



# AGRICULTURE

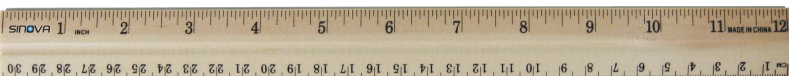
# MEASURES UP!



AGRICULTURE IN THE CLASSROOM  
AgInTheClassroom

Virginia Agriculture in the Classroom's hands-on, problem based learning unit for the elementary classroom using the farm and gardens to teach measurement, area, and perimeter.

### Lessons Included:

- > Discover an Acre
  - > These Farms Measure Up: Becoming an Agricultural Engineer
  - > Garden Math: Measuring Area and Perimeter
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# Discover an Acre

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## Standards of Learning

Math: 3.8, 4.7, 5.8

## Objective

Students will:

- Investigate perimeter and area using 12 inch squares to model a garden
- Measure the perimeter and area of a given space

## Materials:

- 12" ruler
- 12" x 12" construction paper (at least one square per student)

## Background Knowledge

The purpose of this activity is to provide students with a concrete and visual example of area and perimeter. Further, it will give examples of real-world applications for these math concepts in the context of designing and laying out a garden. In this lesson students will use one foot square pieces of construction paper to "plant" their garden. This is similar to a popular school garden layout – the Square Foot Garden. Square Foot Gardens are popular among classes and schools because each class or student can be assigned their own square within which to plant and harvest. It is also an optimal size for a child to use.

As mentioned in the Extension portion of this lesson, different plants can be planted within each square foot. Some will be planted one plant per foot, while others can be planted as 4, 9, or 16 per foot. The number of plants per square foot is dependent upon how large the plant gets. Because plants need sunlight, soil, water, and space to grow, planting too many in a square would cause them to not have adequate access to these growing requirements.

Popular plants to grow in a square foot garden are –

- One plant per square foot (12 inches apart): peppers, "patio" (dwarf bush) tomatoes, potatoes, broccoli, cabbage, cauliflower, kale, head lettuce, New Zealand spinach, peppers, peanuts, potatoes, large sunflowers
- Four plants per square foot (6 inches apart): leaf lettuce, parsley, Swiss chard, sweet corn (small varieties), mustard greens, basil, coriander, dill, parsnips, shallots, small sunflowers, turnips
- Nine plants per square foot (4 inches apart): bush beans, spinach, leeks, anise, chervil, corn salad (mâche), mustard greens, nasturtiums
- Sixteen plants per square foot (3 inches apart): carrots, beets, radishes, onions, cumin, garden cress

## Procedure

1. As a class, brainstorm the units we use to measure various things. Examples: an eraser – centimeter; length of a pencil – inch; height of a door – yards; etc.
2. Ask the children how we would measure the amount of space or surface that a large object would cover (the yards of our houses, the field a farmer would plant a crop on, the land our school sits on, etc.) *\*Direct students to think about an acre, which is approximately 43,000 square feet.*
3. Discuss measuring area and inform the students that we often use square feet to measure area.



For more resources to connect children to agriculture visit [AgInTheClass.org](http://AgInTheClass.org).

4. Show students what a square foot looks like by drawing a square on the board that measures 1 foot on all four sides.
5. Tell the children that today they are going to be planting a garden.
6. Give each student several 12" x 12" pieces of construction paper. Explain each piece of paper is a square foot. It measures 1 foot x 1 foot. The area of one piece of paper is one square foot.
7. Clear a space in the classroom or go to a room such as the cafeteria where students will be able to lay all of the squares on the floor and view them.
8. Ask the students to place each square on the floor one at a time to create their garden. The field can be any shape but each square **must** touch at least one side of another square.
9. When all the squares are laid down, tell students that you now want to construct a fence around your garden. What do you need to know about the garden to know how many fencing supplies to purchase?
  - a. To answer this question students need to determine the perimeter of their garden by counting the outside edges. Bring in circulars from stores that sell landscaping materials, ask them how much the fencing supplies would cost. Is this the most cost effective shape for the garden? Point out that you will save money by having the smallest possible perimeter.
  - b. Next, find the area by counting the squares.
10. Collect the squares and have the students create a new garden (different shape). Again calculate the area and perimeter of the garden. *\*This will show students that while the perimeter may change, area does not change simply because the shape changes.*

### Extension

- Copy seed packet pictures from [www.edhumeseds.com](http://www.edhumeseds.com) and place on the square feet construction paper squares. Write under the seed packet how many of the given seed can be planted per square foot.
  - Use real seeds or colored cotton balls and have students "plant" according to the planting recommendations. Discuss why different plants have different planting recommendations.
  - Have children sort their field crops according to the parts of the plant they are or by how many seeds can be planted per square foot.
  - Incorporate multiplication word problems – Example: I have 4 square feet and want to plant parsnips. If I can plant 4 parsnip seeds per square foot, how many parsnip seeds can I plant?
- Design, plant, and grow a square foot garden.
- Take students outside with the 12" x 12" pieces of construction paper to find square footage and/or perimeter of common objects such as a sidewalk, door, window, a picnic tabletop, a seesaw, or a parking space.



# These Farms Measure Up: Become an Agricultural Engineer

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## Background:

An engineer is someone who uses math and science to solve a problem. An agricultural engineer applies these concepts to the farm. They might design farm machines (such as a new tractor or tool) or facilities (such as chicken house or milking parlor) to maximize the efficiency of the farm.



## Task:

You will apply what you have learned about measurement and perimeter to design a farm for your assigned livestock. Each animal will have a different set of needs and requirements in order to be kept most comfortable. There may be more than one correct way to create the requirements.

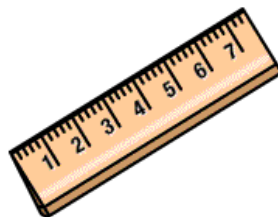
You will work in a group to design your blueprint first on a piece of construction paper by measuring and then drawing the lines for your fences, enclosures, and other features.

Next you will use construction paper to create your own 3-D farm model. Each group will complete one model.

Farms will be inspected by the Farm Safety Inspector to be sure that you have followed the appropriate specifications.

## Materials:

- 2 pieces 11x17 white paper (one for the blue print and one for the 3-D model)
- Construction paper
- Rulers
- Pencils
- Scissors
- Glue



## Group 1: Dairy Cows

### Farm Requirements:

Dairy cows spend a lot of time in the field grazing. In fact, they spend about 6 hours a day eating both the grass in the pasture and the feed provided by the farmer. In order to keep both the dairy herd and the nearby streams and waterways healthy, you need to construct a fence to keep the cows out of the waterways.

**The fence must have a perimeter of 130 centimeters.**

Because you have fenced the cows out of the stream you need to provide them with a watering trough where they can have access to plenty of fresh water throughout the day. Dairy cows drink 25-50 gallons of water each day!

**The watering trough must have a perimeter of 20 centimeters.**

Dairy cows are milked at least twice a day, every day. The building where they are milked is called the milking parlor. Most milking parlors are automated, some are even robotic! You will need to construct a milking parlor so that the cows can be milked.

**The perimeter of the milking parlor must be 60 centimeters.**



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## Group 2: Equine (Horses)

### Farm Requirements:

Horses love to eat short, juicy grass. They also eat hay (which is dried grass), especially in the winter or in their stable. Some horse owners might also supplement their horse's diet with barley, oats, or other types of feed. In a field, horses might spend most of their day grazing. To keep them from wandering off you need to build a fence around pasture.

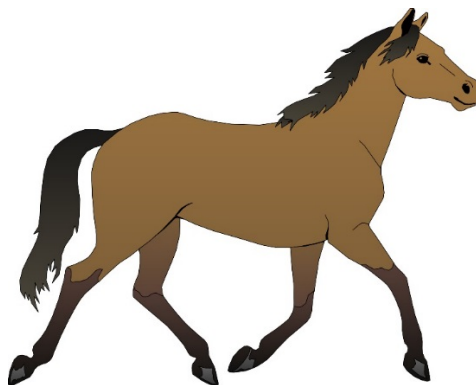
**The perimeter of the fence must be 100 centimeters**

Horses typically have a stable where their grooming equipment might be kept. Horses should be groomed frequently with a comb, brush and hoof pick (which removes dirt, stones, and other objects from the feet). The horse owner might also keep the horse's saddle and blankets in the stable.

**The perimeter of the stable must be 60 centimeters.**

In addition to being used for storage, most stables have stalls for each horse. A horse might sleep in his stall (although horses generally sleep standing up!) or go there to be protected from bad weather. There are 3 horses on your farm and each needs their own stall in the stable.

**Each stall must have a perimeter of 24 centimeters.**



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## Group 3: Chickens

### Farm Requirements:

The majority of chickens raised in Virginia and the nation are raised in climate-controlled barns, called houses, designed to maximize the chicken's health and welfare by providing a balanced diet, clean water, comfortable bedding, and fresh air. On many farms a computer monitors the temperature and air in the chicken house and automatically adjusts to keep the birds comfortable. This information can also be delivered straight to the farmer's phone. Your farm will have two chicken houses on it.

**The perimeter of each chicken house must be 80 centimeters.**

Chicken houses have automated feeders and water dispensers located throughout them. This provides the chickens with access to nutritionally balanced food and fresh water. Place a feeder as well as a water dispenser in each chicken house.

**The perimeter of each feeder must be 12 centimeters and the perimeter of each water dispenser must be 8 centimeters.**



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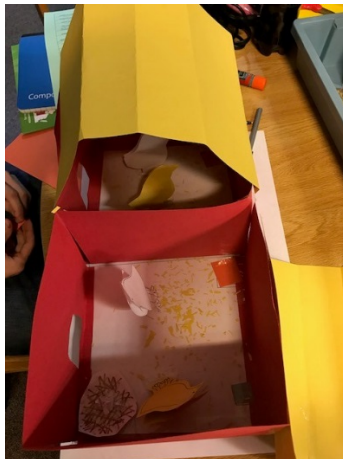
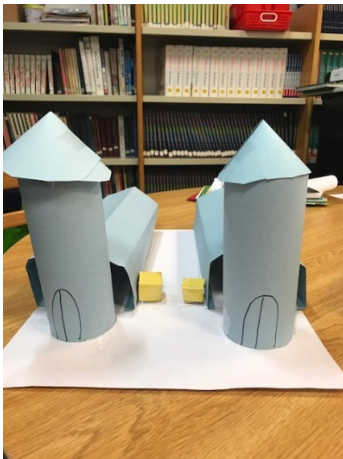
## Teacher's Notes

### Virginia Standards of Learning:

Mathematics: 3.9, 4.7, 5.8

### Extensions/Adaptations:

- You may bring in toy farm animals or toy fencing for students to include in their models.
- Directions can be modified to include other math concepts such as radius/circumference. For example, the cows' water trough could be directed to made with a radius of 5 centimeters.
- You may choose to convert the measurements to standard (rather than the metric that was used).
- This project can be done individually, in pairs or groups. There is generally more than one way to design each enclosure which makes it interesting when the different groups demonstrate various ways of designing their farms.



For more resources to connect children to agriculture visit [AgInTheClass.org](http://AgInTheClass.org).



# Garden Math: Measuring Area and Perimeter

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## Standards of Learning

Math: 3.7, 3.8, 4.7, 4.8

## Objective

The student will be able to:

- Calculate area and perimeter for a given garden item

## Materials

- 8 ½" x 11" paper white paper
- One inch square pieces of construction paper
- pencils
- tape
- yarn (one yard per student)
- ruler, yard stick, or tape measure
- dried beans, peas or corn
- small cups
- small-medium sized item from school garden (or from backyard) such as a leaf or blossom

## Background Knowledge

Perimeter is the outside measurement of a given space. In gardening, it's important to know the perimeter of your garden, so you will know how much fence to purchase. Area is the space within a given perimeter. You should know the area of your garden, so you will know how much seed, fertilizer and mulch to purchase for the given space.

For an excellent lesson to introduce your students to these concepts, search for the "Discover an Acre" lesson plan on [AgInTheClass.org](http://AgInTheClass.org).

## Procedure

### A.

1. Have students pick a garden (or backyard/playground) item about the size of their hand and bring it into the classroom
2. Students should trace an outline of their item on a piece of paper. A couple of small pieces of tape may be needed to hold it in place for tracing.
3. Remove the item to reveal its outline.
4. Give each student a piece of yarn about one yard in length.
5. Ask them to use the yarn to outline the perimeter of their outline.
6. Cut the yarn at the point where it overlaps the starting point.
7. Remove yarn from the paper and lay it on a ruler, yardstick or tape measure to determine the perimeter of the garden item in inches.
8. Write the answer on the paper with the outline. Example: perimeter = 14"

### B.

1. Give students a one inch square of colored construction paper and have them glue it to the paper with the outline.
2. Give students a small cup with dried beans (you may also use peas or corn).
3. Ask them to fill the square inch with the dried beans, laying them side by side.
4. Count the number of beans in the square inch and write that number on the paper beside the square inch. Example: 18 beans = square inch



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5. Estimate the number of beans needed to fill their garden item outline and write their estimate on their paper.
6. Fill the leaf outline with dried beans, laying them side by side.
7. Count the number of beans in the outline and record the total.
8. Divide the number of beans in the outline by the number of beans in the square inch to give the total number of square inches in the garden item.

### **Extension**

Have students measure perimeter and area for other items and spaces within the garden. Items that can be measured are table tops, stepping stones, defined spaces of a sidewalk, a raised bed, etc. Small spaces can be measured in inches and square inches, while larger spaces can be measured in feet and square feet.



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