Agriculture

A

Books

B

&

Common Core

C

To Teach

Mathematics

Illinois
AGRICULTURE
in the Classroom℠

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A SLICE OF SOIL

Objective: Students will use fractions to look at how much of earth is soil suitable for growing food to gain a better understanding of our natural resources and how agriculture is important to their future.

Common Core: Mathematics: CCSS.Math.Content.3.NF.A.1; 3.NF.A.3; 4.NF.A.1; 4.NF.A.2

Language Arts: CCSS.ELA-Literacy.RI.4.7; RF.4.4; W.4.1; W.4.9

Next Generation Science Standards: Interdependent Relationships in Ecosystems: 3-LS4-1; 3-LS4-4; 3-LS2-1 Inheritance and Variation of Traits: Life Cycles and Traits: 3-LS3-2 Energy: 4-PS3-4; ETS1.A
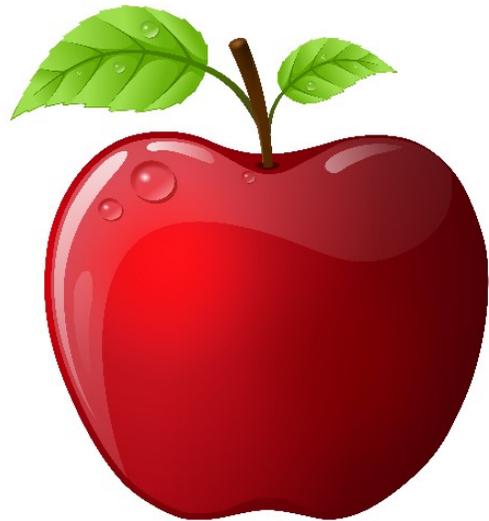
Social Science Standards: SS.EC.1.K; SS.EC.2.4; SS.G.3.2; SS.G.3.5; SS.G.4.6-8

Suggested Reading Materials:

Apple Fractions by Jerry Pallotta ISBN: 0439389011

A Handful of Dirt by Raymond Bial ISBN: 0802786987

IAITC's Soil Ag Mag

Materials Needed:

- 1 Apple
- Paring Knife
- Cutting Board

Procedure:

Soil is one of our most important natural resources on the earth's surface. Many living things depend on it for food. People do, too. Not all soil is good enough for plants to grow. Complete this activity to learn just how little soil we have to grow food.

1. Cut an apple into four equal parts. Three parts represent the oceans of the world. The fourth part represents the land area.

2. Cut the land section in half lengthwise. Now you have two 1/8 pieces. One section represents land such as deserts, swamps, Antarctic, Arctic, and mountain regions. The other 1/8 section represents land where man can live and may or may not be able to grow food.

3. Slice this 1/8 section crosswise into four equal parts. Three of these 1/32 sections represent the areas of the world that are too rocky, too wet, too hot, or where soils are too poor to grow food. Plus, food cannot grow on some land because cities and other man-made structures are built on it.

4. Carefully peel the last 1/32 section. The peel on this small piece represents the amount of soil on which we have to grow food. This amount of soil will never get any bigger.

Lesson Extender:

Represent the fractions found in the activity above as decimals and percentages. Discuss why it is helpful in everyday life to know how to find fraction, decimal, and percentage equivalencies.

MULTIPLYING POLLINATORS

Objective: Students will practice whole number multiplication using pollinator anatomy.

Common Core Standards: CCSS.Math.Content.3.OA.A.1

CCSS.ELA-Literacy.SL.3.1; SL.3.2; SL.3.3; SL.3.4; SL.3.6; RL.3.1; RL.3.7

Next Generation Science Standards: Interdependent Relationships in Ecosystems: Animals, Plants, and Their Environment: K-ESS2-2; Interdependent Relationships in Ecosystems: 2-LS2-2; Natural Selection and Adaptations: MS-LS4-2
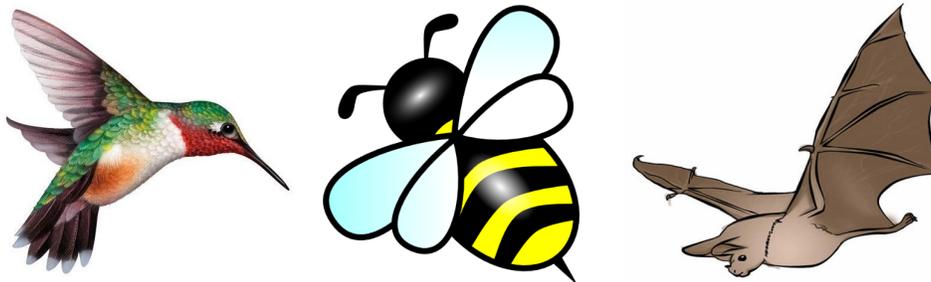
Suggested Reading Materials:

Multiply on the Fly by Suzanne Slade ISBN: 9781607181385

IAITC's Pollinator, Apple and Pumpkin Ag Mags

Materials Needed:

- Multiply on the Fly by Suzanne Slade
- Pollinator Anatomy (on following page)

Procedure:

1. Using the Pollinator Ag Mag, have a discussion about pollinators. Talk about the importance of pollinators and provide examples of different types of pollination (e.g. beetles, birds, bats and wind) and that one in every three bites of food we eat requires pollination.

2. Read Multiply on the Fly, a book that uses the unique anatomy of different pollinators to teach multiplication.

3. Examine the pollinator illustrations throughout the book. Focus on how the illustrations show the unique anatomy of different pollinators to depict multiplication problems. Work together on solving the multiplication problems throughout the story. Use the illustrations as a tool to help solve problems in the story. For example, the firefly illustration shows nine fireflies each with one glowing light—the glowing light is unique to a firefly's anatomy. Therefore, students might reason that the firefly illustration can be described as '9 x 1 = 9' because there are nine fireflies each with one glowing light for a total of nine fireflies.

4. Define insect (a six-legged, air-breathing invertebrate with a body that has well-defined segments, including a head, thorax, abdomen, two antennae and usually, two sets of wings) and have a brief discussion about the anatomy a pollinator might have (e.g. eyes, head, legs, abdomen, wings). Encourage students to think about anatomy (parts) they saw in the book's illustrations.

5. On page 7, find 'Pollinator Anatomy'. As a class, manipulate the pollinator anatomy to depict and solve instructor provided multiplication problems together. Consider using only the abdomen and legs to begin with. For example, to depict and solve '2 x 4', start with two abdomens. Then arrange four legs extending from each abdomen. This example can be described as '2 x 4 = 8' because there are two pollinators each with four legs for a total of eight legs. See the illustration below as a sample.


Sample 1

2 x 4 = 8
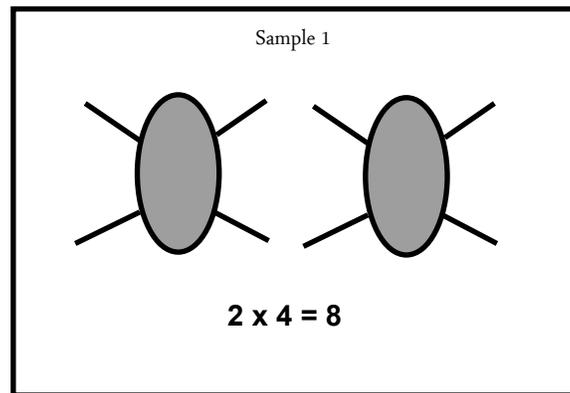
6. Allow students to continue practicing multiplication skills with a community-based learning activity. Group students and give them free range to use all pollinator anatomy on the following page. Give groups a specific multiplication problem to depict and solve like the whole class did in 'Step 5' of this lesson. Have students indicate when they have the solution. Check for accuracy and continue giving additional problems as time permits.

Lesson Extenders:

1. Have students make a book similar to Multiply on the Fly. As done in Multiply on the Fly, students should draw pollinators that illustrate multiplication problems. Tell students the pollinators drawn can be real or imaginative. For example, if a student wishes to draw an imaginative pollinator it could have three legs or seven eyes.

2. Refer to the pages at the back of Multiply on the Fly to learn about insect body parts, insect life cycles, to compare and contrast insects, and more.

3. Research different pollinators (e.g. insects, birds and bats) and discuss ways they are similar and different.
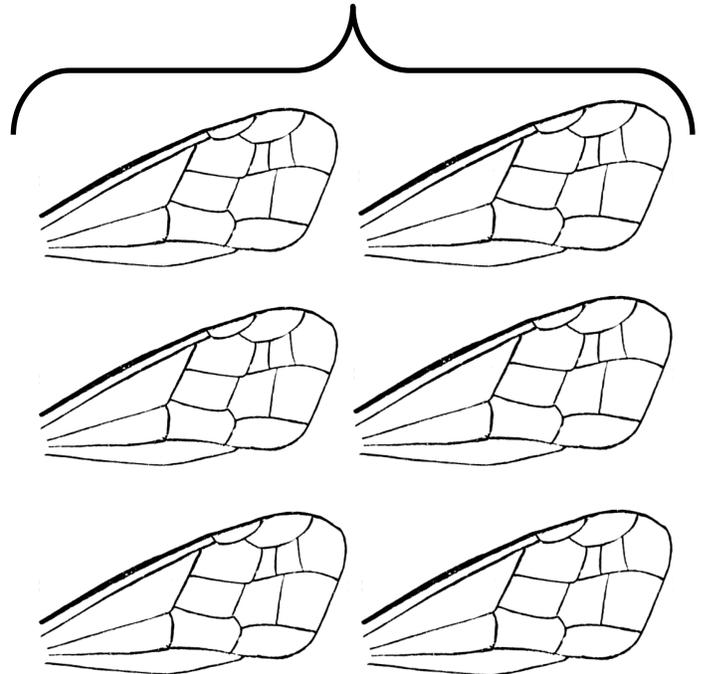
Pollinator Anatomy
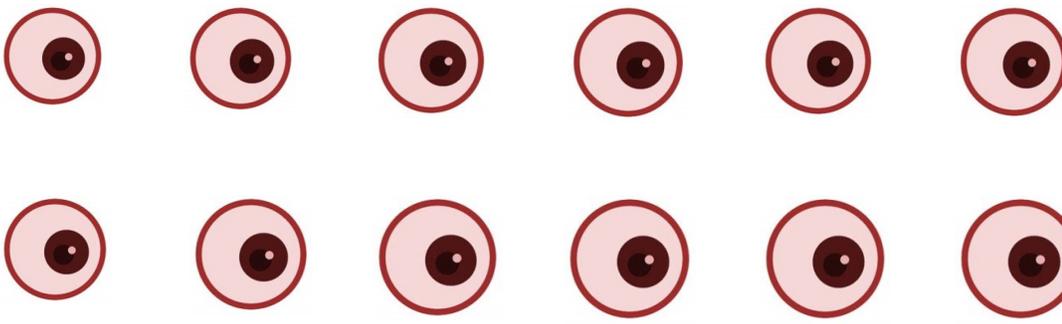
Suggested Use: Eyes

Suggested Use: Abdomen
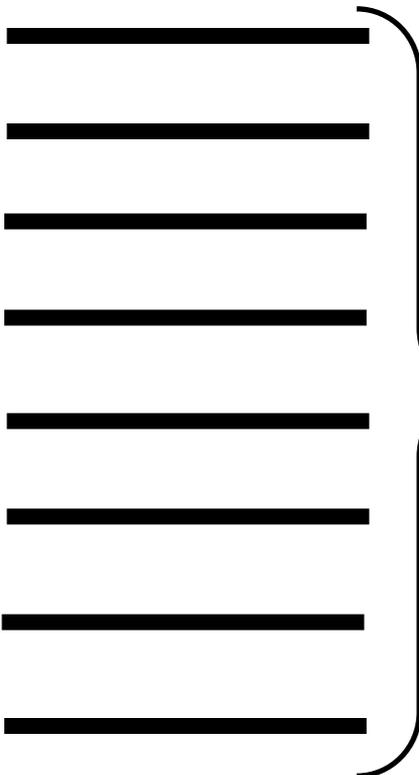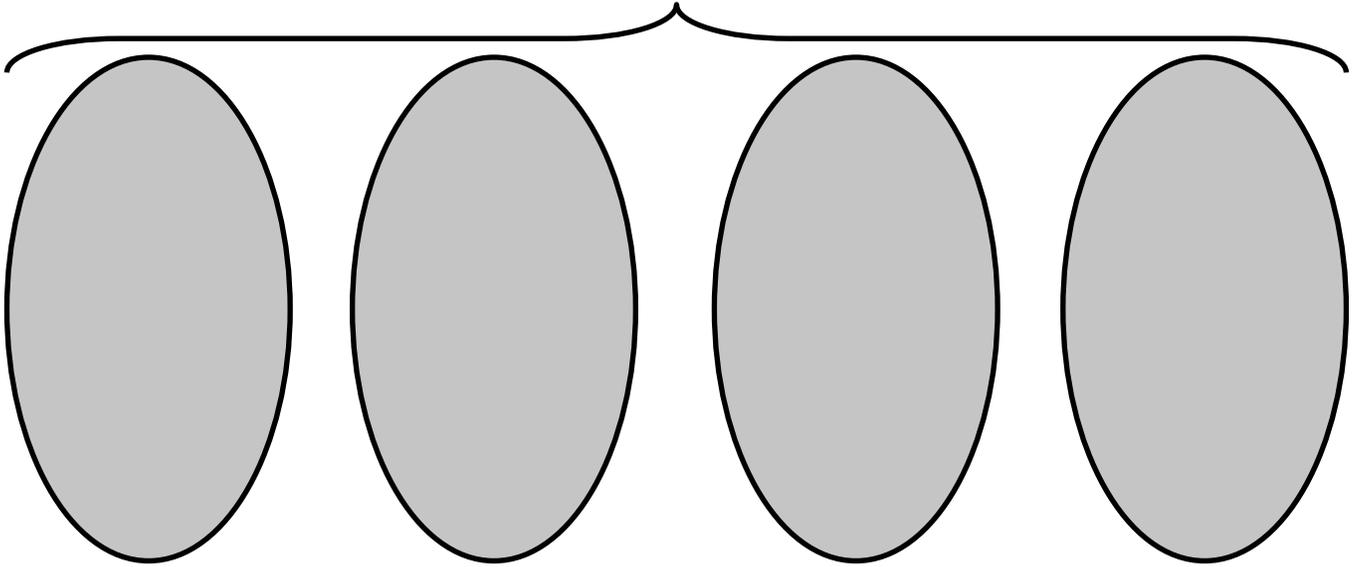
Suggested Use: Legs

Suggested Use: Wings

MR. MILK

Objective: Students will solve word problems involving liquid volumes using dairy products.

Common Core State Standards: CCSS.Math.Content.3.MD.A.2; 4.MD.A.2
CCSS.ELA-Literacy.SL.3.1; SL.3.2; SL.3.3; SL.3.4; SL.3.6

Next Generation Science Standards: Structures and Properties of Matter: 5-PS1-1; 5-PS1-2
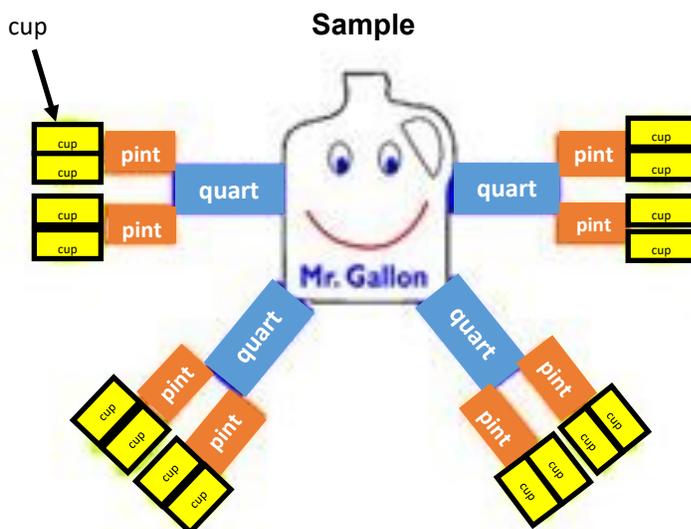
Suggested Reading Materials:
Math Curse by Jon Scieszka and Lane Smith ISBN: 9780670861941
IAITC's Dairy Ag Mag

Materials Needed:
- Dairy containers in the following sizes:
  - Gallon
  - Quart
  - Pint
  - Cup
- Water
- Plastic tablecloths
- Milk Activity sheet (on following page)
- Construction paper
- Scissors
- Tape
- Pencils

Sample

Procedure:
1. Read Math Curse by Jon Scieszka and Lane Smith. After reading the story, refer back to the milk page where questions about liquid conversions are asked.
2. Have a discussion about why knowing conversions is helpful in real life. Encourage students to think beyond liquid conversions by discussing other conversions used in our lives, as well.
3. Explain to students that they are going to make a learning aide, "Mr. Milk Gallon" (pictured above), that shows conversions for gallons, quarts, pints, and cups. Give each student a sheet of construction paper. Then, guide students through the steps below to make "Mr. Milk Gallon".

   A. Fold paper down the center vertically. Then, fold down the center again to create four equal strips.

   B. Cut strips along folds. Students should have four equal strips.

   C. Label one of the strips "gallon".

D. Take an unlabeled strip and fold it in half horizontally. Then, fold in half again to create four equal rectangles. Cut along folds. Students should have four equal rectangles. Label all four rectangles "quart".

E. Take another unlabeled strip. Fold it in half horizontally, fold in half again and again to create eight equal rectangles. Cut along folds. Students should have eight equal rectangles. Label all eight rectangles "pint".

F. Take the last unlabeled strip. Fold it in half horizontally, fold it in half again and again. Fold one last time cross-wise to create sixteen equal rectangles. Cut along folds. Students should have sixteen equal rectangles. Label all sixteen rectangles "cup".

G. Have students arrange cutouts to look like the 'Mr. Gallon' sample on the previous page. To achieve a chunkier gallon like the sample gallon, direct students to fold the gallon strip in half horizontally. Then, cut and tape together.

4. Show different sized dairy containers (e.g. gallon, quart, pint, cup) to the class.
5. Demonstrate how equal liquid capacities can be achieved. For example, carefully demonstrate pouring four quarts of liquid into the gallon container to show four quarts equals one gallon.
6. Provide students with gallon, quart, pint, and cup sized dairy containers, covered work spaces, and water.
7. Using the dairy containers and water, encourage students to pour water from one container to another to determine equivalent and interchangeable conversions (e.g. 4 quarts = 1 gallon and 1 gallon = 4 quarts) related to gallons, quarts, pints, and cups. Provide students with the 'Milk Activity' sheet on the following page and have them record equivalent conversions as they determine them.
8. Review students' 'Milk Activity' sheets.
9. Have students use their 'Milk Activity' sheets as well as 'Mr. Milk Gallon' as a reference to solve addition, subtraction, multiplication, and division word problems involving liquid volumes.

Lesson Extenders:
1. Perform 'Milk Emulsion' experiment found on the IAITC website.
2. Visit www.whereismymilkfrom.com to find out what dairy your milk came from.
3. Investigate what makes a gallon of milk heavier than a gallon of water to explore concepts of weight and density.
4. Determine whether frozen milk floats to facilitate understanding of the states of matter.

MILK ACTIVITY

1 pint = ___ cups

2 pints = ___ cups

3 pints = ___ cups

4 pints = ___ cups

1 quart = ___ pints

2 quarts = ___ pints

3 quarts = ___ pints

4 quarts = ___ pints

1 quart = ___ cups

2 quarts = ___ cups

3 quarts = ___ cups

4 quarts = ___ cups

1 gallon = ____ quarts

1 gallon = ___ pints

1 gallon = ___ cups

MILK ACTIVITY— ANSWER KEY

1 pint = __2__ cups

2 pints = __4__ cups

3 pints = __6__ cups

4 pints = __8__ cups

1 quart = __2__ pints

2 quarts = __4__ pints

3 quarts = __6__ pints

4 quarts = __8__ pints

1 quart = __4__ cups

2 quarts = __8__ cups

3 quarts = __12__ cups

4 quarts = __16__ cups

1 gallon = __4__ quarts

1 gallon = __8__ pints

1 gallon = __16__ cups

PIZZA PARTS

Objective: Students will represent fractions on a pizza.

Common Core State Standards: CCSS.Math.2.G.A.3; 3.NF.A.1
CCSS.ELA-Literacy.SL.3.1; SL.3.2; SL.3.3; SL.3.4; SL.3.6; RL.3.1; RL.3.7

Suggested Reading Materials:

A Fraction's Goal—Parts of a Whole by Brian P. Cleary ISBN: 9781467713801

Give Me Half! by Stuart J. Murphy ISBN: 9780064467018

IAITC's Pizza Ag Mag

IAITC's Wheat Ag Mag

Materials Needed:

- A Fractions Goal—Parts of a Whole by Brian P. Cleary
- Red paper plates (1 per student)
- Yellow paper plates (1 per student)
- Transparencies (1 per student—template on following page)
- Permanent markers
- Scissors
- Tape

Advance Lesson Preparation:

- Copy pizza template found on the following page on transparencies. Cut around circumference.
- Cut a radius on the red plate, the yellow plate, and the transparency. Make enough for students to have one of each.

Procedure: Below find procedure 'Part 1' and 'Part 2'.

Part 1:

1. Share the IAITC Pizza Ag Mag with students. As a class, brainstorm a list of pizza toppings.
2. Give each student a yellow plate.
3. Direct students to use markers to decorate their yellow plate with their three favorite pizza toppings from the list of toppings the class generated in 'Step 1'.
4. Give each student a red plate. Students should interlock the red and yellow plates by sliding them together at their radius cuts. Once interlocked, the plates are able to be rotated to show more or less of each plate. Give students some time to practice rotating the plates to get the feel of how rotating the plates works.
5. Inform students you are going to read them a book and they are going to be active participants as the book is read using their pizzas they just made. Students should have the whole yellow plate with toppings showing at the start of the story.

6. Read <u>A Fraction's Goal—Parts of a Whole</u> by Brian P. Cleary. Pause where appropriate in the story to let students create fractions with their pizzas. For example, pause on page six to allow students to rotate their plates to show half red and half yellow.

7. Check for understanding often.

Part 2:

1. Give each student a pizza transparency.

2. Have students unlock their yellow and red plates. Have students align the pizza transparency and the red paper plate at the cut. Then have them use tape to secure the pizza transparency to the red plate. Next students should interlock their yellow plates with the transparency-covered red plate.

3. Explain to students they are going to participate in a pizza fraction game. Have students bring their pizzas to a class circle.

4. Pizza Game—

◊ Have students sit in a large circle.

◊ Tell students this game involves sharing their pizzas. The red plate shows parts of the pizza that have been shared. The yellow plate shows parts of the pizza available to be shared.

◊ The teacher will call out a topping as well as a fractional part.

◊ Students should "share" by rotating their pizza to show the appropriate fractional part of the red plate. For example, the teacher may say 'share 1/8 of your pizza if you have mushrooms on it.' Students who have mushrooms should share the fractionally correct amount of pizza by rotating their plates to display 1/8 of the red plate.

◊ The teacher should check for accuracy and clarify any misconceptions throughout the pizza game.

◊ The first student to share all of his/her pizza wins.

5. Conclude with a class discussion about how understanding fractions can assist with sharing situations, like sharing a pizza, in the real world.

Lessons Extenders:

1. Do IAITC 'Wheat Grinding' lesson to show students how wheat becomes flour which is the main ingredient in pizza crust.

2. Have students show their favorite way to have a pizza cut by drawing lines on their red plates to symbolize cuts. Have them write fun pizza facts from the IAITC Pizza Ag Mag on each slice formed by the lines they drew.

3. Make pizza transparencies divided into different fractions to practice fractions other than eighths.

4. Ask additional fraction-related questions during the pizza game. For example, if a students has shared four-eighths of his pizza, ask students to state this fraction in reduced form. (1/2) Prompt students to compare fractions based on situations that come up during the game. For example, if 'Student A" has shared four-eighths of his pizza and 'Student B' has shared three-eights, discuss how we know 'Student A' has shared more.

Pizza Template for Transparency Copies
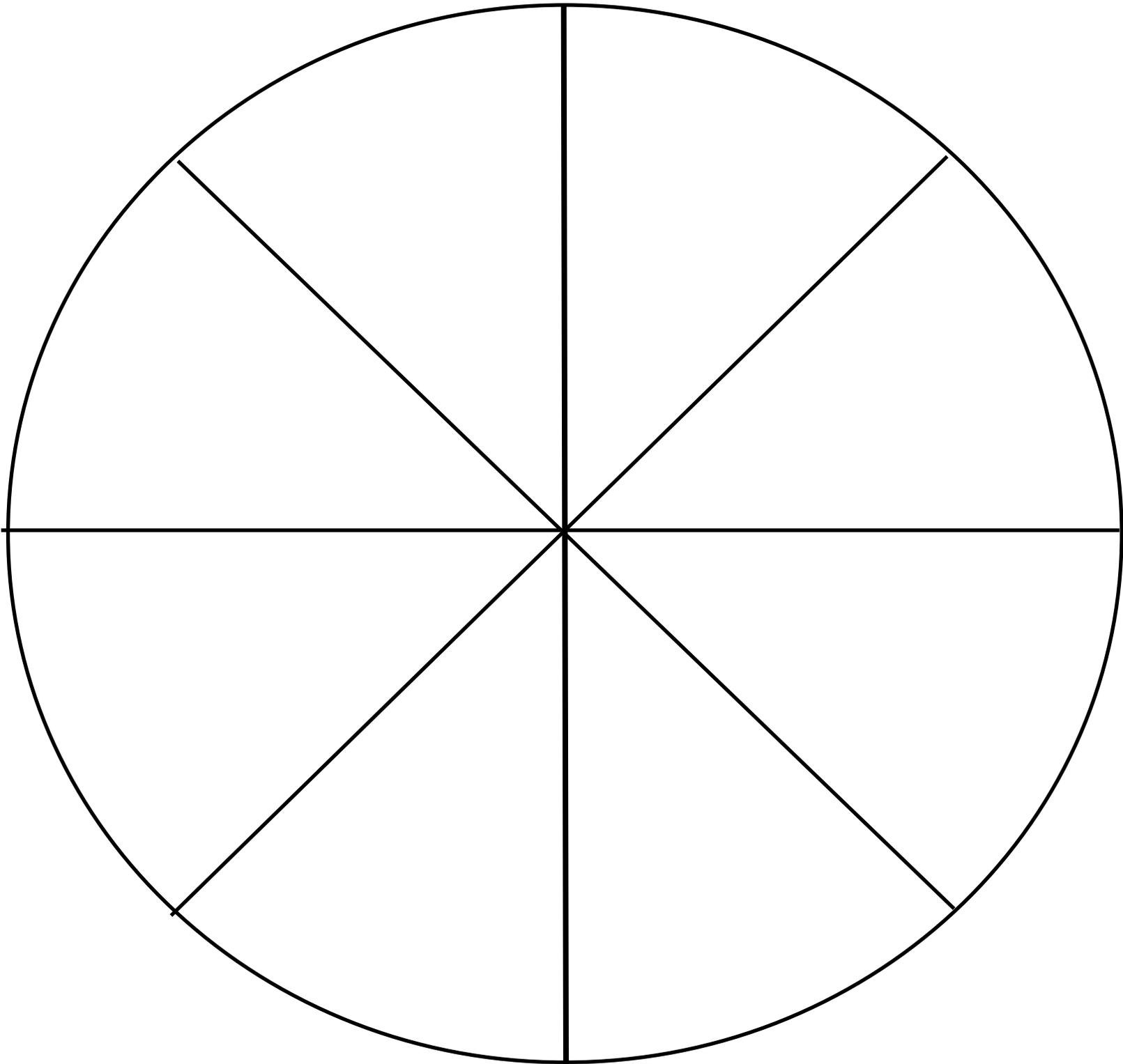
LEMONS + SUGAR + MORE

Objective: Students will be able to graph data that helps them understand the importance of producers and consumers in agriculture.

Common Core: CCSS.Math.Content.3.MD.B.3

CCSS.ELA-Literacy.SL.3.1; SL.3.2; SL.3.3; SL.3.4; SL.3.6; RL.3.1; RL.3.7

Illinois Learning Standards for Social Science: Communicating Conclusions SS.IS.6.3-5;

Global Interconnections: Changing Spatial Patterns SS.G.3.3; Economic Decision Making SS.EC.1.3

Suggested Reading Materials:

Lemonade for Sale by Stuart J. Murphy ISBN: 9780064467155

IAITC's Careers, Nutrition, Specialty Crop, and Water Ag Mags

Materials Needed:

- Lemonade for Sale worksheet (on following page)
- Internet to show video at https://www.bing.com/videos/search?q=growing+lemons+commercially
- Lemonade in different flavors
- Small cups
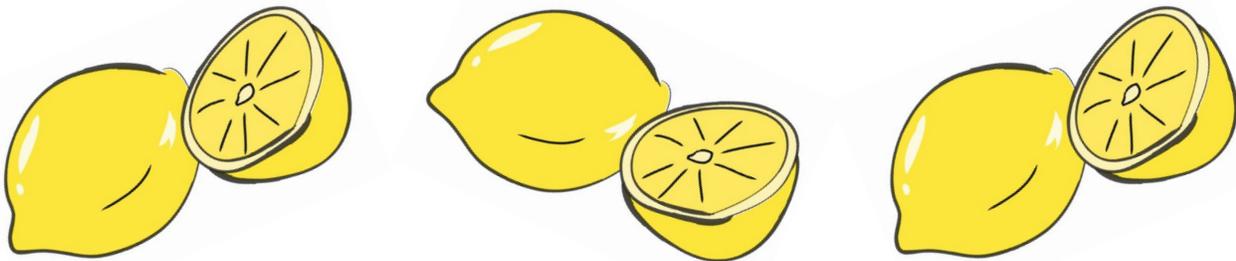
Procedure:

Students should have an understanding of bar graphs. They should also have a basic understanding of what it means to be a producer and a consumer.

1. Have students watch the video showing lemon producers and consumers. Tell students to think about who is producing (making) something and who is consuming (buying) something.
2. Let the video's content guide a discussion about the multiple producers and consumers involved in producing lemon juice.
3. Tell students you will read a story about kids who need to earn money.

4. Tell student to think about these questions as the story is read.
    a. Who is producing something?
    b. Who is consuming that something?
    c. Why are producers and consumers important to agriculture?
5. Distribute 'Lemonade for Sale' worksheet found on following page for students to complete as the story is read. Sample answer for worksheet are on page 24.
6. Read Lemonade for Sale by Stuart J. Murphy.
7. Review and discuss worksheet to ensure students have come up with an accurate list of producers and consumers in the story. Revisit the video, if necessary, to help students identify examples of producers and consumers in the story.
8. Set out different flavors of lemonade, such as traditional, strawberry, etc. Tell students they are going to be "consumers" of the lemonade.   Allow students to sample the different flavors of lemonade. Then, have them indicate their favorite flavor of lemonade on a tally chart visible to the whole class.
9. Group students and have them create bar graphs from the tally chart data.
10. Have students refer to their bar graphs to determine which flavors were most and least favorite.
11. Have students suppose their class results regarding most and least favorite lemonade flavors represent a broader amount of lemonade consumers. Discuss what impact (if any) such consumer preferences might have at different levels of lemonade production (e.g. lemon farmers, lemonade distributors, lemonade stands, etc.)

Lesson Extenders:

1. Make lemonade Illinois specific by looking at a Minute-maid Lemonade label. It has an ingredient (corn syrup) that may come from Illinois. You could also talk about Strawberry Lemonade. Strawberries are grown in Illinois.

2. Set up a lemonade stand at a school event and create a graph to keep track of the sales. During what time did you sell the most? The least? Show when sales were going up and down.

3. Measure the peel to fruit ratio of a lemon.

4. Determine the percentage of water in a lemon.

5. Experiment with the effect lemon juice has on cut apples. Explain the significance of pH and enzymes in cut fruit preservation.

6. Practice measuring skills by measuring out ingredients to make a lemon treat such as lemonade or lemon popsicles.

Lemonade for Sale Worksheet

Identify types of lemon producers and consumers. Use the book <u>Lemonade for Sale</u> for some ideas.

Producers	Consumers

Underline your answer for question 1.

1. The children were   CONSUMERS   PRODUCERS   BOTH

Fill in the blank for questions 2-3.

2. What product did the children produce?

_____

3. What producers were likely involved before the children made their product?

_____

Lemonade for Sale Worksheet—Answer Key

List producers and consumers you identify as <u>Lemonade for Sale</u> is read. You are encouraged to think beyond those directly mentioned in the story.

Possible answers:

Producers	Consumers
Kids (made lemonade)	Kids (bought supplies for lemonade stand)
Farmers (grew lemons and sugar)	Neighbors & children (bought lemonade)
Processing plant (made sugar from sugar cane or sugar	Stores (buy products from farmers and processors)
Stores (make and sell food)	Farmers (buy things like seed and farming equipment)

Underline your answer for question 1.

1. The children were   **CONSUMERS**   **PRODUCERS**   <u>**BOTH**</u>

Fill in the blank for questions 2-3.

2. What product did the children produce?

lemonade

_____

3. What producers were necessary for the children to make their product?

Possible answer: Lemon farmers, sugar farmers, sugar processing plant, stores where they bought supplies, processing plants that made things like the lemon juicer they used to make their lemonade, etc.
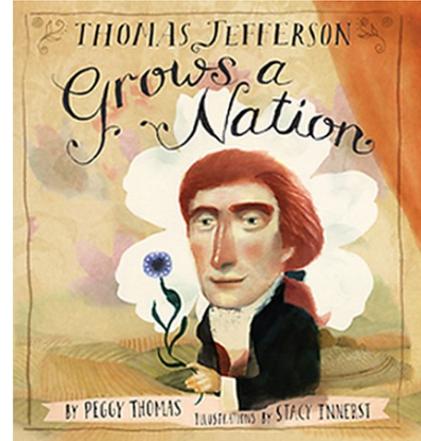
PLOT-A-LOT

Objective: After completing this exercise, students will be able to plot geometric shapes and calculate the area of those shapes, based on a scale.

Common Core: Math.Content.3.MD.5; 3.MD.6; 3.MD.7; 3.MD.8

CCSS.ELA-Literacy.RL.3.10

Materials:

- Graph paper (provided on following page)
- Pencil
- Ruler
- Calculator *optional

Intro: After reading <u>Thomas Jefferson Grows a Nation</u>, discuss his desire to raise and grow a variety of different commodities on his own land and across the nation. In order to do so, he had to plot out how to use the land on his farm, Monticello. Similarly, he went on to design the University of Virginia campus. These details are touched upon in pages 30-31 of the book.

Directions:

Review calculating area with your students.

1. Draw an example rectangle and label the sides 5 centimeters and 8 centimeters.

2. Ask the students how to calculate the area of the rectangle.

> Area = Length x Width
>
> A = L x W
>
> A = (8 cm) x (5 cm)
>
> A = 40 (cm x cm)
>
> A = 40 cm^2
>
> Area = 40 square centimeters

Review calculating perimeter with your students.

1. Draw an elongated rectangle and label the sides 1 cm, and 19 cm.

2. Draw a square rectangle. Label the sides 10 cm, and 10 cm.

3. Ask the students to calculate the perimeter of each rectangle. Perimeter = sum of the lengths of every side.

4. Calculate the area of each rectangle. *Note the difference between cm and cm^2

5. Notice how the rectangles can have the same perimeter and differing areas. They can also have similar area and differing perimeter. (e.g. 5 cm x 20 cm)

Intro:

Thomas Jefferson designed and mapped out the University of Virginia and his home, Monticello. He had to map out his farm to make the best use of the land. On a separate sheet of graph paper, use these same skills to design your own farm. Design your farm to make the best use of your available land, using the rules provided.

Directions:

1. Read all the directions before beginning.

2. On your graph paper, 1 square = 1 unit of land. Draw a rectangle 20 units by 30 units. This space represents all the land you own. What is the total area of the space you own? _____

3. You need a house to live in. Somewhere on your land, draw a plot for your house that has a length of 3 units and width of 3 units. Label your house.

4. With the remaining space, plot and label the areas where you will raise cattle, raise pigs, grow corn, and grow soybeans. You can plot as much space as you like for each commodity as long as it fits on your land. You must plot all four commodities and follow the rules below:

   A. Commodity plots cannot overlap, or overlap with your house.

   B. All plots must use only vertical or horizontal lines (no diagonal).

   C. Your cattle plot must have an area of at least 50 units^2.

   D. Your corn plot must have a length of at least 10 units.

   E. Your soybean plot must have equal length and width.

   F. Your pig plot must have a perimeter of exactly 32 units.

5. Complete the chart below with the length, width, perimeter, and area of each of your commodity plots.

Commodity	Length (units)	Width (units)	Perimeter (units)	Area (units^2)
Corn				
Soybeans				
Cattle				
Pigs				

Lesson Extender: Make a Profit!

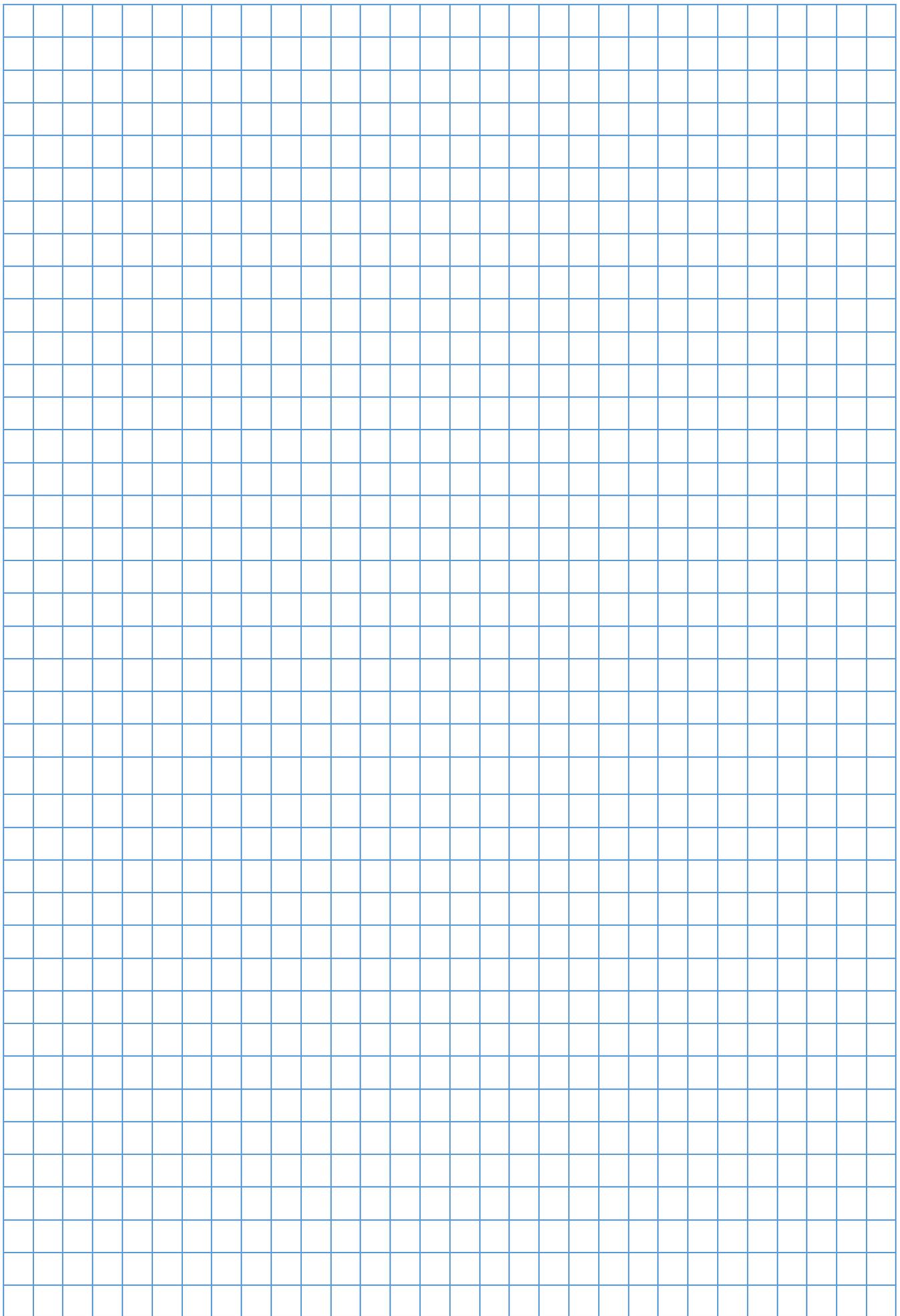**Your commodities make money back depending on the amount of space you provided for each one.**

Corn: Earn $2 for every 5 units^2.
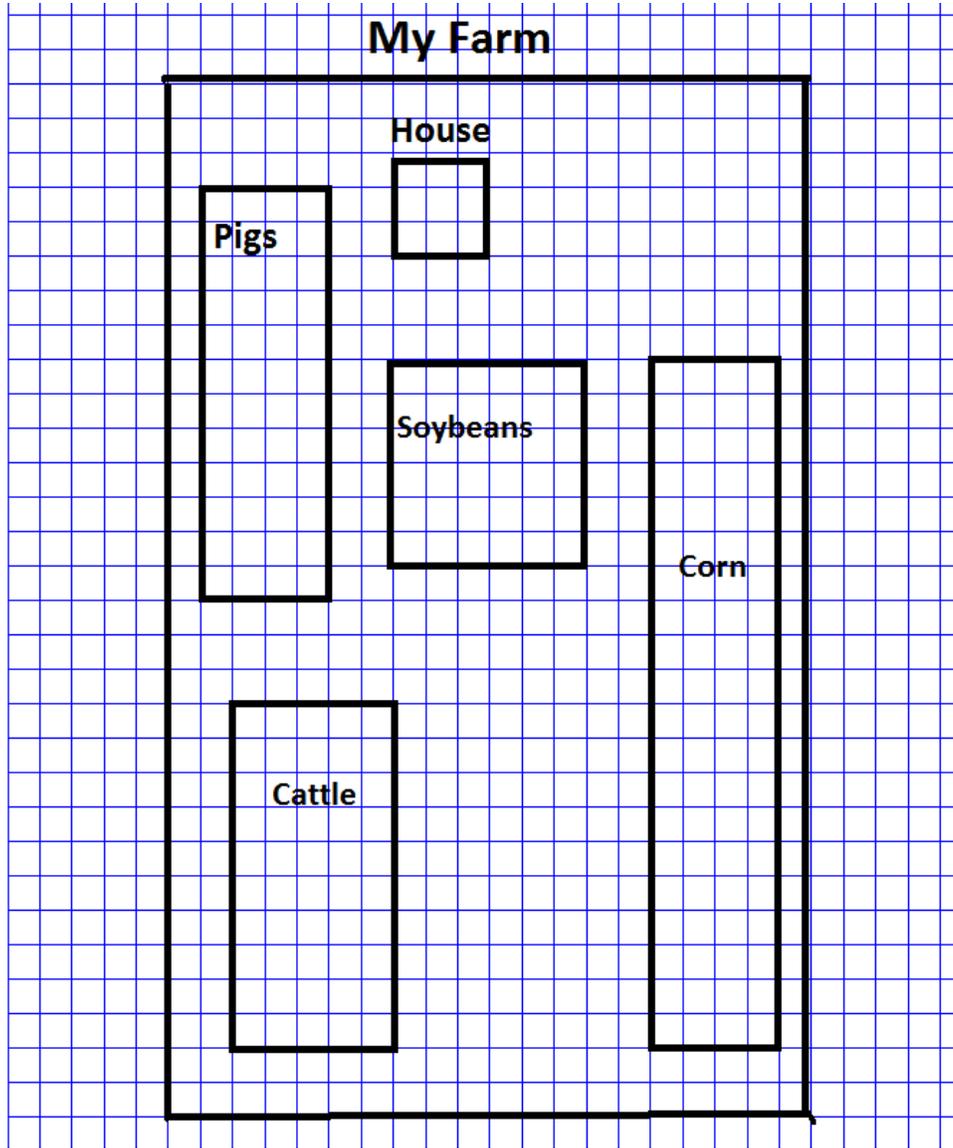
Soybeans: Earn $1 for every 2 units^2 .

Cattle: Earn $5 for every 10 units^2.

Pigs: Earn $3 for every 6 units^2.

Does this change how you would plot your farm? Try again to make the most money!

Plot-a-Lot Sample Answer

Commodity	Length (units)	Width (units)	Perimeter (units)	Area (units²)
Corn	20	4	48	80
Soybeans	6	6	24	36
Cattle	10	5	30	50
Pigs	12	4	32	48

RECOMMENDED READING

A Fraction's Goal—Parts of a Whole by Brian P. Cleary ISBN: 9781467713801

Apple Fractions by Jerry Pallotta ISBN: 9781442007772

Give Me Half! by Stuart J. Murphy ISBN: 9780064467018

Growing Patterns Fibonacci Numbers in Nature by Sarah C. Campbell ISBN: 9781590787526

Lemonade for Sale by Stuart J. Murphy ISBN: 9780064467155

Math Curse by Jon Scieszka and Lane Smith ISBN: 9780670861941

Math for All Seasons by Greg Tang ISBN:9780439755375

Multiply on the Fly by Suzanne Slade ISBN: 9781607181385

Piece=Part=Portion by Scott Gifford ISBN: 9781582462615

Sir Cumference and the First Round Table by Cindy Neuschwander ISBN: 9781570911521

Spaghetti and Meatballs for All! by Marilyn Burns ISBN: 9780545044455

The Grapes of Math by Greg Tang ISBN 9780439598408

The Lion's Share A Tale of Halving Cake and Eating It, Too by Matthew McElligott ISBN: 9780802723604

Thomas Jefferson Grows a Nation by Peggy Thomas ISBN: 9781620916285

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