

You could, if you wish, support this lesson by using the ITP *Number line*, downloaded from www.standards.dfes.gov.uk/numeracy.

Use an OHP calculator. Start at 5. Count down in ones to below zero, asking pupils to predict the next number before you press the equals sign. Explain that negative numbers are referred to as 'negative one', 'negative two', and so on.

Draw on the board a number line with 10 intervals. Mark 0 in the centre of the line, and +5 at the right-hand end.
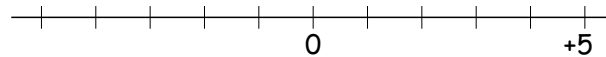
Point to different positions on the line, and invite individual pupils to the board to write in the numbers. When the numbers are written in, count backwards together from +5 to –5 and back to +5.

Erase the numbers, mark in –60 at the left-hand end, and 0 at the sixth division.
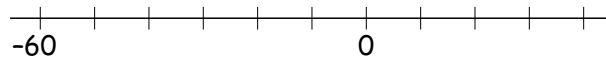
Point to different positions on the line, asking the class:

Q   What number is this?

Label the numbers as they are identified. Ask some questions such as:

Q   Tell me a number that is less than negative twenty … a number that is more than negative thirty … a number that lies between negative twenty and ten.

Record answers on the board, for example:

   –40 < –20   –10 > –30   –20 < 0 < 10

Explain that, just like on a number line with only positive numbers, it is possible to add and subtract by counting the steps along the line.

Q   What is five more than negative two?
Q   What is six less than four?
Q   What is the difference between five and negative three?

Stress that a difference between two numbers is measured by the number of steps or distance between them.
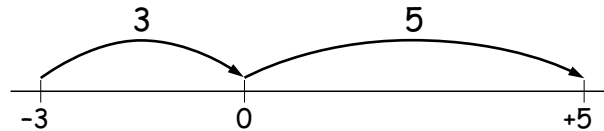
Write on the board:

–5   –4   –3   –2   –1   0   1   2   3   4   5

Ask pupils:

Q   Which pair of numbers has a difference of 8? A different pair? And another pair?

If necessary, illustrate with an empty number line.

Now write on the board:

–1   –0.5   0   0.5   1   1.5

Q   Which pair of numbers has a difference of 2? And a different pair?

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main activity

Vocabulary
temperature
degrees Celsius

Resources
OHTs N1.1a, N1.1b
ITP *Thermometer*
   (optional)
mini-whiteboards

You could, if you wish, use the ITP *Thermometer* to introduce pupils to temperatures above and below zero. Select options and ask questions to consolidate pupils' understanding.

Show pupils **OHT N1.1a**. Explain that a thermometer contains a substance such as mercury or alcohol that expands or contracts as it gets warmer or colder. Say that the thermometers on the slide measure temperature in degrees Celsius, and point out the °C abbreviation on them. Discuss the scales on the thermometers, explaining that they usually show only some numbers, leaving the others unmarked. Identify the positive and negative numbers on the scale. Ask pupils:

Q   What is the temperature in York? In Rome?

Show how to record these temperatures as 2°C and 7°C.

Stress that as you move down the scale and pass zero (equivalent to nought on the number line), the temperature is falling and that the air in the room or outdoors is getting colder. Point out where –5°C lies on each scale and invite a pupil to indicate where –7°C lies. Explain that, with temperatures, this is read as 'minus seven degrees Celsius' not 'negative seven degrees Celsius' and that it means that the temperature is seven degrees Celsius below zero.

Ask a few questions, inviting pupils to write the answers on their whiteboards as appropriate:

Q   The temperature is 2°C and it is getting warmer. Which way will the indicator move? Which way will it move if it is getting colder?

Q   What does minus three degrees Celsius mean? How would you write this?

Remind pupils that they should always include the units when they write a temperature.

Q   The temperature starts at four degrees Celsius and goes down by ten degrees. What is the temperature now? How did you work it out?

Now complete the questions on the slide.

Show and work through the questions on **OHT N1.1b**. Invite pupils to the projector to write the answers, making sure that they include the units.

Unit 2 section 3: Positive and negative numbers

plenary

Write randomly on the board a selection of temperatures. Ask the class to order these temperatures from the hottest to the coldest.

|		
92°C	……………………	hottest
37°C	……………………	
–12°C	……………………	
73°C	……………………	
12°C	……………………	
–2°C	……………………	coldest

Use the temperatures to ask questions such as:

Q   What is the difference between 12°C and 37°C? Between 12°C and –12°C? Between –12°C and –2°C?

Q   The temperature is –2°C. How many degrees must it rise to reach 12°C?

Q   The temperature falls from 37°C to –12°C. How many degrees has the temperature fallen?

After each question, ask pupils how they worked out the answer.


Remember

- A number and its negative are the same distance from nought or zero.

- Numbers get less as you count back along the number line beyond nought or zero, so –10 < –5 (negative 10 is less than negative 5).

- Temperature is measured in degrees Celsius (°C). A temperature of six degrees below zero is minus six degrees Celsius (–6°C).

- –10°C is a lower temperature than –5°C.

- Always include the units when you write a temperature.

These are the temperatures in York and Rome on a day in winter.
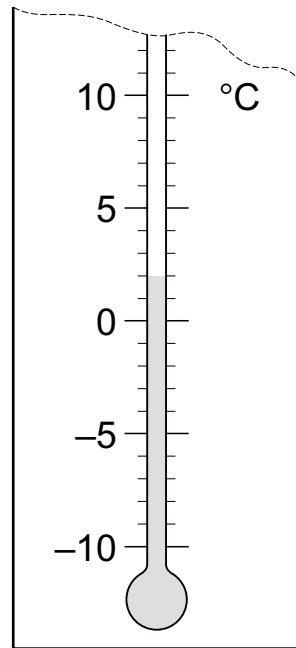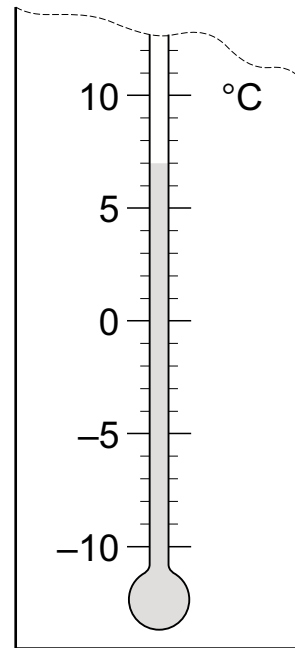
York   Rome

How many degrees colder is it in York than in Rome?

°C

On another day, the temperature in York is 4°C. Rome is 7 degrees colder than York.

What is the temperature in Rome?

°C

Here is a table of temperatures at dawn on the same day.

Temperatures	
London	–4°C
Moscow	–6°C
New York	–9°C
Paris	+6°C
Sydney	+14°C

What is the difference in temperature between:

a. London and Paris?   ....

b. New York and Sydney?   ....

c. London and Moscow?   ....

At noon the temperature in New York has risen by 5 degrees. What is the temperature in New York at noon?

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