Math in the Garden

NAITC Mini-Workshop
June 21, 2019
Little Rock, Arkansas
Presented by Mary Beth Bennett

Square Foot Gardening - What is it?
Square Foot Gardening is the practice of dividing the growing area into small square sections (typically 1 foot on a side, hence the name). The aim is to assist the planning and creating of a small but intensively planted vegetable garden. It results in a simple and orderly gardening system, from which it draws much of its appeal. Actually it was a method of gardening created by Mel Bartholomew in 1976 to address a problem that he saw with most gardens. Most gardens had been based on crop farming and were planted in rows that became hard to maintain throughout the growing season. The square foot garden method builds a garden in a series of squares with each square 12 inches by 12 inches, an area of 1 square foot. Each square holds a different vegetable, flower or herb. How many plants placed in each square depends on the particular variety, how big the plants get, and how far apart they should be planted in order to develop properly. The difference is that instead of being planted in rows with extra space between them, the plants are placed in a square, the same distance apart in all directions.

A standard square foot garden is 4 feet by 4 feet and 6 inches deep. It's divided into 16 equal squares (the "Square Feet" in the title) with a grid laid on top the soil. The size of the box was selected based on how far people can comfortably reach in to tend their gardens without falling into it or stepping on the soil.

Children are smaller and can't reach quite as far, so the children's Square Foot Garden boxes are 3 feet by 3 feet (but still 6 inches deep) with a grid laid on top the soil.

Square Foot Garden boxes can be made of any material that doesn't contain contaminants like preservatives or paint. You might want to check for left over wood at construction sites to get it free or buy premade, ready-to-assemble boxes right from the Square Foot Gardening Foundation's website at www.squarefootgardening.org.

Mel's Mix for growing in the Square Foot Garden
1/3 Peat Moss – Available at any garden center
1/3 Vermiculite – Buy the coarse grade in large 4-cubic-foot bags at garden centers of home improvement stores.
1/3 Blended Compost – If you don't have your own compost, buy three different brand bags of compost at the garden center and mix them together to create a blended compost. Start your own compost pile.

All three of the ingredients in Mel's Mix are natural – not manufactured. They will drain well, so there are no puddles to waterlog the plant roots; but they also hold large amounts of moisture to plants will grow well. This mix is a pleasure to work with, has a light fluffy texture and smells good. The first two ingredients have no nutrients, but the last –compost- is loaded with all the nutrients and minerals that you can imagine. It can be even better if you make your own compost.

Each square is planted with a different crop species based on a formulation of either one, four, nine or sixteen plants per square depending on the plant's overall size. Once a "square foot" is harvested, a different crop can be planted for a continual harvest. To encourage a variety of different crops in succession, and to discourage pests, each square is used for a different kind of plant (crop rotation) within the growing season. The number of plants per square depends on an individual plant's size. For example, a single tomato plant takes a full square, as might herbs such as oregano, basil or mint, while lettuce plants would be planted four per square, and up to sixteen per square of plants such as radish or carrots. Tall plants are trellised on the north side of the bed to avoid shading smaller plants and prevent sprawling on the ground.

One advantage of densely planted crops is that they can form a living mulch and can also prevent weeds from establishing or even germinating. Also, natural insect repellent methods such as companion planting (e.g. planting marigolds or other naturally pest-repelling plants) become more efficient in a close space, which may reduce the need to use pesticides. The large variety of crops in a small space also prevents plant diseases from spreading easily.

Since the beds are typically small, making covers or cages to protect plants from pests, cold, wind or too much sun is more practical than with larger gardens. To extend the growing season of a square foot garden, a cold/hot frame may be built around it, and by facing the cold/hot frame south, the SFG captures more light and heat during the colder months of spring and winter.

I see Square Foot Gardening as a way to garden that helps teach math as part of the learning and can be very helpful to those who are visual learners.

Activities

1. Using 1 foot squares (I found orange Construction Paper 12 in x 18 in with 50 sheets at Ollies for $.99 and cut them down to 12" x 12" for this activity)

Have students put together a 3 foot by 3 foot example on the classroom floor to see how big it is.

You can number the squares 1 – 9 and do math activities with your students depending on the grade level.

What is the total area of the 3 foot by 3 foot area? (9 square feet)

We use the 3 foot by 3 foot bed for children so have them reach across the area without stepping on any of the squares. You could have children stand around the square and reach across the square to touch the student across from them and tell them that they need to keep their feet out of the garden bed because in compacts the soil and makes it harder for the plants.

How many squares are in the area? (9)

Have students build a 4 foot by 4 foot bed in the floor. How many square feet are in the area? (16 square feet) Have them count the number of squares. There should be 16 squares in a 4 foot by 4 foot bed. This is the size recommended for adults.

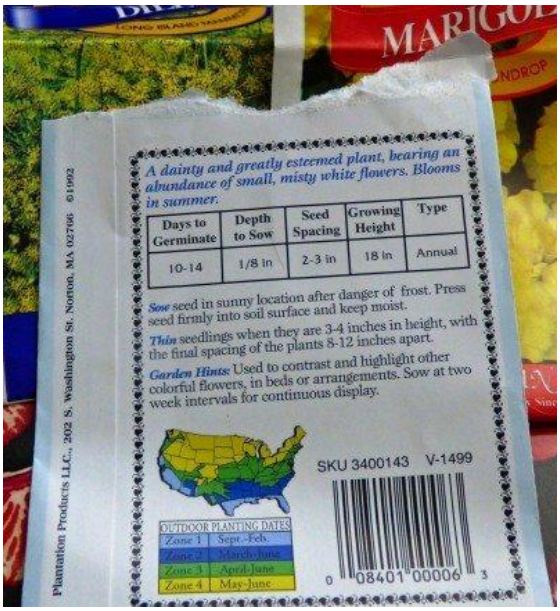
2. Using a flower pattern have math activities like addition, subtraction, fractions, multiplication, division, etc. Have students complete the math problems then use the answers to color in the flowers using the Color code provided. Feel free to come up with your own math problems and Color codes. You might find that you want to use the flowers as a theme and need

them to be a certain color. The coloring of the flower allows you to see who has the correct answers.

3. Square Puzzle

Using the 3 by 3 Squares determine how many squares you can actually get out of each set of squares. Do it for the 4 by 4 area. You should get 14 in the 3 x 3 and 30 squares in the 4 x 4 area. You could also use a 2 x 2 area.

4. Using seed packets, have students read the back of a seed packet and ask how many times they see numbers. This will depend on the seed packet.



You can use various numbers from seed packet to have students determine different things. How many days until we can see a seed if we plant it today? 10 – 14 on left and 5 – 10 on the right. Have them work with a calendar to come up with dates.

Square foot gardening requires the amount of space needed for a plant to grow. Using the thin to numbers 8" – 12" on the left and 6" on the right to determine how many of each plant you can plant in the 12" x 12" space (square foot). (1 on the left and 4 on the right).

Have students look at the seed packet and determine when it will be safe to plant their seed outdoors.

You could have students determine when they should be harvesting vegetables using the information on the seed packet.

Look for the season or sell by date on the packet. If the seed are packaged for the current year you should get good germination. If seeds are packed for previous years you can do germination studies to see how viable the seeds are. You put a certain number of seeds on a wet paper towel and see how many germinate within the time indicated on the seed packet and then use those numbers to come up with percentages of seeds germinating.

What activities can you come up with using the information on a seed packet?

Note **I am providing a link to the WVUES Garden Calendar Website below so that you can see how we use seed information in a variety of ways. The calendar gives dates to plant certain plants both in high tunnels and outdoor. Planting dates will vary from location so have your students come up with their own calendar of activities and whether they have access to an indoor growing area where they might start plants early to be transplanted after the danger of frost passes. You will also find an article I wrote on Square Foot Gardening.

WVUES Garden Calendar Website - https://extension.wvu.edu/lawn-gardening-pests/garden-calendar
The Square Foot Gardening article by Mary Beth Bennett is the top half of the month of May – page 10 of 36 pages.

Resources

- Bartholomew, Mel (2013). *All New Square Foot Gardening* (2nd ed.). Cool Springs Press. *ISBN 978-0-7603-6285-3*
- Bartholomew, Mel (2014). *Square foot gardening with Kids.* Cool Springs Press. *ISBN* 978-1-59186-594-0
- White, Jennifer M, Barrett, Katharine D, Kopp, Jaine, Manoux, Christine, Jophnson, Katie, McCullough, Yvette (2006) *Math in the Garden*. Developed through a partnership of University of California Botanical Garden and Lawrence Hall of Science Berkeley, California. Published by the National Gardening Association, Burlington, Vermont. ISBN 13:978-0-915873-46-3

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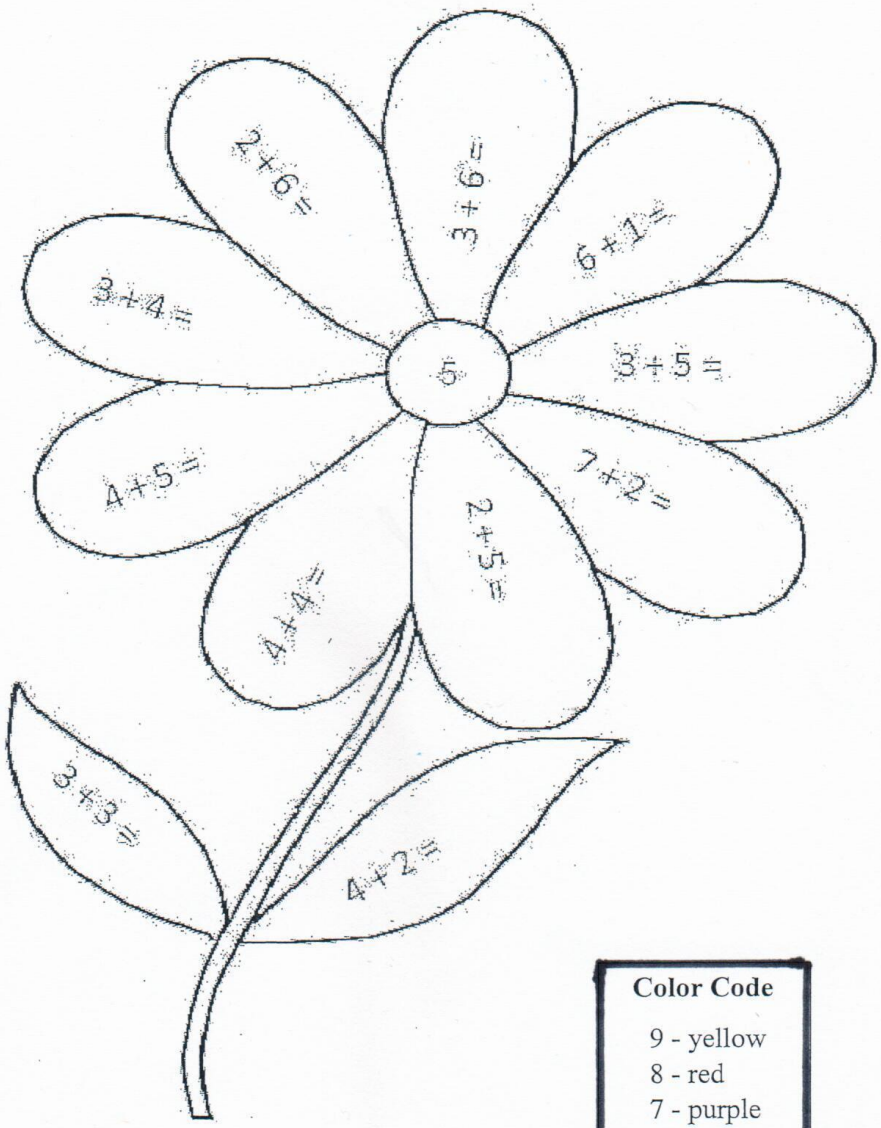
Attachments:
Math Flower template
Square Puzzles

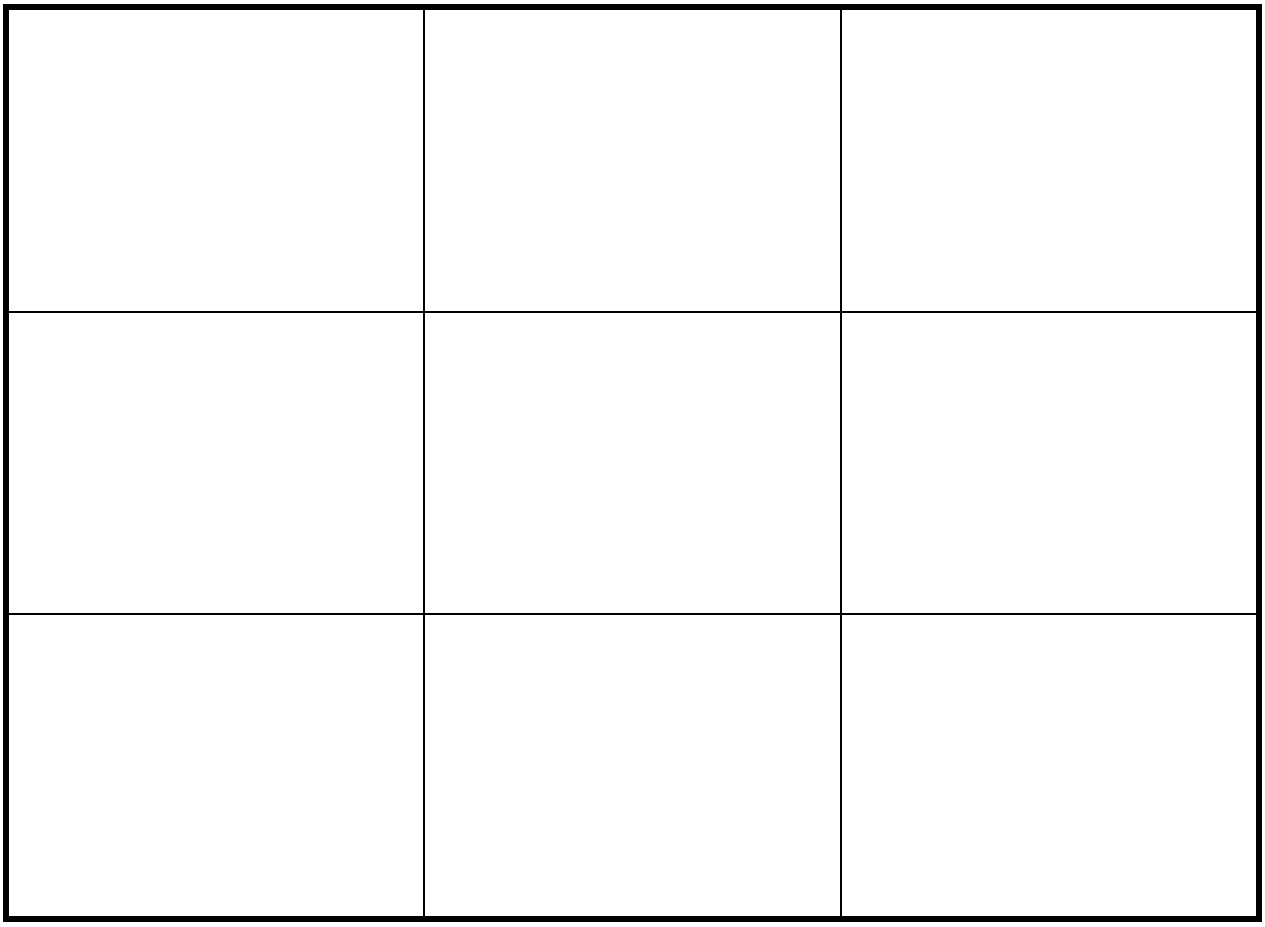
Directions: Add the following numbers together in each petal. Once finished color the petals using the guide provided!



Color Code
9 - yellow
8 - red
7 - purple
6 - green
5 - orange

Square Puzzles

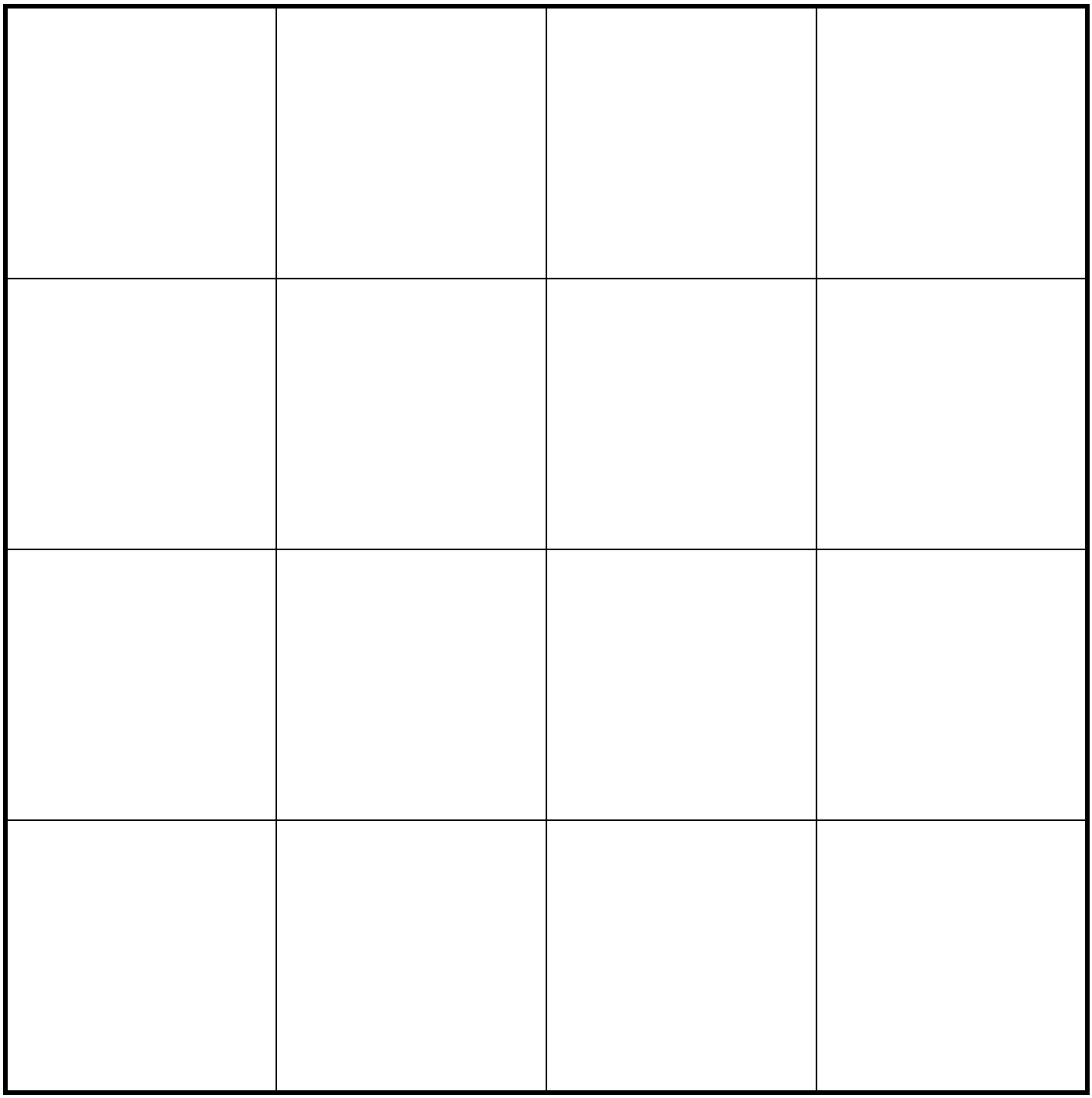
How many actual squares in a 3 x 3 Square Foot Garden? How many can you find?



What is the definition of a square?

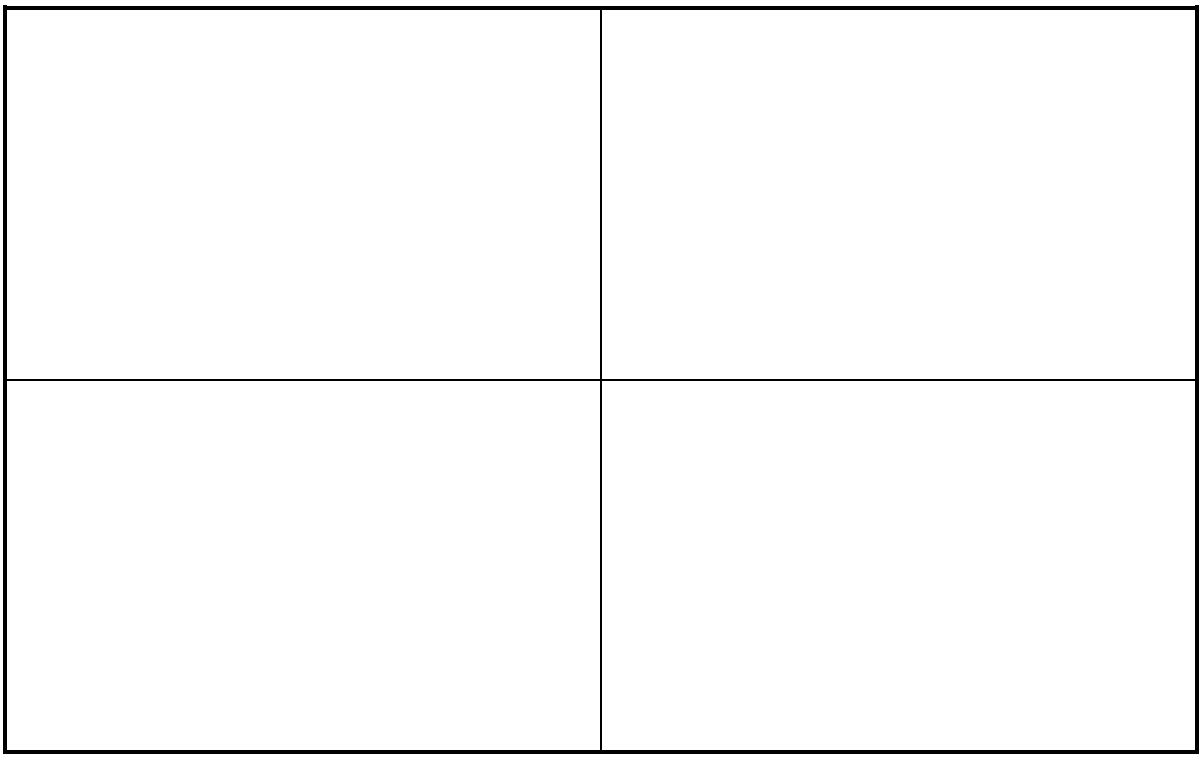
How many squares did you find? _____

How many actual squares in a 4 x 4 Square Foot Garden? How many can you find?



How many squares did you find? _____

How many actual squares in a 2 x 2 Square Foot Garden? How many can you find?



How many squares did you find? _____