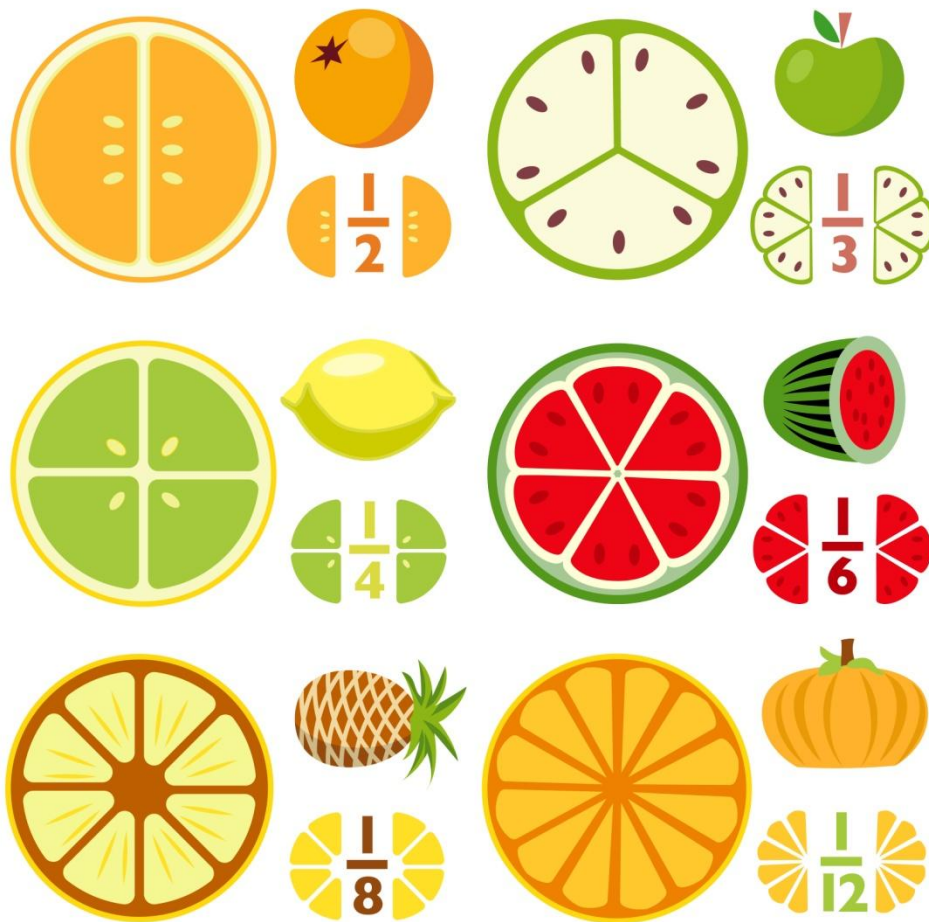


Mathematics

Ag-tivities



Grade and standard aligned
mathematics activities that teach
students about agriculture.

Introduction:

Mathematics can be incorporated into all areas of the curriculum. This book provides lessons that teach mathematics concepts while educating students about agriculture.

At the beginning of each chapter there is a short explanation of the concepts covered in the mathematics substrands for that grade level. The substrands include Number and Number Sense, Computation and Estimation, Measurement, Geometry, Probability and Statistics, and Patterns, Functions, and Algebra. The lessons that follow provide the numbers for the Standards of Learning, necessary materials, background information, and the procedure. Extensions and pictures are also included. The Masters for the activities are located at the end of this book.

Each lesson incorporates interesting information about agriculture with mathematics concepts. Students gain skills to solve math problems while learning about agricultural facts about various commodities and plant growth.

Acknowledgments:

AITC acknowledges the contributions of our writer, Katie Claer. She graduated with a degree in Interdisciplinary Liberal Studies and a minor in Elementary Education from James Madison University in May 2011. Katie's concentration was in Math and Science, with an additional endorsement in Algebra I. In May 2012 she will graduate from MU with her Master of Arts in Teaching, concentrating in Elementary Education and completing an endorsement in Gifted and Talented Education. Tammy Mahey and Lynn MacLeod provided guidance, ideas, and materials for this project. They are both AITC Education Coordinators.

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Kindergarten

Number and Number Sense

Young children gain essential counting skills during kindergarten. The concept of one-to-one correspondence develops and flourishes during this year.

Computation and Estimation

Kindergarten students add and subtract up to 10 concrete objects.

Measurement

Weather and seasons are incorporated into early childhood lessons.

Geometry

Simple plane figures are identified by kindergarteners. The location of objects is also an important concept for young children to understand.

Probability and Statistics

Not only are students expected to understand numerals, but the children are also required to use tallies as a form of counting. Picture and object graphs are also taught during this grade.

Patterns, Functions, and Algebra

Naming patterns and contributing objects to extend the patterns are skills gained during kindergarten. The students' abilities to classify objects are not only an important skill in mathematics, but in science as well.

Egg Carton Math

Standards of Learning

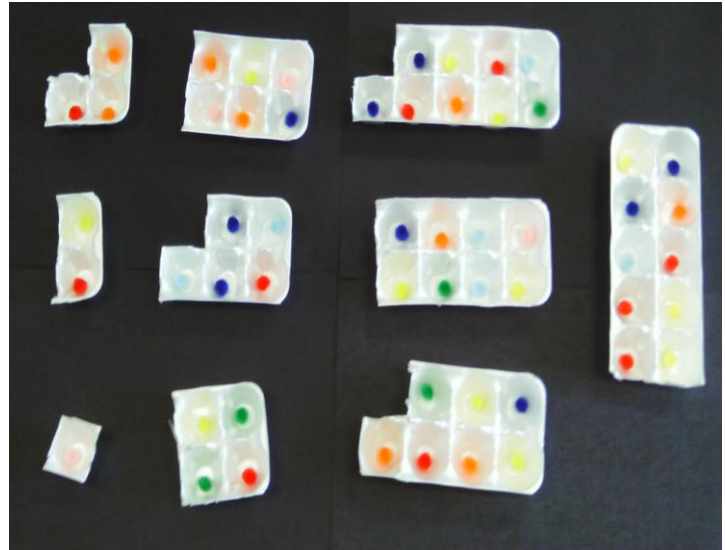
Math: K.1, K.6

Science: K.7, K.9

English: K.2

Materials

- Pom-poms, fake eggs, or other small objects that can fit inside an egg carton
- 3-5 Egg cartons (diagram found on p. 37)



Background Knowledge

Young children can benefit from concrete examples of abstract ideas. This lesson allows students to count objects and begin to understand addition problems that equal 10 or less.

Illinois produces over 1.4 million eggs each year! We are the 18th state in terms of egg production as well. People in Illinois consume 32.4 lbs of eggs per person each year.

Procedure

1. Create the manipulatives shown above. Practice counting with the students prior to the activity.
2. Discuss eggs, chicks, and chickens and the importance of them for farmers. Read books such as *Eggs and Chicks* by Fiona Patchett or *From Egg to Chicken* by Gerald Legg.
3. Use the egg cartons and objects to practice counting, number recognition, addition, and subtraction.

Extension

Create the lifecycle of an egg as it grows into a chicken. Also, this lesson could be helpful for older students struggling with the concept of addition and/or subtraction.

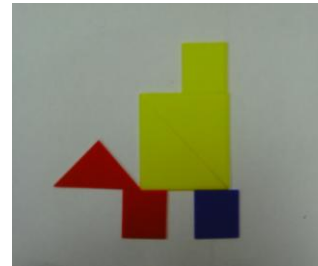
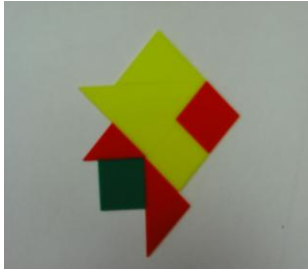
Farmyard Tangrams

Standards of Learning:

Math: K.16, K.11, 1.12, 1.17, 2.20

Science: 1.5, 2.4, 3.5, 3.6

English: 1.1, 1.2, 2.3, 3.2



Materials:

- Tangrams
- Tangram patterns in the shapes of farm animals provided in *Barnyard Tangrams* by Barbara R. Evans.

Background Knowledge:

Tangrams allow children to create patterns. These manipulatives come in many different shapes, including squares and triangles. Shapes can be used to represent different things, including animals and equipment found on a farm.

Procedure:

1. Read a book about farm animals, such as *Barnyard Banter* by Denise Fleming, *Big Red Barn* by Margaret Wise Brown and Felicia Bond, or *Farm Alphabet Book* by Jane Miller.
2. Allow students to explore the tangrams for several minutes.
3. Provide tangram patterns and ask students to put the tangrams on the picture until all of the pieces fit. Provide several different options for students to use.
4. Ask students to create their own tangram image of a farmyard animal.

After students have had enough time to make their own creations, allow students to take a “Barnyard Tour” and observe the animals created by their classmates.

Extension:

Kindergarten students can also identify, describe, and trace plane geometric figures. Older students can express through oral or written language facts about their tangram animal, such as the name used for the baby of that animal.

1st Grade

Number and Number Sense

Counting to 100 is a goal for 1st graders. Developing an understanding of place value and fractions both begin during this year.

Computation and Estimation

Students begin to add and subtract numbers up to 18. Story and picture problems are incorporated into lessons.

Measurement

The value of coins is explored by first graders, as well as nonstandard units.

Geometry

Objects in the environment can be sorted into plane figures by students in 1st grade. Also, shapes are identified by the number of sides, vertices, and right angles they have.

Probability and Statistics

Data collection techniques are practiced by students. Interpretive words such as *more than* and *less than* are used by the children.

Patterns, Functions, and Algebra

Students still continue to sort objects and extend patterns. Equality is introduced with the equals (=) sign.

Apple Orchard Math

Standards of Learning:

Math: 1.1

Science: 1.4

English: 1.1

Materials:

- 1 copy of a complete 100s chart per student (see p. 38)
- 1 copy of a blank 100s chart per student (see p. 39)

Background Knowledge:

Counting to 100 is an essential skill young children must acquire in order to learn higher level math concepts. Practicing counting and writing the numbers helps children gain number sense.

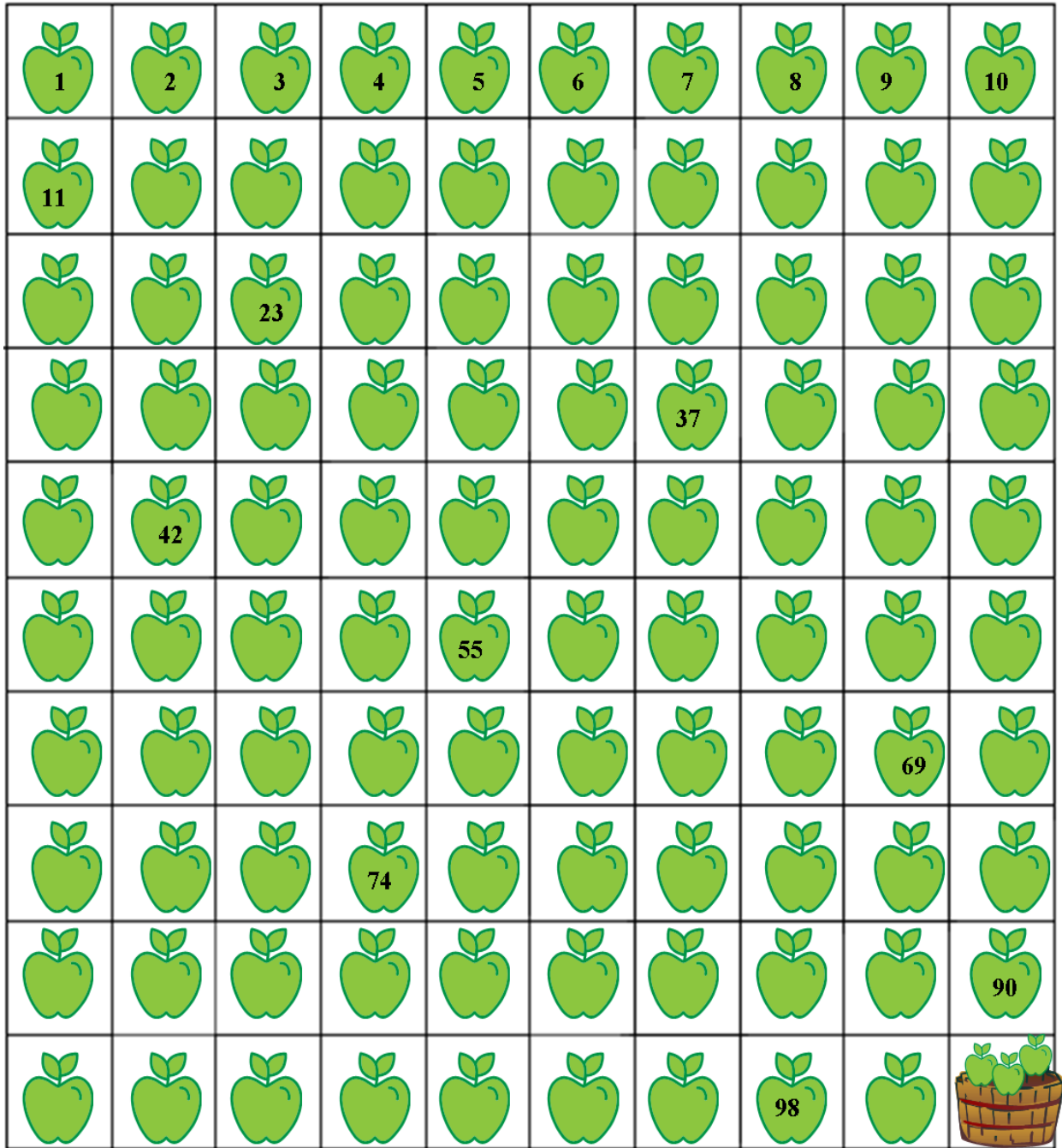
Apples are concrete, everyday objects students know about and can use to count. Also, apples are an important crop—thousands of acres of apples are harvested every year. Discussing apples in the fall can teach children about harvesting this abundant crop. Illinois ranks 13th in the United States for apple production.

Procedure:

1. Practice counting on the completed 100s chart. Discuss counting by tens down the chart (10, 20, 30, 40, etc). Ask students to find certain numbers on the chart, such as 76, to support their knowledge of numbers.
2. Ask the students to complete the Apple 100s Chart. Count the first row since it is already filled out. Help them with the next row (11 is done for them). Then allow them time to finish the chart. Some numbers are already filled in to keep students on track. Provide the completed 100s chart if students are still having difficulty counting and writing numbers.

Extension:

Students can discuss the life cycle of an apple. Apple picking, apple pie baking, and other fall activities can be completed alongside this lesson. Read *Amazing Apples* by Consie Powell and have students participate in poems about the fruit and fall.



Classifying Products by Shape

Standards of Learning:

Math: K.11, 1.12

Science: K.1, 1.1

English: K.2

Materials:

- Chart paper large enough to be used as a grid on the floor for the children to see, with sections titled: triangle, rectangle, square, and circle with a picture beside the shape.
- Products and their general shapes (provide a picture or an example):
 - Apple (circle)
 - Hamburger patty (circle)
 - Flower petal (triangle)
 - Tomato (circle)
 - Ear of corn (rectangle)
 - Cotton ball (circle)
 - Cucumber (rectangle)
 - Strawberry (triangle)
 - Cracker (square)
 - Cheese (triangle, square, circle, or rectangle)
 - Peanut (circle)
 - Chicken nugget (circle)
 - Evergreen tree (triangle)
 - Slice of bread (square)
 - Soy bean (circle)
 - Bunch of grapes (triangle)
 - Hay bale (circle)
 - Peach (circle)
 - Watermelon (circle)
 - Wheat (rectangle)
 - Lumber (rectangle)
 - Turkey meat (square)
 - Slab of fish (rectangle)
 - Egg (circle)
 - Cereal box (rectangle)
 - Green bean (rectangle)
 - Potato and/or sweet potato (circle)
 - Wool (circle)
 - Blanket (square)
 - Sausage link (rectangle)
 - Pumpkin (circle)
 - Bacon (rectangle)

Background Knowledge:

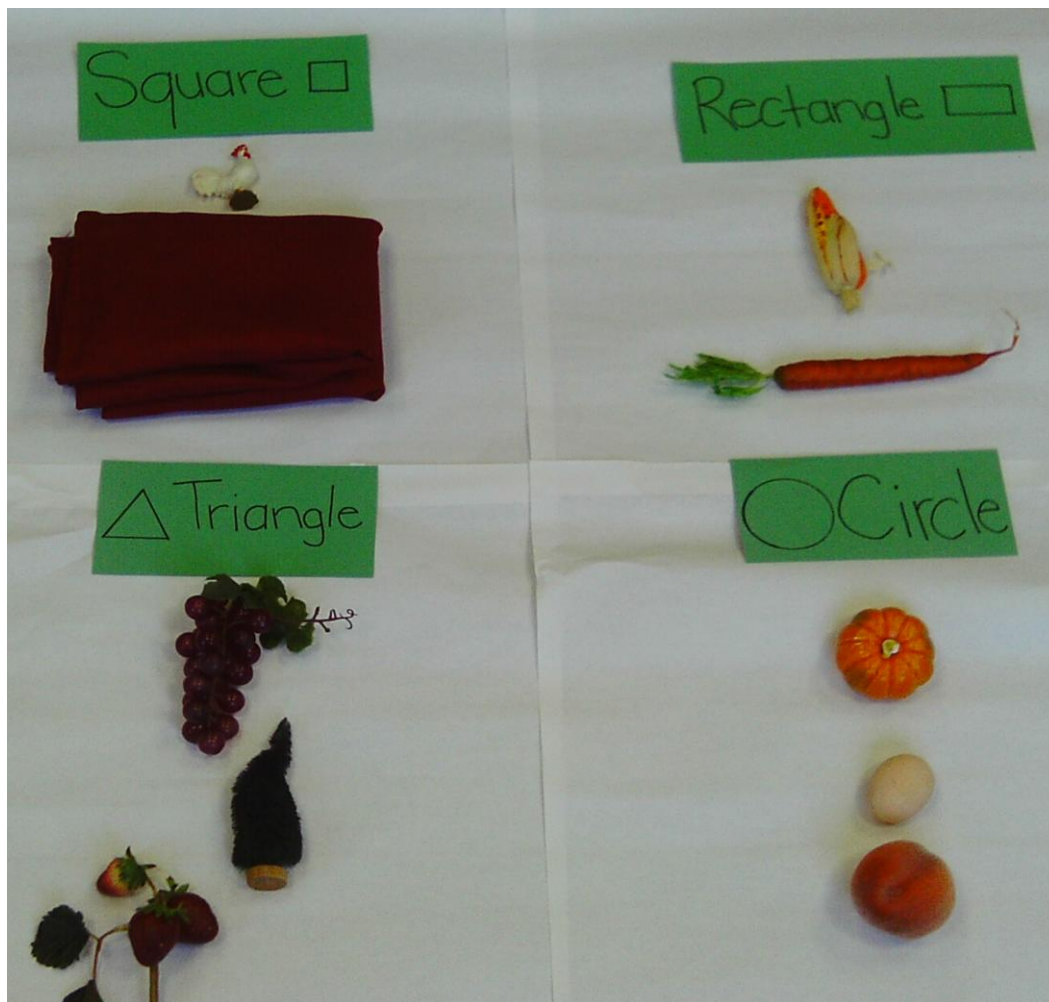
All types of shapes occur in nature, including triangles, squares, rectangles, and circles. Each shape is unique according to the number of vertices, right angles, and sides.

Procedure:

1. If available, read books such as *Food for Thought* by Joost Eiffers and Saxton Freymann or *The Shapes We Eat* by Simone T. Ribke.
2. Discuss shapes and the characteristics of each figure.
3. Ask the children, one at a time, to sort the products by their shape.

Extension:

Graph the number of products for each shape.



2nd Grade

Number and Number Sense

Three-digit numerals, and an understanding of each place value, are the focus of 2nd grade. Increasingly more complicated fractions and skip counting are introduced to students.

Computation and Estimation

Addition and subtraction facts up to 20 should be recalled by students. An understanding of estimation is acquired for subtraction and addition.

Measurement

Specific measurements are gathered and understood by students including cups, pints, quarts, and gallons.

Geometry

Lines of symmetry are drawn by students and solid figures are introduced.

Probability and Statistics

Data from experiments is used to create graphs and predict outcomes in 2nd grade lessons.

Patterns, Functions, and Algebra

Not only are object patterns still used in 2nd grade, but numeral sentences are also incorporated. The non-equals sign, \neq , is discussed.

Scarecrow Measuring

Standards of Learning:

Math: 2.11

Science: 2.1

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
- *The whole pieces of construction paper must be the same size.



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:

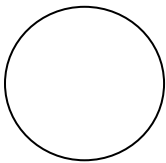
1. Read students *Scarecrow* by Cynthia Rylant. Farmers use scarecrows to keep pests out of their farms in order to preserve their crops. This book beautifully describes the peaceful, but important, purpose of a scarecrow.
2. Allow students to create a face for the scarecrow. Use the yarn for hair and 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.

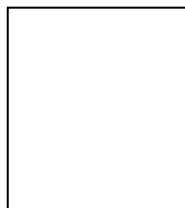
4. Use the whole piece of brown construction paper for the body and write "Gallon" in the middle. Attach the head to the top of the brown paper (see picture).
5. Cut the red paper into 4 equal pieces and write "Quart" in the middle of them. Glue one on the right side of the brown paper, one on the left 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:

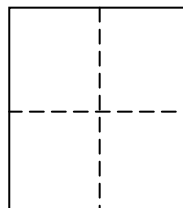
Provide students with a recipe that uses some, if not all, of these units. Help them practice measuring ingredients and cook the food item.



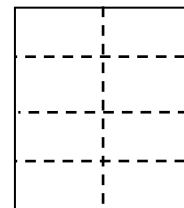
Paper Plate for Head



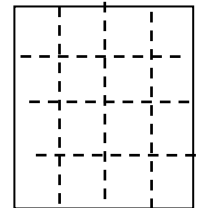
**Gallon
Brown
Paper**



**Quart
Red
Paper**



**Pint
Orange
Paper**



**Cup
Yellow
Paper**

Produce Printing

Standards of Learning:

Math: 2.15

Science: 2.8

Materials:

- Large pieces of white paper (1 per student)
- Several different paint choices for students
- Paint brushes or sponges
- Produce stamps:
 - Apples: cut in half horizontally
 - Peppers: cut horizontally into rings
 - Carrots (cut if desired)
 - Ears of corn
 - Potatoes: can cut symmetrical designs into it to create a stamp
 - Leaves
 - Onion
 - Peanuts
 - Cucumbers: sliced horizontally
 - Baby pumpkins: cut horizontally or vertically
 - Grapes: whole or cut
 - Squash: whole or cut



Background Knowledge:

Symmetry can be found in nature. Produce can be used to demonstrate natural symmetry. This lesson allows students to investigate fruits and vegetables that farmers grow, as well as the concept of symmetry.

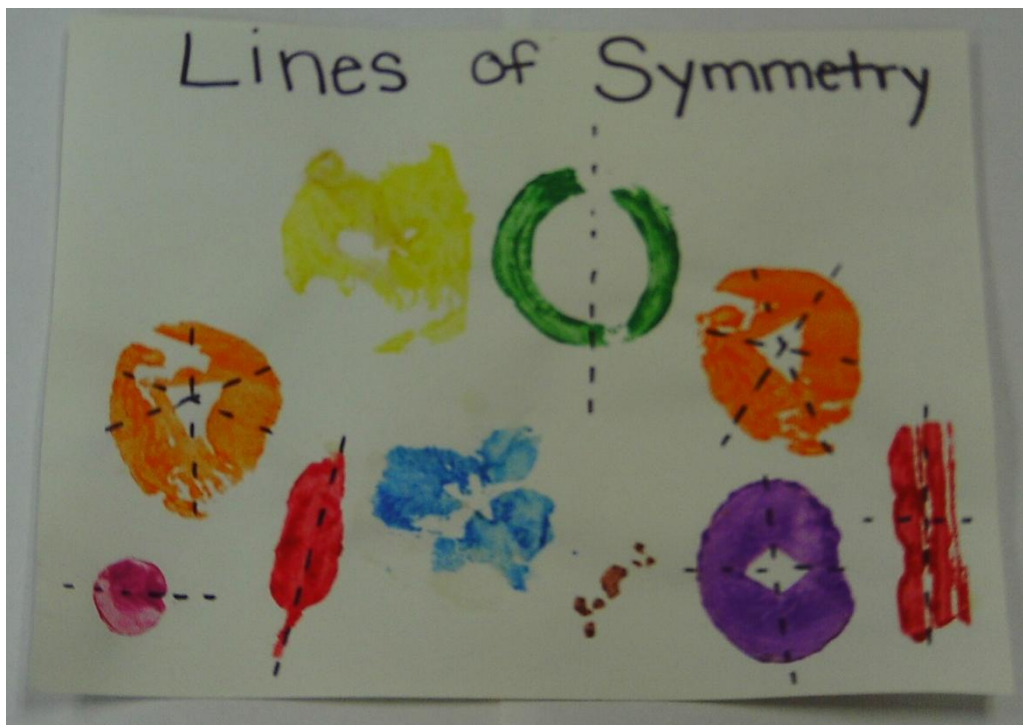
Procedure:

1. Pass out the supplies to the students. Provide several examples of produce for the children to paint with.
2. Allow the children to put paint on the produce and stamp the images on the paper. Try to keep each image spaced out in order to draw lines of symmetry.

3. After the students have time to stamp with the produce, discuss symmetry. Objects are symmetric if one half of the image is the mirror image of the other half.
4. After the paint is dry, ask the students to find lines of symmetry in their paintings and draw them on their produce prints.

Extension:

Discuss the parts of the produce they see (seeds, veins, etc).



3rd Grade

Number and Number Sense

Students in 3rd grade should read and write six-digit numerals. They should also recall basic multiplication and division facts. Mixed numbers and fraction inequalities are also taught in 3rd grade.

Computation and Estimation

Students are expected to solve single- and multi-step addition and subtraction problems. Arrays, sets, and number lines model multiplication problems for 3rd graders.

Measurement

Larger quantities of money must be recognized by 3rd grade students. Perimeter and area of polygons are measured by students.

Geometry

Comparisons between plane and solid figures teach students how to identify them by specific characteristics.

Probability and Statistics

Line plots are added to the types of graphs students can create.

Patterns, Functions, and Algebra

Patterns with numbers, tables, and pictures are created by students. The children also investigate the commutative properties of addition and multiplication.

Watermelon Fractions

Standards of Learning:

Math: 3.3

Science: 3.8

Materials:

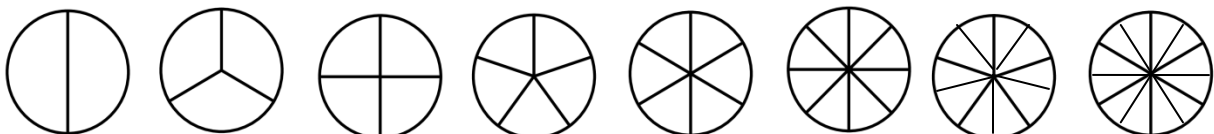
- Interactive Bulletin Board:
 - Paper plates cut into fractions and colored like watermelon
 - Equals signs
 - “What is missing?” signs
 - “Are the missing parts equal?” signs
- Samples of watermelon

Background Knowledge:

By third grade, students have had prior experiences with fractions. This lesson provides students with the opportunity to compare fractions and determine equivalency. Students can discover equal and non-equal watermelon slices, and how that relates to the missing fraction. Students can also learn about the life cycle of this fruit. First it starts as a seed, and then sprouts into a leaf. A flower blooms and is pollinated. Then a small watermelon is formed, which grows until ripe.

Procedure:

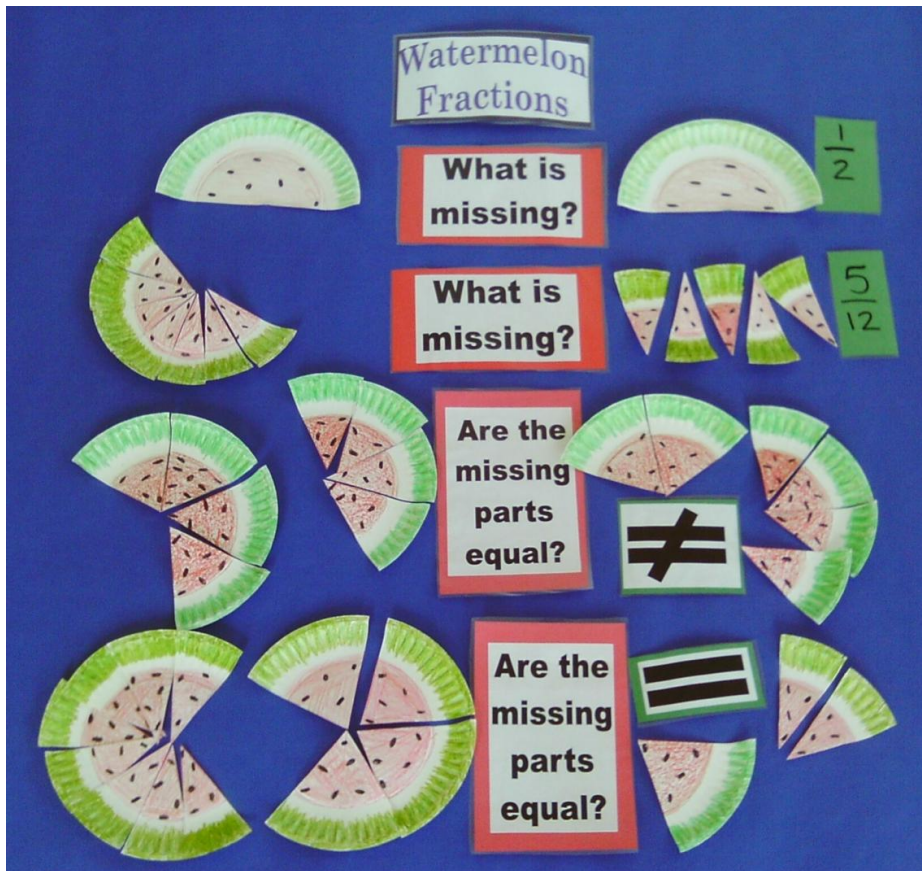
1. Take several white paper plates and cut them into the following fractions:
 - a. Halves, thirds, fourths, fifths, sixths, eighths, tenths, and twelfths.



2. Color the fractions to make them look like watermelon.
3. Create various scenarios for fractions (allow students to use extra watermelon slices to determine the answers):
 - a. Put up $\frac{1}{2}$ and ask: What is missing?
 - b. Put up $\frac{7}{12}$ and ask: What is missing?
 - c. Put up $\frac{1}{4}$ and ask: What is missing?
 - d. Put up $\frac{4}{6}$ and $\frac{2}{3}$ and ask: Are the missing parts equal?
 - e. Put up $\frac{4}{6}$ and $\frac{4}{8}$ and ask: Are the missing parts equal?
 - f. Put up $\frac{1}{5}$ and $\frac{2}{10}$ and ask: Are the fractions on the board equivalent?

Extension:

Begin asking simple computation questions, such as $\frac{3}{4} + \frac{1}{4} = \underline{\quad}$. Also, review the life cycle of a water melon with the AITC lesson, "Watermelon Chain." Read students *Watermelon Wishes* by Lisa Moser to see illustrations of the life cycle of watermelons incorporated into a heart-warming story.



Agriculture Arrays

Standards of Learning:

Math: 3.5, 3.6, 3.20

Materials:

- Chart paper
 - Practice array can be found on p. 40
- Soybeans
- Cotton balls

Background Knowledge:

Arrays can be used to discover multiplication facts and the commutative property of multiplication. For example, a 2×3 array is similar to a 3×2 array. By providing concrete objects, students can understand how multiplication works and equality between facts. Cotton and soybeans are important agriculture commodities. Before allowing students to use the manipulatives, ask them for any facts they know about cotton and soybeans. One bale of cotton can make 215 pairs of jeans. Soybeans are made into different types of oils, soaps, cereals, and crayons. Read *Why the Brown Bean was Blue: the Story of a Soybean Frown Turned Upside Down* by Susan M. Pankey for more information about soybeans.

Procedure:

1. Use large sheets of chart paper to create a large 12×12 array.
2. Bring in beans and cotton balls for the students to use. Allow students, one at a time, to create arrays that represent multiplication facts through the 12's table.

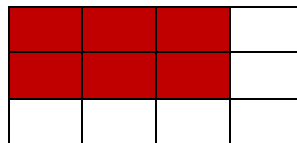
3. Show different ways to set up multiplication problems. If a student is given 2×3 , and the array looks like this:

XXX	XX
XXX	XX
4. Pair students off. Give them cotton balls and soybeans to work with. Ask them to create 2 arrays for specific multiplication problems (i.e. 3×4 and 4×3 ; 5×6 and 6×5).
5. Check student work to ensure understanding.
6. To further review with the students, ask individual children to create arrays for new multiplication problems.

Extension:

Move from using concrete objects to abstract understanding through paper-and-pencil assignments. Provide grids and ask students to color different arrays.

2×3



For the purpose of this picture, pumpkin seeds were used.

Classifying Products by Solid Figure

Geometry Unit: Solid Figures

Lesson 1

Standards of Learning:

Math: 3.14

Social Studies: 3.6

Materials:

- Products and their *general* shapes (provide a picture or an example):
 - Apple (sphere)
 - Tomato (sphere)
 - Ear of corn (rectangular prism)
 - Cotton ball (sphere)
 - Cucumber (cylinder)
 - Strawberry (cone)
 - Block of cheese (rectangular prism)
 - Peanut (cylinder)
 - Chicken nugget (sphere)
 - Evergreen tree (square pyramid)
 - Soybean (sphere)
 - Bunch of grapes (cone)
 - Hay bale (cylinder)
 - Peach (sphere)
 - Watermelon (cylinder)
 - Lumber (rectangular prism)
 - Egg (sphere)
 - Cereal box (rectangular prism)
 - Sausage link (cylinder)
 - Loaf of bread (rectangular prism)
 - Pumpkin (sphere)
- Large chart paper to be put on the ground and used as a grid, with sections titled: sphere, square pyramid, rectangular prism, cone, and cylinder with a picture beside the shape.

Background Knowledge:

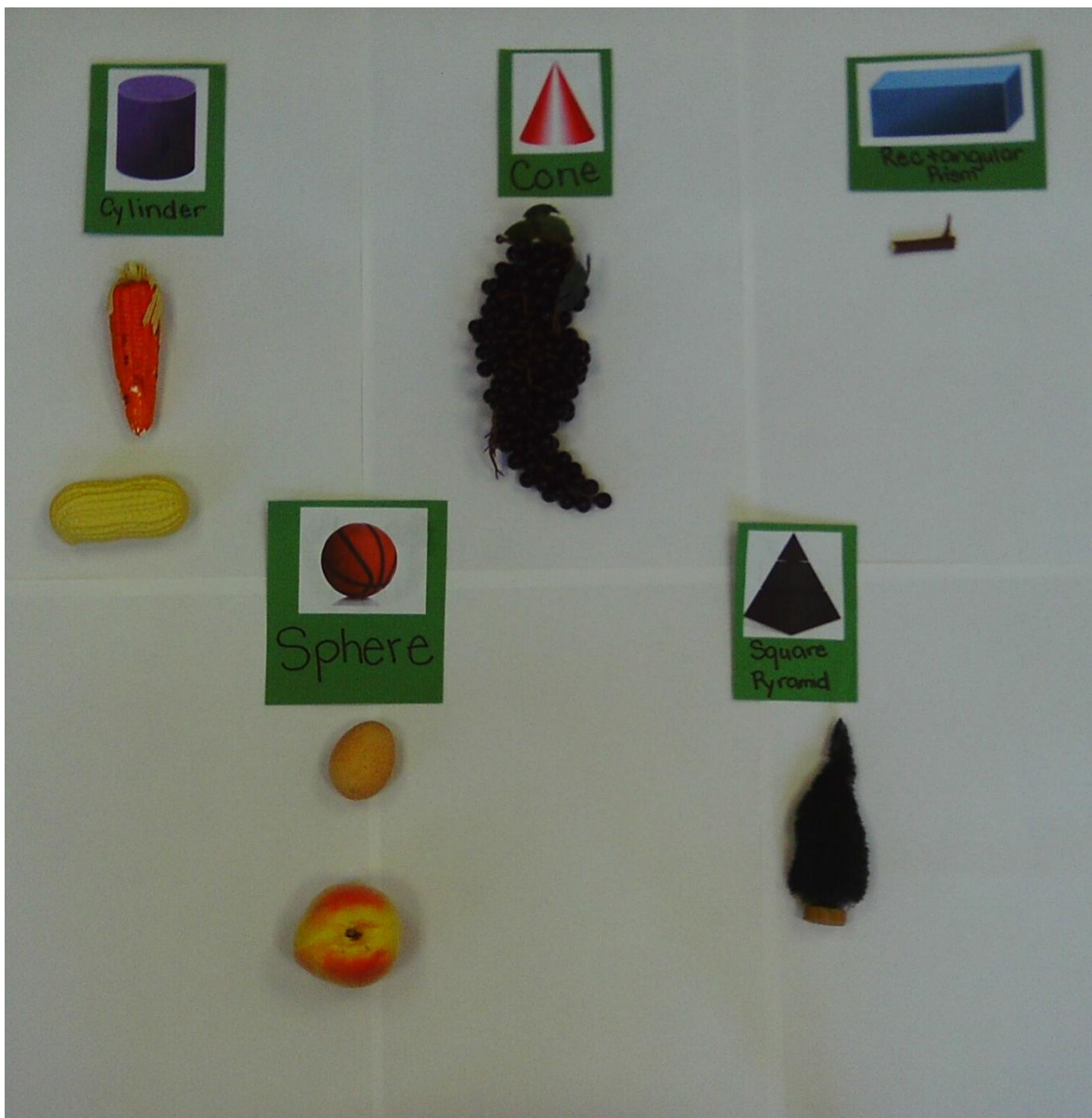
Many products that can be classified by general solid figures. Students can identify objects as a sphere, square pyramid, rectangular prism, cone, and cylinder using specific characteristics, including the number of angles, vertices, edges, faces, and general shape. This lesson provides concrete, tangible objects students can study and investigate to determine what solid figure the objects represent.

Procedure:

1. Discuss shapes and what the characteristics are of each solid figure.
2. Ask the children, one at a time, to sort the Virginia products by their solid figure.

Extension:

Graph the number of products for each solid figure.



Classifying Products by Solid Figure

Geometry Unit: Solid Figures

Lesson 2

Standards of Learning:

Math: 3.14

Social Studies: 3.6

Materials:

- Products and their *general* shapes (provide a picture or an example):
 - Apple (sphere)
 - Tomato (sphere)
 - Ear of corn (rectangular prism)
 - Cotton ball (sphere)
 - Cucumber (cylinder)
 - Strawberry (cone)
 - Block of cheese (rectangular prism)
 - Peanut (cylinder)
 - Chicken nugget (sphere)
 - Evergreen tree (square pyramid)
 - Soybean (sphere)
 - Bunch of grapes (cone)
 - Hay bale (cylinder)
 - Peach (sphere)
 - Watermelon (cylinder)
 - Lumber (rectangular prism)
 - Egg (sphere)
 - Cereal box (rectangular prism)
 - Sausage link (cylinder)
 - Loaf of bread (rectangular prism)
 - Pumpkin (sphere)
- Large chart paper to be put on the ground and used as a grid, with sections titled: sphere, square pyramid, rectangular prism, cone, and cylinder with a picture beside the shape.
- Worksheet (see p. 101)

Background Knowledge:

Many products that can be classified by general solid figures. Students can identify objects as a sphere, square pyramid, rectangular prism, cone, and cylinder using specific characteristics, including the number of angles, vertices, edges, faces, and general shape. Students must use their prior knowledge of solid figures to sort pictures of products.

Procedure:

1. After completing Lesson 1 of “Classifying Products by Solid Figure,” complete the following activity:
 - a. Review with the students the objects from Lesson 1 and how to classify solid figures.
 - b. Ask review questions such as:
 - i. How many faces does a sphere have?
 - ii. What shape is the base of a rectangular prism?
 - iii. What shape is the base of a cylinder?
 - c. Ask students to complete the review sheet on page 41.

Extension:

Graph the number of products for each solid figure.



4th Grade

Number and Number Sense

Students in 4th grade must identify decimal place values through the thousandths and determine their fraction equivalents.

Computation and Estimation

Decimals are used in sum and difference problems in this grade.

Measurement

Equivalent measurements for the U.S. Customary and metric units are explored by students for weight, length, and liquid volume.

Geometry

Points, lines, line segments, rays, and angles are identified by 4th graders. An understanding of parallelism and perpendicularity is also demonstrated.

Probability and Statistics

Predictions of outcomes are discussed with students, specifically the likelihood, or unlikelihood, of something happening.

Patterns, Functions, and Algebra

Students now create numerical and geometric patterns. The associative property is introduced for multiplication and addition.

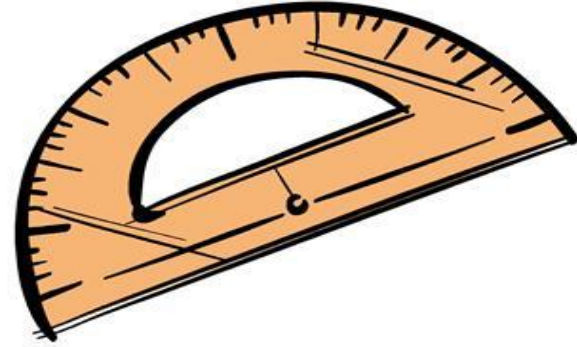
Natural Angles

Standards of Learning:

Math: 4.10

Materials:

- Picture of a flowering tree (see p. 42)
- Ruler
- Protractor
- Different colored pencils to differentiate the labels:
 - Red: points
 - Orange: lines
 - Yellow: line segments
 - Green: rays
 - Blue: angles
 - Purple: perpendicular lines
 - Brown: intersecting lines
 - Black: parallel lines



Background Knowledge:

Lines, angles, and points make up objects. Nature can be used to discover geometry by completing a “Geometry Search.” Some farmers grow flowering trees that produce fruit, such as apples. These trees are filled with intersecting lines, angles, points, and other geometric representations.

Procedure:

1. Describe and illustrate to the students points, lines, line segments, rays, and angles.
 - a. A point looks like a dot.
 - b. Lines extend in both directions forever.
 - c. Line segments begin and end with points.
 - d. Rays have one end point and extend to infinity.

- e. Angles are two rays that share the same endpoint/vertex.
2. Parallel lines never intersect, perpendicular lines intersect and form a right angle, and intersecting lines intersect at least once creating any type of angle.
3. Give each student a picture of a flowering tree (see p. 42).
4. Ask them to use the key described above to draw on the picture the geometric representations they see. Encourage them to label the representations appropriately underneath the image.

Extension:

Invite students to go outside and take pictures of natural geometric representations they see.



Pollination Probability

Standards of Learning:

Math: 4.13

Social Studies: VS.1, VS.4, VS. 6

English 4.7



Materials:

- *Farmer George Plants a Nation* by Peggy
- Thomas Name cards (see p. 43-45)
 - To make it easier to identify the students, punch two holes at the top of the name card and tie a piece of yarn so that the children can wear it around their necks.
- Quarters
- Recording sheets (see p. 46-47)

Background Knowledge:

When settlers came to America, they brought foreign items with them, including apple trees, peach trees, and watermelon. Not only did they bring produce to plant, worms and honeybees were also transported across the Atlantic. Without earthworms or bees, the nonnative plants would not have been able to survive. Colonists grew squash, beans, watermelon, pumpkins, apples, and peaches, with the help of pollinating bees and wiggling earthworms. Through this lesson, students learn about probability, pollination, and historic agriculture.

Procedure:

1. Read to the students *Farmer George Plants a Nation* by Peggy Thomas. Point out similarities and differences between the past and present farming practices. Discuss the agricultural advancements Washington made and the importance of his life to this nation.
2. Describe the game to the students:
 - a. Some people will be farmers. Everyone else will be bees. The bees will simulate pollination by flipping coins. If it is heads, the farmer's crop is pollinated by that bee. If the coin lands on tails, the bee did not pollinate the

- crop. The bees will have 3 minutes to visit the farms. At each stop, the bee will flip the coin and record which side it landed on. No matter what side landed facing up, the bee and farmer need to record the information on their sheets of paper.
3. Tell students they will discover pollination through probability. Assign 1 student as the farmer of the following crops grown in colonial times: squash, pumpkins, beans, watermelon, apples, and peaches (total of 5 students). Give them their name cards to identify their crops.
 4. Ask the farmers to stand throughout the room and give them the “Farmer’s Record” sheet (p. 46). Instruct them to keep track of the number of bees that visit their farm, and if the bees pollinated their crops or not. If a bee’s coin lands on heads, your crop was pollinated. If a bee’s coin lands on tails, your crop was not pollinated. Check the appropriate box on your sheet for each bee that visits you and your farm.
 5. Give the rest of the children a quarter and tell them they are bees that will pollinate the farmer’s plants. Distribute the name cards so students remember their roles.
 6. Hand out the “Bee Record” sheet to the students acting as bees (p. 47). Instruct them to go to a farmer, flip their quarter, and record if it landed on heads or tails. Ask them to tell the farmer which side of the coin landed facing up. DO NOT move on to the next farmer until you know your flip was recorded.
 7. Allow students to “pollinate” the farms for 3 minutes. They must be careful to keep track of each coin flip!
 8. Once the 3 minutes is up, ask the students to find the probability of pollination.
 - a. Bees: Take the number of pollinated crops and divide that number by total number of trips to the farmers. Multiply this number by 100 to get the percentage.
 - b. Farmers: Take the number of pollinated crops and divide that number by the total number of bees that visited your farm. Multiply this number by 100 to get the percentage.
 9. Complete several more times so students have an opportunity to play all of the parts.
 10. Then, discuss how, in the long run, your probability will be about 50% pollination.
 - a. Visit <http://pbskids.org/cyberchase/games/probability/cointoss.html> to show students that, as you flip more coins, your probability gets close to 50/50.

Extension:

Have students write a story about their life in colonial times, describing the hardships colonists faced, especially during the initial days and the food shortage. If you have old, colonial-styled clothing, allow farmers to wear them.

5th Grade

Number and Number Sense

An understanding of prime and composite numbers develops in 5th grade.

Computation and Estimation

Multi-step problems with whole numbers, decimals, and fractions are expected of students. Children also use the order of operations.

Measurement

Perimeter, area, and volume are solved by students. The parts of a circle are introduced, including: diameter, radius, chord, and circumference.

Geometry

Fifth grade students classify angles, triangles, and plane figures.

Probability and Statistics

Sample spaces are used by fifth graders to make predictions. Stem-and-leaf plots and line graphs are created. Also, vocabulary such as mean, median, mode, and range is gained.

Patterns, Functions, and Algebra

Variables are presented to children in one-step linear equations. The distributive property of multiplication over addition is also investigated.

Flowering Factorization

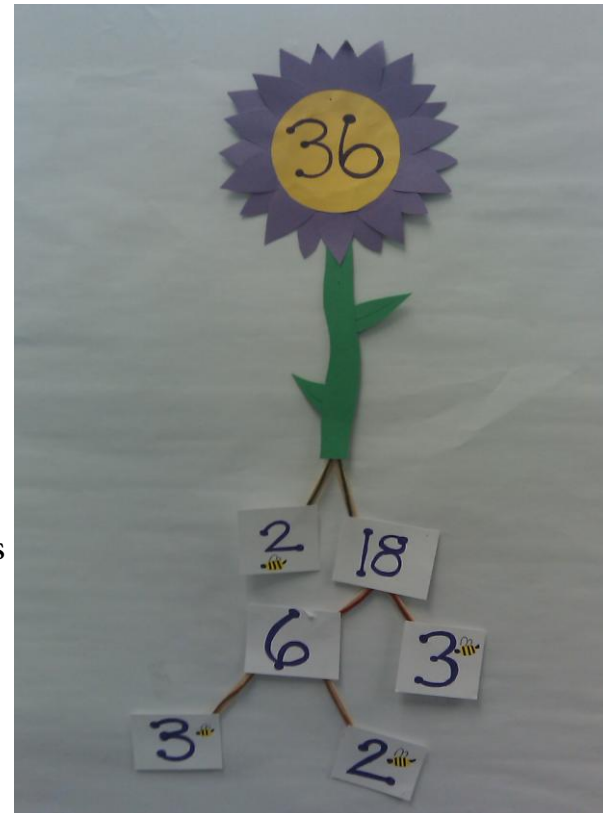
Standards of Learning:

Math: 5.3

Science: 5.5

Materials:

- Construction paper of every color
- White squares
- Brown yarn cut into 2 inch lengths or craft sticks
- Markers
- Scissors
- Tape or glue
- Practice worksheet (see p. 48-49)



Background Knowledge:

Plants use roots to obtain essential nutrients from soil. Without the thin stringy fibers, flowers and crops 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 into only prime numbers. Students get a visual representation of how a number can be divided into multiplication fact 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 only the prime factors that make it composite ($18 = 2 \times 3 \times 3$).

2. Use the practice worksheet (p. 48-49) 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 begin to find the prime numbers for the number 36 (starting factors: 2×18 , 3×12 , or 6×6).”

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

Quilt Classifying

Standards of Learning:

Math: 5.11, 5.12

History: USI.8

English: 5.8, 5.9

Materials:

- Quilts
- Construction paper of every color
- Large paper grocery bags
 - Each child needs one panel of the bag (sides with the handles on them). Either cut these prior to the lesson, or pair students up with a grocery bag and ask them to do it.
- Rulers
- Protractors
- Glue
- Cotton plants or bolls
- Cotton balls
- Scissors
- Sample quilt template (see p. 50)



Background Knowledge:

Some farmers grow cotton. Cotton is harvested and sent to a cotton gin to separate the seeds from the cotton. The bales of cotton leave the gin and arrive at a textile mill where the cotton is cleaned, stretched, rolled, and dyed.

Cotton has been an important agricultural commodity since the United States was founded. The cotton gin was created by Eli Whitney, leading to incredible growth in production and life for Americans.

Procedure:

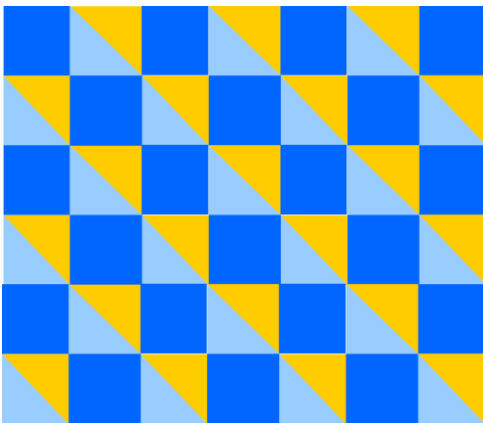
1. Discuss with the students about cotton and its importance in Virginia. Read *Eli Whitney and the Cotton Gin* by Jessica Gunderson and talk about the significance of this invention.
2. Pass around a cotton plant or boll and cotton ball and discuss the differences between the two. Ask students about their clothes and how the cotton cloth feels in comparison to the cotton examples passed around.
3. Bring in several quilts and lay them out on the floor. The quilts can be intricate or simple, but there should be enough angles and shapes, especially triangles, for students to measure.
4. Assign students to different blankets. Pass out rulers and protractors
5. Ask students to find an acute angle (less than 90°) on their blanket. Ask them to measure it and check other members of their groups to make sure everyone has chosen an appropriate angle.
6. Ask students to find an obtuse angle (greater than 90°). Ask them to measure it and check other members of their groups to make sure everyone has chosen an appropriate angle.
7. Ask students to find an equilateral triangle (all sides are equal). Ask them to measure it and check other members of their groups to make sure everyone has chosen an appropriate triangle.
8. Ask students to find an isosceles triangle (two sides are equal). Ask them to measure it and check other members of their groups to make sure everyone has chosen an appropriate triangle.
9. Discuss with students patterns found in the quilts, shapes that be classified, and the texture of the fabrics.
10. Provide students with a section of a brown paper grocery bag to use as a base for their quilt. Allow them to use construction paper, glue, scissors, protractors, and rulers to create their own paper quilt. Make sure they understand they must include a combination of acute, right, obtuse, and straight angles as well as right, acute, obtuse, equilateral, and scalene triangles. Their quilts can include patterns or a scene of some sort.
 - a. Students should measure and draw their shapes using a protractor and ruler. After cutting the shapes out, students should glue them on to the brown bag base in their chosen design.
11. Display the quilts around the classroom.

Extension:

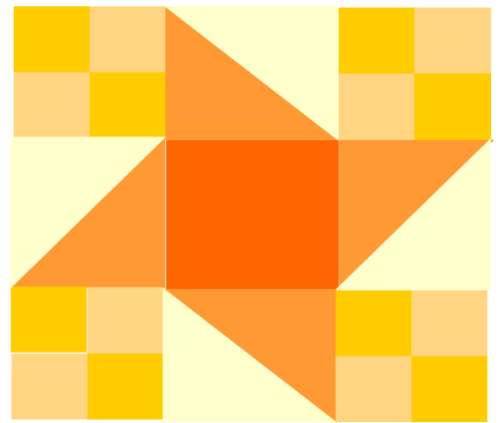
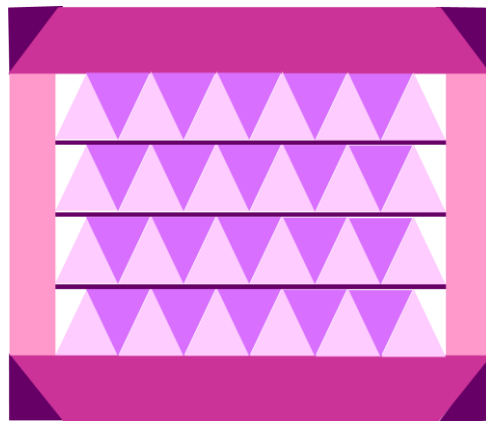
Students could research ways to harvest cotton and quilting techniques during the Civil War. Research about how cotton was used and the products made with this crop could also be completed. Then, students can research harvesting methods cotton farmers use and how people make quilts today. A Venn diagram can be created using the information students find.

Also, during the Civil War, quilt patterns communicated messages amongst slaves. Students could research different symbols used in the quilts and what the symbols meant. Then they could incorporate the symbols into their quilts and write a journal entry from the perspective of a slave searching for freedom.

Material for quilts used to come from sack bags, old clothing, and scraps of cloth. Women would gather together and have quilting bees. Certain areas of the country used this as a way to build community values and relationships. Quilts brought people together, especially during the Great Depression. Ask students to write a diary entry as if they were growing up during the Depression. Many farmers also struggled with their crops, so students could take on the role of quilter or farmer.



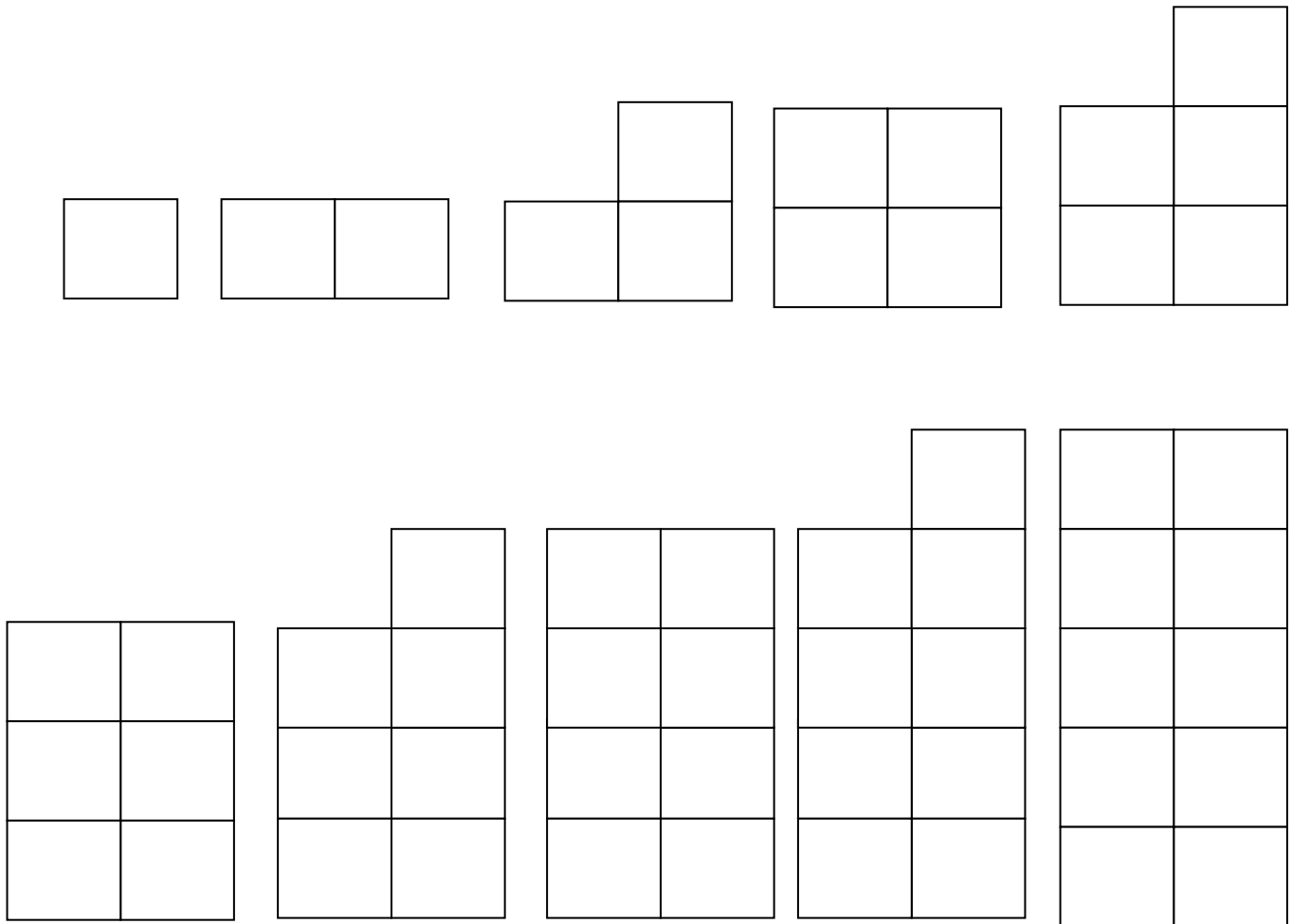
Examples of Quilt Patterns



Masters

Egg Carton Math

Diagram



Apple Orchard Math

Hundreds Chart

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




















































































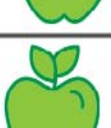

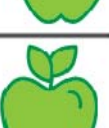

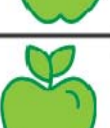
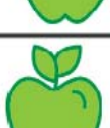
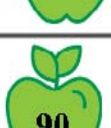



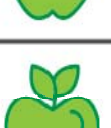






Apple Orchard Math

Worksheet

Name: _____













Apple Hundreds Chart

Directions: Fill out the rest of the chart with the correct numbers.

 1	 2	 3	 4	 5	 6	 7	 8	 9	 10
 11									
		 23							
						 37			
	 42								
				 55					
								 69	
			 74						
									 90
							 98		 39

Classifying Products by Solid Figure

Worksheet

Cylinder	Sphere	Rectangular Prism	Square Pyramid	Cone
	   	  	 	 

Name: _____



Name the following:

N

A

T

U

R

A

L

Points:

Line Segments:

Angles:

Intersecting Lines:

Lines:

Rays:

Perpendicular Lines:

Parallel Lines:

A

N

G

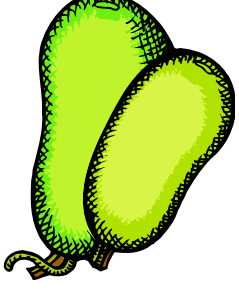
L

E

S



Apple
Farmer



Squash
Farmer



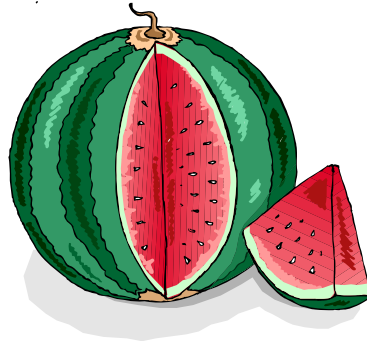
Bean
Farmer



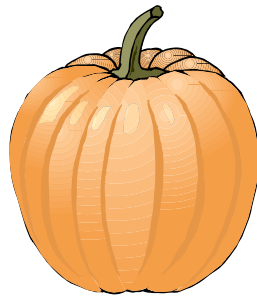
Peach
Farmer

Pollination
Probability

Name Cards



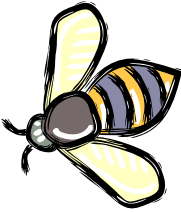
**Watermelon
Farmer**



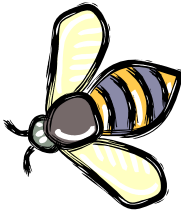
**Pumpkin
Farmer**

Pollination Probability

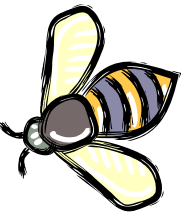
Name Cards



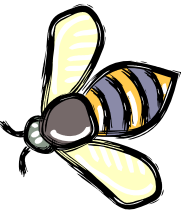
BEE



BEE



BEE



BEE

Pollination Probability

Name: _____

Farmer's Record

Type of Crop: _____

Directions: Check off in the "Pollinated" column if the bee flipped the coin and landed on heads. Check off in the "Did not Pollinate" column if the bee flipped the coin and it landed on tails. Fill out the rest of the information below the chart.

Bee Count	Pollinated (heads)	Did not Pollinate (tails)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

Bee Count (continued)	Pollinated (heads)	Did not Pollinate (tails)
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		

Total number of bees that visited your crops: _____

- 1) What was the probability that a bee pollinated your crops?
- 2) What was the probability that a bee did not pollinate your crops?

Pollination Probability

Name: _____

Bee's Record

Directions: Check off in the "Pollinated" column if you flipped the coin and it landed on heads. Check off in the "Did not Pollinate" column if you flipped the coin and it landed on tails. Fill out the rest of the information below the chart.

Farm Visits	Pollinated (heads)	Did not Pollinate (tails)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Farm Visits (continued)	Pollinated (heads)	Did not Pollinate (tails)
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

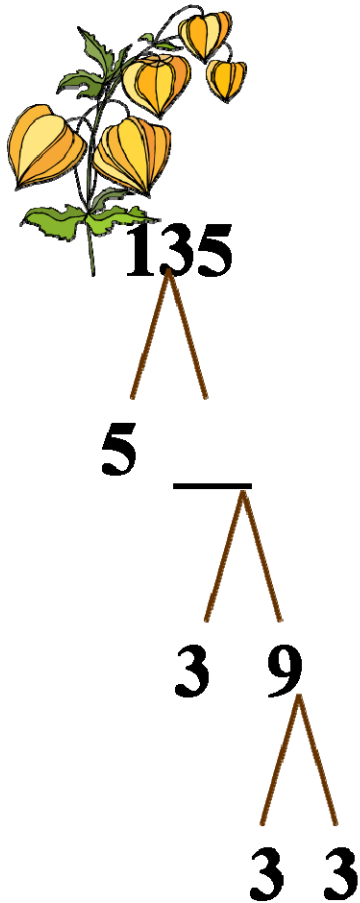
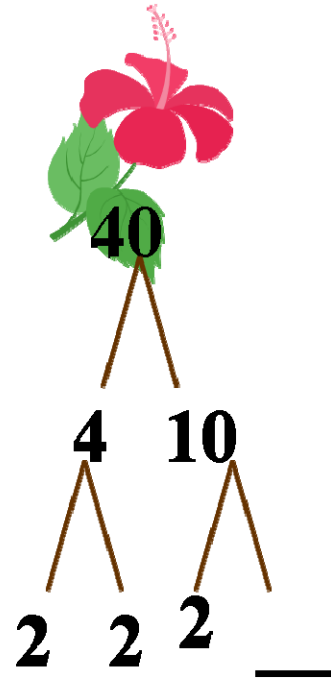
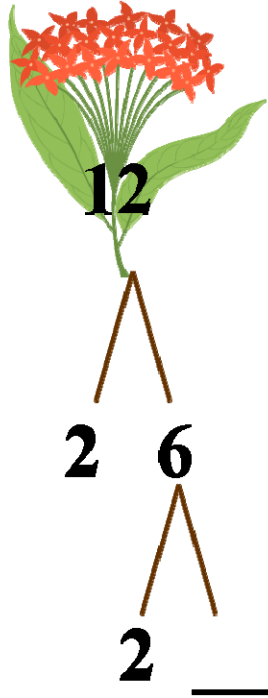
Total number of crops you pollinated: ____ Total number of crops you didn't pollinate: ____

1) What was the probability that you pollinated a farmer's crops?

2) What was the probability that you did not pollinate a farmer's crops?

Flowering Factorization

Page 1



**Use this space to make
your own prime
factorization flower.**

Flowering Factorization

Page 2

**Write the prime
factorization for:
12**

$$\underline{\quad} \mathbf{X} \underline{\quad} \mathbf{X} \underline{\quad} = \underline{\quad}$$

**Write the prime
factorization for:
40**

$$\underline{\quad} \mathbf{X} \underline{\quad} \mathbf{X} \underline{\quad} \mathbf{X} \underline{\quad} = \underline{\quad}$$

**Write the prime
factorization for:
135**

$$\underline{\quad} \mathbf{X} \underline{\quad} \mathbf{X} \underline{\quad} \mathbf{X} \underline{\quad} = \underline{\quad}$$

Quilt Classifying

Quilt Template

