

OUT AND ABOUT

OUTDOOR ACTIVITIES FOR KEY STAGE 2 MATHEMATICS

www.sfran.ac.uk/resource-centre/outandabout/



HANDLING DATA

Temperature investigation

Learning focus

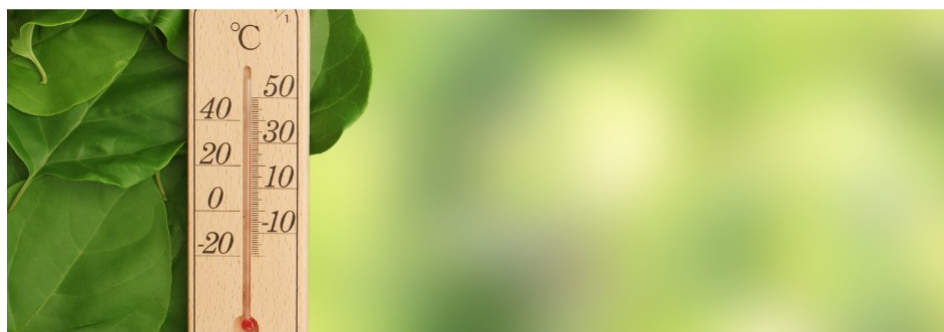
- Use a thermometer to measure temperature
- Record results in a table
- Create a line graph
- Interpret a line graph

Key vocabulary

- Temperature
- Scale
- Thermometer
- Degrees
- Celsius
- Interval
- Negative
- Maximum
- Minimum
- Range
- Mean

Resources

- Thermometer
- Chalk
- String
- Sticks
- Pebbles



Activity

It would be worthwhile introducing this activity the day before the investigation so that children can take the first temperature recording as early as possible in the morning.

Introduce the activity by displaying online temperature data. For example, display a weather map showing the temperature in different locations or display temperature readings for the local area over a 7-day period. Discuss the temperatures and any trends that can be seen.

What do the numbers mean?

What do the symbols mean?

What is the maximum/minimum temperature?

Which is the warmest/coldest location? Which is the warmest/coldest day?

Teaching point

Temperature can be expressed using a temperature scale, which quantifies how hot or cold something is. Most countries around the world use the Celsius scale. This scale is also known as the centigrade scale because the interval between the freezing point of water and the boiling point of water is divided into 100 degrees, with 0 degrees Celsius (0°C) representing the freezing point of water and 100 degrees Celsius (100°C) representing the boiling point of water.

A small number of countries, including the United States, use the Fahrenheit scale. Water freezes at 32 degrees Fahrenheit (32°F) and boils at 212 degrees Fahrenheit (212°F).

Introduce the thermometer and discuss its main features.

What is the name of the device used to measure temperature? What numbers can you see on the thermometer?

What do you notice about the numbers below zero?

What is the maximum/minimum temperature a thermometer can show?

What do the intervals represent?

What temperature does the thermometer show now?



Teaching point

Temperature is measured using a thermometer. Thermometers have temperature sensors and a means of expressing the temperature as a numerical value. The temperature can be read directly from a digital thermometer. Traditional thermometers consist of a glass rod with a very thin tube inside. The liquid is supplied from a 'bulb' at the base of the thermometer. As the temperature of the liquid rises, the liquid expands and rises up the tube, and the temperature can be read from the scale.



Explain that the children will be exploring changes in temperature in the outdoor environment throughout one day. Encourage the pupils to suggest how they might conduct this investigation.

How often should you measure the temperature throughout the day?

What will you need to keep the same each time?

Where would be a good place to position the thermometer?

How will you record your findings?

Work with the children to devise a recording sheet. For example, they could record results in a table showing the temperature recorded at various time points (hourly intervals) throughout the day. The children could also be encouraged to record their estimates for each time point. They should prepare the recording sheet so that it is ready to use the following day.

Assign children to small groups and invite each group to choose a different location for the investigation. On the day of the investigation, each group should go outdoors at the agreed times and measure the temperature at their chosen location. They should record their results on the recording sheet.

After the investigation, allow time for the children to display and interpret the data collected. Encourage children to discuss and compare their findings.

What do you notice about the temperature throughout the day?

Is this what you expected? Explain your response.

Are there any differences between groups? Can you explain why?

Remind pupils that we choose different types of graph depending on the type of data that we have. A line graph can be used for data which records changes over a period of time.

Teaching point

Temperature is a continuous variable. A continuous variable can take any value on a continuum. When temperature changes over time, it does so continuously, passing through every real number on the way.

Line graphs are used to represent continuous data. The measurements are plotted as points and straight lines are used to join each point to adjacent points. Only the plotted points represent actual values. Line graphs are therefore useful for showing trends over time and predicting future outcomes.

Ask children to create a line graph to show the continuous change in temperature over the day. They could use pieces of string or chalk to mark the axes on the school grounds. Encourage children to suggest an appropriate label and scale for each axis. They should label the x-axis 'Time' and mark the scale starting with the time they began the investigation, marking the times in hourly intervals, and finishing with the time when the last measurement was made. They should label the y-axis 'Temperature ($^{\circ}\text{C}$)' and mark an appropriate scale, taking account of the maximum and minimum temperatures recorded (the range). Pupils could then use chalk or small natural resources such as pebbles to plot the data on the graph and they could use pieces of string or sticks to join the points plotted.

Ask questions which require pupils to interpret their line graph.

What was the temperature at 9am? 2pm?

At what time did the temperature rise above 15° ?

At what time did the temperature drop below 11°C ?

What was the maximum / minimum recorded temperature?

Ask the children to calculate the difference between the maximum and minimum temperature. Introduce the term range.

Teaching point

Range is a measure of spread. It is the difference between the largest and smallest values in a set.

Pupils could also calculate the mean/average temperature by adding up all the temperatures recorded and dividing by the number of temperature recordings.

Teaching point

To find the mean of a set of numerical data, add up all the numbers in the set and divide the total by the number in the set.

Next, ask questions which focus on the lines between the plotted points. Explain that by looking at the line between plotted points we can estimate the temperature for the times in-between.

What was the temperature at 10am? 11am?

Estimate the temperature at 10.30am.

To challenge children further, ask questions which encourage them to read beyond the data. For example:

*What would you expect if you repeated this investigation at a different time of year?
What would you expect if you carried out this investigation in another country?*

Taking ideas further

The children could investigate how fast warm water cools over an hour. They will need a container of fairly hot water and a thermometer. They should measure the temperature of the water at 5 minute intervals and record their findings in a table. Once they have completed the investigation, they could create a line graph to show the change in temperature. Allow sufficient time for the children to discuss and interpret their graph.

Children could research the history of the Celsius and Fahrenheit scales. They could convert temperatures from one scale to another.

They could explore global temperature records and use these to study differences between countries, changes over time, and so on. This will provide opportunity to study a wider range of temperatures, including temperatures below zero.

Explore other contexts where it would be appropriate to use a line graph, such as a baby's weight, the height of a sunflower, the amount of rainfall, sale prices of houses.

They could search for examples of line graphs in different media sources, such as the internet, newspapers and magazines, and create a display.

Assessment opportunities

Are the children able to:

- Read a thermometer accurately to record temperature
- Present results in a table
- Choose an appropriate scale for both axes on their line graph
- Plot temperature measurements in a line graph
- Interpret the information in a line graph
- Calculate the range and mean of a set of data