Lesson - Bar charts and time graphs

Year: Year 4

Hello, I am Otto! A chart can tell a story in a single glance. Newspapers, weather forecasts and school reports all use charts and graphs. In this chapter you learn to read and draw bar charts, to use tables and pictograms, and to read time graphs that show how something changes during the day or over several weeks.

Starter activity

Ask ten children in your class which pet they like best: dog, cat, rabbit or fish. Make a tally chart with a mark for each answer. Count the marks and then draw a bar for each pet. Which bar is the tallest? Which is the shortest? You have just carried out a survey and shown the data in a bar chart!

Tally charts and frequency tables

Definition: data, tally and frequency

Data are facts or numbers that we collect, for example the favourite sports of the children in a class. A **tally chart** records each answer with a mark; every fifth mark crosses the group of four, so we count in fives. The **frequency** is the number of times something happens, and a **frequency table** lists each item with its frequency.

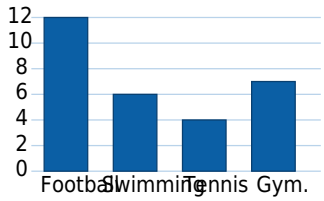
Sport	Tally	Frequency
Football	|||| |||| ||	12
Swimming	||||		6
Tennis	||||	4
Gymnastics	|||| ||	7

Count the groups of five first, then the extra marks. The total number of children is 12 + 6 + 4 + 7 = 29.

Bar charts

Definition: bar chart

A **bar chart** uses bars of different heights to show data. Each bar stands for one category. The height of the bar tells you the frequency. A bar chart has a title, labels on both axes, and a scale on the vertical axis.



The bar for football reaches 12, so 12 children chose football. The bar for tennis reaches 4. Football is the most popular sport and tennis is the least popular.

Method: reading a bar chart

1. Read the title to see what the chart is about.
2. Look at the vertical axis and find out the scale: does each line go up in 1s, 2s, 5s or 10s?
3. For a bar, follow the top of the bar across to the scale and read the value. If it is between two lines, work out the middle value.
4. Compare bars by subtracting the values, and add bars to find a total.

Watch out for the scale

Always check what each square or line on the vertical axis is worth. If the scale goes up in 5s, a bar that reaches the second line is 10, not 2! If a bar finishes half way between 10 and 15, its value is 12 or 13 (about 12.5), and you must decide what is sensible.

Example 1

In the bar chart above, how many more children chose football than tennis? How many children took part?

Football is 12 and tennis is 4. The difference is $12 - 4 =$ **8 more children**. The total number of children is $12 + 6 + 4 + 7 =$ **29 children**.

Pictograms

Definition: pictogram

A **pictogram** uses pictures or symbols to show data. A **key** tells you how many items each symbol stands for. A half symbol stands for half the number.

Item	Symbols
Mondays	●●
Tuesdays	●●●
Wednesdays	●◐

Key: ● = 4 children, ◐ = 2 children. On Monday there are 2 symbols, so 8 children have

school dinners. On Tuesday there are 3 symbols, so 12 children. On Wednesday there is 1 symbol and a half, so 4 + 2 = 6 children.

Example 2

Using the pictogram, how many children in total have school dinners on the three days?

8 + 12 + 6 = **26 children**. Check using symbols: 2 + 3 + 1 = 6 whole symbols and 1 half symbol, so 6 × 4 + 2 = 26.

Choosing a scale and drawing a bar chart

Method: drawing a bar chart

1. Look at the biggest number in your data. Choose a scale that is easy to count in (1, 2, 5 or 10) and that fits on your paper.
2. Draw the vertical axis with the scale and the horizontal axis with the categories. Space the bars evenly with equal widths.
3. Draw each bar to the right height. Leave a gap between the bars.
4. Give the chart a title and label both axes.

Example 3

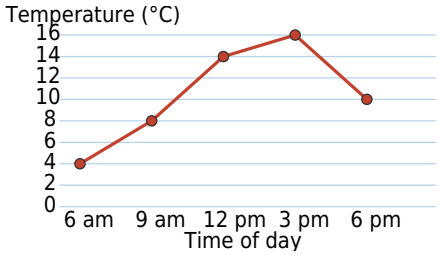
The numbers of books borrowed on four days are 30, 45, 20 and 55. Choose a scale.

The biggest number is 55. A scale of 10 per square means 6 squares high, which fits well, and the values 30, 20 are exact lines. 45 and 55 are half way between lines. A scale of 5 is more accurate but needs 11 squares. We choose **5 per square** if there is room, or 10 per square if there is little room.

Time graphs

Definition: time graph

A **time graph** (or line graph) shows how something changes over time. Time is on the horizontal axis. The measurement, such as temperature or height, is on the vertical axis. Points are joined with straight lines to show the change. Time graphs are used for temperatures, heights of plants, and the amount of water in a tank.



At 6 am the temperature is 4 °C. It rises to 16 °C at 3 pm and then falls to 10 °C by 6 pm. The line goes up when the temperature rises and down when it falls. The highest point is the warmest time of the day.

Key fact: reading a time graph

- Find the time on the horizontal axis and go up to the line, then across to the scale to read the value.
- A line that goes up means the amount is increasing; a line that goes down means it is decreasing; a flat line means no change.
- The steeper the line, the faster the change.
- To find the change between two times, subtract the two readings.

Example 4

Use the temperature graph. When is it warmest? By how much does the temperature rise from 6 am to 12 pm?

The highest point is at 3 pm, so it is warmest at **3 pm** (16 °C). At 6 am it is 4 °C and at 12 pm it is 14 °C. The rise is 14 − 4 = **10 °C**.

Example 5

Between which two times does the temperature rise fastest?

Work out the rise for each pair: 6 am to 9 am: 8 − 4 = 4. 9 am to 12 pm: 14 − 8 = 6. 12 pm to 3 pm: 16 − 14 = 2. The biggest rise is 6 °C, between **9 am and 12 pm**. This is also the steepest part of the line.

Did you know?

The first time graphs were drawn about 200 years ago by a Scottish engineer called William Playfair, who also invented the bar chart. Scientists today use graphs to show changes in the weather, in the population of animals and in the temperature of the Earth. A hospital uses a time graph to show a patient’s temperature through the day.

Otto's tip

Before you answer a question about a chart, read the title and check the scale. Say to yourself, "What is each square worth?" Then mark the value with your finger or a ruler. And when you draw a chart, label the axes and give it a title, or nobody will

know what it shows!