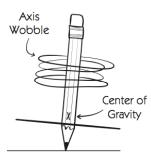
# Grade 5, Unit Eight: Data, Measurement, Geometry & Physics with Spinning Tops

This unit is special because it combines math and science. Students study the geometry of circles and then do their own experiments with spinning tops they created to gather data. While studying the physics of spinning tops, students learn more about geometry, measurement, and data analysis. In this unit, your child will:

- identify the radius, diameter, and circumference of a circle
- measure length to the nearest millimeter and time to the nearest second
- determine the range, mode, median, and mean in a set of data
- use descriptive statistics (see above) to compare two sets of data
- create and interpret a line plot

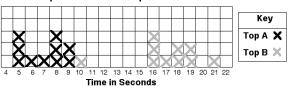


Your child will learn and practice these skills by solving problems like those shown below. Keep this sheet for reference when you're helping with homework.

Problem	Comments
Use a centimeter ruler and a piece of string to measure the radius, diameter, and circumference of this circle. Round the circumference to the nearest tenth of a centimeter. Label them on the circle.  3 cm 6 cm	Students review the properties and parts of circles in preparation for making their own spinning tops.
radius <u>3 cm</u> diameter <u>6 cm</u>	
circumference 18.8 cm	

Francisco made two different tops. He spun them each 10 times and recorded the length of each spin in seconds. His results are shown on this line plot.

#### Spin Times for Tops A and B



Find the range, mode, and median, and mean for Top A.

5 5 5 6 <u>7 8</u> 8 8 9 9 range <u>4 seconds</u> mode <u>5 and 8 seconds</u> median <u>7.5 seconds</u> mean <u>7 seconds</u>

Find the range, mode, median, and mean for Top B.

 10
 16
 16
 16
 17
 18
 18
 19
 19
 21

 range
 11 seconds
 mode
 16 seconds

 median
 17.5 seconds
 mean
 17 seconds

Write two comparisons about Tops A and B.

1) Top B spun longer than Top A. Even the shortest spin of Top B (10 sec.) was longer than the longest spins of Top A (9 sec.).
2) Top A was more consistent. All its spins fell in a range of 4 seconds, but the spins for Top B fell in a range of 11 seconds. The shortest spin for Top B (10 sec.) was an outlier: without that spin, the range was 5

seconds, so maybe it was just a bad spin.

In this unit, students make their own tops, spin them many times, gather and analyze data about those spins, and then adjust the designs of their tops to see if they can make them spin longer. In the process, they learn more about the physics of spinning tops and about conducting scientific experiments.

Students use double line plots to present and analyze sets of data in order to make comparisons about them. They also use measures of variability (range) and center (mean, mode, and median) to make meaningful comparisons.

The definitions below will help refresh your memory about the statistics students use in this unit.

range the difference between the highest and lowest values in the data set

**mode** the value or values that appear most often in the data set

**median** the middle value in the data set, when all the values are put in numerical order (If there is an even number of values, as there is in the example at left, the median is the average of the two middle values.)

**mean** the average (Add all the values and divide the sum by the number of values to find the mean.)

## Frequently Asked Questions about Unit Eight

### Q: What science ideas do students learn in this unit?

**A:** Hands-on experiences make the scientific content knowledge and process skills in this unit relevant and comprehensible. Students learn about kinetic energy, friction, gravity, and inertia. They also explicitly discuss and carry out the process of scientific inquiry: ask a question/make a hypothesis, design an investigation focusing on one variable, collect data, organize the data, analyze the data, form a conclusion, and suggest relevant further investigations.

## Q: Why does this unit address science and math together?

**A:** Math and science are closely related. Scientists use mathematics to make sense of data. In this unit, students analyze and interpret data from experiments with spinning tops that they have made themselves. By integrating math and science in a purposeful way, this unit helps students see that mathematics is not a collection of disconnected skills and topics, but a way of thinking and a set of tools they can use to make sense of the world around them.