Lesson Plan: Representing Data

Level: Stage 1

Syllabus links: ST1-11DI-T "identifies the components of digital systems and explores how data is represented"

LESSON OUTLINE

In this lesson, students investigate and explore how data is represented on the SWAQ website, including the use of tables and graphs. The teacher will use the projector to demonstrate the steps for the students to follow on their own devices. Students will complete a worksheet to check their understanding.

Resources/Materials:

- ⚑ Computer/laptops with internet access (for each student, or in pairs)
- ⚑ Projector with internet access
- ⚑ Worksheet (included)
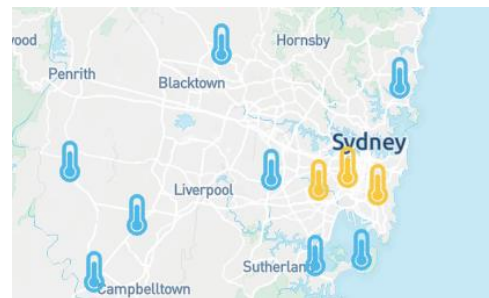
Description of activity:

Introduction

Begin the lesson by having a discussion about what is meant by the term "data". Explain that data is a collection of facts or information which can be in the form of numbers, words, measurements or observations. As an example, you can do a quick collection of data from the class by asking a question such as 'how many siblings does each person have?' and recording the results on the board. Explain that these results/numbers can be called "data".

SWAQ stations are also continuously collecting data about the weather and air quality at each participating school. Instead of asking questions, they use sensors to measure things such as the temperature, humidity, and wind speed. Explain to your students that in this lesson they will be exploring how the data collected at the SWAQ station at their school is represented on the SWAQ website.

Each student (or pair of students) should have access to their own computer/laptop. You will guide them through what to do by demonstrating the steps they should follow using the projector. Start by entering the URL into the address bar (www.swaq.org.au)

On the home page, click on the button "explore the data" in the orange banner.

EXPLORE THE DATA

Visual Representations

When you scroll down, the first thing you will come to is a map. This is a visual representation of the data using symbols and a colour scale. The default measurement is temperature.
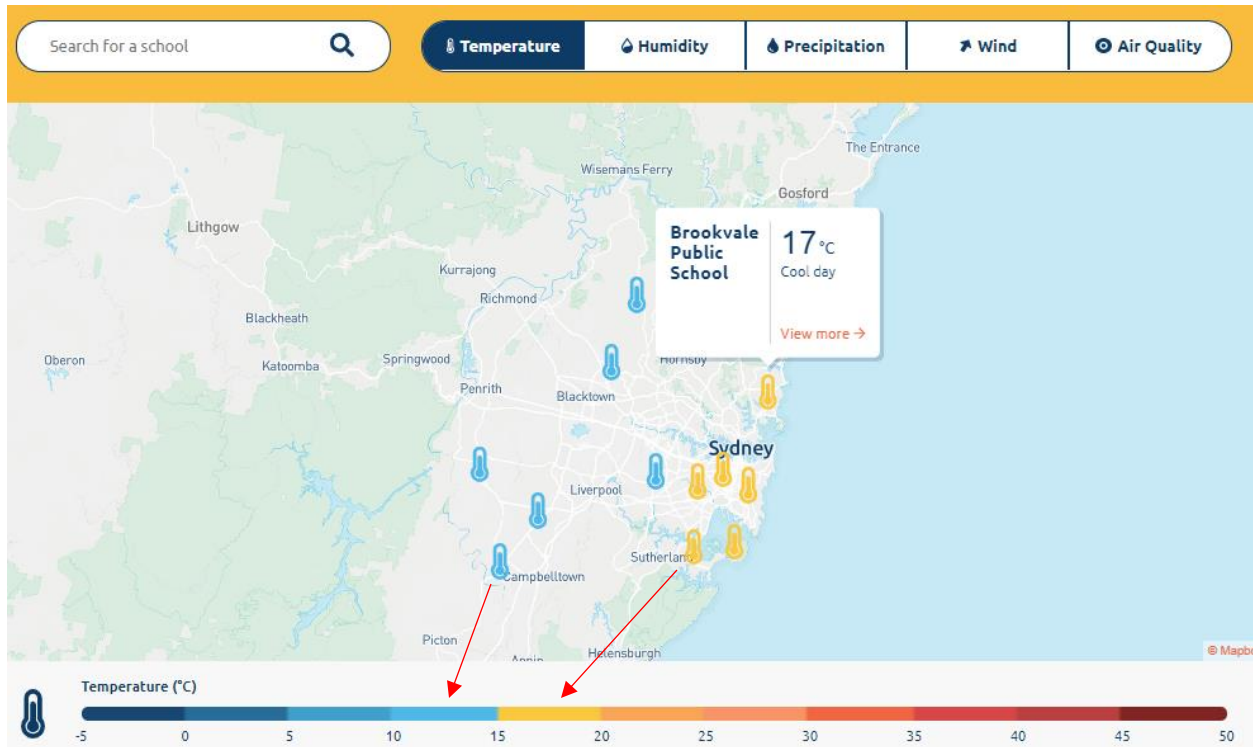
The symbols on the map show the location of each school, and the colour of the symbols shows the temperature according to the scale shown below the map. In the example above, the schools in the East have recorded temperatures in the range 15 – 20°C as shown by the yellow colour, whilst schools in the West have recorded temperatures in the range 10 – 15°C as shown by the light blue colour. Hovering your mouse over any one school will make an information box pop up showing the name and actual temperature measurement of that school, as seen with Brookvale Public School in the map above.

Explain all of these details to your students whilst simultaneously demonstrating on the projector. Then allow them to have a moment to explore themselves. You can ask them to find their own school and to tell you what the temperature has been recorded as. You can also ask them whether this temperature is hotter or colder than most other schools. Once they have had a chance to try for themselves, you should demonstrate how to find the answers to these questions.

After taking a moment to explore temperature, click on the next measurement (humidity) from the options displayed in the orange bar above the map. You should notice the symbols change to water droplets with different shades of blue according to a new colour scale below. Demonstrate again how the colour of the water droplet matches to a particular section from the scale below. Once again, give your students some time to explore before moving on to each of the other measurements. Note that for wind speed, in addition to the colour of the arrow (which tells you the speed), the arrows also point in different directions (to show the direction that the wind is blowing). Also note that for air quality, some schools are grey in colour because they do not have an air quality sensor installed in those schools.

You may now give your students some time to answer the worksheet questions.

Table Representation

Once students have completed their worksheets, use the projector to scroll down a little further below the maps until you see a table with the list of schools and all their data, as shown below.

	Temperature (°C)	Humidity (%)	Precipitation (mm)	Wind (km/h)	Air Quality
Brookvale Public School	17 °C	78 %	0 mm	4 km/h N	12
Chullora	15 °C	85 %	0 mm	1 km/h N	38
Dulwich Hill Public School	17 °C	75 %	0 mm	4 km/h undefined	N/A
Glenorie Public School	14 °C	86 %	0 mm	1 km/h SE	21
Kellyville Public School	15 °C	82 %	0 mm	1 km/h NW	N/A
Kurnell Public School	18 °C	79 %	0 mm	2 km/h NE	16
Leppington Public School	14 °C	85 %	0 mm	6 km/h SE	18
Luddenham Public School	14 °C	84 %	0 mm	2 km/h S	17
Narellan Public School	14 °C	85 %	0 mm	1 km/h S	N/A

Notice that the table uses the same colour scheme, shown as a coloured line to the left of the numbers. Explain to your students that this table is a different way to represent the same data. Instead of showing the measurements on a map, here we can see it in a table. Each row represents a certain school, and each column represents a different measurement. Demonstrate that the measurements are the same by going to the map, hovering over a school to read its measurement, and then returning to the table to check that the measurement is the same. Here, you can ask your students to check whether the answers they got for their worksheets while using the maps are the same as what they can see written in the table.

Graphical Representations

For the next component of the lesson, you need to select a specific school. If you have a SWAQ station installed at your school, you can choose your school by clicking on its name from the table. Scrolling down you will see each of the four weather measurements (with comparisons to the previous day), and beneath this, you will see the air quality index displayed on a scale, with the individual air pollutant measurements below.

Scrolling down further, you will see the heading, 'historical data'. Previously, you have been looking at the data as it has been currently measured. This next section will allow you to explore how the data has been changing over time, by looking at the last 24 hours or the last week.
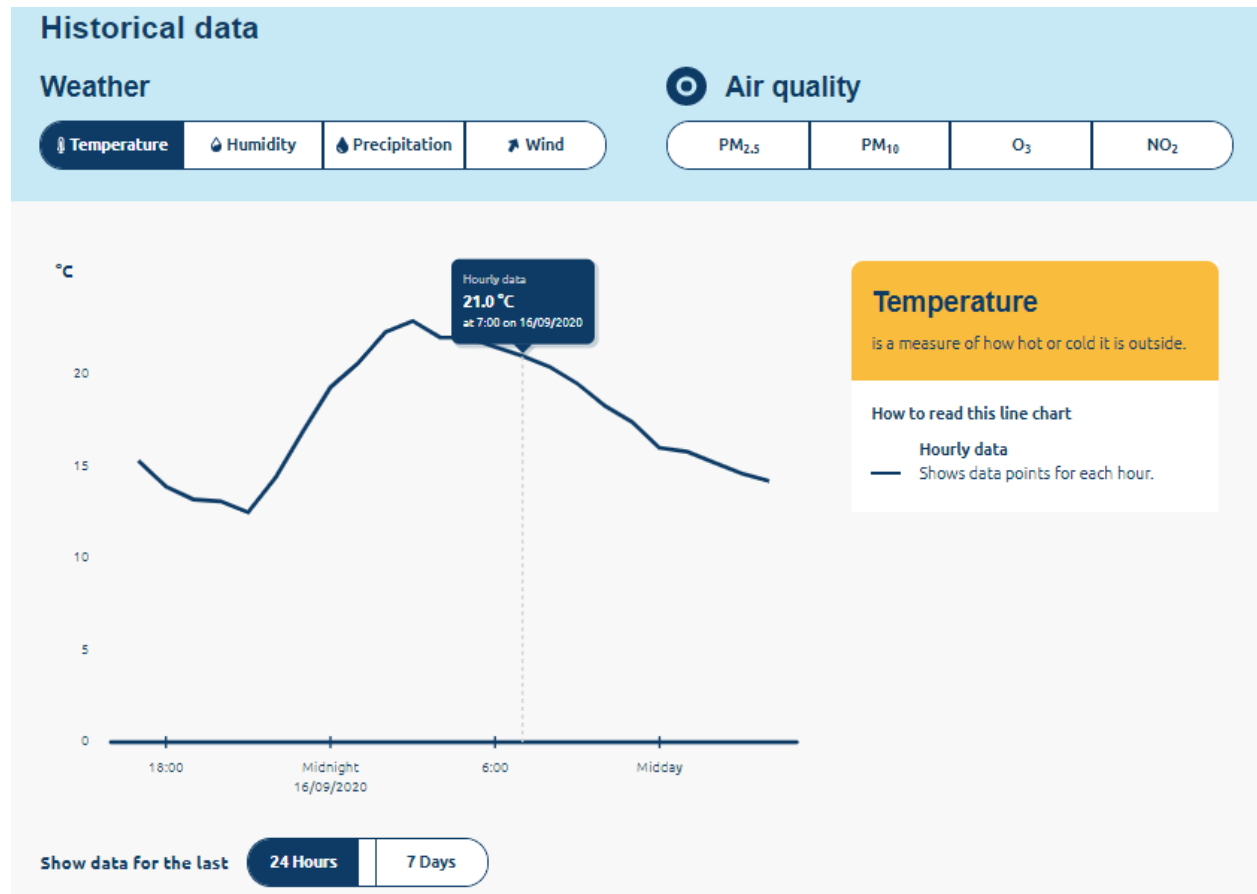
Once again, the default measurement is temperature, and the default time setting is the last 24 hours. Temperature is shown here using a line graph. Hovering your mouse over any section of the line will show you the precise hourly measurement, as can be seen above for 7am. Show your students this by starting at the beginning of the line on the left of the graph and following the changes hour by hour until you reach the end of the line to the right of the graph. Point out that when the temperature is getting colder, the line is moving downwards, and when the temperature is getting hotter, the line is moving upwards. This graph can easily allow you to identify the coldest and hottest parts of the day, by looking to see where the line is the lowest and highest on the graph and then hovering over these points. Switching to the last 7 days (by clicking the button below the graph) will show you another line graph where you can see the trend that it gets hotter in the daytime and colder in the night time.

Allow your students a few minutes to explore the graphs in this section, and to answer the next set of worksheet questions. Please note that the worksheet refers only to the temperature graph from the last 24 hours. Some of the graphs are more complex than others (for example wind speed, $PM_{2.5}$ and PM_{10}). Students can look at these graphs, but they will not be required to understand them or answer questions on them.
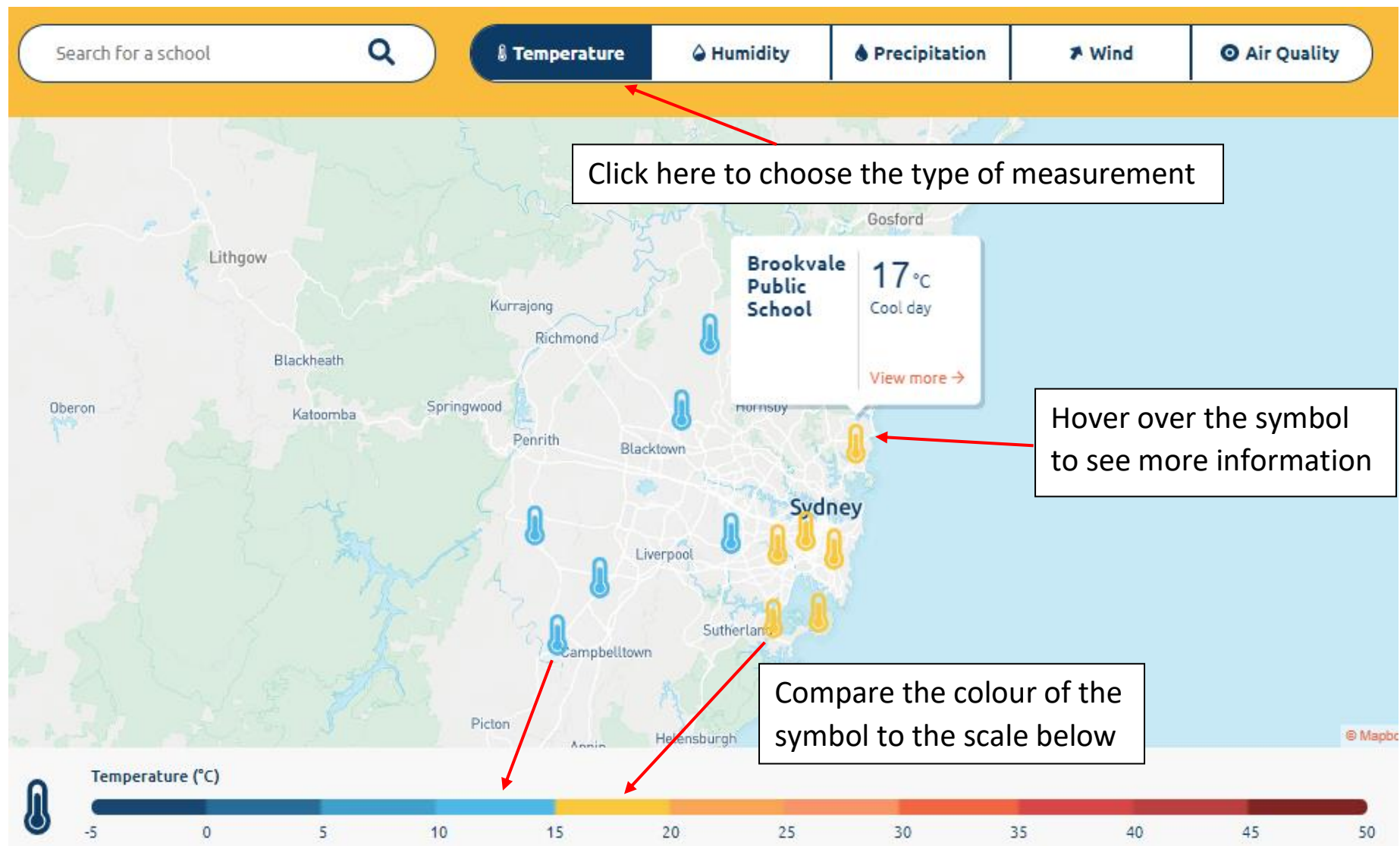
Key Questions to Ask

Why do we collect data?

What are the benefits of displaying the data on a map?

What are the benefits of displaying the data in a table?

What are the benefits of displaying the data using a graph?

Which representation of the data did you like the most? Why?

Representing Data Worksheet 1

Click here to choose the type of measurement

Hover over the symbol to see more information

Compare the colour of the symbol to the scale below

Use the maps from the SWAQ website to answer these questions.

1. What is the temperature at Taren Point Public School?

2. Is the temperature at Taren Point warmer, colder or the same as at Glenorie Public School?

3. What is the humidity at Luddenham Public School?

4. Is the humidity at Luddenham greater, lower or the same as at Kurnell Public School?

5. Has it rained at any of the schools? If it has, where did it rain the most?

6. What is the wind speed at Narellan Public School?

7. What is the name of another school where the wind is blowing in the same direction as at Narellan?

8. Which school has the best (lowest) air quality?

9. What is the difference in air quality between the best and worst schools?

Representing Data Worksheet 2
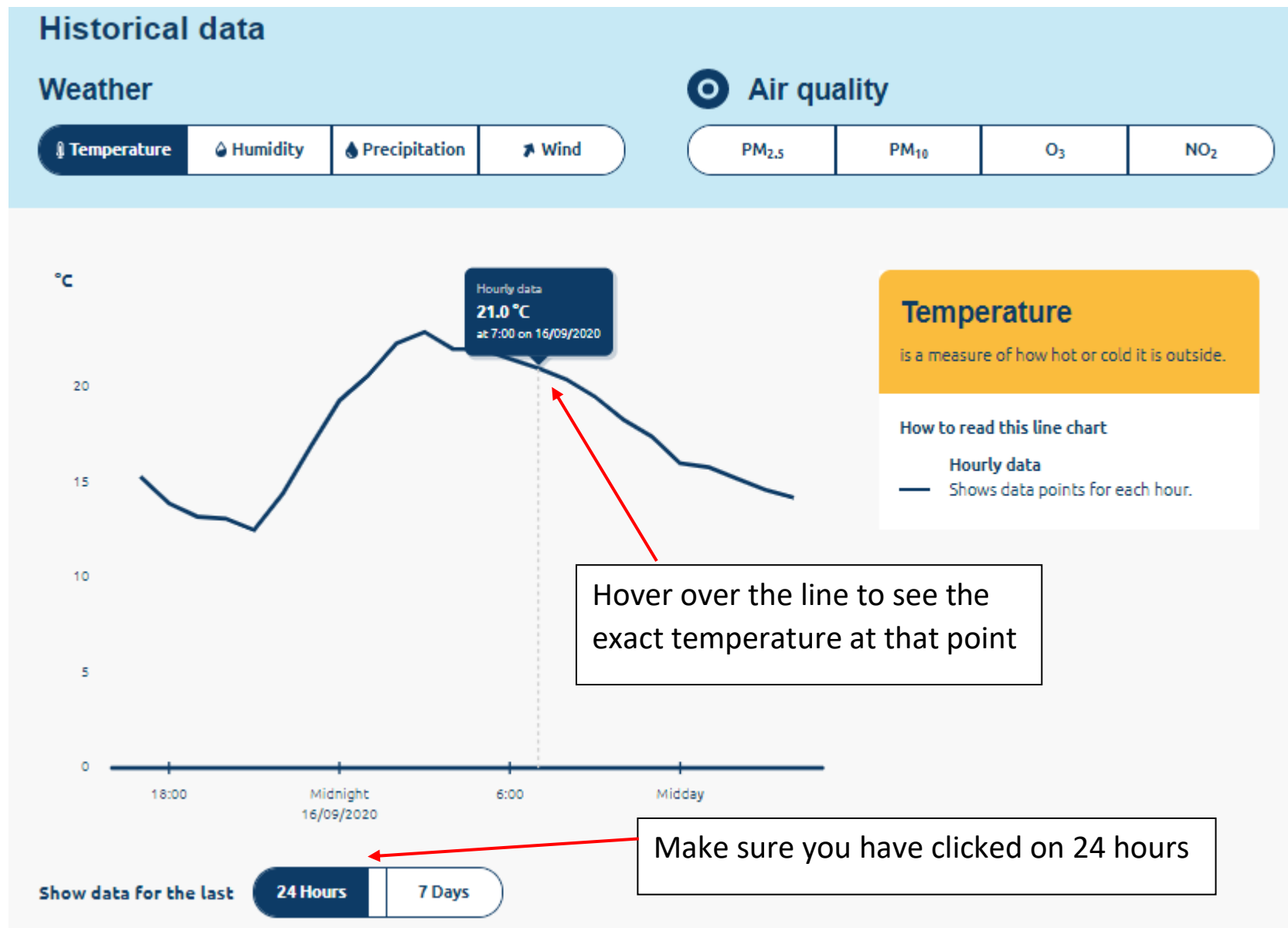
Use the temperature graph from the last 24 hours to answer these questions.

1. What is the hottest temperature from the last 24 hours?

2. What was the time when the temperature was the hottest?

3. What is the coldest temperature from the last 24 hours?

4. What was the time when the temperature was the coldest?

5. During what time of the day was the temperature getting hotter?

6. During what time of the day was the temperature getting colder?

7. What is the difference between the hottest and coldest temperatures?