LONGWOOD GARDENS

Go Figure Program

Pre- and Post-Activities

BACKGROUND FOR TEACHER

Students will be able to apply common math equations for **perimeter**, **area**, and **volume** while exploring the Gardens at Longwood. Students will experience how mathematics is necessary to implement creative designs.

Numbers at Longwood Gardens

- The Conservatory spans over 195,668 square feet. This is about 4.5 acres.
- Longwood has over 9,000 taxa or species and varieties of plants representing 200 different plant families.
- Longwood produces upward of 110,000 plants each year.
- The Meadow Garden is 86 acres.
- More than 170 Eastern Bluebirds fledge at Longwood every year.
- Longwood Gardens encompasses 1070 acres; 400 acres are open to the public.
- Longwood has a yearly budget of nearly $50 million.
- The Pipes Gallery behind the Ballroom showcases the Aeolian organ with 10,010 pipes.
- Longwood has the largest green wall in North America with 47,000 plants.
- Under the Conservatory are approximately 4000 feet of tunnels.
- The orchid room houses the best 300-500 orchids of our 6500 orchid collection.
- There are over 240,000 tulips are planted each year.
- Longwood is illuminated with 500,000 lights for the Christmas season, which equates to the arborists installing nearly 28 miles of lights from September to November each year.

VOCABULARY

Accuracy
Area
Base
Estimate
Formula
Height
Length
Measurement
Perimeter
Triangle
Unit cubes
Volume
Width

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COMMON CORE STANDARDS IN MATHEMATICS

3.MD.C.5	Recognize area as an attribute of plane figures and understand concepts of area measurement.
3.MD.C.5a	A square with side length 1 unit called “a unit square” is said to have “one square unit” of area, and can be used to measure area.
3.MD.C.6	Measure areas by counting unit squares (square cm, square m, square in., square ft., and improvised units).
3.MD.D.8	Solve real world and mathematical problems involving perimeters of polygons, including finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different areas or with the same area and different perimeters.
4.MD.A.1	Know relative sizes of measurement units within one system of units including km, m, cm, kg, g, lb., oz., l, ml, hr., min., and sec. Within a single system of measurement express measurements in a larger unit in terms of smaller units. Record measurement equivalents in a two-column table.
4.MD.A.3	Apply the area and perimeter formulas for rectangles in real world and mathematical problems.
5.MD.A.1	Convert among different-sized standard measurement units within a given measurement system and use these conversions in solving multi-step, real world problems.
5.MD.C.3	Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
5.MD.C.4	Measure volume by counting cubes, using cubic cm, cubic in., cubic ft., and improvised units.
5.MD.C.5	Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
5.MD.C.5b	Apply the formulas V=LxWxH and V=BxH for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.

Go Figure 2

PRE- AND POST-ACTIVITIES

Create Shapes (K-2)
Curriculum Connections: Visual arts, mathematics
Materials: Pre-cut shapes of paper in various sizes and colors (square, rectangle, triangle, circle), glue sticks, large white paper, markers or crayons

1. Give each student a piece of white paper and a glue stick.
2. Place various shapes in a central location.
3. Instruct students to use whatever shapes they want to create a creature, plant, or other object by gluing the shapes together on the white paper.
4. Students can use colored markers or crayons to add a design to the creation.
5. Allow students to share creations. Be sure they can recognize the specific shapes used to form the new creation. How many squares were used? How many triangles? etc.

Extension/Modification Activity: Have students create a large rectangle using various small shapes.

Square Foot Quilt (3-5)
Curriculum Connections: Mathematics
Materials: 12”X12” squares of paper, markers, colored pencils, crayons, rulers, calculators

1. Hand out 12” squares to the students.
2. Have students use the rulers to confirm that the paper is one square foot.
3. Instruct students to use the ruler to create 1” squares by drawing lines 1” apart.
4. How many square inches are in one square foot?
5. Next, ask students to fill in each square inch with different colors. Students can be creative.
6. Once students have colored in the square foot, attach the squares together on the floor.
7. Calculate how many square feet the class has in all. Calculate how many square inches in all.
8. Hang the large square foot quilt.

Formula Review (6-8)
Curriculum Connections: Mathematics
Materials: Empty shipping boxes of different sizes, rulers, paper, pencils, tape

1. Give each student a box, a ruler, paper, and a pencil.
2. Label each box with a unique name.
3. Each student will use the ruler to measure the sides of the box, and write the length on the box.
4. Using the formula for volume (LxWxH), have student calculate the cubic units for each box.
5. Students should write the volume of the assigned box under its name.

Go Figure 3

6. Once all calculations have been made, students can connect different sized boxes to create new shapes.

Extension/Modification Activity: Students can extend the activity by calculating the cubic inches if all the boxes were connected.

Estimating with Seeds (K-3)
Curriculum Connections: Mathematics, visual arts
Materials: Common dry seeds (lima beans, peas, chia seeds, popcorn kernels, kidney beans), cardstock paper, scrap paper, pencils, glue sticks

1. Give each student a piece of cardstock paper and a pencil.
2. Instruct students to draw something that grows in nature. (a tree, flower, plant, etc.)
3. Students will be using various seeds to cover the drawing. Before taking seeds, students must estimate how many seeds will be needed to cover specific areas of the drawing.
4. Have students record the estimate on a separate piece of paper.
5. Once an estimate is recorded, students may get the desired seeds then use the glue stick to secure seeds over a specific area.
6. Once seeds are secured, have students count the number of seeds that were used to cover the specific area of the drawing. How close was this number to the estimate?
7. Students will then estimate the number of seeds needed for the next section of the drawing.
8. The process of covering the drawing continues in the same way.
9. Display seed masterpieces once dry.

Space to Grow (3-8)
Curriculum Connections: Mathematics
Materials: Seed packets (1 packet per student), rulers, string or yarn, sheets of large brown paper of equal size, pencils

1. Share some information about seeds with students. Discuss information that can be found on the back of a seed package. Be sure to mention differences in growing season, the size of the plants, etc. Emphasize the spacing requirements for each type of seed.
2. Give each student a packet of seeds.
3. Students need to find the spacing requirements on the back of the packet.
4. Using a ruler, have students cut a piece of string to represent the planting distance required for their specific seed.
5. Give each student a large sheet of brown paper.
6. Students will measure and determine how many seeds can be planted on the large brown paper. Students should use the piece of string to space and mark spots for each seed.
7. After counting the number of seeds that can be planted on the piece of large brown paper, compare results.

Go Figure 4

8. Why do some seeds need more space between them?
9. If you wanted to grow the most plants, which seeds would be the best choice? Why?
10. Collect all materials.

Extension/Modification Activity: Have students use what they learned to plan and plant a garden at their own school.

Design a Garden for Your School (6-8)
Curriculum Connections: Mathematics
Materials: Graph paper, colored pencils, rulers, measuring tapes, pencils

1. Take students to an outside area that would provide enough sunlight for a raised bed garden.
2. Using the measuring tape, measure and record the dimensions of the space.
3. Give each student a piece of graph paper and a pencil.
4. Using the measurements collected, have students calculate how many garden beds can be placed in the area measured and the dimensions of each garden bed.
5. On graph paper students will design a raised bed garden using the measurements collected. Students can be creative with shapes that will fit in the designated space.
6. Once the beds have been drawn on the graph paper, students can determine what types of plants they want to grow. Groups must be specific and estimate how many plants will be needed for each raised bed.
7. Students can create a key and use colored pencils to represent various plants.
8. Upon completion, have groups share their vision for the designated area.

Extension/Modification Activity: Students may decide to create a themed garden area. Examples of garden themes include pollinator gardens, edible gardens, pizza gardens, alphabet gardens, literature gardens, etc.

SUGGESTED PRINT RESOURCES FOR TEACHERS

Bartholomew, Mel. *All New Square Foot Gardening with Kids: Learn Together: Gardening Basics: Science and Math, Water Conservation, Self-sufficiency, Healthy Eating*. Minneapolis, MN: Cool Springs, 2014. Print.

Bucklin-Sporer, Arden, and Rachel Kathleen. Pringle. *How to Grow a School Garden: A Complete Guide for Parents and Teachers*. Portland, Or.: Timber, 2010. Print.

Steffora, Tracey. *Measuring in the Garden*. Chicago: Heinemann Library, 2011. Print.

White, Jennifer M. and Katharine D. Barrett. *Math in the Garden: Hands-On Activities That Bring Math to Life.* Burlington, VT: National Gardening Association, 2006. Print.

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SUGGESTED PRINT RESOURCES FOR STUDENTS

Leedy, Loreen. *Measuring Penny*. New York: Henry Holt, 1997. Print.

Lionni, Leo. *Inch by Inch*. New York: I. Obolensky, 1960. Print.

Myller, Rolf. *How Big Is a Foot?* New York: Dell Pub., 1991. Print.

Go Figure 6