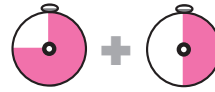


# Whorls, arches and loops



45 mins + 30 mins

In the first session, students take a set of their fingerprints and learn to recognise patterns in them. In the second session, they contribute to a bar graph that displays the number of different fingerprint patterns in the class and use the bar graph to predict which fingerprint pattern might be the most common in another class.



## At a glance

Student book pages 25–28

### Session 1

- Discuss the use of fingerprints and demonstrate how to take a set.
- Students carry out the team investigation.
- Discuss common patterns in fingerprints.

### Session 2

- Students contribute to a class bar graph using their set of prints.
- Discuss the information shown on the graph.
- Discuss predictions for another class.
- Discuss questions in the student book.





## Lesson outcomes

### 1 Students are able to recognise and describe patterns.

They show their ability by:

- classifying the patterns in fingerprints as whorls, arches or loops; and
- matching similar fingerprint patterns.

### 2 Students are able to recognise and describe patterns shown in data.

They show their ability by using a class bar graph of fingerprints to determine which are the most and the least common fingerprint patterns in the class.

### 3 Students are able to use patterns shown in data to make a prediction.

They show their ability by predicting that the fingerprint pattern that is most common in their class might also be the most common in another class.



## Equipment and preparation

### Session 1

#### For class demonstration

- 1 soft-leaded pencil (2B or 3B)
- 1 small piece of paper
- transparent sticky tape

#### Team investigation

- For each team**
- 3 worksheets, 'Fingerprints' (BLM 4.4)
  - 1 soft-leaded pencil (2B or 3B)
  - transparent sticky tape
  - 1 magnifying glass
  - job badges for director, manager and speaker

*Managers will find it easier to collect the equipment if you put the items for each team into a separate container.*

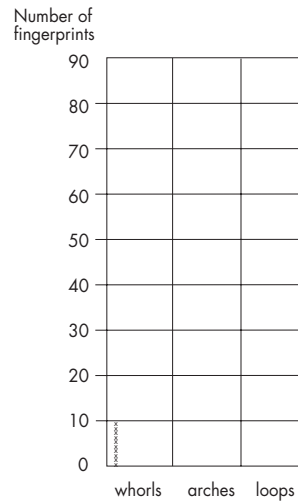
**Preparation** **BLM** Make three copies of 4.4 for each team.

**Session 2**

**For the class** paper, for a chart (about 100 x 30 centimetres)

**For each student** each student's worksheet from Session 1

**Preparation** Prepare a bar graph chart as shown.



**Teaching strategies**

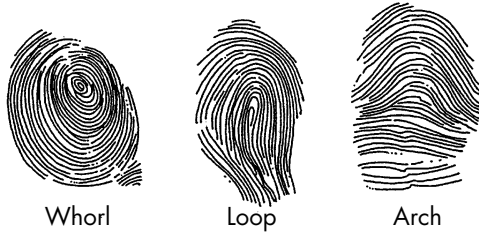
**Session 1**

**1** Read the introduction in the student book.

**Fingerprints are clues that detectives sometimes use to solve crimes. No two fingerprints are exactly alike. Detectives try to match the fingerprints they find at a crime scene to those of known criminals. If the prints match exactly, the police can use the information as evidence.**

**Look at your fingertips. The pattern of lines on the ends of your fingers forms your fingerprint. You were born with these patterns. They grow larger as your hands grow larger, but they will never change.**

Look at someone else's fingertips. How are their patterns similar to yours? You might notice that all fingerprints contain one of three basic patterns.



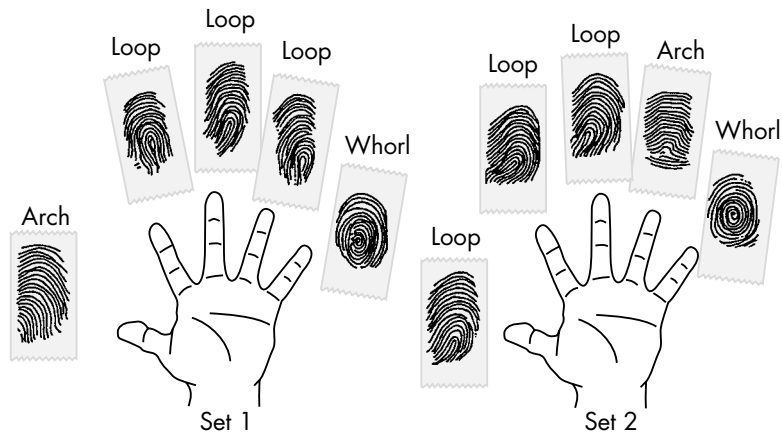
Some loops lean to the right or to the left. Both of these fingerprints are called loops.



Some arches look short or tall. Both of these fingerprints are called arches.



You might see one or more of these patterns on the five fingers of anyone's hand. Sets of fingerprints may look like this.



These two sets of fingerprints both have three loops, one arch and one whorl, but the order of the patterns in each set is different. The order of the patterns helps to identify different people.

2 Discuss how police and other agencies use people's fingerprints.

3 Demonstrate how to take fingerprints by taking your own, following steps 1 to 3 in the student book. Pass the prints around the class. Explain that each student will make their own set of fingerprints.

*If there is enough time, students could take a set of fingerprints from both hands. They will then see that the order of fingerprint patterns is not necessarily the same for both hands.*

4 Outline the team investigation: *What patterns can we see in our fingerprints?*



Form teams and allocate jobs.

Ask managers to collect team equipment.

5 Ask students to carry out steps 1 to 5 in the student book.

**Step 1** Use a pencil to blacken the print pad on your worksheet.

**Step 2** Ask one of your team mates to cut off a piece of sticky tape, about 2 centimetres long. Then rub your left thumb on the print pad.

**Step 3** Your team mate presses the sticky tape onto your thumb, peels it off and sticks it **above** the thumb on your worksheet.

**Step 4** Take it in turns to help each other make fingerprints for all the fingers (and thumb) on your left hands. Put each print next to the end of the same finger drawn on your worksheet.

**Step 5** Use a magnifying glass to look at the patterns on your set of fingerprints.

Write 'whorl', 'arch' or 'loop' next to each one to show which pattern it is.

6 When students have finished the investigation, ask:

**What patterns did you find in your fingerprints?**

**How many different patterns are there?**

## Session 2

7 Display the bar graph chart you have drawn up and ask students to help you record the data from their fingerprints.

*One way to do this is to ask students to hold up fingers to show how many of each pattern they counted on their left hand. On the bar graph, record one cross for every time someone in the class has that fingerprint pattern (eg, if one student has four fingers with whorls then record four crosses on that column).*

8 Discuss the data shown in the chart. Ask:

**Which column is the tallest?**

**Are any of the columns the same height?**

**Are there more whorls or more loops in our class?**

**How many more whorls than arches are there?**

How many fingerprints are there all together?

9 Ask: **Would you predict that a graph of fingerprint patterns from another class would look the same as our graph?**

**How can you find out whether your prediction is correct?**

*It is reasonable for students to expect that these patterns will continue—students have no evidence to make them think otherwise. However, a small sample reduces the reliability of predictions about whether the patterns shown in the data will repeat in another group. The only way to know for sure is to take the fingerprints of another class and count them. Students might enjoy conducting such an experiment and comparing their fingerprint distribution with that of another class.*

**10** Ask students to use the bar graph to answer the questions in the student book:

- 1** How many whorl fingerprints are there in our class?
- 2** How many arch fingerprints are there in our class?
- 3** How many loop fingerprints are there in our class?
- 4** Which type of fingerprint occurs most commonly in our class?

Keep the chart to use in Lesson 9.



## Background information

Everyone's set of fingerprints is unique. The patterns are made by tiny ridges in the skin.

The most common fingerprint patterns include whorls, arches and loops, although some people show double loops and other composite prints.

In the general population, about 65 per cent of all fingerprints are loops; 30 per cent are whorls; and only 5 per cent are arches. The ridges within anyone's fingerprint will not look exactly like one of the basic patterns, but they will usually fall into one of the three types.

These tiny differences are what makes each person's fingerprints unique. The ridges on our fingertips help us to grip objects. When we touch an object, the oil and perspiration on our skin leave behind a latent (potential) fingerprint. Investigators dust these latent fingerprints with a fine powder to make the patterns visible and then lift the fingerprints with sticky paper.



## Extensions

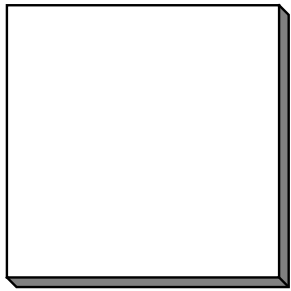
One student in each team makes an additional set of un-named prints. Exchange this mystery set of prints and the team's copies of the worksheet from the lesson with another team. Teams then try to identify the owner of the un-named set of prints.

Try dusting and lifting fingerprints left on surfaces such as glass. Use talcum powder or powdered paint and a very soft make-up brush or a cotton ball to highlight the prints. Lift them with transparent tape and display them on contrasting coloured paper.

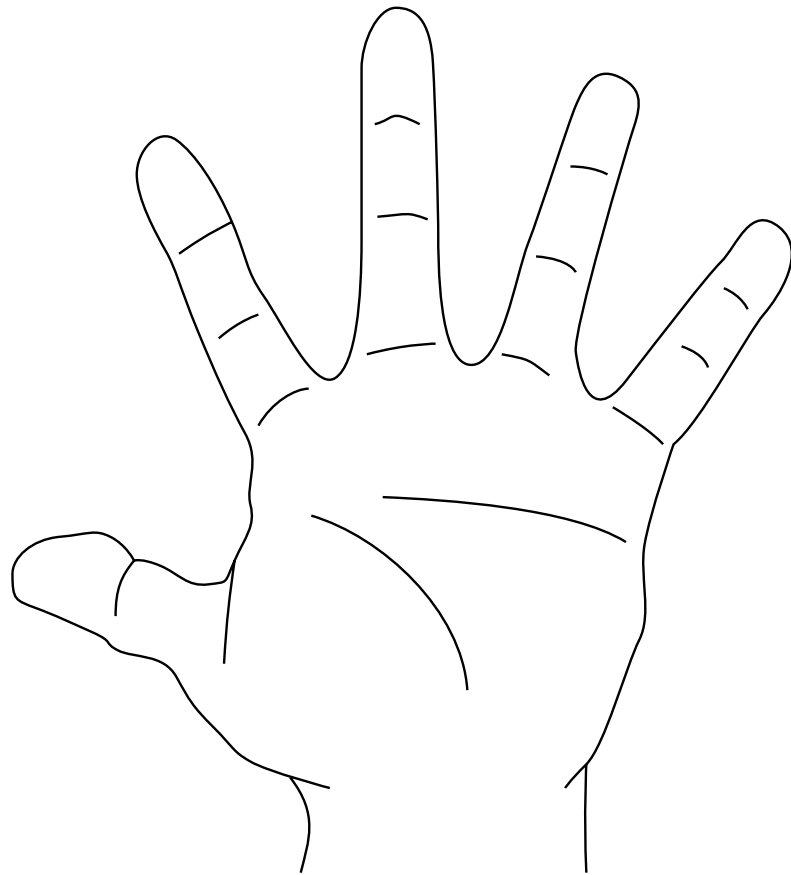
Encourage interested students to find out about fingerprinting techniques. One new technique includes using lasers to find latent fingerprints. Invite a detective from your local police station to show students how the police gather fingerprints from a crime scene. 🌀

# Fingerprints

Name: .....



Print pad



Left hand

Date: .....