



Title: Planning a Garden Using a Grid

Grades: 3

Subject: Science, Math

Time: 45 minutes

Standards:

Science Standard 5: Understand the structure and function of cells and organisms.

- Benchmark # 1: Know that plants and animals progress through life cycles of birth, growth and development, reproduction, and death; the details of these life cycles are different for different organisms.
- Benchmark # 2: Know that living organisms have distinct structures and body systems that serve specific functions in growth, survival, and reproduction (e.g., pumpkins grow on vines that move along the ground, beans have tendrils that hold onto a fence or trellis and climb upward).
- Science Standard 6: Understand relationships among organisms and their physical environment.
- Benchmark # 3: Know that an organism's patterns of behavior are related to the nature of that organism's environment (e.g., availability of food and resources, physical characteristics of the environment-paths, trellises).

Mathematics Standard 4: Understand and apply the basic and advanced properties of the concepts of measurement.

- Benchmark # 2: Select and use appropriate tools for given measurement situations (e.g., rulers for length, protractors for drawings circles).
- Benchmark # 3: Know approximate size of basic standards of units and the relationships between them (e.g., between feet and inches). Benchmark # 4: Understand relationships between measures (e.g., between length, perimeter and area).

Mathematics Standard 5: Understand and apply the basic and advanced properties of the concepts of geometry.

- Benchmark # 7: Understand how scale in maps and drawings show relative size and distance.

Objectives:

- Identify the basic needs and developmental stages of various plants.
- Design and construct a garden plan that meets the needs of specific plants.
- Use measurement tools (e.g., rulers) and an understanding of basic units of measure to subdivide an existing grid into smaller units (e.g., one unit equals one square foot).
- Interpret graphic representations of data and use it in practical applications.

Materials:

- Summer and Fall Grid worksheets provided below
- Scissors
- Glue
- Plant Data Chart sample provided below

Overview: Gardeners know that plants need space to grow. If plants are not given sufficient space, they will compete with each other for the sunlight, water and nutrients they are forced to share, and consequently they will not grow to their full potential. However, most gardeners also want to make the best use of the space they have available, so to maximize the area they have to plant and still meet the requirements each plant has for growth and development, they often make a garden plan before even one seed is put into the ground.

The location of plants in a garden is important and there are a number of factors that need to be considered in making a plan. Using a garden grid to plan where and how to space plants makes gardening much easier. Basing a grid on a square foot design (12" x 12"), the number of plants per square foot depends largely on the average growth and development of particular types of plants. As a



general rule of thumb, plant one large plant, such as broccoli or summer squash, per square foot. For medium large plants, such as lettuce and potatoes, space four plants evenly over one square foot. For medium small plants, such as spinach, space nine plants per square foot. For small plants, such as onions, carrots or radishes, space sixteen plants per square foot.

It is important to select a sunny spot for the vegetable garden. The majority of vegetables prefer six to eight hours of sunlight a day, although the green leaf vegetables, such as spinach and lettuce, can do with a little less. It is also important to have the proper equipment to optimize space and provide support for plants. Tomatoes need a stake or cage for support. Beans and cucumbers grow well on a trellis, although there are varieties of both of these plants that grow in bush form as well. Companion planting is also a consideration, some plants simply grown well when in close proximity to others, such as tomatoes and basil.

Of course, not all plants can grow at the same time. Over history, planters have practiced succession planting and crop rotation. Once one plant is ripened and picked, the gardener puts in a new crop for the new season. When it's time to plant the original crop again, the farmer usually plants it in a different spot. By rotating the crops the gardener gives the soil time to recover and replenish between growth cycles.

Vegetables that can be grown for a summer harvest include, tomatoes, summer squash, zucchini, and beans. Colder weather crops that yield a fall harvest include peas, lettuce, potatoes, broccoli, and winter squash and pumpkins. Pumpkins grow very big, so plant only one per square foot, and guide the vine along a walkway or trellis.

Kid's Speak: Planting a garden and growing your own vegetables can help you eat healthier and help the environment at the same time, but it is important to know something about how vegetables grow before you plant a garden. All vegetables love sun, but some are best grown in the early summer, when it's warm, while others grow better in cooler weather and are harvested in the fall. Some crops, like peas, beans and tomatoes, can grow upwards. Others like squash and pumpkins grow outwards and spread across the ground. All plants need space to grow. Some vegetables need a lot of space, like squash and broccoli, and others only a little space, like carrots and radishes; so it's important to plan out the garden before planting to make certain the plants have enough room to grow.

Eco-Fact: Broccoli is very rich in vitamins. It is known as the "King of the vegetable Kingdom".

Procedures:

Before Planning the Gardens:

- Explain to students that plants need the right amount of space to grow so they do not compete with each other for sunlight, water and nutrients. One way to ensure plants have the right amount of space is to use a planning grid.
- Display a class size version of the Plant Data Chart provided below showing only the headings. Fill in the data along with the students using the information from the overview.

Plant Data Chart

Garden Plants	Plants per Square Foot	Growth Habits & Requirements	Harvest Conditions
Basil			
Beans, Pole			
Broccoli			
Lettuce			
Radishes			
Potatoes			
Pumpkins			
Spinach			
Yellow Squash			
Tomatoes			

- Explain to students how to read the chart. Tell them this chart will help them to determine where and when to plant their fruits, vegetables and herbs. Using the grid will help them to decide how many plants they can use based on the space available.
- Explain to students that a space one square foot in size measures one foot (or 12 inches) on each side of the square. Therefore, if one pumpkin can be planted in a square foot of space it should be plotted to look similar to Figure A, and if sixteen radishes can be planted in one square foot of space it should be plotted similar to Figure B.

Figure A

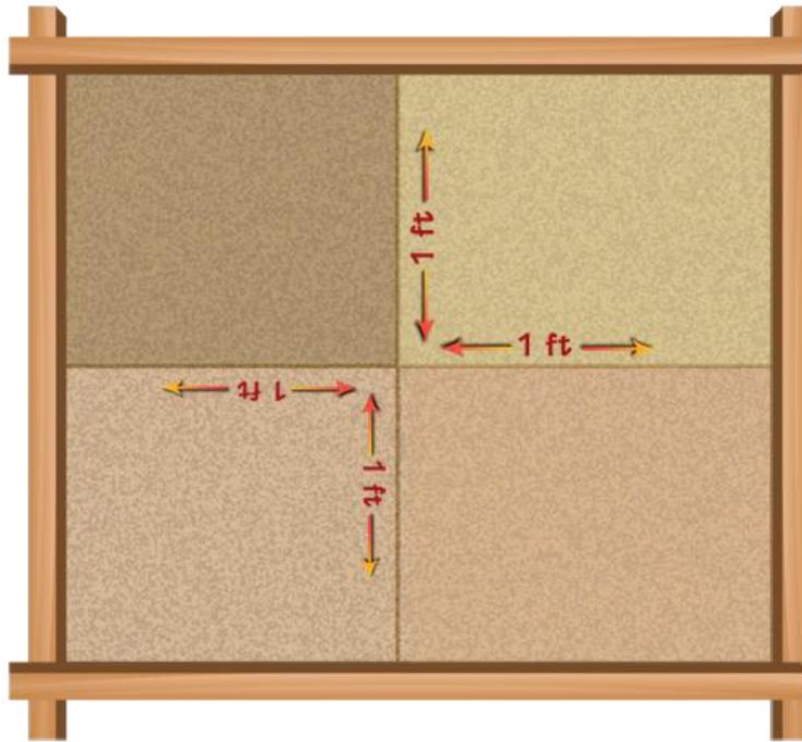


Figure B



- Distribute the grid worksheets provided below. Explain the grid's scale. The grid shown represents a four-foot by four-foot garden space. Each of the four units of the grid can be further divided into four smaller units, each equal to a square foot of actual garden space. Have students use the ruler to divide the units of the grid into four square foot units, using the straight edge of the ruler to mark off and divide the grid to resemble Figure C.

Figure C



Instructions for Planning the Gardens:

1. Explain to students they are going to plan two gardens, that if planted, would be harvested at different times, one while the weather is still warm and one in the cooler weather.
2. Have students identify and label where the path is located in each of their gardens and where they will place the trellis. This will help them determine where to locate certain plants on the grid in both the warm and cool weather gardens.
3. Students will cut out the plants at the top of the worksheet, and sort them into the two groups. Students will use the Plant Data Chart to decide where to place each type of plant on the grid for each garden.
4. Once they have determined that all the growing conditions have been met for each type of plant, they can glue the plant cutouts into place in the center of each two-foot square. This will show the type of plant for that location. Then in each of the smaller one-foot squares have them label the number of plants that should be placed there (e.g., four lettuce plants in each one-foot square, one pumpkin in each one-foot square, placed along the garden path). When planting the pumpkins one of the four one-foot squares will not be along a path. Ask students how they can solve this problem (e.g., students could put an arrow in the one foot square not along the path to indicate the vine should be trained in that direction, pumpkins could be planted along the perimeter of the garden, using the interior squares for other plants. This however, would change the current pattern design and adjustment would have to be made.)

After Planning the Gardens:

- Once students have determined where to locate the plants for each garden, draw two large grids on the board and fill in the information based on student suggestions. Refer to the Plant Data Chart and change out some of the plants for radishes and spinach. Perhaps you could replace one square foot of space planned for lettuce with spinach. What changes would have to be made to the garden? With a little research this can be done for other plants. Have students look up another vegetable or fruit they would like to put in their garden and have them make the appropriate changes.

**Adaptations:**

- Have the students use graph paper to develop their own grid system, and plot where each type of plant should be located.
- For younger students do the same activity as described above as a whole group activity, talking them through the placement process.

Extensions:

- Plant a class garden according to the grid students designed.
- Research and discuss why some plants grow better in some seasons rather than others.
- Check out the Green Thumb Challenge section this GEF website to learn more about planning and planting a garden.
- For tips on dietary guidelines and healthy eating habits visit the [USDA Food Pyramid](#).