

Shapes and Data Displays: math lesson, Grade 3 – download the PDF

Look around you: a window, a tile, a kite, a cracker. Many things are shaped like **quadrilaterals**. In this chapter you will learn what makes each one special, how to cut shapes into equal parts, and how to show information with picture graphs, bar graphs and line plots. You will also practice measuring with a ruler to the half inch and the quarter inch.

1. Quadrilaterals and their attributes

D Quadrilateral

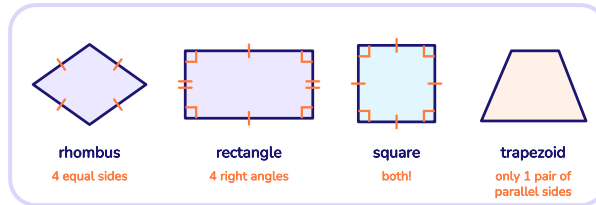
A **quadrilateral** is a closed shape with exactly **4 straight sides** and **4 angles**. The word comes from “quad” (four) and “lateral” (side).

An **attribute** is something you can notice about a shape. When you study a quadrilateral, look at three attributes:

- the **sides**: are some of them the same length?
- the **angles**: are some of them right angles (square corners)?
- the **parallel sides**: do some sides run in the same direction and never meet?

Shapes can share attributes and still be different. A kite, a rectangle and a window frame all have 4 sides, so they are all quadrilaterals. But they do not have the same attributes, so they have

different names.



E Example 1: Is it a quadrilateral?

A shape has 5 straight sides. Is it a quadrilateral?

No. A quadrilateral has exactly 4 sides. A shape with 5 sides is a pentagon. A shape with 3 sides is a triangle.

2. Rhombus, rectangle and square

Three special quadrilaterals appear again and again.

D Rhombus

A **rhombus** is a quadrilateral with **4 sides that are all the same length**. Its corners do not have to be right angles.

D Rectangle

A **rectangle** is a quadrilateral with **4 right angles**. Its opposite sides have the same length.

D Square

A **square** is a quadrilateral with **4 equal sides** and **4 right angles**.

In the picture, small orange marks on the sides show sides that have the same length. A little square in a corner shows a right angle.

E Example 2: Naming a shape

Kai draws a quadrilateral. All 4 sides measure 6 cm. The corners are slanted, so none is a right angle. What is it?

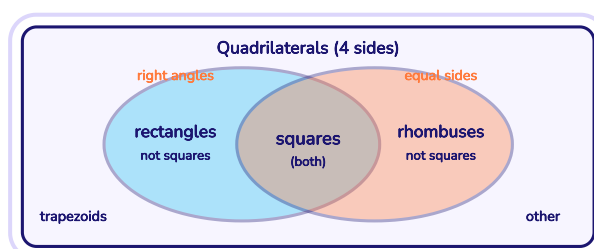
All sides are equal, so it is a rhombus. It has no right angles, so it is not a square.

⚠ Careful!

Do not say that a shape is “only” a square. A square has 4 equal sides, so it is also a rhombus. It has 4 right angles, so it is also a rectangle.

3. Sorting shapes into categories

You can sort shapes into groups that have an attribute in common. A bigger group can hold smaller groups. Quadrilaterals are the big group. Rectangles and rhombuses are two smaller groups inside it, and they share the squares.



P**Remember the families**

- Every square is a rectangle.
- Every square is a rhombus.
- Not every rectangle is a square (a long, thin rectangle is not).
- Not every rhombus is a square (a slanted rhombus has no right angles).

M**Method: name a quadrilateral**

1. Count the sides. If there are not 4, it is not a quadrilateral.
2. Check the sides. Are all 4 equal?
3. Check the corners. Are all 4 right angles?
4. Choose the most helpful name: 4 equal sides and 4 right angles gives a square.

E**Example 3: Two attributes**

A quadrilateral has 4 right angles. Two sides are 8 inches long and two sides are 3 inches long. Which shape is it?

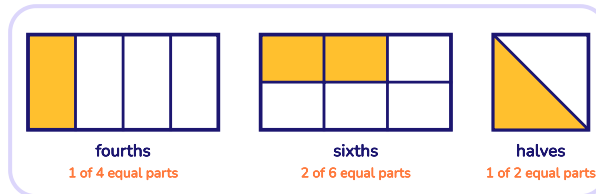
It has 4 right angles, so it is a rectangle. The sides are not all equal, so it is not a square.

4. Partitioning shapes into equal parts

To **partition** a shape means to cut it into parts. When all the parts are exactly the same size, they are **equal parts**. Equal parts have special names.

- 2 equal parts: **halves**

- 3 equal parts: **thirds**
- 4 equal parts: **fourths** (or quarters)
- 6 equal parts: **sixths**
- 8 equal parts: **eighths**



P

Unit fractions

When a whole is cut into equal parts, one part is a **unit fraction**. One of 4 equal parts is $\frac{1}{4}$ of the whole. One of 6 equal parts is $\frac{1}{6}$. Two of 6 equal parts is $\frac{2}{6}$.

Equal parts do not have to look the same. A square can be cut into 2 small rectangles or into 2 triangles. Both ways make halves, because each part covers the same amount of space.

E

Example 4: Naming parts

A rectangular banner is cut into 6 equal parts. Two parts are painted blue. What fraction of the banner is blue?

Each part is $\frac{1}{6}$. Two parts make $\frac{2}{6}$. So $\frac{2}{6}$ of the banner is blue, and $\frac{4}{6}$ is not blue.

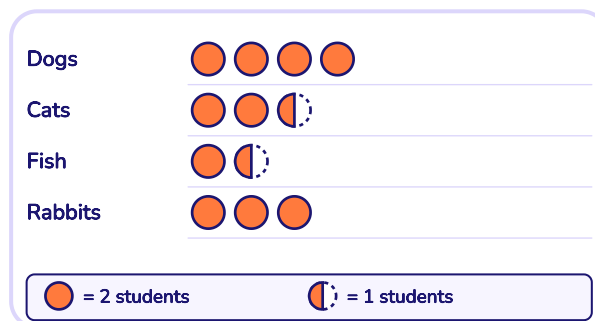


Careful!

Parts that are not the same size are not fourths or thirds, even if there are 4 or 3 of them.

5. Scaled picture graphs

A **picture graph** uses symbols to show data. In a **scaled** picture graph, one symbol stands for more than 1. The **key** tells you how many each symbol is worth. A half symbol is worth half as much.



Example 5: Reading the graph

How many students have a dog? The Dogs row has 4 full circles. Each circle is 2 students, so $4 \times 2 = 8$ students.

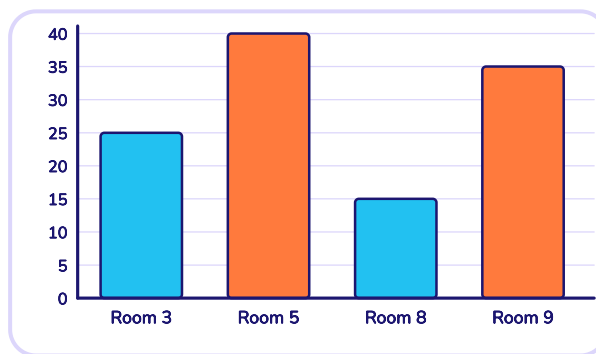
How many have a cat? The Cats row has 2 full circles and a half circle: $2 \times 2 = 4$, and the half circle adds 1. That is 5 students.

M**Method: read a scaled graph**

1. Read the key first.
2. Count the full symbols and skip count by the scale.
3. Add the value of any half symbol.

6. Scaled bar graphs

A **bar graph** uses bars to compare amounts. On a **scaled** bar graph, the lines on the side count by 5, 10 or another number. The top of a bar tells you the value. If a bar ends between two lines, it is halfway between those two numbers, so be careful.

**E****Example 6: Comparing bars**

Room 5 collected 40 cans and Room 8 collected 15 cans. How many more cans did Room 5 collect?

40 – 15 = 25. Room 5 collected 25 more cans.

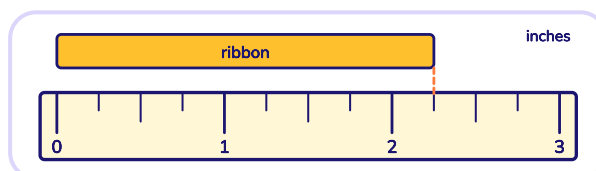


Zyro's tip

On my planet we count by the scale, not by ones. Put your finger at the bottom, then count 5, 10, 15, 20... until you reach the top of the bar!

7. Measuring to the half and quarter inch

A ruler is a number line. Between 0 and 1 there are marks for **half inches** and **quarter inches**. The longest marks are the whole inches, the medium marks are halves, and the shortest marks are quarters.



Between 2 and 3 you count 2 inches, then $2\frac{1}{4}$, $2\frac{1}{2}$, $2\frac{3}{4}$, and then 3. Each small step is one quarter of an inch, and 4 quarters make 1 inch.



Example 7: Reading a ruler

The ribbon above ends 1 small mark after the 2 inch mark. That is $2\frac{1}{4}$ inches. In centimeters, the same ribbon is about 5.7 cm long.

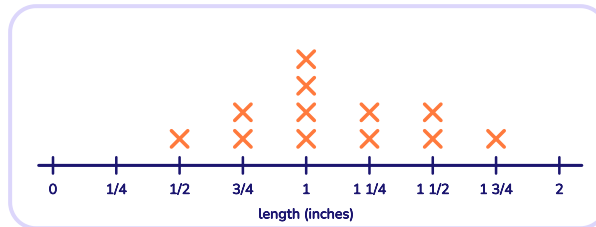


Method: measure an object

1. Line up one end of the object with the 0 mark.
2. Find the whole inch just before the other end.
3. Count the small marks after it: each one is $\frac{1}{4}$ inch.

8. Line plots

A **line plot** shows data above a number line. Each measurement is one **X**. When you measure to the nearest half or quarter inch, the number line shows those fractions, and a tall column of X marks means that length is common.



E Example 8: Using a line plot

How many shells were measured? Count all the X marks:

$$1 + 2 + 4 + 2 + 2 + 1 = 12 \text{ shells.}$$

How many shells are 1 inch long? There are 4 X marks above 1, so 4 shells.

Key takeaways

- A quadrilateral has exactly 4 sides and 4 angles.
- A rhombus has 4 equal sides. A rectangle has 4 right angles. A square has both.
- Every square is a rectangle and a rhombus, but not the other way around.
- Equal parts have names: halves, thirds, fourths, sixths, eighths. One part is a unit fraction such as $\frac{1}{4}$.
- In scaled graphs, read the key or the scale and skip count.
- On a ruler, one small mark is $\frac{1}{4}$ inch. On a line plot, each X is one measurement.



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