

Math and Science Pumpkins

Description:

Pumpkins are a great manipulative for math and science exploration. These activities are ideal to follow up on field trips and make the most of the natural connections between pumpkins and math and science.

Part I: Pumpkin Predictions & Measurements

Students will use pumpkins to make predictions and explore different ways to measure objects - weight, circumference, diameter and volume - then graph and record findings.



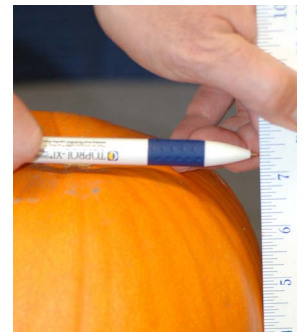
1. Divide your class into groups of 3-4 students. Provide each group with a pumpkin. (Pumpkins should be quite different from one another.)
2. Ask students to look around at the other pumpkins and predict which group has the largest pumpkin. Which one do they think weighs the most? Do they think the largest pumpkin will weigh the most? Will the smallest weigh the least? Students should record their predictions. These predictions and actual measurements can be recorded on a class-wide graph.

3. Students then weigh the pumpkins and compare findings with prediction. **Consider:** Weigh one pumpkin in front of the class before the students make predictions about their group's pumpkin. This base knowledge can change predictions into estimations.

4. Repeat this prediction process for finding the circumference, radius, diameter, and height of students' pumpkins. **Note:** To find the circumference, measure around the widest part of the pumpkin. Unlike perfect circles, pumpkins are, at-best flattened spheres, so these measuring techniques will likely not be 100% accurate.

5. Students record the actual measurements next to their predictions on the attached handout. Create a classroom graph based on these measurements. Do the findings match the predictions? What conclusions can students draw about the relationship between weight and circumference? Are there other relationships that can be made?

6. **Challenges:** a) Have students organize the classroom findings to show averages, mean and median using the pumpkin data. b) Demonstrate the **water displacement method** to measure the volume of an irregularly shaped object. c) Show students how to find pi with the information they have gathered on the radius and circumference.



Grade Level: 2-5

Essential Skills: 3, 4, 5

NGSS: 2-LS4-1, 3-LS4-2, 2-PS1-2, 2-PS1-3, K-2-ETS1-2, 3-LS3-2, 3-5 ETS1-1

CCSS: W.2.7, W.2.8, W.3.8, MP.2, 2.MD.D.10, 3.MD.B.3, SL.3.4

Math: MD.2, G.2, MD.3, G.3, OA.3, MD.4, G.4, OA.4, MD.5, G.5, OA.5, MP.4

Time: 2-3 Class periods

Materials:

- Pumpkins of different sizes
- Ruler
- String
- Bathroom scale
- Paper and pencils
- Tub with water
- Paper Towels
- Modeling Clay

AITC Library Resources:

- Books:
- From Seed to Pumpkin;*
 - It's a Fruit, It's a Vegetable, It's a Pumpkin*
 - Pumpkin Circle (English and Spanish)*
 - Kids' Pumpkin Projects*
 - Project Seasons*

More Lessons:

Pumpkin Pie in a Bag

Part II: Do pumpkins float or sink? The Law of Buoyancy

1. Fill a large container (clear is best) with water.
2. Have students make a prediction about whether or not a pumpkin will float or sink in the water. Record the numbers for each (yes/no) on the board. Ideally, have pumpkins of different sizes and ask students to predict which ones will float or sink. Ask them why they think the different sized pumpkins will float or not. Students will likely say the smaller pumpkins will float and the larger ones will sink. (Pumpkins, no matter their size, float.)
3. Place the pumpkins in the tub of water and watch what happens. What else floats or sinks? Why?

What's Happening:

Why do the pumpkins float? People have been wondering why things float or sink for centuries. **The Law of Buoyancy**, called **Archimedes' Principle**, states that a body floating in a fluid is supported (or buoyed up) by a force equal to the weight of the fluid it displaces.

In simpler terms for this experiment, a pumpkin will float if it displaces as much water as it weighs. When a pumpkin is immersed in water it experiences a force known as the buoyancy force. This force is equal to the weight of the water displaced by the pumpkin.

Here is another example: A lump of steel will sink because it is unable to displace water that equals its weight. But steel of the same weight, shaped as a bowl, will float. This is because the weight gets distributed over a larger area and the steel in this form is able to displace water equal to its weight.

As a result, a heavily laden ship floats because its total weight is exactly equal to the weight of the water it displaces. It is this weight that exerts the buoyant force supporting the ship.

Test This Concept:

1) Take a piece of modeling clay and shape it into roughly a cubic centimeter ball. Next, put it in a glass of water to see if it floats. It should sink. A cubic centimeter of water weighs 1 gram by definition. A gallon of water weighs 8.34 pounds. So, in order to float, an item that weighs 1 gram must displace more than a cubic centimeter of water. An item that weighs 8.34 pounds must displace more than a gallon of water to float.

2) Challenge students to partner up and create a shape that will allow the piece of modeling clay to float.

Note: If students flatten out the clay and make a boat shape using a flat bottom with a lip around the edge it will float. Have students test their shape out once they complete it. Although the weight of the clay didn't change, the amount of water displaced did change.



Clay in a ball shape sinks, but in a boat shape floats.

Part III: Predicting & Counting Seeds

1. Use three different sized pumpkins for this activity. Begin by having students predict and record which pumpkin, the largest or smallest, has the most seeds on their worksheet.
2. Next, slice the pumpkins in half **lengthwise** and then examine them. Have students examine the size of the cavities, seed density, and how seeds are attached along the ribs.
3. Place a newspaper under the pumpkins. Have students scoop out the seeds, remove the seeds from the fleshy fiber and dry them on a paper towel.
4. Students then count the seeds in each pumpkin. Chart the students' predictions and the actual numbers. Are the seeds in each pumpkin the same size or different? Do students notice any difference in the seeds of the small and large pumpkin?
5. Next, have students count the ribs on the middle-sized pumpkin. Based on what they observed in the small and large pumpkin, have them predict how many seeds will be in the mid-sized pumpkin.
6. Cut the mid-sized pumpkin lengthwise and count the seeds. Were their predictions accurate? Did the larger pumpkins have more seeds than the smaller ones? How many ribs did it have? Did ribs have an influence on the number of seeds?

Tasty Fun: Pumpkin seeds are tasty and highly nutritious snacks. They contain zinc and other important minerals. Save the seeds from the pumpkins and roast them in an oven to make a classroom treat. Add in a little math by having the students divide the pumpkin seeds by the number of students and determine how class members can get equal portions.

For Younger Grades: Pumpkins are ideal for discussing **life cycles** and **sequencing**. The book, *The Pumpkin Circle* and others can be checked out from [AITC's Lending Library](#).



Hoja de calabazas de matemáticas y ciencias

Nombre del estudiante: _____

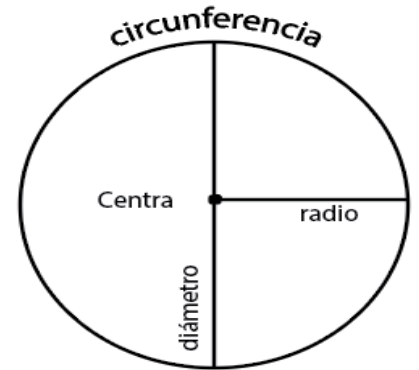
Parte I: Predicciones y mediciones de calabaza

Predicciones:

¿Cual grupo de calabaza crees que pesará más? ¿Por qué?

¿Pesará más la calabaza más grande?

¿Pesará menos la calabaza más pequeña?



Mediciones:

1. Prediga cuáles serán las medidas para su calabaza y regístrelas en la columna de predicciones en el cuadro a continuación. Use la imagen de referencia en la parte superior de la página como recordatorio de cada medición.

2. Usando un trozo de cuerda, envuélvala alrededor de la calabaza y marque con los dedos donde se une el extremo de las cuerdas. Luego, sujetando la cuerda con los dedos, mida la cuerda en una regla para determinar la circunferencia de la calabaza. Registre la circunferencia de su calabaza en el cuadro al dorso de esta página debajo de la columna real.

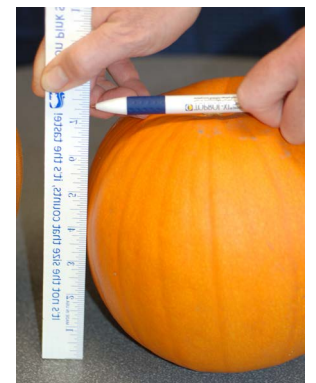
3. Usando la regla, mida desde el centro de la calabaza hasta el exterior de la calabaza para determinar el radio. Registre el radio en la tabla al reverso de esta página.

4. Calcule el diámetro de la calabaza usando la siguiente fórmula:

$Diámetro = 2 \times Radio$, registre su cálculo en la tabla.

5. Mida la altura de la calabaza con una regla que comience en la base de la calabaza y mida hasta la parte superior del cuerpo de la calabaza (no la parte superior del tallo). Registre la información en la tabla.

6. Pesa tu calabaza usando una balanza. Registre el peso de su calabaza en la tabla.



Registre sus medidas en la tabla al reverso de esta página.

| Medición | Predicción | Real |
|--|-------------------|-------------|
| Circunferencia- La distancia alrededor de tu calabaza. Mide en el punto más ancho con una cuerda. | | |
| Radio- Distancia desde el centro a un punto en el borde exterior. Es la mitad del diámetro. | | |
| Diámetro- Cualquier línea recta que pase por el centro del círculo y vaya al borde del círculo. Diámetros = radio x 2. | | |
| Peso | | |
| Altura | | |

Parte II: La Ley de Flotabilidad

Predicción: ¿Flotará tu calabaza? ¿Por qué?

Después de la prueba: ¿Tu calabaza flotó? Explique.

Usando la plastilina que te proporciona su maestro, moldea la plastilina en una forma que le permita flotar usando lo que sabes sobre la flotabilidad y el desplazamiento del agua. Responda las siguientes preguntas después de haber probado su diseño para determinar si flota o no.

1) ¿Tu diseño flotó?

2) En caso afirmativo, ¿cómo determinó en qué forma moldear su arcilla para que flote? Si no, ¿qué crees que podrías haber hecho de manera diferente para hacer flotar tu arcilla? Si su forma no flotaba y tiene tiempo, intente adaptar su diseño y volver a probarlo.

Parte III: Prediciendo y contando semillas

Mirando todas las calabazas en el aula, haga una predicción de cuál tendrá la mayor cantidad de semillas y por qué.

Predicción:

Contando semillas: Tu maestro te abrirá la calabaza y los miembros de tu grupo contarán la cantidad de semillas que tiene.

1) Después de cortar la calabaza, ¿cuántas semillas tenía?

2) ¿Fue correcta su predicción sobre la calabaza que eligió que tiene la mayor cantidad de semillas?