



Grade 4 Performance Task

Planting Tulips

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Classroom Activity

Note:

Since performance tasks span different parts of the assessment system (summative, interim, and as part of the digital library of resources), here are some suggestions for turning “Planting Tulips” into a rich, classroom-based learning task:

- Bring in actual bulbs for students to examine. Since they are three-dimensional, have a discussion about how you would measure them to determine their “width.”
- Show a short video to demonstrate the planting process.
- Use colored tape to make the outline for the tulip garden on the floor. Have students determine actual spacing within that area and model where tulips should go within that space. Alternatively (and if permissible), plant an actual garden that requires using mathematics to determine spacing and depth of plants.

Setting the Context

Teacher: “Our school has decided to build planters in front of the school and plant flowers in them. A planter is a container used to grow plants. The principal would like the entrance of the school to be in full bloom for the Spring Fair event.

Teacher: “As a class, we have been selected to determine the type of flower, the shape of the planters, and how many plants we will need to fill the container.”

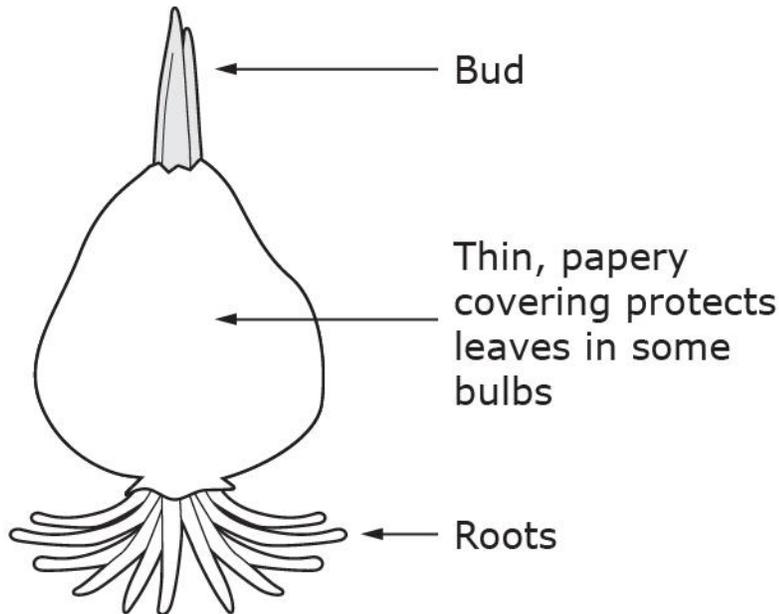
Teacher asks: “Does anyone know what types of flowers bloom in the spring?” [Give students an opportunity to make a list of all the flowers they know. Write the names of the flowers on the board or ask a student to record the flowers on the overhead or whiteboard.]

Teacher: “Many people plant bulbs in the fall and they bloom in the spring. [Write the word bulb on the board.] Who can tell me what a ‘bulb’ is or what it looks like?”

[Let students share their ideas or their personal experiences with bulbs.]

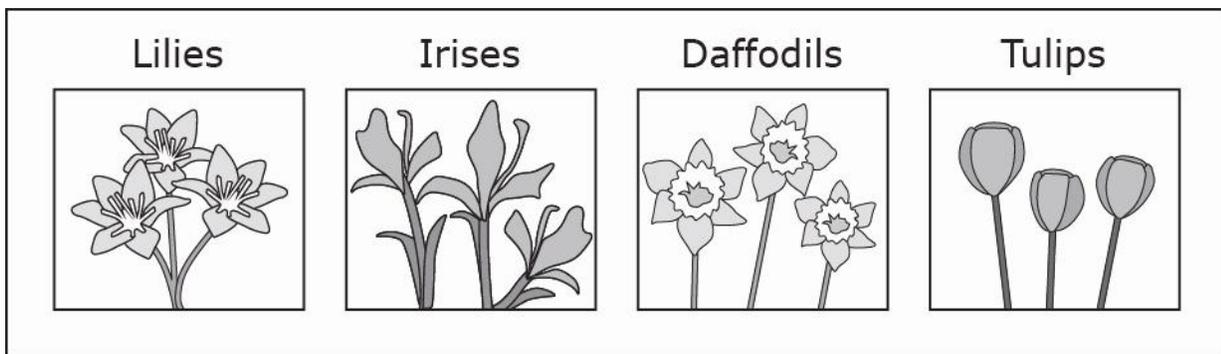
Teacher: “Let’s look at a diagram of a tulip bulb. [Using the overhead, show the class the diagram of a bulb. Be sure to say and point to each part of the diagram.]

Sprouting Bulb



Teacher asks: “What is the purpose of the bulb? Why do you think these types of plants need to have a bulb?” [Let students share their ideas. If no one responds, explain that bulbs are produced by plants to either store food or for protection from animals (daffodil bulbs/flowers taste bad to animals) or harsh weather. In very hot or cold climates, the bulb provides a protective covering for the stem that will grow and push through the ground when the conditions are just right.]

Teacher: “Bulbs like the one shown in this diagram sprout different flowers like those shown in this picture.” [Tell the students the name of each flower and show the picture.]



Teacher: “These flowers come from bulbs of different sizes. It is important that we measure the bulbs before we plant them, because bulbs need space to grow. Why do you think space is necessary?” [Let students share ideas and/or personal experiences planting flowers or vegetables.]

Measurement

Teacher: “What tool can we use to measure the different sizes of the bulbs?” [Students will suggest the use of a ruler. If they don’t, tell them.]

[Follow this by asking a student to volunteer to help measure the tulip in the diagram on the overhead. Help the student measure the bulb in the diagram (from the top of the roots to the base of the bud) using a ruler, and record its height and width on the overhead or whiteboard.]

Teacher: “Now we will see how this measurement can be used to plant the bulbs.”

Calculations

Teacher: “Suppose we decide to plant tulips. We will need to learn the planting guidelines for tulips.”

Teacher: “For tulips, the planting guideline for the space between bulbs is 3 times the width of the bulb. In other words, you need to measure the width of the bulb and multiply it by 3 to determine the space between the bulbs. There does not need to be any space between the bulb and the side of the container.”

“For example, if the bulb is 2 inches in width, what would the space between bulbs need to be?” [Have students figure out the space between bulbs. Then write on the overhead or whiteboard:]

$$2\text{-inch bulb width} \times 3 = 6 \text{ inches of space between the bulbs}$$

Teacher: “A common mistake for new gardeners is that they forget to calculate the total space needed. The total space includes the width of the bulb plus the space needed between the bulbs. Suppose we had several tulip bulbs to plant. In our example, how much total space would be needed to plant a bulb that is 2 inches in width?” [Have students figure out the total space, and then write on the overhead or whiteboard:]

$$2\text{-inch bulb width} + 6 \text{ inches between bulbs} = \text{total space of 8 inches for each bulb}$$

Teacher: “Let’s practice calculating the space between bulbs and the total space needed.” [Put the table on the overhead or whiteboard. Ask students to work in pairs to complete the table. Check students’ answers.]

Tulip	Width of Bulb (in)	Spacing between Bulbs (in)	Total Space Needed (in)
A	1		
B	2		
C	3		
D	4		

[After 5 minutes. Show students the solution to the table as shown here.]

Teacher: “Okay, your time is up. Here are the correct answers for the total space needed for planting bulbs of different sizes.”

Tulip	Width of Bulb (in)	Spacing between Bulbs (in)	Total Space Needed (in)
A	1	3	4
B	2	6	8
C	3	9	12
D	4	12	16

Teacher: “In the Planting Tulips task, you will need to determine the space of a planter and how many tulips can be planted in each container.”

Student Task

PLANTING TULIPS PERFORMANCE TASK

In this task, your class is helping the principal to plant flowers in front of the school. You will help decide the shape of the planter and how many tulips can fit into the container. Remember to calculate the total space needed, which includes the space between the tulip bulbs and the width of the tulip bulb.

Working with Measurements

1. Bernard and Sara recommend a rectangular planter that is 5 feet long and 2 feet wide. Bernard says that it will be easier to figure out how many tulips to plant if the measurements are in inches.



Fill in the blanks to show the number of inches for each measurement.

Length: 5 feet = _____ inches

Width: 2 feet = _____ inches

Figuring Out Digging Depth

2. The class will need to dig a hole to a depth of at least twice the length of the tulip bulb. Rosa measures the length of two different tulip bulbs. She finds one is $1\frac{1}{2}$ inches long and the other is $2\frac{1}{2}$ inches long.

Sam thinks that they should dig all of the holes 3 inches deep, but Rosa says that 3 inches is not deep enough. Who do you think is correct? Explain your reasoning.

Bulbs in the Rectangular Planter

3. The class finds a bag containing bulbs that are each $1\frac{1}{2}$ inches wide and decides to use them in their rectangular planter. Following the planting guidelines, answer the questions and show your calculations.

PLANTING GUIDELINES: The distance between tulip bulbs should be 3 times the width of the bulb.

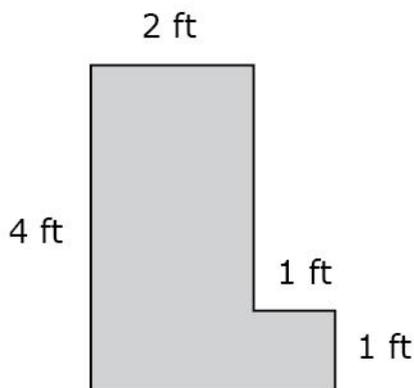
- A. This picture shows a tulip bulb that is $1\frac{1}{2}$ inches wide. Use your ruler and mark an "X" where the next bulb could be planted.



- B. Using your drawing, calculate the total length of space that is needed for each bulb with a $1\frac{1}{2}$ -inch width. Your answer should include the width of the bulb shown.
- C. How many tulip bulbs with a $1\frac{1}{2}$ -inch width can be planted in a single row that is 5 feet long?
- D. How many tulip bulbs with a $1\frac{1}{2}$ -inch width can be planted in a single column that is 2 feet long?
- E. How many total tulip bulbs with a $1\frac{1}{2}$ -inch width can be planted in the 5-foot by 2-foot rectangular planter? Explain or show your reasoning.

Selecting a Planter

4. Edward thinks that the L-shaped planter shown will hold more tulip bulbs than the 5-foot by 2-foot planter.



Following the same planting guidelines, how many tulip bulbs with a $1\frac{1}{2}$ -inch width can the L-shaped planter hold?

Which planter shape (rectangle or L-shaped) holds more tulip bulbs? Explain or show your reasoning.

Task Specifications

Item Id:	MAT.04.TULIPS.PT
Title:	Planting Tulips
Grade:	4
Content Domain(s):	Operations and Algebraic Thinking; Number and Operations—Fractions; Measurement and Data
Assessment Target(S):	<p>Claim 1, Target I: Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.</p> <p>Claim 3, Target E: Distinguish correct logic or reasoning from that which is flawed and—if there is a flaw in the argument—explain what it is.</p> <p>Claim 3, Target B: Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures.</p> <p>Claim 2, Target D: Identify important quantities in a practical situation and map their relationships (e.g., using diagrams, two-way tables, graphs, flowcharts, or formulas).</p> <p>Claim 2, Target B: Select and use appropriate tools strategically.</p> <p>Claim 2, Target A: Apply mathematics to solve well-posed problems arising in everyday life, society, and the workplace.</p> <p>Claim 3, Target A: Test propositions or conjectures with specific examples.</p> <p>Claim 3, Target D: Use the technique of breaking an argument into cases.</p>
Score Points:	See Scoring Rubric
Task Purpose:	The purpose of this task is to assess student’s ability to problem solve with fractions in the context of area/space.

Scoring Rubric

Scoring Criteria for Planting Tulips Task

Scorable Parts	Points	Claims
<p>1.</p> <p>Bernard says that it will be easier to figure out how many tulips to plant if the measurements are in inches.</p>	<p>0–2 Points</p> <p>Full credit for correctly converting feet to inches for both lengths. Accept other valid responses.</p>	<p>Contributes evidence to Claim 1, Concepts and Procedures</p>
<p>2.</p> <p>Sam thinks that they should dig all of the holes 3 inches deep, but Rosa says that 3 inches is not deep enough. Who do you think is correct? Explain your reasoning.</p>	<p>0–2 Points</p> <p>Full credit for stating Rosa is correct because the $2\frac{1}{2}$-inch bulb will need a hole 5 inches deep. Three inches is not deep enough.</p>	<p>Contributes evidence to Claim 3, Communicating Reasoning</p>
<p>3.</p> <p>A. Use your ruler and mark an “X” where the next bulb could be planted.</p> <p>B. Using your drawing, calculate the total length of space that is needed for each bulb with a $1\frac{1}{2}$-inch width.</p> <p>C. How many tulip bulbs with a $1\frac{1}{2}$-inch width can be planted in a single row that is 5 feet long?</p> <p>D. How many tulip bulbs with a $1\frac{1}{2}$-inch width can be planted in a single column that is 2 feet long?</p> <p>E. How many total tulip bulbs with a $1\frac{1}{2}$-inch width can be planted in the 5-foot by 2-foot rectangular planter? Explain or show your reasoning.</p>	<p>0–6 Points</p> <p>Full credit for:</p> <p>Marking an “X”. There should be 3 inches between the edge of the bulb and the edge of “X”.</p> <p>Finding 6 inches as the total length of space needed per bulb.</p> <p>Finding 10 bulbs will fit in a 5-foot long row.</p> <p>Finding 4 bulbs will fit in a 2-foot long column.</p> <p>Finding 40 total bulbs will fit in the 5-foot by 2-foot planter.</p>	<p>Contributes evidence to Claim 2, Problem Solving</p>

<p>4.</p> <p>Following the same planting guidelines, how many tulip bulbs with a $1\frac{1}{2}$-inch width can the L-shaped planter hold?</p> <p>Which planter shape (rectangle or L-shaped) holds more tulip bulbs? Explain or show your reasoning.</p>	<p>0–3 Points</p> <p>Finding 36 bulbs will fit in the L-shaped planter.</p> <p>Full credit is given for stating the rectangular planter will hold more bulbs and showing all supporting calculations for this answer. Responses should include the calculating of the number of bulbs for the L-shaped planter and comparing this to the number of bulbs for the rectangular planter (found in question 3 E).</p>	<p>Contributes evidence to Claim 3, Communicating Reasoning</p>
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