Lesson - Line graphs and timetables

Year: Year 5

Hello, I am Otto! Graphs and tables help us see information at a glance. A line graph shows how something changes over time, like the temperature during a day or the height of a plant each week. Timetables tell us when buses, trains and lessons start and finish. In this chapter you read and draw line graphs, answer questions about them and use timetables, including the 24-hour clock.

Starter activity

Think about the weather today. Was it cold in the morning, warm at midday and cold again in the evening? If you wrote down the temperature every two hours and joined the points with a line, you would draw a line graph. Where would the highest point be? What would the line do at night? Keep these questions in mind as you read.

What is a line graph?

Definition: line graph

A **line graph** shows how something changes over time, such as temperature through the day or the height of a plant each week. Time goes along the horizontal axis (the x-axis) and the amount goes up the vertical axis (the y-axis). The points are joined with straight lines.

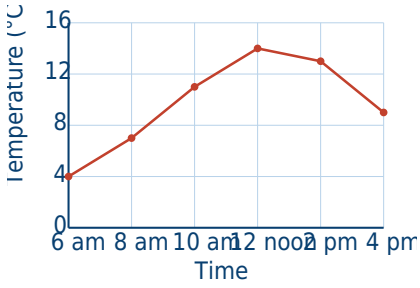
Method: reading a line graph

1. Read the title and the labels on both axes.
2. Check the scale: what is each square or gap worth? The scale may count in 1s, 2s, 5s or 10s.
3. Go up from the time on the bottom axis to the line, then go across to the vertical axis to read the amount.
4. Write the answer with the unit, for example 11°C.

Reading values

Here is the temperature in a garden in Manchester on a spring day.

Time	6 am	8 am	10 am	12 noon	2 pm	4 pm
Temperature (°C)	4	7	11	14	13	9



Example 1

What was the temperature at 10 am? What was the highest temperature, and when?

Go up from 10 am until you reach the line, then read across: **11°C**. The highest point of the line is **14°C at 12 noon**.

Differences, rises and falls

Rule: finding a change

To find how much something went up or down, subtract the smaller reading from the larger one. A flat part of the line means no change. The line is steepest where the change is biggest.

Example 2

How much did the temperature rise between 8 am and 12 noon? How much did it fall between 2 pm and 4 pm?

Rise: $14 - 7 = $ **7°C**. Fall: $13 - 9 = $ **4°C**.

Example 3

Between which two times was the rise the biggest?

Rises: 6 am to 8 am is 3, 8 am to 10 am is 4 and 10 am to 12 noon is 3. The biggest rise is **between 8 am and 10 am**.

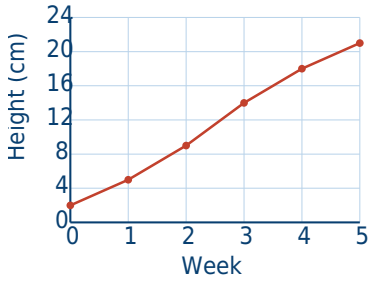
Key fact: estimating between points

Between two plotted points the actual value is not known exactly, so a reading is only an **estimate**. At 9 am the temperature is about halfway between 7°C and 11°C, which is about 9°C. We use the word "about" or "approximately".

Drawing a line graph

Method: drawing a line graph

1. Draw the two axes on squared paper and give the graph a title.
2. Choose a scale that fits the biggest number, for example one square for every 2 or 5 units. Number the scale evenly.
3. Label the horizontal axis (for example Week) and the vertical axis (for example Height in cm).
4. Plot each point with a small cross, then join the points with a ruler.



Example 4

The heights of a sunflower in centimetres over five weeks are 5, 12, 25, 41 and 60. Choose a scale for the vertical axis.

The biggest value is 60, so the scale needs to reach at least 60. Counting in 10s takes 6 squares up the page, which fits well. So choose **one square for every 10 cm** and number the axis 0, 10, 20, up to 60.

Reading tables and timetables

Definition: timetable

A **timetable** is a table that shows the times when things happen, such as when buses or trains leave and arrive. To read a timetable, find the right row for the place and the right column for the journey, and read the time where they meet.

Place	Bus 1	Bus 2	Bus 3
School	08:10	08:40	09:10
Library	08:25	08:55	09:25
Station	08:45	09:15	09:45

Example 5

Using the timetable, when does Bus 2 reach the station? How long does Bus 1 take from the school to the station?

Bus 2 reaches the station at **09:15**. Bus 1 leaves at 08:10 and arrives at 08:45. From 08:10 to 08:45 is **35 minutes**.

Definition: 24-hour clock

The **24-hour clock** uses four digits, from 00:00 to 23:59, so there is no need for am or pm. For afternoon and evening times, add 12 to the hour. For example 3:45 pm is 15:45 and 9:20 pm is 21:20. Midnight is 00:00 and 12 noon is 12:00.

Method: finding how long a journey takes

1. Count on from the start time to the next whole hour.
2. Count the whole hours to the hour before the finish.
3. Count on the last minutes to the finish time.
4. Add all the parts together.

Example 6

A train leaves at 09:40 and arrives at 11:15. How long is the journey?

From 09:40 to 10:00 is 20 minutes. From 10:00 to 11:00 is 1 hour. From 11:00 to 11:15 is 15 minutes. Total: 20 + 60 + 15 = **1 hour 35 minutes**.

Watch out

There are 60 minutes in an hour, not 100. If a journey starts at 09:40 and takes 45 minutes, it ends at 10:25, not 09:85. Count on to the next hour, then add the rest. Check the scale of a graph too, since it may count in 5s or 10s instead of 1s.

Did you know?

The 24-hour clock is used by airlines, railways, hospitals and the army all over the world, because it never gets confused between morning and evening. Line graphs were invented about 250 years ago by a Scottish engineer called William Playfair, who wanted to show how trade changed over time.

Otto's tip

Before you answer a question about a graph, look at the scale and the axis labels. A quick check of "what is one square worth?" can save you from many mistakes. For timetables, count on to the next hour, then add the minutes.