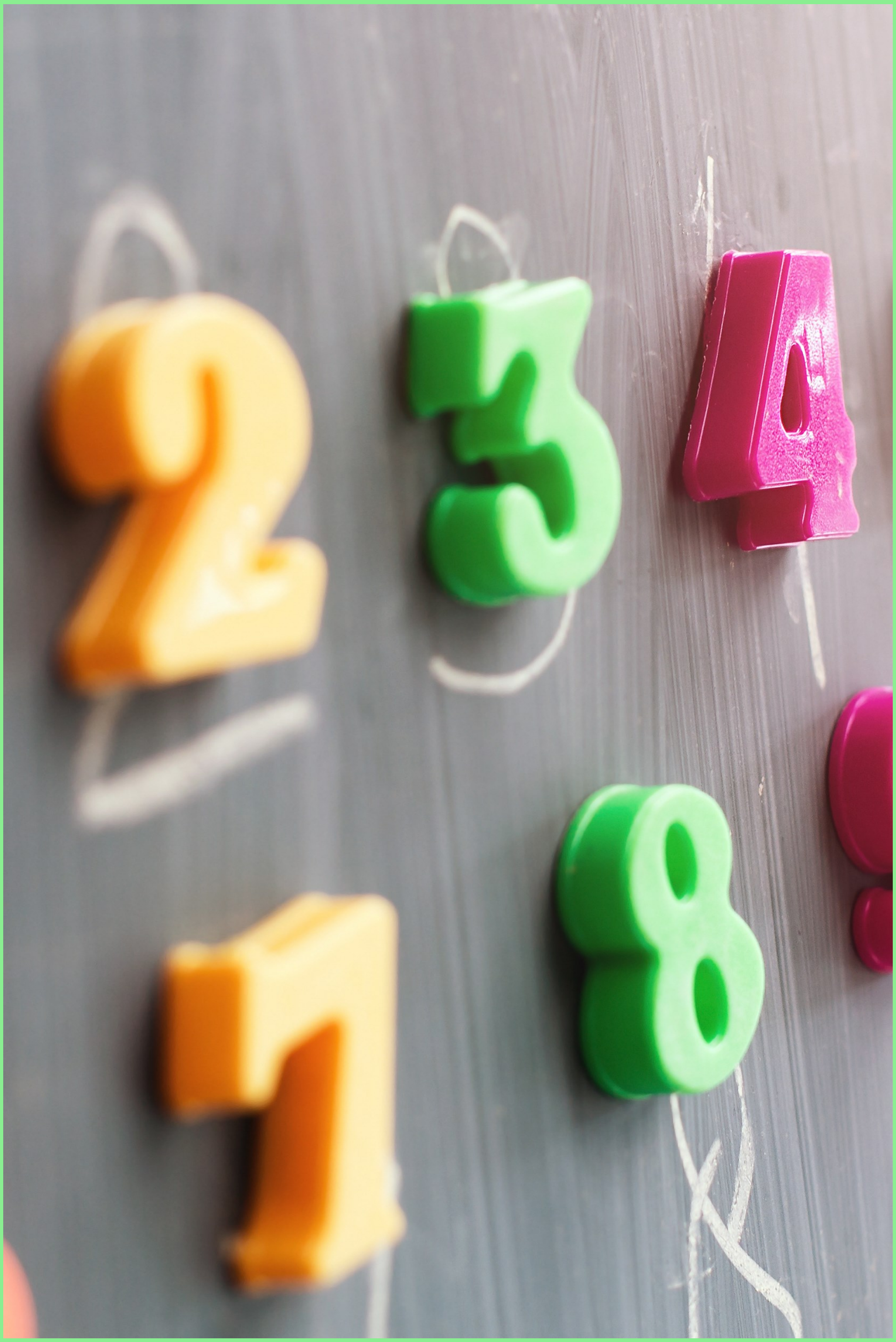
# Elementary Mathematics



A collection of lessons and activities for the elementary classroom using hands-on examples found on the farm to teach mathematics concepts.

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# Apple Observation

**Standards of Learning**
Math: 2.11, 2.17, 3.9, 3.17, 4.6, 4.7, 4.14

**Objective**
The student will be able to:
- determine the mass, in grams, of an apple
- use a ruler to determine height
- use a tape measure to determine circumference
- organize data into a chart/graph

**Materials**
- apples (encourage each student to bring one in)
- Apples by Gail Gibbons (optional)
- rulers
- scale
- tape measure
- chart paper
- markers
- handout, attached

**Background Knowledge**
There are many varieties of apples; in fact, the United States grows 2500 different types! Virginia growers produce an average of 8 to 10 million bushels of apples per year. Apple varieties grown in Virginia include Red Delicious, Fuji, and Granny Smith. This lesson will require students to measure the height, mass, and circumference of an apple. Data will then be organized into a class chart.

**Procedure**
1. After reading Apples to the class, discuss the fact that there are many different types of apples. Point out, as well, that apples may vary within the same type.
2. Have each student bring an apple to class.
3. Pass out the handout and have students complete their initial observations.
4. Next, have students complete the bottom of the worksheet using the scale, ruler, and tape measure.
5. Create a chart on the board for mass, height, and circumference (one each). The Y axis should be mass/height/circumference, and the X axis should have each student's name written across.
6. Have students take turns coming up and charting their apple's measurements. When completed, you will have 3 bar graphs.
7. Students should then write at least 2 sentences for each graph. Examples: The average height was 3.5 inches. Max's apple had the largest circumference.

**Extension**
Students may create their own math questions about the graphs. They then trade with a partner and answer each other's questions.

# Apple Observation

1. Describe what your apple looks like: ___________________________________
_______________________________________________________________________
__________________________________________________________

2. Draw a picture of your apple in the space below.

3. Describe what your apple smells like: __________________________________
_________________________________________________________________
_________________________________________________________________

4. Describe what your apple feels like: ___________________________________
_________________________________________________________________
_________________________________________________________________

........................................................................................................

# Apple Measurement

5. Weigh your apple using the scale, record its mass (in grams) __________

6. Use the ruler to measure the height (in inches) of your apple, record __________

7. Use the tape measure to determine the circumference (the distance around the

middle, in inches) of your apple, record ___________

# Birthday Cow

**Standards of Learning**
Math: K.13, K.14, 1.14, 2.17
Science: K.1, 1.1, 2.1
English: K.2, 1.3, 2.3

**Objective**
Students will:

- Use symbols to create a representation of information
- Illustrate data by using objects graphs, picture graphs, and tables
- Count numbers and say number words

**Materials**

- White paper plates with one hole punched out for the tail
- Construction paper of all colors
- Black circles to represent spots
- Yarn
- Markers/crayons/colored pencils
- Scissors
- Glue

**Background Knowledge**
Cattle wear identification tags usually in their ears or around an ankle in a bracelet. Identifying the cow helps the farmer keep up with how much the cow eats, the age of the cow, and basic information the farmer needs. For this activity help the student create a cow to learn their own birthday.

**Procedure**

1. Use a paper plate to form the cow's head. Cut out and glue on ears, eyes, and nose.
2. Have students cut out black spots, one for each year of their age. Glue onto plate.
3. Ear tags are used to keep track of farm animals. Have students cut out a square of construction paper for an ear tag. Assign each month a different color. Have student's write the numerals for their birthday on it. Attach ear tags to one of the ears.

# Counting Kernels

**Standards of Learning**
Math: K.2, K.4, 1.1

**Objective**
Students will:

- Count concrete objects and record the corresponding numeral

**Materials**

- Green and yellow construction paper
- Glue
- Markers
- Corn kernels (feed corn is best, but you can also use popcorn kernels)

**Background Knowledge**
Corn seeds are the kernels which are attached to a high-fiber center core called a "cob." The kernels are arranged in rows along the ear. An ear of corn can have as few as 6 rows or as many as 36 rows, but the number of rows is always even. Corn is grown on every continent except Antarctica. In Virginia, most corn that is grown on farms is used for animal feed.

**Procedure**

1. Bring an ear of corn into class. Have students brainstorm a list of items that are made using corn.
2. Pass out the construction paper. Have students trace their hands onto the yellow paper with fingers together and then cut out. Next use the green paper to draw and cut out 2 husks. Glue the husks onto the bottom of the cob.
3. Next give each student a handful of corn kernels.
4. Have students glue as many kernels as they can onto their construction paper cob.
5. Count how many kernels fit. Write this number on the husk.

**Extension**
Make corn prints by dipping corn slices into paint and pressing onto art paper.

# Counting Seeds With Farmer Jack

**Standards of Learning**
Science K.7, 1.4, 1.7
English K.1, K.2, K.5, K.6, K.8, 1.1, 1.2, 1.5, 1.8
Math K.1, K.2, K.5, K.6, 1.1, 1.2

**Objective**
Students will:
- Develop listening comprehension skills
- Identify seasonal changes in plants
- Follow directions
- Count seeds
- Add and subtract basic facts

**Materials**
- Chart paper
- "Counting Seeds with Farmer Jack" poem (provided)
- 15-20 vegetable seeds per student

**Background Knowledge**
When planting their crops, farmers always need to think about the number of people their share is going to feed. Therefore, farmers must use a number of mathematical procedures in order to make the most of each year's crop production.

While listening to the poem, students will use their manipulatives to demonstrate the number of seeds Farmer Jack is planting in the soil.

**Procedure**
1. Ask the students if they know what a vegetable seed is.
2. Tell them that it is the part of the plant that is planted into the ground. The rest of the vegetable will grow from the seed.
3. Tell the students that today they will be doing a math activity with vegetable seeds.
4. After having written the poem, "Counting Seeds with Farmer Jack," on chart paper, either echo read or choral read the poem with the students.
5. Talk with the students about any parts of the poem they may not understand.
6. Give each student a pile of 15-20 vegetable seeds.
7. Tell the students that you are going to read the poem aloud again and they should listen.
8. Tell them that as you read the poem, every time you say a number, they should take that many seeds from their pile and put them aside. (You may want the students to draw a line down the middle of a piece of paper or for them to divide their desk in half so their two piles are distinct.)
9. Tell the students that by the end of the poem they should have set aside the total number of seeds Farmer Jack planted in his garden.
10. Read the poem aloud to the students.
11. As you are reading, the students should be setting their seeds aside.
12. After reading, ask the students to count up the number of seeds they set aside.
13. As the students give their answers, there is a possibility that not all students will have the correct number. Therefore, write each answer the students give on the board.
14. Look back at the poem with the students and read it line by line.
15. Ask the students how many seeds Farmer Jack planted in the first line of the poem. Write "4" on the board.

16. Ask the students how many seeds Farmer Jack planted in the third line of the poem. Write “2” on the board.
17. Ask the students how many seeds Farmer Jack planted in the seventh line of the poem. Write “3” on the board.
18. Ask the students how many seeds Farmer Jack planted in the fifteenth line of the poem. Write “5” on the board.
19. Place an addition sign between each number on the board.
20. As a class, complete the problem, 4 + 2 + 3 + 5 = 14.
21. Tell the students that Farmer Jack planted 14 seeds in his garden.
22. Ask the students the following questions:
    Why do you think Farmer Jack planted vegetable seeds?
    What type of vegetables do you think he planted?
    What is your favorite vegetable?

***Counting Seeds with Farmer Jack***

Four vegetable seeds in the soil,
All planted in a line.
Farmer Jack put in two more,
They were all looking fine.

We will need more vegetables than that,
Thought Farmer Jack.
So three more seeds he planted,
He took them right out of his pack.

Then Farmer Jack asked,
“How many seeds are here?
Are there enough
To last us all year?”

Of course not,
He knew.
So five more he added,
And up they all grew

# Discover an Acre

**Standards of Learning**
Math 2.5, 2.11, 3.9, 3.10, 3.14, 4.7, 5.8, 5.13, 6.10, 6.11, 6.14, 7.7, 7.8

**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
- Measuring tapes
- 12” x 12” construction paper (three squares 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 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, tampala (amaranth)
- 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 (mache), mustard greens, nasturtiums
- Sixteen plants per square foot (3 inches apart): carrots, beets, radishes, onions, cumin, garden cress

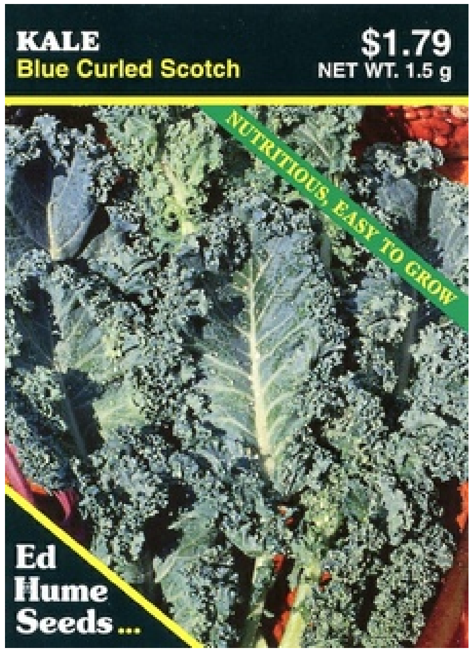
**Procedure**
1. As a class, brainstorm the units we use to measure various things. Examples: an eraser – cm; length of a pencil – in; height of a door – yards; etc.
2. Ask the children how we would measure the amount of space or surface that a large object would cover (the yards of our houses, the field 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 use square feet to measure area.
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, have the students find the area and perimeter of their garden.
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. Area changes when the number of square feet changes.*

## Extension

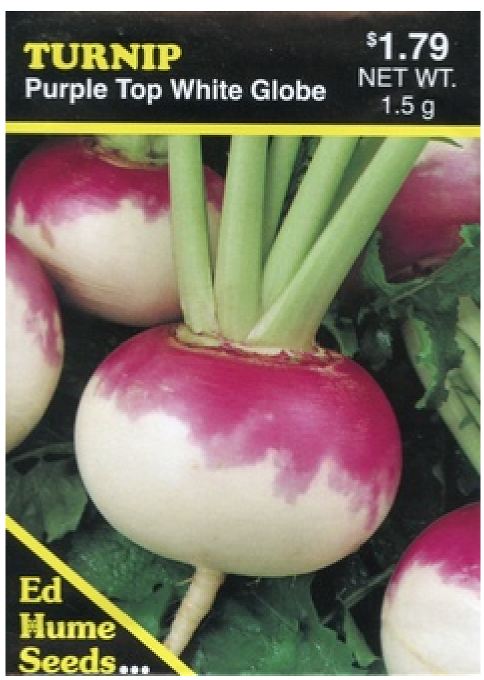
- Copy seed packet pictures from www.edhumeseeds.com and place on the square feet. Write under the seed packet how many of the given seed can be planted per square foot.
  - Have children sort their field crops according to the parts of the plant they are or by how many seeds can be planted per square 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.

# Kale



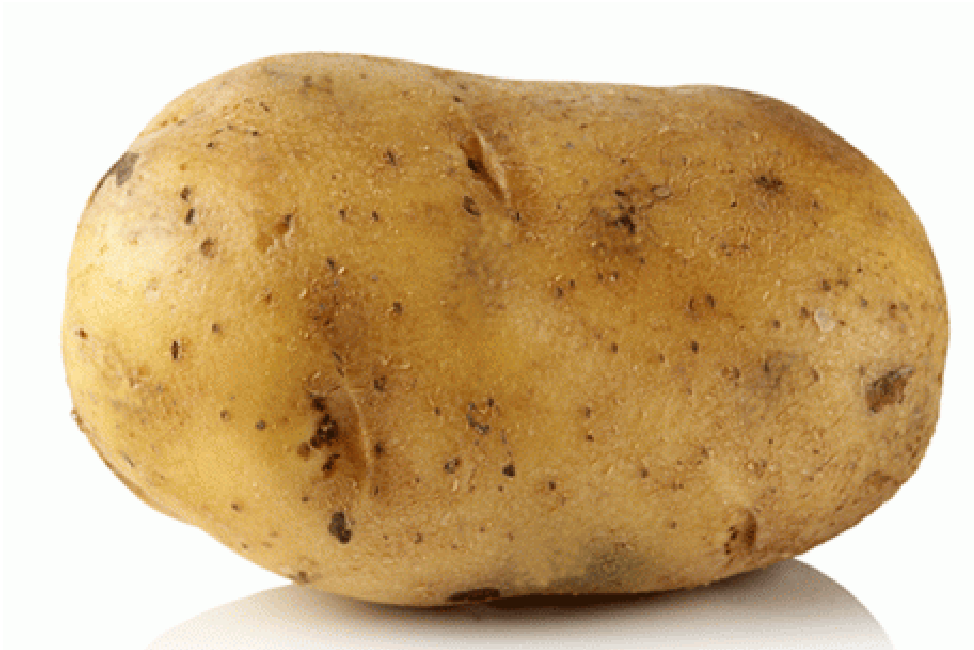

1 plant per square foot

# Turnip



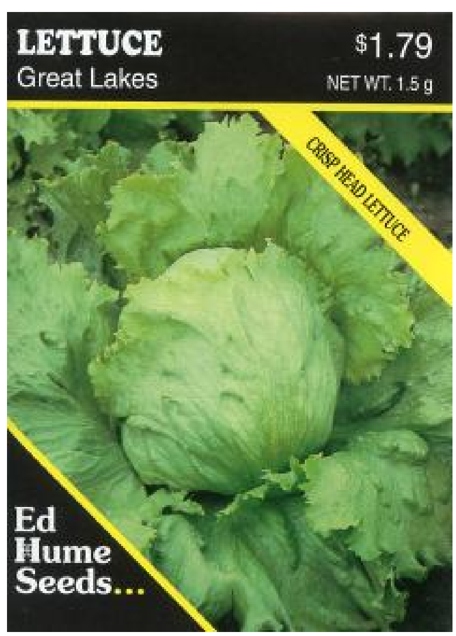

4 plants per square foot

# Potato



1 plant per square foot

# Head Lettuce

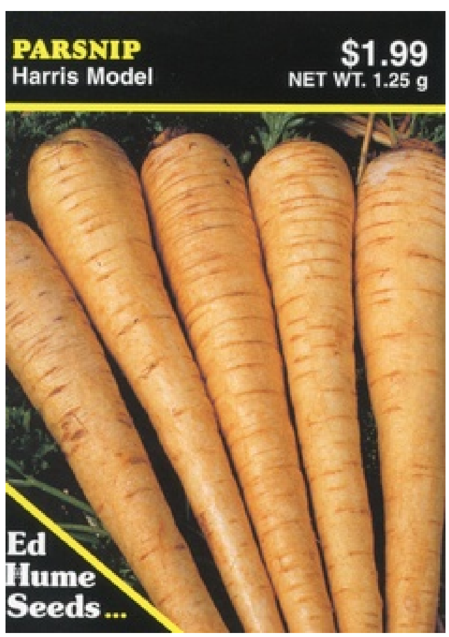



1 plant per square foot

Large Sunflower

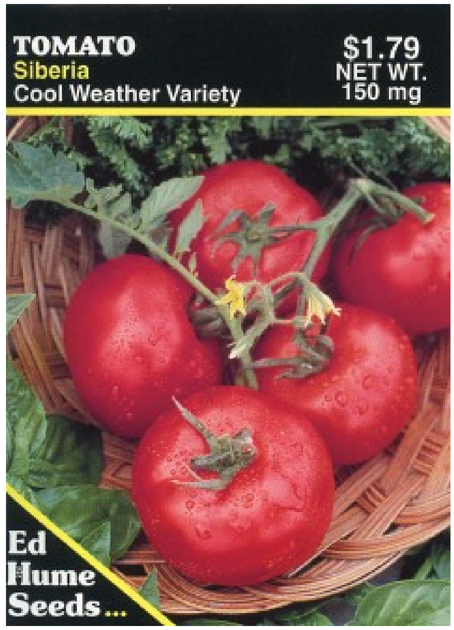

1 plant per square foot

Parsnip



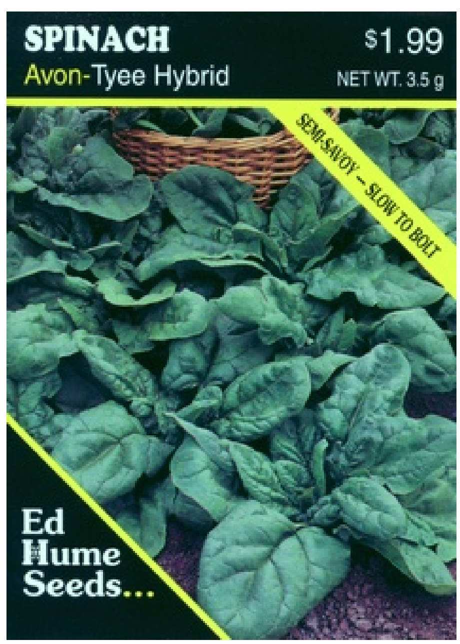

4 plants per square foot

# Tomato



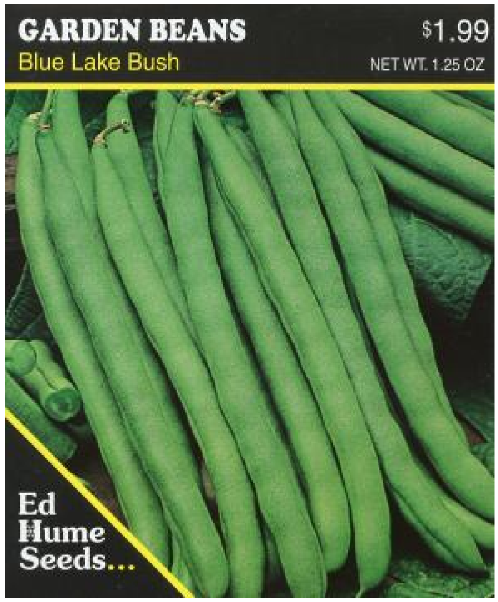

# 1 plant per square foot

# Spinach




# 9 plants per square foot

# Bush Beans

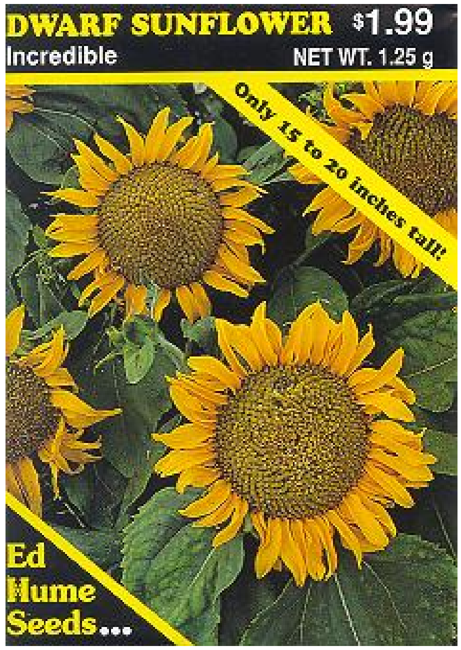



4 plants per square foot

# Eggplant


1 plant per square foot

# Dwarf Sunflower

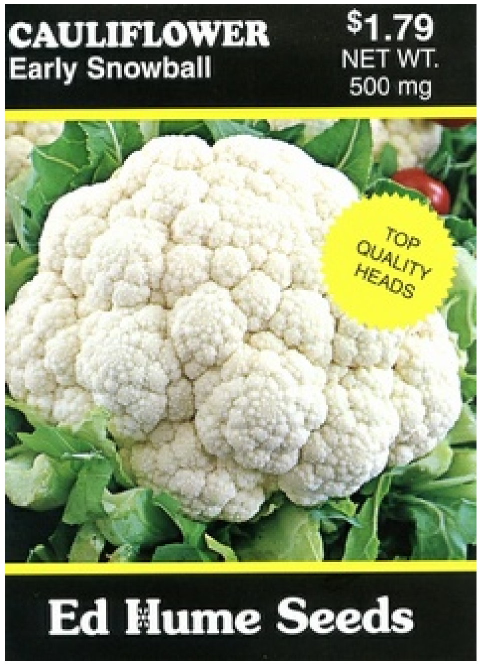



4 plants per square foot

# Dill

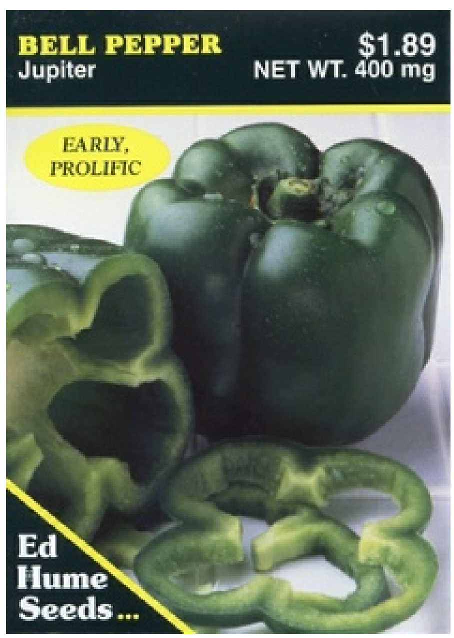

4 plants per square foot

# Cauliflower



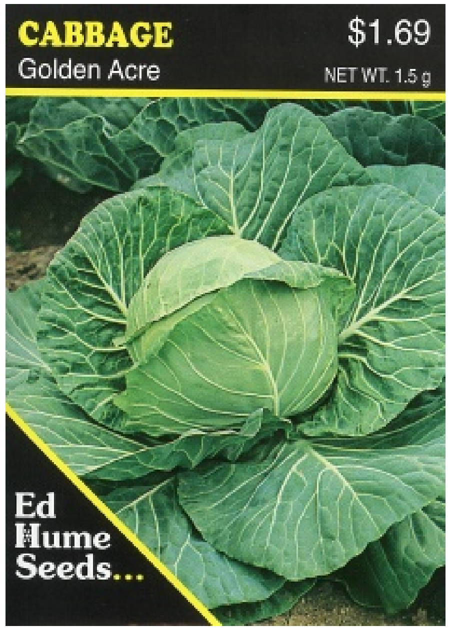

1 plant per 2 square feet

# Peppers



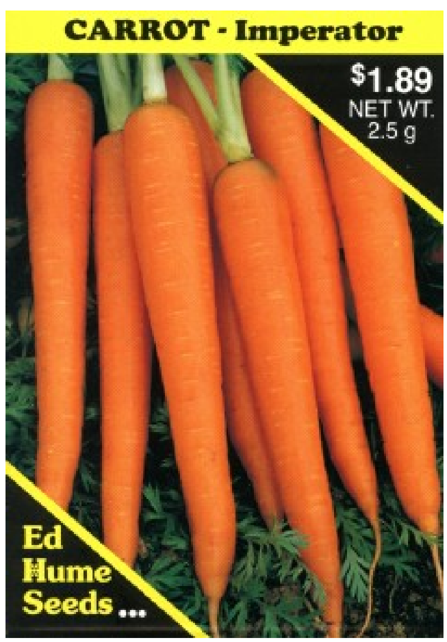

1 plant per square foot

Cabbage




1 plant per square foot

Carrots




16 plants per square foot

# Leaf Lettuce


4 plants per square foot

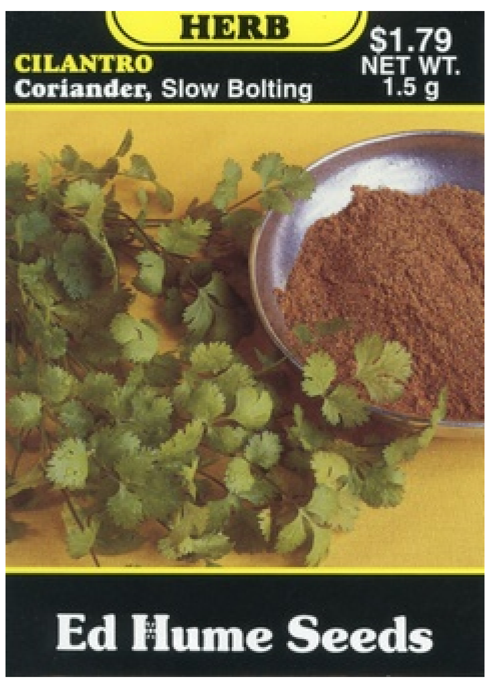
# Swiss Chard


4 plants per square foot

# Basil

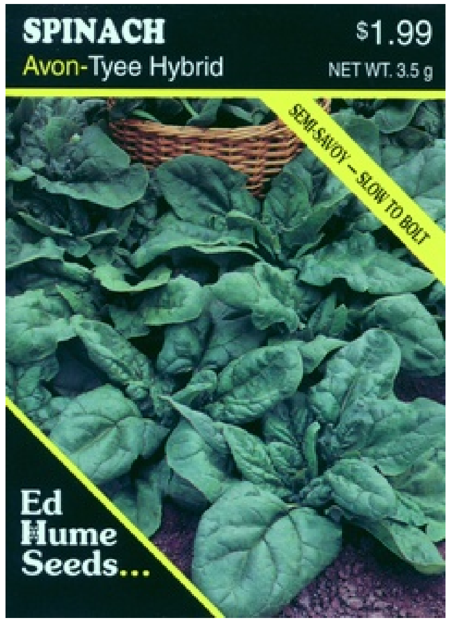

4 plants per square foot

# Coriander (Cilantro)




4 plants per square foot

# Spinach

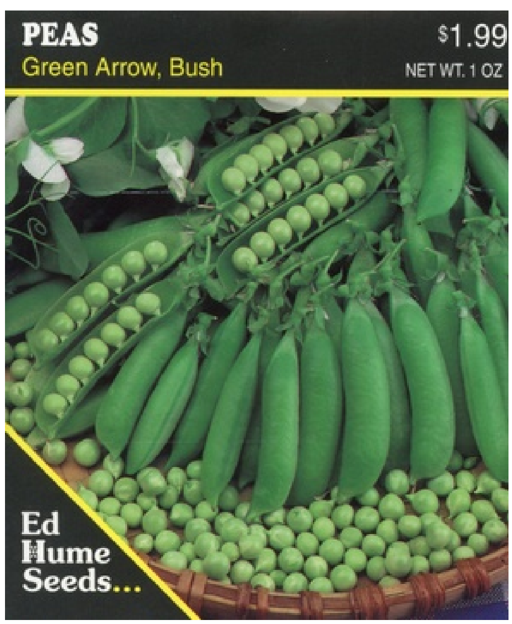



9 plants per square foot

# Corn

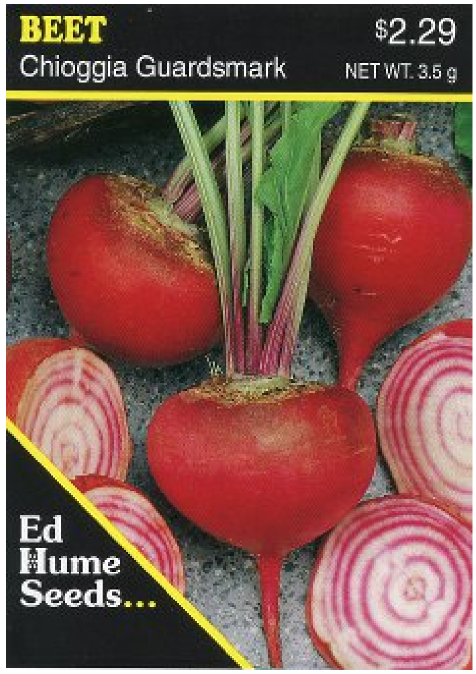

2 plants per 3 square feet

# Peas



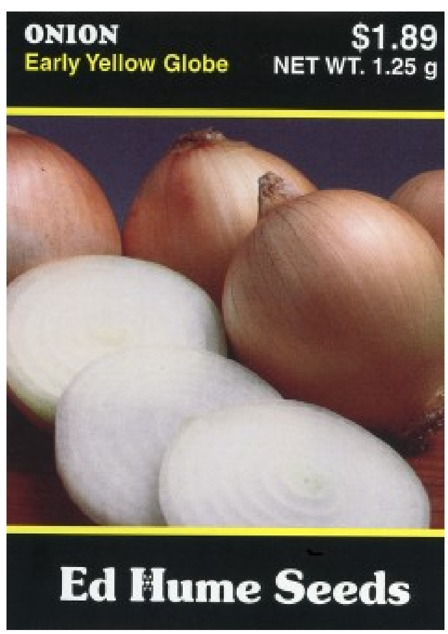

3 plants per square foot

# Beets



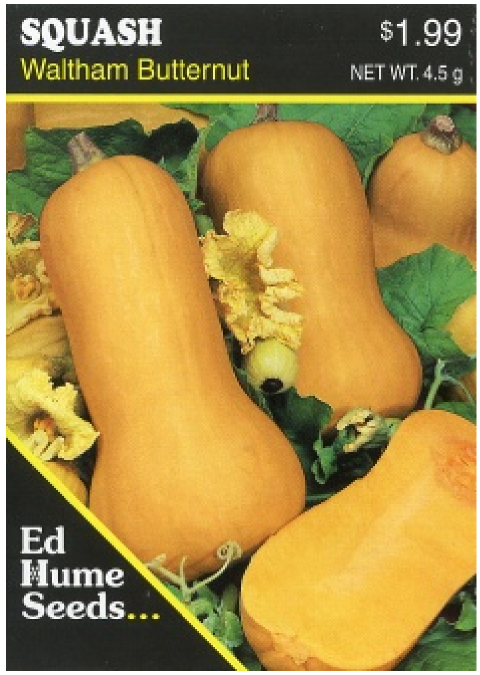

4 plants per square foot

# Spring Onions



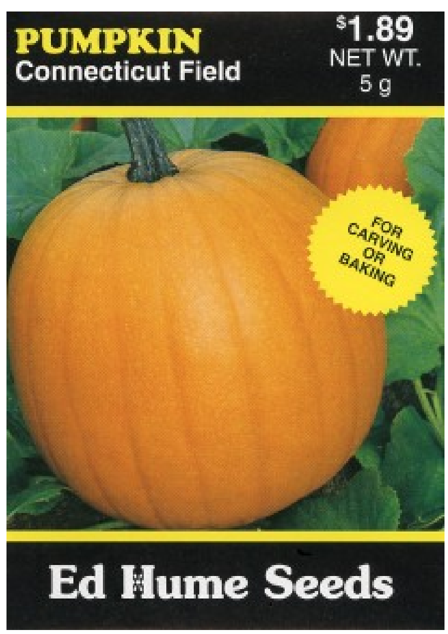

4 plants per square foot

# Squash




2 plants per 3 square feet

# Pumpkin




1 plant per 10 square feet

# Farmer Ben's Farm Hand

**Standards of Learning**
This lesson is adaptable to multiple grade/ability levels and may address the following mathematics strands:

- Number and Number Sense
- Computation and Estimation
- Patterns, Functions, and Algebra

Samples clues are given below and represent several adaptations of this lesson.

**Objective**
Objectives reflect multiple adaptations of lesson.
The student will be able to:

- recognize and extend a pattern
- recognize numerals 0-100
- solve addition/subtraction/multiplication/division problems
- recognize place values
- recognize odd and even numbers
- identify place value

**Materials**

- copy of hundreds chart for each student (*you may download from the AITC website, www.agintheclass.org)*
- corn or wheat Chex
- M&Ms
- square, "window pane," pretzels
- Skittles
- plastic baggies

**Background Knowledge**
Prepare for lesson by pre-packaging baggies for each student with above food items.

A need is something necessary for survival. Farm animals need air, water, food, shelter, and care. It is the farmer's responsibility to provide these necessities to his or her animals.

**Procedure**

1. Distribute hundreds chart to students. Tell them this is Farmer Ben's farm. He is very busy taking care of his animals and needs their help.
2. First, ask students to list different animals that might live on a farm as well as what products we get from them. Example: dairy cows give milk and hogs give bacon.
3. Ask students to brainstorm different things that Farmer Ben might have to do to take care of his animals. Tell them that Farmer Ben's animals need food, water, shelter, and health care. They will be helping Farmer Ben provide this for his animals.
4. Distribute baggies with food items in them. Tell students that the Chex represents food. The Chex are a grain; farm animals eat grain too.
5. Turn the M&Ms upside-down to create Ws, this is water. Farmer Ben must be sure that his animals have plenty of fresh water to drink.
6. The square pretzels look like windows and they represent shelter. Shelter may be a barn, poultry house, or pen.
7. The Skittles are vitamins. Farmer Ben takes care of his animals and makes sure that

they stay healthy.

8. Now begin reading the clues that Farmer Ben has given to help students locate where on the farm they should place the appropriate item.
9. Read clues aloud and ask students to share their answers to check for understanding.

**<u>Sample Clues</u>**

- **Numbers and Number Sense**
  - **i.** Place water on numbers with an 8 in the ones place
  - **ii.** Place vitamins on the number that has a 5 in both the ones and the tens place.
  - **iii.** Place food on all the numbers that are less than 93 but greater than or equal to 86
  - **iv.** Place shelter on even numbers which are greater than 31 but less than 37
- **Computation and Estimation**
  - **i.** Place shelter on the sum of 3 and 7
  - **ii.** Place food on the number that is the difference between 86 and 67
  - **iii.** Place water on the number that is the product of 4 and 8
  - **iv.** Place vitamins on the number that is the sum of 26 and 51
  - **v.** Place water on numbers which are divisible by 5 and greater than 10 but less than 30
- **Patterns, Functions, and Algebra**
  - **i.** Place food on 11, 13, and 15 and water on 12 and 14.  What comes next?
  - **ii.** Place shelter on numbers 100, 97, 94, and 91.  What are the next 3 numbers where shelter should be placed?

**<u>Extension</u>**

Have students choose a farm animal that they would like Farmer Ben to raise.  Draw a picture depicting the animal as well as its needs.

Have students create a Venn Diagram comparing and contrasting the needs of farm animals and the needs of humans.

Journal Prompt: Pretend you are Farmer Ben, describe what a day is like for you.  What are your responsibilities?

# Farmer Ben's Farm

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

# Flowering Factorization

**Standards of Learning**
Math: 5.3
Science: 5.5

**Objective**
Students will:

- Identify and describe the characteristics of prime and composite numbers

**Materials**

- Construction paper of every color
- White squares
- Brown yarn cut into 2 inch lengths or craft sticks
- Markers
- Scissors
- Tape or glue
- Worksheet (see attached)

**Background Knowledge**
Plants use roots to obtain essential nutrients from soil. Without the thin stringy fibers, flowers and plants would not survive. Farmers rely on healthy soil and strong roots to keep their crops alive until they are ready to harvest. Roots begin forming during germination and continue to grow while the plant grows.

This activity can teach students the parts of the plant and the importance of roots while learning prime factorization. Factors of a multiple can be broken down until only prime numbers. Students get a visual representation of how a number can be broken down into factor families, and eventually only prime factors, using roots shooting from the stem of a flower.

**Procedure**

1. Discuss with students how to complete prime factorization. Explain that prime numbers can be multiplied together to make composite numbers. Prime factorization breaks down a composite number until you reach the prime factors that make it composite (18 = 2 X 3 X 3).
2. Use the attached worksheet to review prime factorization with your students. Make sure they understand that once a factor cannot be divided into two factors, except 1 and itself, it is a *prime* number.
3. Remind the students to circle the prime numbers in the factorization trees so they can determine the prime factorization for the composite numbers they are practicing with.
4. After everyone has demonstrated a clear understanding of prime factorization, and their “trees” have been approved, ask them to choose one composite number to use for their Flowering Factorization activity.
5. Provide all of the supplies listed above.
6. Ask the students to cut out the center of a flower and write their composite number on it. Give them time to make their flower petals, stem, and leaves.
7. Once everyone has made their flowers, have the students write on white squares of construction paper the factorization of their composite number. Make sure the students include all of the steps, and not just the prime numbers. They need to demonstrate how they reached the prime numbers.

8. Ask the students to attach the factors appropriately, matching the practice they completed on the scratch paper.
9. On the prime numbers, draw a worm, bee, ant, or other garden critter to indicate the final factors of the prime factorization.
10. Hang up the flowers around the room.

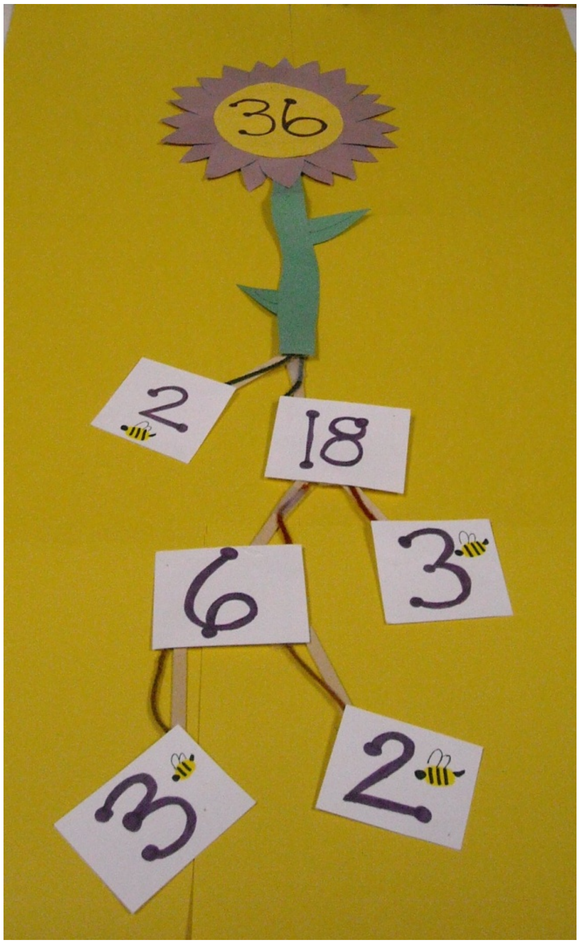
**Extension**

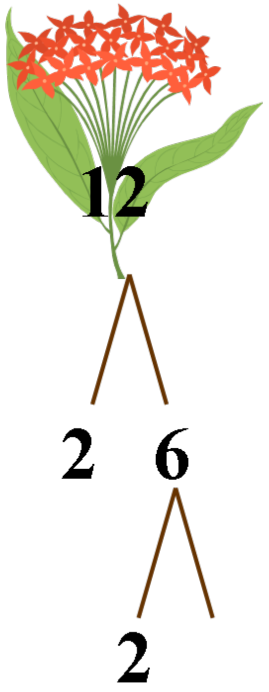
Smaller versions of this activity can be done using tooth picks. You can assign certain characteristics of composite number and students must provide an example, such as “This composite number has 2 prime numbers (21).” Or, “Show me 3 different ways you can find the prime numbers for the number 36 (starting factors: 2x18, 3x12, or 6x6).”

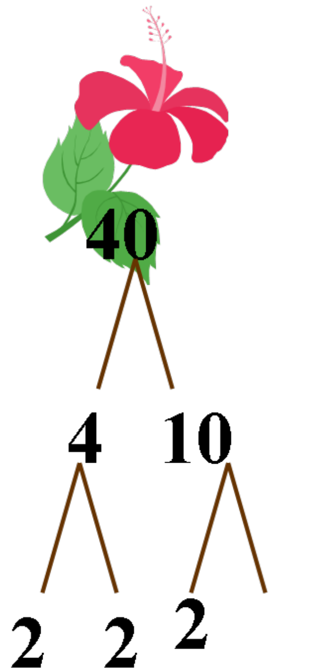
Students could also complete this activity using root vegetables. Discuss the structure of a plant, specifically the cells.

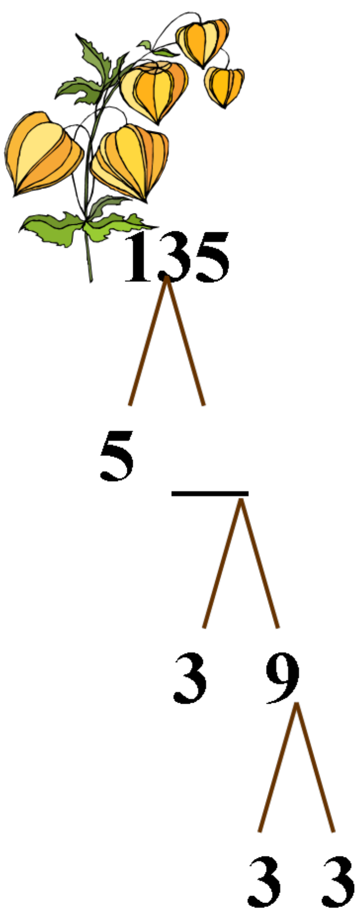
**Modification**

For lower grades, rather than using prime numbers, use addition facts.






Use this space to make your own prime factorization flower.

# Funky Fraction Chicken

**Standards of Learning**
Math: K.5, 1.3, 2.3, 3.3, 3.7, 4.2, 5.2

**Objective**
The students will:

- use tactile representations to identify fractions and to compare equivalent fractions.
- create a chicken using their fraction tactiles.

**Materials**

- 3 white or yellow paper plates per student (lower levels may only use 2, see Background Knowledge below)
- staplers
- glue or tape
- crayons
- scissors (one per student)
- orange construction paper
- chicken feet template (attached)

**Background Knowledge**
This lesson is a great way to represent fractions with your students using the funky fraction chicken. It might be helpful to start out representing fractions with objects that are placed on the plate. It is important to explain to your students that the plate serves as a whole and when the plate is cut in half then they are left with 2 halves. One ½ is half of the plate and the other ½ is half of the plate and when they are put together they equal a whole. Then you can cut the 2 halves in half again and explain to your students that now they have 4 fourths. One ¼ is a fourth of the plate and that same goes for the other pieces and when they are put together they make up the whole plate again. Depending on how old your students are you may want to go higher in fractions. This also serves as a great way to show equivalent fractions such as ¼ + ¼ = ½ or ½ + ½ = 1. You can also go as high or low as you wish with this step too.

This lesson can be easily adapted to grade level and/or student ability. Lower levels may stop at ¼, while upper levels may add "feathers" to their chickens and go up to $1/8^{th}$ or $1/16^{th}$. Teachers who wish to stop at ¼ should only use 2 plates per child and may omit steps 5-7 below. The picture accompanying the lesson has gone up to sixteenths.

**Procedure**

1. Pass out 3 paper plates to each student. Have students place the plates in a row in front of them. Talk about how each plate is the same and equivalent to the others.
2. Take the middle plate and cut it in half, by folding and then cutting on the crease.
3. Place both pieces on top of the first place. Point out that 2 halves make one whole. You may write this on the board as 1 = 2/2 and discuss simplifying fractions.
4. Pick up one of the halves. Fold it in half and cut along the crease. You have now created 2 fourths. Place these back on the first plate. Now ½ = 2/4, again discuss simplifying fractions.
5. Take the third plate. Fold it in half once, and then again. Cut to create fourths.
6. Take the fourths and cut them in half. Now 2/8 = ¼ and 4/8 = 2/4 = ½.
7. Take 4 of the eighths and cut them in half. Now 2/16 = 1/8 and 8/16 = ½ and so on.

8. Now it is time to assemble your Funky Fraction Chicken.
9. Tell students to pick up the whole plate and place it upside-down in the middle of their desk. This is the chicken's body.
10. Take the piece which represents ½ and place it right-side up at the bottom of the body. The straight side should be at the bottom. Staple the half into place. This will be the head.
11. Now take the two quarter pieces. Put them on the side of the chicken's body so that the point is facing in. Staple into place. These are the wings.
12. Cut a small triangle out of construction paper. Glue it to the bottom of the head, point side down. This is the beak.
13. Use a black marker or crayon to draw 2 eyes on the head.
14. Cut out legs. Color them orange (*or you may print these on orange paper*).
15. Staple to the top of the body.
16. The eights and sixteenths are feathers; arrange and glue to the body.
17. Display the Funky Fraction Chickens around the room!

**Extension**

Engage students with more henhouse math!

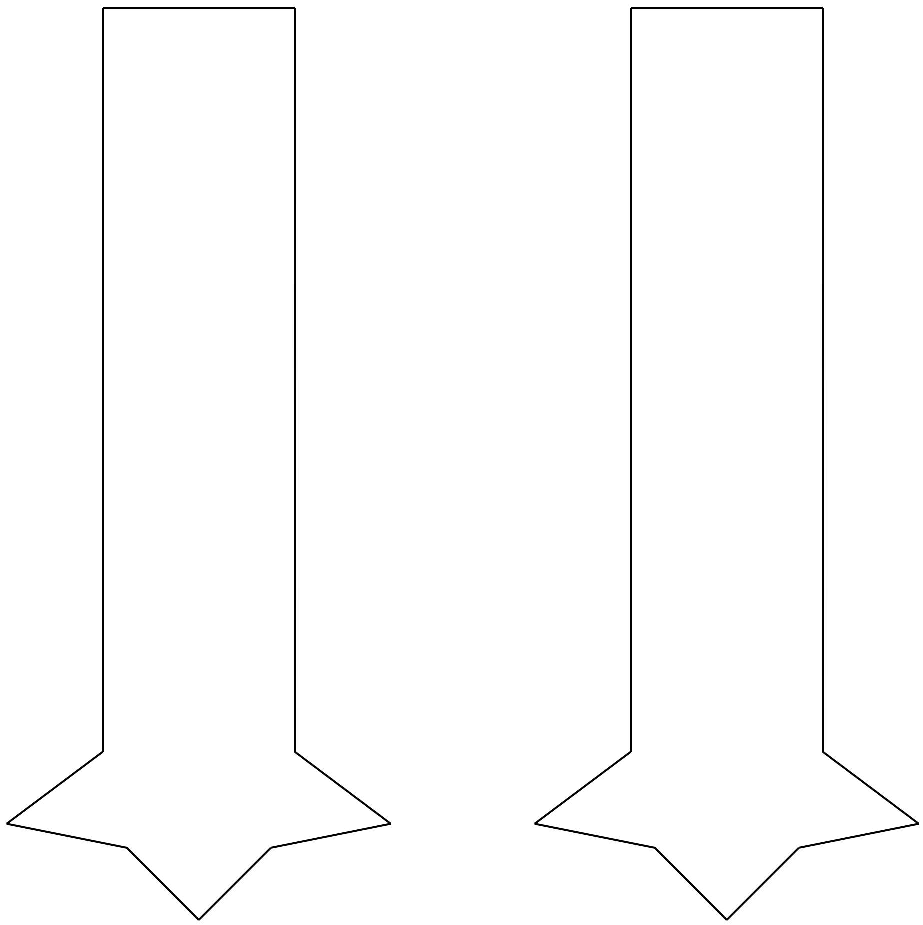
A hen lays approximately one egg every 25 hours. How many eggs will a hen lay in a week/month/year?

A chicken egg takes 21 days to hatch, a turkey and duck egg each take 28. What is the average hatching time for poultry?

**References**

Original lesson adapted from Illinois Agriculture in the Classroom.

**Funky Fraction Chicken Feet Template**



# Garden Math: Measuring Area and Perimeter

**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.

**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

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.

# A Handy Measure

**Standards of Learning**
Math K.10, 1.9, 2.11

**Objective**
Students will:

- Be able to use nonstandard units as well as a ruler/yardstick to measure height.

**Materials**

- masking tape
- yardsticks
- construction paper
- scissors
- A Field Full of Horses by Peter Hansard (optional)

**Background Knowledge**
Horses helped settle the "New World," and they are still important today. Early horse traders found it was easier to use their hands to measure horses than to carry around measuring sticks. They would count hand-widths from the ground to a horse's withers, the high part of its back, between the shoulder blades. A horse is generally 14.2 hands (14 hands and 2 inches) or taller. Anything shorter than 14.2 hands is considered a pony.

This activity provides a great opportunity for your students to learn about measurements since you will be talking about inches. There are many different types of measurements such as those for volume, area, and length and this is something that you will want your students to know. When you start talking about inches then you can get into feet and how there are 12 inches in a foot. This can further go into the fact there are 3 feet in a yard so how many inches are there in a yard? This can be a fun guessing game for your students before they actually use a measuring stick to find out how many inches are in a foot, feet in a yard, and inches in a yard. You may also want to ask your students how many inches they think are in 14 hand widths, but it is important to remind them that everybody's may not be the same because they all have different sized hands. This activity brings a lot of experiment to classroom for students to learn with numbers.

**Procedure**

1. Read the book, A Field Full of Horses to students. Discuss how a horse is measured using hands. *If the book is unavailable you may share the Background Knowledge above, instead*.
2. Along a wall, measure 14 hand widths and 2 inches from the floor. Place a piece of masking tape to mark the height.
3. Explain to students that the tape represents the usual height of a horse. Label the tape accordingly.
4. Divide students into pairs to measure each other's heights.
5. One student should stand with his/her back to the wall while the other marks the height with a piece of masking tape. Have students label each piece of tape with his/her name.
6. Use a yardstick to measure the height from floor to tape marker. Record this data.
7. On a piece of construction paper have students carefully trace their hands. Have students estimate how many hands they think will be necessary to measure their height.
8. Have each student trace and cut as many hands as needed to measure his/her height.
9. Allow students to tape hands to the wall from floor to tape marker to visually display their heights.
10. Discuss whether or not students' predictions were correct.

**Extension**
Have students estimate the length, height, and width of classroom objects using hands or inches. Then have them test their predictions.

**References**
Lesson adapted from Oklahoma AITC

# Pumpkin Patch Math

**Standards of Learning**
This activity is adaptable to fit many of the mathematics SOLs in the following strands:
- Number and number sense
- Computation and estimation
- Geometry
- Patterns, functions, and algebra

**Objective**
Students will:
- Count numbers to 100
- Identify 5's and 10's
- Identify numbers greater or less than
- Answer basic addition and subtraction questions

**Materials**
- Copy of a hundreds chart for each student or pair of students
- Candy corn and candy pumpkins

**Background Knowledge**
Pumpkins are an important specialty crop for Virginia with about 3000 acres of pumpkins and gourds grown annually. Most Virginia pumpkins are grown for ornamental use during the fall season and especially around Halloween. Virginia farmers produce approximately 5.3 million large pumpkins each year! In order to be ready for a fall harvest, farmers typically plant their pumpkin crops in early summer, around mid-June to July. Pumpkins like the warm summer soil and require plenty of water. They also need lots of space for their vines and help from bees to pollinate their blossoms.

**Procedure**
1. Have students work individually or in pairs.
2. Distribute a copy of the hundreds chart to each student or pair of students as well as a handful of the candy corn and pumpkins.
3. Tell students they will be planting corn and pumpkins on their charts.
4. Call out clues and have students place the candy on the correct numbers. See below for sample clues.
5. Review concepts presented in the clues. Ask volunteers, or select students, to give you the number or numbers that answer the clue to check for understanding.

**Sample Clues**

Patterns
- Alternate corn with pumpkins on a few numbers and then ask what will come next in the pattern
- Greater than/less than
- Pumpkins on number that is 6 less than 40
- Corn on number that is 10 greater than 34

Geometry
- Place candy on numbers to create angles, ray, line, line segment, square, rectangle, trapezoid, parallelogram, etc.

Place value

- Corn on number with a 7 in the tens place
- Pumpkin on number with a 3 in the ones place
- Corn on number with an 8 in the ones place and 3 in the tens place

Computation

- Pumpkin on the number that is the sum of 12 and 76
- Pumpkin on number that is the difference between 99 and 57
- Corn on number that is the product of 2 and 10

# Pumpkin Pudding Pie

**Standards of Learning**
Science K.1, K.7, 1.1, 1.4, 2.1, 2.8, 4.1, 4.4
Math 1.10, 2.11, 3.9, 4.8

**Objective**
Students will:
- Identify pumpkins as agricultural products
- Measure liquid volume with the appropriate tools

**Materials**
- 2 and 2/3 cups cold milk
- Measuring cups
- 2 packages (4 oz.) instant vanilla pudding mix
- 2 gallon-size Ziploc freezer bags
- 1 can (15 oz.) pumpkin
- Can opener
- 1 teaspoon cinnamon
- ½ teaspoon ginger (ground)
- Measuring spoons
- 1 box graham cracker crumbs
- Small plastic cups
- Whipped topping (optional)
- Plastic spoons
- *Pumpkin Circle: The Story of a Garden* by George Levenson

**Background Knowledge**
There are flowering/non-flowering plants and edible/non-edible plants that are grown in Virginia. The pumpkin plant serves as both a flowering and edible plant, which is important for your students to know when categorizing. A pumpkin plant starts with a seed, then the roots sprout underground, the leaves sprout from the soil, the flowers blossom, and the fruit or pumpkin comes last. There is also a great opportunity for your students to experiment with measurement in this activity. They can learn the different measurements that are used when measuring liquids such as teaspoons, tablespoons, liters, cups, etc. Your students can gain their independence while learning about the pumpkin cycle and measurement. This fun cooking lesson can be used to reinforce the lifecycle and characteristics of a pumpkin. Enjoy this tasty snack while exploring with measurement!

**Procedure**
1. Read *Pumpkin Circle: The Story of a Garden* by George Levenson and review the life cycle of a pumpkin plant.
2. Discuss the difference between flowering / non-flowering and edible / non-edible plants and categorize the pumpkin plant.
3. Brainstorm a list of how we use pumpkins and write them on the board.
4. Make pumpkin pudding pie as an example of one way we can use pumpkin as food.
5. Instruct one or two students to measure out the cold milk.
6. While students are measuring the milk, place a gallon size Ziploc bag inside of another gallon size Ziploc bag (to prevent spills).
7. Combine the cold milk and instant vanilla pudding mix in one of the gallon Ziploc freezer bags. Remove the air from the bag and zip shut.
8. Have the students squeeze and knead with their hands until this mixture is well blended. (You may wish to have each student take a turn at this.)

9. Now ask a student to open the can of pumpkin and add it to the bag.
10. Instruct two students to measure and add each of the following ingredients:
    - 1 teaspoon ground cinnamon
    - ½ teaspoon ground ginger
11. Remove the air from the bag and zip shut.
12. Again, have the students squeeze and knead with hands until this mixture is well blended. Set aside.
13. Place ½ tablespoon of graham cracker crumbs in the bottom of the small plastic cups. (You may wish to give this task to several students or set it up before beginning the activity.)
14. Cut the corner of the freezer bag and squeeze pie filling into cups, on top of the graham cracker crumbs.
15. Garnish with whipped topping. (The topping may also be placed in a freezer bag with the corner cut for dispensing, if canned whipped topping is not purchased.)
16. Add a spoon, serve, and enjoy!

**Extension**

- Challenge students to determine measurement amounts if the recipe was doubled or tripled.
- Have students find equivalent fractions for the measurements used in the recipe.
- Have students find the equivalent measurements in metric units.

# Scarecrow Measuring

**Standards of Learning**
Math: 2.11
Science: 2.1

**Objective**
Students will:
- Estimate and measure cups, pints, gallons, and liters
- Volume is measured in metric and English units, using specific tools

**Materials**
- Paper plate
- Yarn
- Brown construction paper for gallon body
- Red construction paper for quarts
- Orange construction paper for pints
- Yellow construction paper for cups
- Extra construction paper
- Examples of the following measuring containers: gallon, quart, pint, cup

**Background Knowledge**
Measuring tools, such as gallons, quarts, pints, and cups, are important for cooking and buying food products. Milk comes in a gallon jug, strawberries are packaged in quarts, consumers can buy pints of blueberries, and soybeans are measured in cups. Students need to understand how to convert units: 2 cups = 1 pint, 2 pints = 1 quart, and 4 quarts = 1 gallon.

**Procedure**
1. Read students *Scarecrow* by Cynthia Rylant. Farmers use scarecrows to keep pests out of their farms to preserve their crops. This book beautifully describes the peaceful, but important, purpose of a scarecrow.
2. Allow students to create a face for the scarecrow. Use the yarn for hair and the additional construction paper for a hat.
3. Show the gallon container. Discuss and illustrate how much it holds. Explain that you are using the brown piece of paper to represent a gallon. Repeat this step with the other measurements.
4. Use the whole piece of brown construction paper for the body and write “Gallon” in the middle. Attach the head to the top of the brown paper (see picture below).
5. Cut the red paper into 4 equal pieces and write “Quart” in the middle of them. Glue one on the right side of the brown paper, one on the left side of the paper, and two on the bottom of the paper.
6. Cut the orange paper into 8 equal pieces. Write “Pint” on the papers and glue two to each quart.
7. Cut the yellow paper into 16 equal pieces. Write “Cup” on the papers and glue two cups to each pint.
8. Discuss the conversions from cup, to pint, to quart, to gallon. Bring in items that are measured in these ways so students have a representation of the unit.
    a. Milk: gallon
    b. Quart: strawberries
    c. Pint: blueberries

d. Cup: soybeans

**Extension**
Provide students with a recipe that uses some, if not all, of these units. Help them practice measuring ingredients and cook the food item.


Paper Plate for Head

Gallon (brown paper)

Quart

Pint

Cup

# Sym-MOO-try Cow

**Standards of Learning**
Math: 1.3, 2.3, 2.15

**Objective**
The student will be able to:
- identify a line of symmetry
- define and investigate symmetry using paper folding
- identify half versus whole

**Materials**
- 11 x 17 white paper
- scissors
- cow template, attached
- sponge paint brushes
- black and pink tempura paint
- glue
- black marker
- optional: black yarn and "googly" eyes

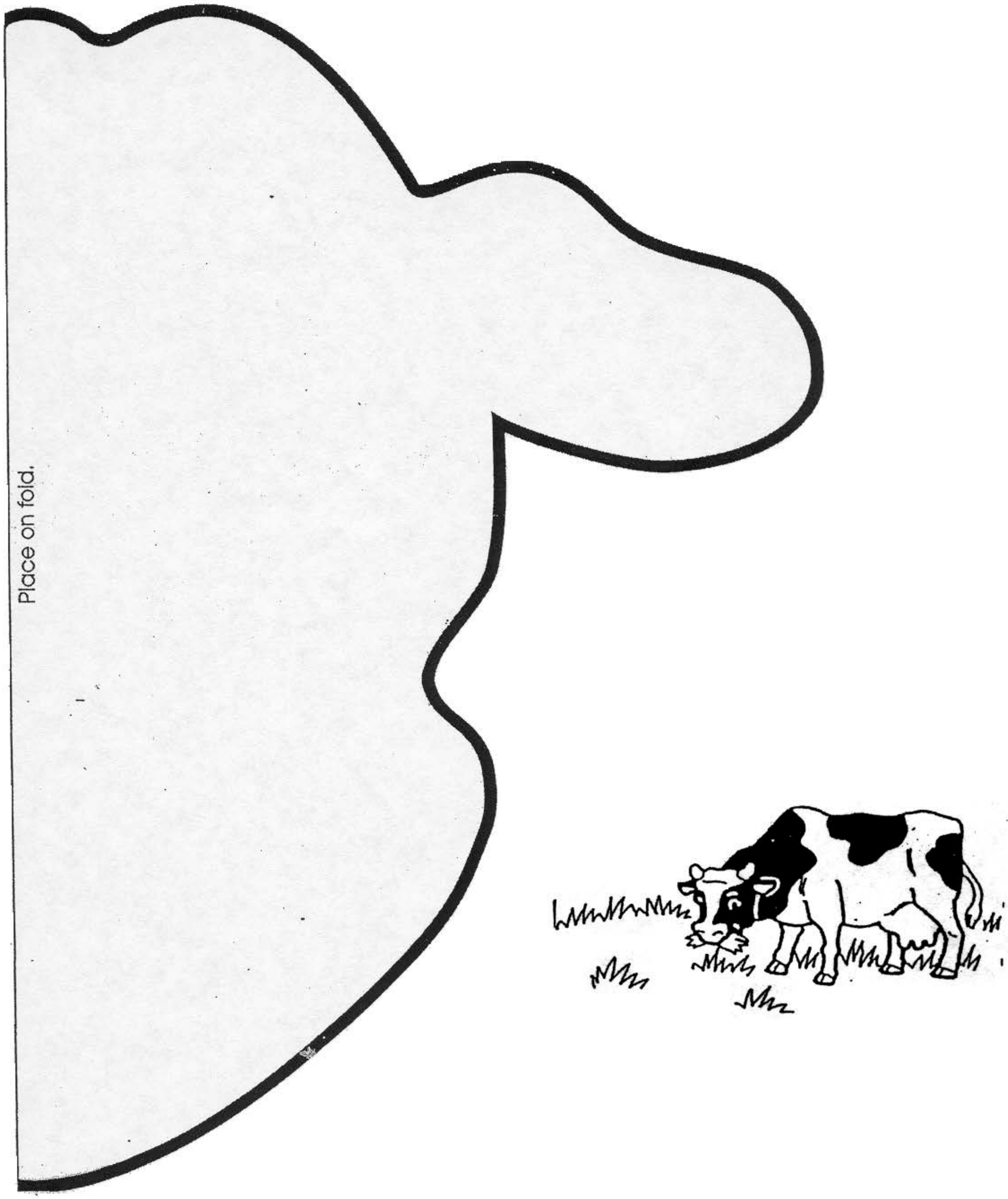
**Background Knowledge**
The most widely recognized dairy cow is the Holstein, which has black and white spots. The spots are similar to people's fingerprints in that no two cows have the same pattern of spots. Dairy farmers milk their cows at least twice a day. One cow produces 90 glasses of milk a day, and 200,000 in her lifetime. In fact, a cow's udder can hold 25-50 pounds of milk! Diary is Virginia's third largest agricultural commodity.

**Procedure**
1. Pass out templates and have students cut them out.
2. Pass out 11 x 17 paper. Fold in half horizontally "hamburger-style."
3. Line up straight edge of template with the fold. Trace and cut out.
4. Use sponge brushes to make black spots on *one half* of the cow. Use the pink for the ear.
5. Close cow along the fold and press lightly to transfer paint.
6. Open cow up to see the whole and ask students to describe their observations. Point out that the spots are symmetrical across the fold.
7. Let dry and add eyes and black yarn for hair. You may also use a black marker to draw the nose.

**Extension**
Farmers use ear tags to track breed lines in cows. Have students make their own ear tags for their cows, using their birthday as the number.

**References**
Original lesson adapted from Alabama Agriculture in the Classroom.

## Sym-MOO-try Cow Template



# These Farms Measure Up: Become an Agricultural Engineer

### 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.

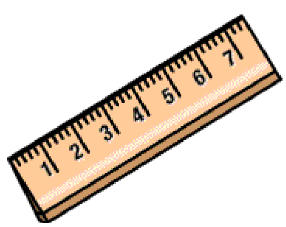
You will work in a group to design your blueprint first on a piece of construction paper by measuring and then drawing the lines for your fences, enclosures, and other features.

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.**

# 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.

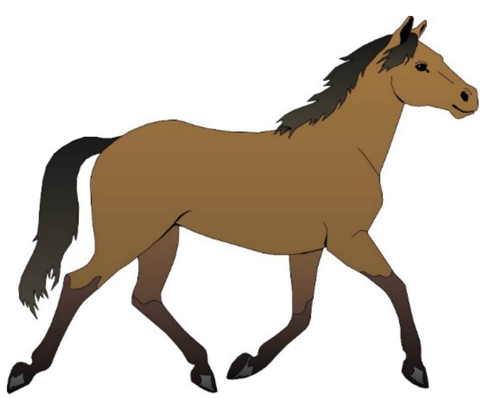
**The perimeter of the fence must be 100 centimeters**

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.**



# 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.**

## 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.