

# Estimating Game

## ***Math, Economics, Marketing***

### **Background Information**

The grain elevator has an essential part in getting crops from the farm to the processor to be made into consumable products. The grain elevator provides three vital services --- buying grains and oilseeds from farmers, storing them until needed and reselling to processors.

The farmer's local grain elevator dries, stores and conditions the grains and oilseeds. Then it usually sells the grains and oilseeds to a terminal elevator, flour miller or domestic processor.

Terminal elevators --- massive grain-handling facilities located at major transportation intersections --- also store and condition the grains and oilseeds before selling and shipping them to an export elevator or processor. The export elevators, located on ports or rivers, ship the grains and oilseeds to overseas customers.

### **Elevators - Past and Present**

These large storage facilities are named for the moving belts used inside to move, or "elevate" the grain. It is stored in a temperature and humidity-controlled environment to prevent spoilage and insect growth.

The first grain elevators were all made of wood, which proved to be dangerously combustible since grain dust is a highly explosive substance. Therefore elevators were modified over the years and are now made of cement. The first elevator had a capacity of 55,000 bushels. Three years later, this was doubled. Today, the largest grain elevator in Kansas can store 32,000,000 bushels of grains and oilseeds!

### **How Much is a Bushel?**

Whether farms are buying seed or selling their crop, measuring the portion to be sold is essential. Products are priced by weight, volume and piece.

Farmers sell wheat, corn and soybeans by the bushel. Grain sorghum and sunflowers are sold by hundredweight or by the pound. Some fruits and vegetables are sold by the piece. The price for each measurement unit depends on the current market value.

**Grade Level:** 4-6

**Time:** 25 minutes

**Standards:**

**Math-** Measurement and data; numbers and operations in base ten; concepts of volume related to multiplication and addition

**Economics -** *decision making skills as consumer; products or goods, supply and demand*

*For Common Core & Kansas standards, visit [www.ksde.org](http://www.ksde.org)*



## Materials Needed

- Copies of worksheet A, one for each student
- Center of toilet paper roll or any cylinder-shaped object, one for each group (*Note: A Pringles can would also work.*)
- Clear plastic wrap or paper cupcake holder
- Rubber bands
- Bags of wheat, grain sorghum, sunflower, corn and soybean seeds
- Containers ranging from 1-8 oz.
- Scales or balance
- Measuring cups

## Prepare Ahead

1. Divide the class into five groups. Have one student from each group bring an empty toilet paper roll or other cylinder-shaped object from home.
2. Obtain seed from a local elevator or other source.

## Activity

1. Discuss the requirements for grain storage.
2. Instruct the students to cover one end of the tube with plastic wrap or paper cupcake holder and fasten with a rubber band so that the container will hold the grains and oilseeds.
3. Demonstrate varying amounts of seed in containers ranging from 1-8 oz to give the students perspective on amount of seed in different size containers.
4. Using scales or balance, compare the weights of the different seeds in 1/4 cup.
5. Have students estimate the number of kernels of each seed to fill a 1 cup measuring cup. Have students record their estimates on worksheet A. Then, supply them with the following information for their "Actual Number of Kernels in 1 Cup" column.
  - Corn - approximately 634 kernels per cup
  - Wheat - approximately 5,625 kernels per cup
  - Grain Sorghum - approximately 6,125 kernels per cup
  - Sunflower Seeds - approximately 1,266 kernels per cup
  - Soybeans - approximately 1,172 kernels per cup
6. Based on their knowledge of the number of kernels in one cup, ask students to estimate the amount that the cylinder will hold. Estimates should be done in ounces and cups. Students should record their estimates on worksheet A.
7. They should measure their estimate and pour it into their grain bin. If the bin overflows, they must begin again. If not, they must continue to estimate and add seeds until their bin is full.
8. Students should measure the amount of grain it takes to fill their grain bin in both ounces and cups and record it on their worksheet.
9. Have students repeat the experiment with each seed type and keep records.

## Additional Activity

Hand out worksheet B. Gather materials and have students create rainsticks



# Estimating Games

## Student Handout A

1. Which seed is heaviest?
2. Which seed is the lightest?
3. What changes could be made to increase the amount of grains and oilseeds that can be held?
4. What will happen if the grains and oilseeds are not clean when they are sorted?

<b>Crop</b>	<b>Number of pounds per bushel</b>	<b>Number of seeds per pound</b>
Wheat .....	60.....	12,000
Grain Sorghum .....	56.....	14,000
Sunflower, oilseed .....	27.....	6,000
Corn .....	56.....	1,450
Soybean .....	60.....	2,500

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## Discussion Questions

1. Which seed is heaviest? (corn)
2. Which seed is the lightest? (grain sorghum)
3. What changes could be made to increase the amount of grains and oilseeds that can be held? (increase height or diameter of the bin)
4. What will happen if the grains and oilseeds are not clean when they are sorted? (The grains or oilseeds may become damaged by insects, develop pockets of mold, or lower the quality of other grain in the same bin.)

<u>Crop</u>	<u>Number of pounds per bushel</u>	<u>Number of seeds per pound</u>
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Sunflower, oilseed .....	27.....	6,000
Corn .....	56.....	1,450
Soybean .....	60.....	2,500



# Estimating Games

**Table 1: Commodity By the Pound**

<i>Commodity or Produce</i>	<i>Pounds (lbs.) Weight per bushel</i>
Corn, shelled	56 lbs.
Cotton	32
Sorghum, grain	56
Soybeans	60
Sunflower (oil type)	24-32
Wheat	60
Apples	48
Peaches	50
Tomato's	53
Sweet Potatoes (dry)	50

Look at a bushel basket and notice the amount of volume it can hold. Now look at the difference in density and mass or weight the grain and fruit products have when measured by the same volume of a bushel basket.



# Estimating Games

## Extension Activity for grains in the classroom: Rainsticks

### Legend: Chilean Indians invented the rainstick to make rainy weather

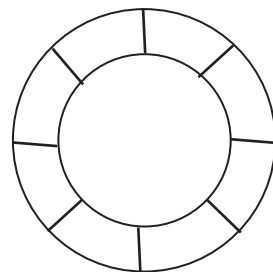
Rainsticks are ceremonial musical instruments used to invoke the rain spirits. They are made by people who live in the deserts of northern Chile. In Chile, rainsticks are traditionally made from dead cactus tubes with hundreds of cactus spines hammered into the tube. Tiny lava pebbles cascade gently through the tube and sound much like rain.

#### Materials

A paper towel tube or other long cardboard tube  
Aluminum foil  
Seeds from the five Kansas crops (Corn, Grain Sorghum, Wheat, Sunflower, Soybeans)  
Construction paper  
Glue  
Scissors  
Crayons or markers

#### Directions

1. Trace around the end of your tube on a piece of construction paper.
2. Draw a bigger circle around the circle you traced and then draw several spokes between the two circles. (See example at right.)
3. Cut along the spokes.
4. Put glue on the spokes and fold the spokes inward to cap one end of your tube.
5. Cut two pieces of aluminum foil that are about one and half times the length of your tube and each about three inches wide.
6. Crunch the aluminum foil into two long, thin, snakelike shapes.
7. Then twist each one into a spring shape.
8. Put the aluminum foil springs into your tube.
9. Pour some seeds into your tube. The tube should only be about 1/10 full. You can experiment to see how different amounts and different types of seeds change the sound.
10. Make another cap from brown paper (the same as the first three steps) and cap your tube.
11. Optional: Decorate the tube by covering it with brown paper or construction paper, and then making designs with crayons or markers (or cutout paper or stickers).



Name \_\_\_\_\_

Student Handout B

# Capacity of Grain Elevator

	Estimate Number of Kernels in 1 Cup	Actual Number of Kernels in 1 Cup	Estimates in Ounces and Cups		Actual Ounces and Cups	
Wheat			oz.	oz.	oz.	oz.
			cups	cups	cups	cups
Grain Sorghum			oz.	oz.	oz.	oz.
			cups	cups	cups	cups
Sunflowers			oz.	oz.	oz.	oz.
			cups	cups	cups	cups
Corn			oz.	oz.	oz.	oz.
			cups	cups	cups	cups
Soybeans			oz.	oz.	oz.	oz.
			cups	cups	cups	cups



# Estimating Games - Vocabulary

**Grain Elevator** - a tower containing a bucket elevator or a pneumatic conveyor, which scoops up grain from a lower level and deposits it in a silo or other storage facility. These facilities make it possible to handle grain in bulk.

**Terminal Elevator** - A large grain elevator that receives grain on or after official inspection and weighing that does the cleaning and treating of the grain. These elevators have the capacity to transfer grain to rail cars, barges, or ships for transport to domestic or foreign markets.

**Export Elevator** - The majority of grain exported from the United States is carried by barge down the Mississippi and Columbia Rivers to export elevators, where it is unloaded and stored until it can be loaded onto ships.

**Ports** - When grain is exported by ship, the elevator near the water is called a port. Also, a city, town, or other place where ships load or unload. Also, a place along a coast in which ships may take refuge from storms. Some grain is transferred directly from barge to ship, without being stored in an elevator.

**Storage Bins** - Bins that hold large quantities of grain, sorted by type of grain and grade, until it is needed to fill an order.

**Bushels** - Traditional measure of volume of a container, specially for dry commodities or produce such as fruits, vegetables, or grains. In the United States it equals 2150.42 cubic inches or about 9.3 U.S. gallons. See table for weight per bushel of each grain type on Student Handout A.

**Market Value** - The highest price a willing buyer would pay and a willing seller would accept, both being fully informed; the price that it might be expected to bring if offered for sale in a fair market; not the price that might be obtained on a sale at public auction or a sale forced by the necessities of the owner, but such a price as would be fixed by negotiation and mutual agreement.

**Hundredweight** - A unit of weight equal to 100 pounds.

**Volume** - the volume of any solid or fluid is how much three-dimensional space it occupies, often quantified numerically. One-dimensional figures (such as lines) and two-dimensional shapes (such as squares) are assigned zero volume in the three-dimensional space. Volume is presented as mL or cm<sup>3</sup> (milliliters or cubic centimeters).

**Mass** - mass is commonly confused with weight. Mass refers to the degree of acceleration a body acquires when subject to a force: bodies with greater mass are accelerated less by the same force.

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