

Measuring and Estimating Length: math lesson, Grade 2 – download the PDF

How long is your pencil? How tall is the door? How far can a frog jump? To answer questions like these, you measure **length**. In this chapter you will learn to use rulers, yardsticks and meter sticks, to pick the best unit, to make smart estimates, and to compare lengths.

1. What Is Length?

D Length

Length tells how long something is, from one end to the other end. We measure length with **units**, and a unit is a fixed amount of length that everyone agrees on.

A crayon, a rope, a hallway and a road all have a length. To measure them, you count how many units fit along the object. You write the number first and the unit after it, like **4 inches** or **12 centimeters**. The unit matters: 4 inches and 4 feet are very different lengths!

2. Four Units of Length

In the United States we use two systems. Inches and feet belong to the U.S. customary system. Centimeters and meters belong to the metric system. Here are the four units you need to know.

Unit	Short name	A good thing to measure
inch	in	a crayon, a key, a small toy
foot	ft	a rug, a shoe box, the height of a desk
centimeter	cm	a bean, an eraser, a paper clip
meter	m	a door, a hallway, a playground

P Units that match

1 foot = 12 inches

1 yard = 3 feet = 36 inches

1 meter = 100 centimeters

P Big unit, small number

The longer the unit is, the **fewer** units you need. A desk that is 24 inches long is only 2 feet long, because one foot is a bigger unit than one inch.

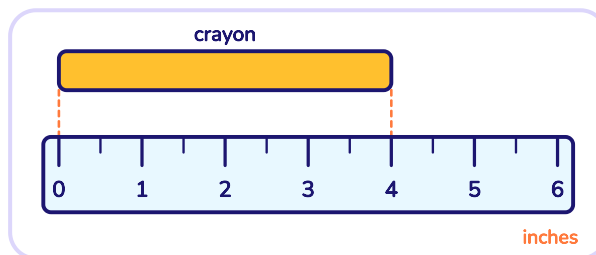
A meter is a little longer than a yard. A meter is about 39 inches, and a yard is exactly 36 inches.

3. Measuring with a Ruler

A ruler has a row of equally spaced marks. The space between two marks is one unit. Most school rulers show 12 inches on one edge and about 30 centimeters on the other edge.

M**How to measure with a ruler**

1. Put the **0 mark** at one end of the object.
2. Keep the object straight, right next to the ruler.
3. Look straight down at the **other end** of the object.
4. Read the number at that end and write it with its unit.

**E****Example 1: Reading a ruler**

The crayon starts at 0 and ends at the 4 mark. Its length is **4 inches**.

E**Example 2: An object that does not start at 0**

A ribbon starts at the 2 mark and ends at the 7 mark. Count the units it covers: from 2 to 7 is 5 steps. You can also subtract: $7 - 2 = 5$. The ribbon is **5 inches** long.



Careful!

Do not read only the number where the object ends. If an object starts at the 2 mark and ends at the 7 mark, its length is 5, not 7. Always begin at 0, or subtract the starting number.

4. Choosing the Right Tool and Unit

Different jobs need different tools. A short thing needs a small unit and a ruler. A long thing needs a big unit and a longer tool.

Tool	How long it is	Best for
ruler	12 inches or about 30 cm	a pencil, a book, a toy
yardstick	3 feet (36 inches)	a table, a bookshelf, a bed
meter stick	100 centimeters	a door, a wall, a big poster
measuring tape	long and bendable	a hallway, a jump, a rope

M**How to choose a unit**

1. Think about how big the object is.
2. Small objects use inches or centimeters. Big objects use feet or meters.
3. Pick the tool that matches the unit.

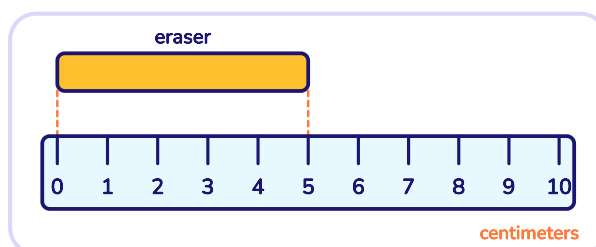
E**Example 3: Which unit?**

You want to measure the length of a classroom. Inches would give a huge number, and a tiny ruler would be slow. Feet or meters are the best units, and a measuring tape is the best tool.

5. Estimating Lengths**D****Estimate**

An **estimate** is a smart guess that is close to the real length. You make an estimate *before* you measure.

To estimate well, use a **benchmark**, which is an object whose length you already know. Some good benchmarks are a crayon, about 4 inches, a new pencil, about 7 inches, and a fingernail width, about 1 centimeter.



E**Example 4: Estimating with a benchmark**

Maya knows her crayon is 4 inches long. Her marker looks about twice as long as the crayon, so she estimates $4 + 4 = 8$ inches. Then she measures and gets 9 inches. Her estimate was off by only $9 - 8 = 1$ inch, so it was a very good estimate.

!**Zyro's tip**

Zyro says: "On my planet we always guess first and measure second. After a few tries, my guesses get closer and closer!"

6. Comparing Lengths and Finding the Difference

To compare two lengths, measure both with the **same unit**. Then the bigger number is the longer object. To find **how much longer** one object is, subtract.

**E****Example 5: How much longer?**

The red ribbon is 9 inches. The blue ribbon is 14 inches. The blue ribbon is longer. The difference is $14 - 9 = 5$, so the blue ribbon is **5 inches longer**.

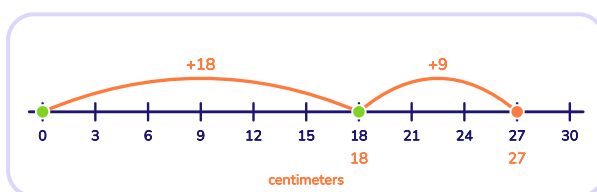


Same unit only!

You cannot compare 12 inches and 30 centimeters just by looking at the numbers. Change both lengths to the same unit first.

7. Number Line Diagrams

A **number line diagram** is a picture that helps you add and subtract lengths. Each hop on the line shows a length. The numbers on the line are equally spaced, just like the marks on a ruler.



Example 6: Adding lengths on a number line

An ant walks 18 centimeters and then walks 9 more centimeters. Start at 0, hop 18, then hop 9 more. You land on 27. So $18 + 9 = 27$ and the ant walked **27 centimeters**.

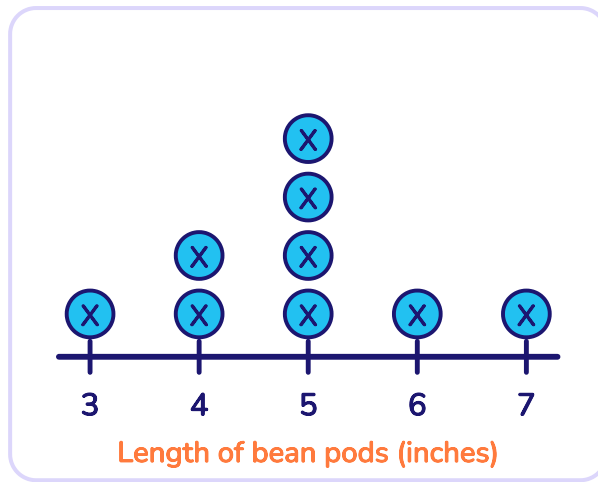
You can also go backward to subtract. If the ant has walked 27 centimeters and 9 of them were the last part, then $27 - 9 = 18$ centimeters were the first part.

8. Line Plots



Line plot

A **line plot** shows measurement data on a number line. Each measurement gets one **X** above its number. The tallest stack of Xs shows the most common length.



M

How to make a line plot

1. Measure every object to the nearest whole unit and list the data.
2. Draw a number line that covers the smallest to the largest length.
3. Put one X above the number for each measurement.
4. Write the unit and a title under the line.

Look at the line plot above. It has $1 + 2 + 4 + 1 + 1 = 9$ Xs, so nine bean pods were measured. The most common length is 5 inches, with 4 Xs. The longest pod is 7 inches and the shortest is 3 inches, so the difference is $7 - 3 = 4$ inches.

9. Length Word Problems

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Solving a length word problem

1. Read the problem and find the lengths you know.
2. Draw a quick sketch or number line.
3. Decide: add to put lengths together, subtract to find a difference or what is left.
4. Write the answer with its unit and check that it makes sense.

For example, a rope is 52 inches long and you cut off 17 inches. What is left? Subtract: $52 - 17 = 35$. The rope that is left is 35 inches long. This makes sense because 35 is less than 52.

Key takeaways

- Length tells how long something is. Always write the unit after the number.
- **1 foot = 12 inches** and **1 meter = 100 centimeters**.
- Line up the 0 mark with one end, and read the number at the other end.
- Pick small units for small objects and big units for big objects. A bigger unit needs fewer units.
- Estimate with benchmarks, then measure to check.
- Compare with the same unit and subtract to find how much longer.
- Number lines help you add and subtract lengths, and line plots show the data with Xs.



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