



Pumpkins and Circles

National Standards: Mathematics > Measurement

NM-MEA.3.-5.1, NM-MEA6-8.1 Understand measurable attributes of objects and the units, systems, and processes of measurement (Grades 3-5) (Grade 6)

- Understand such attributes as length, area, weight, volume, and size of angle and select the appropriate type of unit for measuring each attribute.
- Understand, select, and use units of appropriate size and type to measure angles, perimeter, area, surface area, and volume.

NM-MEA.3-5.2, NM-MEA.6-8.2 Apply appropriate techniques, tools, and formulas to determine measurement (Grades 3-5) (Grade 6)

- Select and apply appropriate standard units and tools to measure length, area, volume, weight, time, temperature, and the size of angle.
- Select and apply techniques and tools to accurately find length, area, volume, and angle measures to appropriate levels of precision.
- Develop and use formulas to determine the circumference of circles and the area of triangles, parallelograms, trapezoids, and circles and develop strategies to find the area of more-complex shapes.

NM-DATA.3-5.2, NM-DATA.6-8.2 Select and use appropriate statistical methods to analyze data. (Grades 3-5) (Grade 6)

- Collect data using observations, surveys and experiments
- Represent data using tables and graphs such as line plots, bar graphs, and line graphs.
- Discuss and understand the correspondence between data sets and their graphical representations.

Kentucky: Mathematics Standards

- Develop and apply strategies to problems from everyday and mathematical situations and evaluating the solutions relative to the original problem situation.
- Multiple strategies for modeling, interpreting, and formulating problems based in real-world situations, within and outside mathematics, and aids in investigating and understanding mathematical content.
- Recognizing patterns and relationships and using model, known facts, and mathematical properties to explain and justify thinking.
- Relate mathematical ideas within mathematics and to other disciplines using graphic, numerical, physical, algebraic, and verbal models.
- Relate concepts of a mathematical topic to other disciplines.

Geometry and Measurement

M-4-GM-1, M-6-GM-2

- Analyze structures of geometric figures; read and use measurement tools.

M-4-GM-9, M-5-GM-6

- Exchange units within a measurement system.

M-6-GM-4

- Estimate, compare, and convert units of measures for length, weight/mass, and volume/capacity within the U.S. customary system and within the metric system

Probability and Statistics

M-4-PS-2, M-5-PS-2, M-6-PS-3

- Choose appropriate means to collect and represent data.

M-4-PS-5, M-6-PS-2

- Draw conclusions based on data.

M-6-PS-1

- Collect, organize, analyze, and interpret data in a variety of graphical methods, including line plots, line graphs, bar graphs, and stem and leaf pods.

Ohio: Mathematics > Measurement Standard

- Estimate and measure to a required degree of accuracy and precision by selecting and using appropriate units, tools and technologies.

Benchmark(s)

Grade 4

- A.** Select appropriate units for perimeter, area, weight, volume (capacity), time and temperature.
- D.** Identify appropriate tools and apply counting techniques for measuring sides, lengths, perimeter and area of squares, rectangles, and simple irregular two-dimensional shapes.

Grades 5 & 6

- A.** Select appropriate units to measure angles, circumference, surface area, mass and volume.
- C.** Identify appropriate tools and apply appropriate techniques for measuring angles, perimeter or circumference and area of triangles, quadrilaterals, circles, and composite shapes.

Ohio: Mathematics > Data Analysis and Probability Standard

- Pose questions and collect, organize, represent, interpret and analyze data to answer those questions.

Grade 4

- A.** Gather and organize data from surveys and classroom experiments. Including data collected over a period of time.
- B.** Read and interpret table, charts, graphs, and timelines as sources of information, identify main idea, draw conclusions, and make predictions.
- C.** Construct charts, tables, and graphs to represent data.

Pumpkins are used as props in the stage settings throughout the production of *The Legend of Sleepy Hollow*. Pumpkins symbolize fall harvest, aiding the understanding of the season, Fall, as the time and place for the play's setting.

Objective

Students will measure and analyze circles to identify and determine the relationship among radius, diameter, center and circumference.

Students will gather information, estimate, graph and record data about pumpkins in the practice of measurement for comparisons.

Students will report data in graphical representations.

Materials

- A variety of different sized pumpkins (at least one per group)
- Scale
- Knife or hacksaw blade for cutting pumpkin
- Spoon or scoop to clean out pumpkin
- Newspaper
- String
- Ruler / yardstick
- Permanent marker to label pumpkins
- Pencils and papers for student use
- Containers of various sizes with markings to measure volume (i.e. cups)

Vocabulary

- Circumference
- Measurement
- Variables
- Data
- Weight
- Mass
- Volume
- Diameter
- Radius

Activity

Teacher will:

Position a variety of pumpkins of different shapes and sizes throughout the classroom and label each pumpkin (e.g., A, B, C, D, etc.).

Students will:

Complete the following tasks upon gathering and recording estimated data for a select pumpkin.

Read, construct and interpret graphs.

Work in groups to estimate and record the following for a pumpkin:

- Circumference of the pumpkin
- Weight of the pumpkin
- Weight of the insides of the pumpkin (seeds and pulp) after removed
- Volume of the inside of the pumpkin once it has been scooped out. (Use any unit of measurement that you can measure easily (e.g., cups)
- Diameter / radius across the widest part of the pumpkin

Task 1: Finding Circumference

Activity

Students will:

- Select a point around the middle of a pumpkin.
- Wrap a piece of string around the pumpkin's middle for a circular measurement.
- Remove and measure the length of string to determine the circumference of the pumpkin.
- Record the actual circumference.

Task 2: Finding Weight

Activity

Students will:

- Place a pumpkin on a scale and record the actual weight of the pumpkin.
- Ask the teacher to cut around the stems and remove pumpkin tops.
- Scoop out the pulp and seeds from inside the pumpkin and place on a scale for weighing.
- Record the weight of the pumpkin's pulp and seeds.
- Use the formula, *Total weight – Weight of insides = Weight of shell*, to calculate the weight of the shell of the pumpkin.
- Record the calculated weight of the pumpkin shell.
- Weigh the shell to find the actual weight of the shell. (*Student will put the stem/top back on the shell.)
- Record the actual weight of shell.
- Record the difference between the actual weight and calculated weight.

Task 3: Finding Volume

Activity

Students will:

- Use a variety of containers that are marked with the same unit of measurement (e.g., cups or ounces, or liters, etc.).
- Fill a pumpkin with water to measure its volume.
- Record of the amount of water that has been placed in the pumpkin, making note of the number of cups, ounces, liters, etc.
- Record the total amount of water poured into the pumpkin. This number will reflect volume.

Task 4: Finding Diameter and Radius

Activity

Students will:

- Cut a pumpkin in half at its measured circumference point (with adult assistance).
- Use a ruler or yardstick to measure the diameter of the pumpkin. (If the pumpkin has an odd shape, students will take several different diameter measurements and use an average for the actual measurement.)
- Use the diameter measurement to calculate the radius of the pumpkin.
- Use the formula " $2\pi r$ " to compare the diameter to the circumference, and record the difference.

Performance Assessments

Teacher will evaluate students' abilities to:

- Combine data from all groups and create a graph that represents each pumpkin's circumference. Compare and order.

- Create a double bar graph showing the weight of the empty shell and the weight of the insides of the pumpkin that should show the total weight of the pumpkin.
- Combine data from all groups and create a graph that represents each pumpkin's volume.
- Create a "Pumpkin Pie Graph" that represents the weight of the shell and the insides of the pumpkin.
- Compare the estimated data with the actual data and make conclusions, such as the accuracy of your estimations.
- Create a graph showing the relationship of the pumpkins' sizes to the pumpkins' weight, weight of insides, circumference or volume. Identify any patterns in the data.