

What's a Square Foot Anyway? Laying Out the Design Plan

Activity Overview

Teams of students layout a restoration design plan on the school grounds using a scale drawing and square foot templates.

Objectives

Students will:

- Transfer points on graph paper to physical points on the ground.
- Apply mathematical concepts (e.g. geometry, graphing, measurement, perimeter, area, etc.) to a real-life design project
- Demonstrate techniques of measurement using scale drawings
- Generate a model for a real-world project

Subjects Covered

Math

Grades

3 through 12

Activity Time

1 hour

Season

Any

Materials

A restoration design plan drawn on graph paper, 2 "square foot" cardboard pieces and string per student (see attached instruction sheet), surveyor flags, one 100 foot measuring tape, spray paint

State Standards

Math:

Communicate mathematical ideas (A.4.2), logical arguments (A.8.2, A.12.2)

Connect mathematical learning with other subjects (A.4.3)

Develop effective oral & written presentations (A.8.4)

Background

After students design their restoration plot, they need to transfer the plan from paper to the school landscape. In this activity, students are able to make that transition from a concept on paper to an actual location on the school landscape. This step not only lays out the restoration plot, but also offers students a chance to see how a concept can materialize into a reality. Once their design plan is completed, students will develop seed mixes and calculate the amount of seed needed for the restoration project.

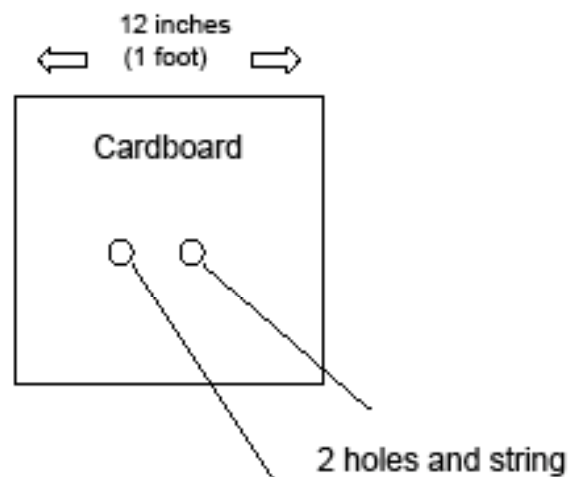
The following list of warm-up activities may help students not familiar with these mapping concepts:

- In the classroom, draw out sample designs or have students draw a design on graph paper. Have the students determine the area in square feet. One square on the graph represents one square foot.
- Practice using the cardboard square foot templates to create different shapes and visualize various square foot areas.
- Measure spaces such as a classroom or library using the square foot templates.

Activity Description

In this activity, you will lay out your restoration design plan on the school grounds. Follow each step and when you are finished, your schematic drawing will be physically marked on the ground ready for site preparation and planting.

First, measure and cut out two one square foot cardboard pieces. Attach a string to each cardboard piece to tie the cardboard to your feet. You will wear the cardboard to lay out the restoration plot.



What's a Square Foot Anyway? Laying Out the Design Plan (cont.)

Analyze non-routine problems & arrive at solutions (A.12.3)

Represent & explain whole numbers, decimals, & fractions (B.4.1)

Read, represent, & interpret rational numbers (B.8.1)

Create & critically evaluate numerical arguments (B.12.5)

Identify & use relationships among figures (C.4.3)

Use coordinate systems to find map locations (C.4.4)

Analyze properties and relationships of figures (C.12.1)

Use geometric models to solve problems (C.12.2)

Recognize & describe measurable attributes & units (D.4.1)

Demonstrate understanding of measurement (D.4.2)

Read & interpret measuring instruments (D.4.3)

Determine measurements by using basic relationships or estimations (D.4.5)

Identify & describe attributes in situations not directly or easily measurable (D.8.1)

Demonstrate understanding of measurement facts, principles, techniques (D.8.2)

Determine measurement indirectly (D.8.4)

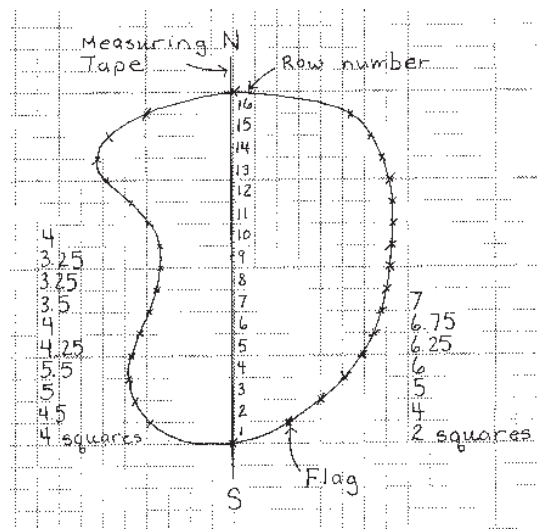
Select & use tools to determine measurements directly (D.12.2)

Source

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Option 1

1. Assign roles. You need 2 students to call out the design (“callers”) and two students to place flags (“flaggers”). The remaining students will wear the square feet cardboard pieces on their feet and step out the design (“line people”).
2. Divide into two teams. Each team will have one “caller”, one “flagger”, and several “line people.”
3. Draw a line through the middle of your design in a north/south or east/ west direction, (using cardinal points is preferable). Number each row. Count the number of squares to the right of the line. Record this number on the row. Count the number of squares to the left of the line. Record this number on the row. (See illustration below.)
4. Go outside and layout the measuring tape in a north/south or east/west direction at the site of the restoration. The measuring tape represents the line on the design plan.
5. Divide into your two teams. Begin at one end of the design plot. One team will layout the design to the left of the line and the other team will layout the design to the right of the line.
6. To begin the mapping process, the “callers” call out the number of squares in the first row. The “line people” then line up shoulder to shoulder wearing the cardboard templates on their feet. For instance on the example below, in the first row, there are 2 squares (or 2 square feet) to the right of the line and 4 squares (or 4 square feet) to the left of the line. One student with cardboard squares tied to his/her feet stands to the right of the line to measure out two square feet. To the left of the line, two students will stand side-by-side to measure out 4 square feet.



7. Once the “line people” are standing in position the “flaggers” place a flag at either end of the row.

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8. Repeat this process for each row in the design.
9. After each flag is placed on the ground you will see the perimeter of your design laid out with flags. Walk the perimeter of the restoration plot.
10. Use spray paint to semi-permanently mark the perimeter of the restoration.
11. If you plan to locate a trail through the restoration, place a flag in the square that the trail bisects. Again, use spray paint to mark the trail.

Option 2

1. Draw a line through the middle of your design in a north/south direction, (using cardinal points is preferable). Number each row. Count the number of squares east of the line. Record this number on the appropriate row. Count the number of squares west of the line. Record this number on the appropriate row. (See illustration above.)
2. Next label the flags to correspond with the rows. On each flag, write the row number and number of squares for that row with a permanent marker.
3. Go outside and layout the measuring tape in a north/south direction. The measuring tape represents the line on the design plan.
4. Line up students along one side of the north/south measuring tape. Students should stand shoulder to shoulder wearing the cardboard templates on their feet. Each student will pace off two rows at one time. Give each student two flags that correspond to the rows they are standing on. As a coordinated group, walk the appropriate number of steps for each row. Some students will finish before others. When you complete a row, set the flag in the ground.
5. Repeat this process on the west side of the measuring tape.
6. After each flag is set in the ground you will see the perimeter of the design laid out with flags. Now walk the perimeter of the restoration plot.
7. Use spray paint to semi-permanently mark the perimeter of the restoration.
8. If you plan to locate a trail through the restoration, place a flag in the square that the trail bisects. Again, use spray paint to mark the trail.

Extensions

- Practice different layouts using a set number of square feet, e.g. 4, 6, 10, etc. Measure the perimeters of the different layouts. Which layouts create the largest perimeters? What effect would perimeter have on a restoration plot?
- Measure the square feet of different existing features on the school grounds. Compare and rank the areas in terms of size. What is the ratio of built areas to natural areas?
- Create a map of an area using cardboard pieces.
- Calculate the amount of prairie seed needed for the restoration plot. (See Earth Partnership for Schools activity “How Much Seed Do I Need.?”)

What's a Square Foot Anyway? Laying Out the Design Plan (cont.)

Additional Resources

- Wyzga, Marilyn C. (1995). *Homes for wildlife*. U.S. Fish and Wildlife Service, Office of Extension Publications, through the University of New Hampshire Cooperative Extension.
- (1995) *Project Wet* curriculum & activity guide. Bozeman, MT: The Watercourse and the Council for Environmental Education.

Assessments

- Calculate square footage of shapes and designs drawn on graph paper.
- Draw a restoration design and calculate square footage.
- Explain the relationship between perimeter and shape.