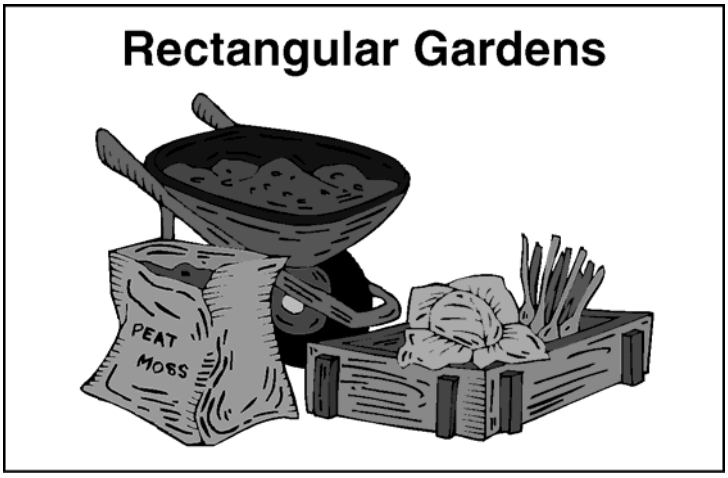
SITES-M Mathematics Challenge



Level: Grade Four

Standard: Geometry and Measurement

Learning Target: Focus on Measurement

Grade Level Expectations

GLE 0406.4.3 Solve problems that involve estimating and measuring length, area, capacity and weight.

Checks for Understanding

0406.4.8 Recognize that a measure of area represents the total number of same-sized units that cover a shape without gaps or overlaps.

State Performance Indicators

SPI 0406.4.9 Solve problems involving area and/or perimeter of rectangular figures.

SITES-M Mathematics Challenge

Grade 4–Focus on Measurement
Rectangular Gardens

The purpose of the Mathematics Challenges is to provide opportunities for students to develop and demonstrate understanding of important mathematical concepts and standards. Each Challenge includes a set of tasks that require higher-order thinking skills. Because these types of tasks may be new for students and they will have varying levels of understanding, the student responses will vary. The Challenges and guiding questions were designed to help teachers plan their implementation and elicit, analyze, and act on evidence of student understanding.

You will be able to choose which Mathematics Challenge Packet to implement each month, according to the learning needs of your students and your teaching context. Each packet contains all the materials necessary to implement the Mathematics Challenge including a grade-appropriate Challenge, the Mathematics Challenge Meeting Protocol, and the Guiding Questions for Analyzing Student Responses to Mathematics Challenges.

For each Challenge, you will complete a six step process of planning, implementation, and analysis and reflection.

The Mathematics Challenge Process

Stage	Step	Task
Planning	Step 1.	Review the Mathematics Challenge Meeting Protocol
	Step 2.	Review and solve the Mathematics Challenge prior to your Professional Learning Community (PLC) meeting. Think about your responses to the guiding questions on the Meeting Protocol
	Step 3.	Hold your PLC meeting and discuss your responses to the Guiding Questions on the Meeting Protocol
Implementation	Step 4.	Implement the Mathematics Challenge with your class
Analysis and Reflection	Step 5.	For your own planning and documentation, respond to the Guiding Questions on the Analyzing Student Responses Protocol
	Step 6.	To help us improve the Challenges and to provide recommendations for teachers implementing them in future years, complete the Mathematics Challenge Feedback Log and provide copies of all student work to the Assessment Coordinator

SITES-M Mathematics Challenge

Grade 4–Focus on Measurement
Rectangular Gardens
Mathematics Challenge Meeting Protocol

Each month, your Professional Learning Community will meet to discuss the implementation of one Mathematics Challenge. In preparation for your monthly meeting, please print and review this month's Mathematics Challenge, solve all tasks within the Challenge, and think about the guiding questions below. These questions will be used to facilitate a group discussion regarding the implementation of the upcoming Mathematics Challenge.

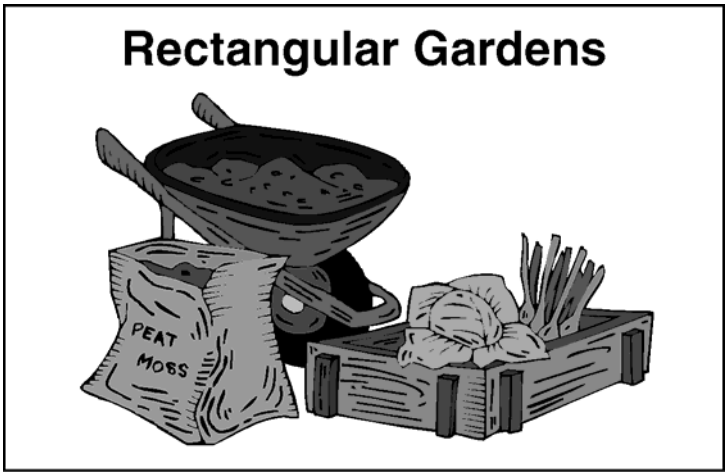
Guiding Questions for Implementing the Mathematics Challenges

1. What is the title of the Challenge that you will use this month?
2. What skills or standards is this Challenge measuring?
3. Where does this Challenge fit within your curriculum? Within which unit?
4. At what point during the unit will you administer this Challenge (e.g., At the beginning of a unit to determine what students do or do not know, at the end of a unit to assess what students have or have not learned, in the middle of a unit to determine where to go next instructionally)?
5. How will your students complete this Challenge (e.g., individually, one-on-one, in small groups, as a class)? Why?
6. Are there any prerequisite skills, common misunderstandings, or vocabulary needs that you will have to address? What are they?
7. What difficulties do you anticipate your students will have with the Challenge? How will you address them?
8. Are these skills and difficulties different for special needs students, ELL students, etc.? How? Will you do anything different for these students? What?
9. How will you evaluate student responses (e.g., grade responses with the provided rubric, scan responses to identify common mistakes/misconceptions, have students evaluate one another's responses, have students evaluate their own response)?
10. What will student responses to this Challenge tell you about student understanding?
11. How might you use this evidence of student understanding to adapt your teaching and learning?
12. What other materials, resources, or support might you need? Where can you get them?
13. How can your colleagues assist you in the analysis of student understanding?
14. What other questions or concerns do you have about this Mathematics Challenge?

After you have implemented the challenge with your class, be sure to respond to the Guiding Questions on the Analyzing Student Responses Protocol.

SITES-M Mathematics Challenge

Grade 4–Focus on Measurement



Standard: Geometry and Measurement

Learning Target: Focus on Measurement

Claims:
Students should understand and be able to explain or demonstrate how to:

- ✓ Solve problems that involve measuring length and area;
- ✓ Recognize that a measure of area represents the total number of same-sized units that cover the shape without gaps or overlaps;
- ✓ Solve problems involving area and/or perimeter of rectangular figures.

Task Preparation:
Each student will need a copy of the Student Response Sheet.

Stimulus Cards (Drawing or Word Description):
None

Manipulatives/Supplies:
Pencils

SITES-M Mathematics Challenge

Grade 4–Focus on Measurement

Cues/Directions:
Distribute student response sheets. Students should be directed to look carefully at each figure. Allow students time to answer.

1. Instruct students to follow along as you read aloud and say: **The students in Mr. Garfield's fourth-grade class are making plans for an organic garden. There is enough land for the garden to have an area of 36 square feet. The students are making drawings to help plan the shape of the garden. They are using a grid of unit squares like the one below. Draw a rectangle on the grid so that it has an area of 36 square units. Use the grid lines for sides and the points for corners. (TEACHER NOTE:** Students should draw a correct rectangle on the grid.**) How do you know your rectangle has an area of 36 square units? (TEACHER NOTE:** Students should write their explanation in the box.**) The students plan to put a fence around the garden to keep out animals. On the grid, 1 square unit represents 1 square foot of land. Suppose your shape is used for the garden. How many feet is it around your garden? (TEACHER NOTE:** Students should write their correct answer on the line.**) How do you know? (TEACHER NOTE:** Students should write their explanation in the box.**)**

2. **Draw 2 different rectangles on the grid below. Make sure the area of each is 36 square units, and make both rectangles different from your drawing in task 1. Label your new rectangles A and B. (TEACHER NOTE:** Students should draw the correct rectangles on the grid.**) Complete the table below in grid units for your rectangles. (TEACHER NOTE:** Students should correctly fill in the table.**) Is there a rectangle that is 36 square units that does not fit on the grid? (TEACHER NOTE:** Have students check the correct box.**) How do you know? (TEACHER NOTE:** Students should write their explanation in the box.**)**

3. **Eli and Serena each drew a plan for the garden that was not a rectangle. Look at their plans on the grid of unit squares below. (TEACHER NOTE:** Give students time to examine plans.**) Eli says his garden will have an area of 36 square feet. Is he right or wrong? (TEACHER NOTE:** Have students check the correct box.**) How do you know? (TEACHER NOTE:** Students should write their explanation in the box.**) Serena says her garden will have an area of 36 square feet. Is she right or wrong? (TEACHER NOTE:** Have students check the correct box.**) How do you know? (TEACHER NOTE:** Students should write their explanation in the box.**) Look at the plans again that Eli and Serena drew. Which garden needs more fence around it? (TEACHER**

NOTE: Have students check the correct box.**) How do you know? (TEACHER NOTE:** Students should write their explanation in the box.**)**

4. **Look at Eli's garden again. (TEACHER NOTE:** Give students time to examine plans.**) Some students say the shape can be broken into two small rectangles. Outline the two rectangles on the drawing. (TEACHER NOTE:** Students should correctly outline the rectangles on the grid.**) Write a number sentence that tells how to get the area of Eli's garden from the area of the two rectangles you outlined. (TEACHER NOTE:** Students should write their correct answer on the line.**) Look at Eli's garden one last time. Some students say the shape is one big rectangle with a smaller rectangle removed. Outline the two rectangles on the drawing below. (TEACHER NOTE:** Students should correctly outline the rectangles on the grid.**) Write a number sentence that tells how to get the area of Eli's garden from the area of the two rectangles you outlined. (TEACHER NOTE:** Students should write their correct answer on the line.**)**

5. **Mr. Garfield says they have 24 feet of fencing to use for the garden. Can the students make a garden that is 36 square feet and put 24 feet of fence around it? (TEACHER NOTE:** Have students check the correct box.**) How do you know? (TEACHER NOTE:** Students should write their explanation in the box.**)**

SITES-M Mathematics Challenge

Grade 4–Focus on Measurement

TSM10028

SITES-M Mathematics Challenge
Grade 4–Focus on Measurement

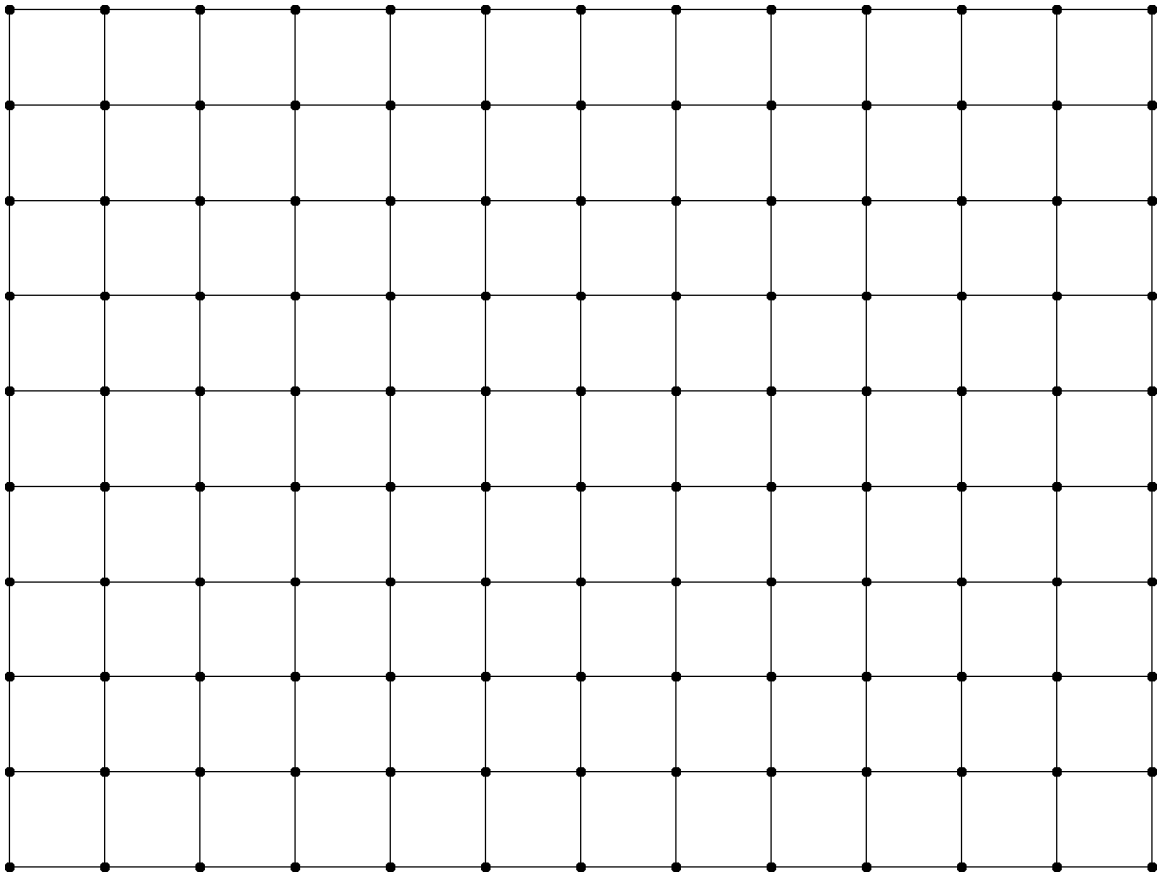
Student Response Sheet

Rectangular Gardens

Name: _____ **Date:** _____

The students in Mr. Garfield's fourth-grade class are making plans for an organic garden. There is enough land for the garden to have an area of 36 square feet.

1. **The students are making drawings to help plan the shape of the garden. They are using a grid of unit squares like the one below.**



Draw a <u>rectangle</u> on the grid so that it has an area of <u>36 square units</u>. Use the grid lines for sides and the points for corners.

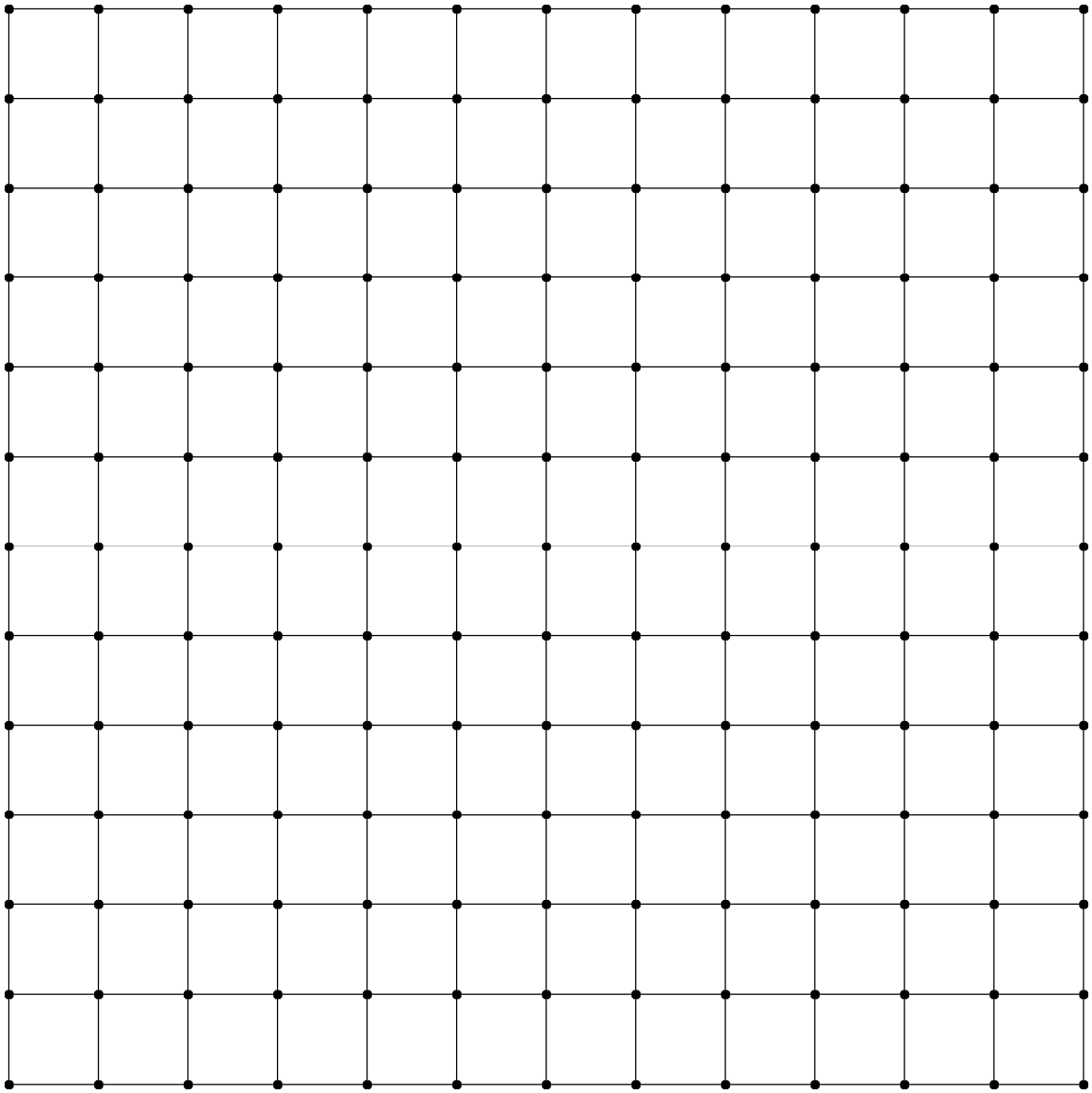
How do you know your rectangle has an area of 36 square units?

The students plan to put a fence around the garden to keep out animals. On the grid, 1 square unit represents 1 square foot of land. Suppose your shape is used for the garden. How many <u>feet</u> is it around your garden?

_____ **feet**

How do you know?

2. Draw 2 <u>different</u> rectangles on the grid below. Make sure the area of each is 36 square units, and make both rectangles different from your drawing in task 1. Label your new rectangles A and B.



a. Complete the table below in grid units for your rectangles.

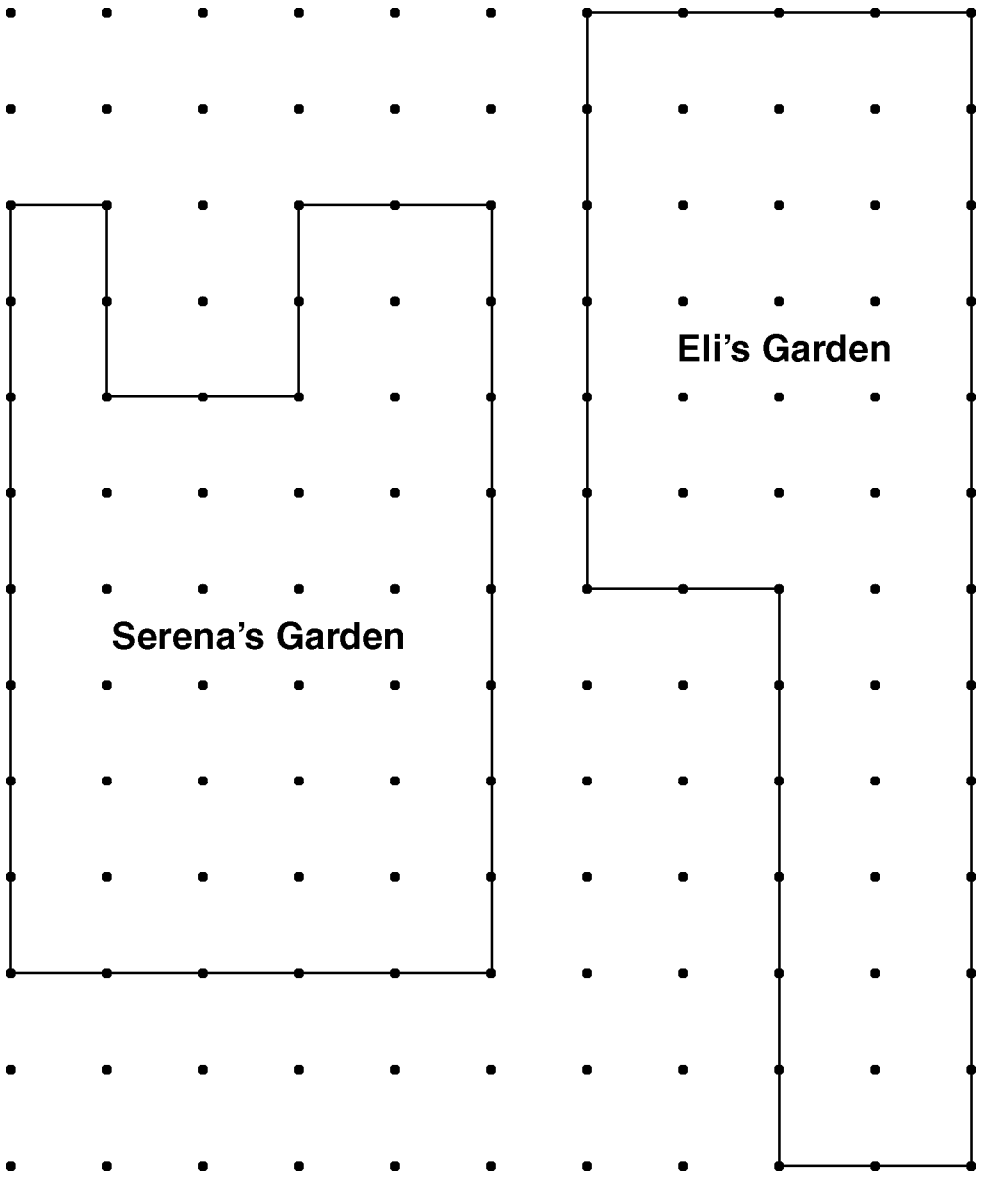
	Length	Width	Perimeter
Rectangle A			
Rectangle B			

b. Is there a rectangle that is 36 square units that does not fit on the grid?

Check one: ☐ **Yes** ☐ **No**

How do you know?

3. Eli and Serena each drew a plan for the garden that was <u>not</u> a rectangle. Look at their plans on the grid of unit squares below.



a. Eli says his garden will have an area of 36 square feet. Is he right or wrong?

Check one: ☐ **Right** ☐ **Wrong**

How do you know?

b. Serena says her garden will have an area of 36 square feet. Is she right or wrong?

Check one: ☐ **Right** ☐ **Wrong**

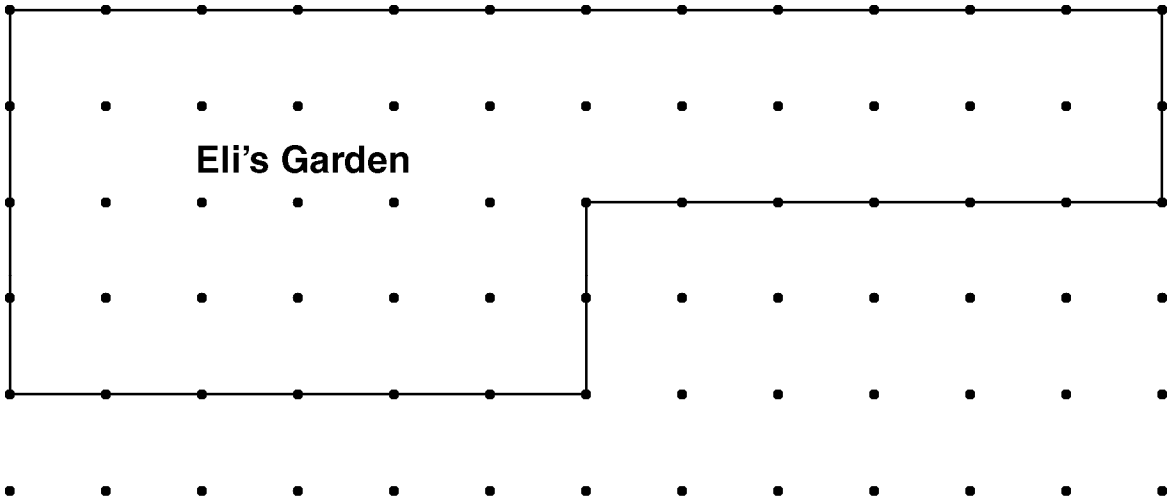
How do you know?

c. Look at the plans again that Eli and Serena drew. Which garden needs more fence around it?

Check one: ☐ **Eli** ☐ **Serena**

How can you tell?

4. Look at Eli's garden again.

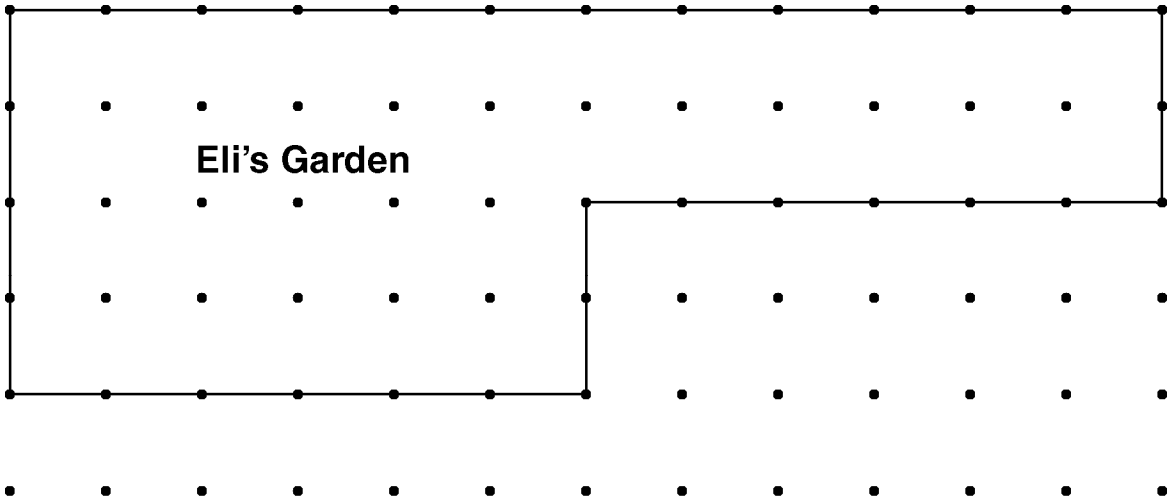


a. Some students say the shape can be <u>broken</u> into two small rectangles. Outline the two rectangles on the drawing.

Write a number sentence that tells how to get the area of Eli's garden from the area of the two rectangles you outlined.

_____

b. Look at Eli's garden one last time. Some students say the shape is one big rectangle with a smaller rectangle <u>removed</u>. Outline the two rectangles on the drawing below.



Write a number sentence that tells how to get the area of Eli's garden from the area of the two rectangles you outlined.

_____

5. Mr. Garfield says they have 24 feet of fencing to use for the garden. Can the students make a garden that is 36 square feet and put 24 feet of fence around it?

Check one: ☐ **Yes** ☐ **No**

How do you know?

Learning and Teaching Considerations

Task 1:

A) Be sure that students understand that area is the two-dimensional space inside a region.

B) Be sure that students understand that although squares are the most common units of area, any tile that conveniently fills up a plane region can be used.

C) If a student says or writes, "I just know," prompt him or her by saying something like "I'm glad you know, but it's important in math to be able to explain your answers so other people can understand what you're thinking."

D) If a student says or writes, "I don't know," say something positive like "Let's start with what you do know about this problem." Students often know more than they think or say, and encouraging them to vocalize or write about that knowledge is all they need.

Task 2:

A) Be sure that students understand that perimeter is a length to be measured. It is the distance around a region.

B) Be sure that students are given opportunities to compare regions with different areas to help students distinguish between size and shape and between area and length.

C) Students may add the length of the four sides together to find the perimeter.

D) Students may add the length to the width and then multiply the sum by 2 to find the perimeter.

E) Students may multiply the length by 2, multiply the width by 2, and then find the sum of the 2 products to find the perimeter.

F) Students may have the misconception that the perimeter is found by multiplying the length by the width.

Task 3:

A) Students may count squares to find the area of each region.

B) Students may break Eli's garden into 2 rectangles and Serena's garden into 3 rectangles to find the area.

C) Students may have the misconception that they count the number of points rather than the distance between 2 points to find the length of each side.

Task 4:

A) Students may break Eli's garden up into 2 rectangles by drawing a vertical line or horizontal line.

B) Students may draw a rectangle around Eli's garden by adding a 6 by 2 imaginary rectangle (which would make the dimensions of the big rectangle 12 by 4) and then later subtracting out the 6 by 2 imaginary rectangle.

C) Students may use multiplication and addition or repeated addition to find the area of each rectangle.

Task 5:

A) Students may know that a square is a type of rectangle; both are quadrilaterals with opposite sides or equal length and two pairs of parallel sides.

B) Students may have the misconception that perimeter measures the square units inside the region.

C) Students may explore rectangles with a fixed perimeter. They should begin to notice that as the rectangle approaches a square shape, its area, or the number of squares inside, increases.

D) Students may have the misconception that a square is not a rectangle and not provide the 6 by 6 rectangle as an answer.

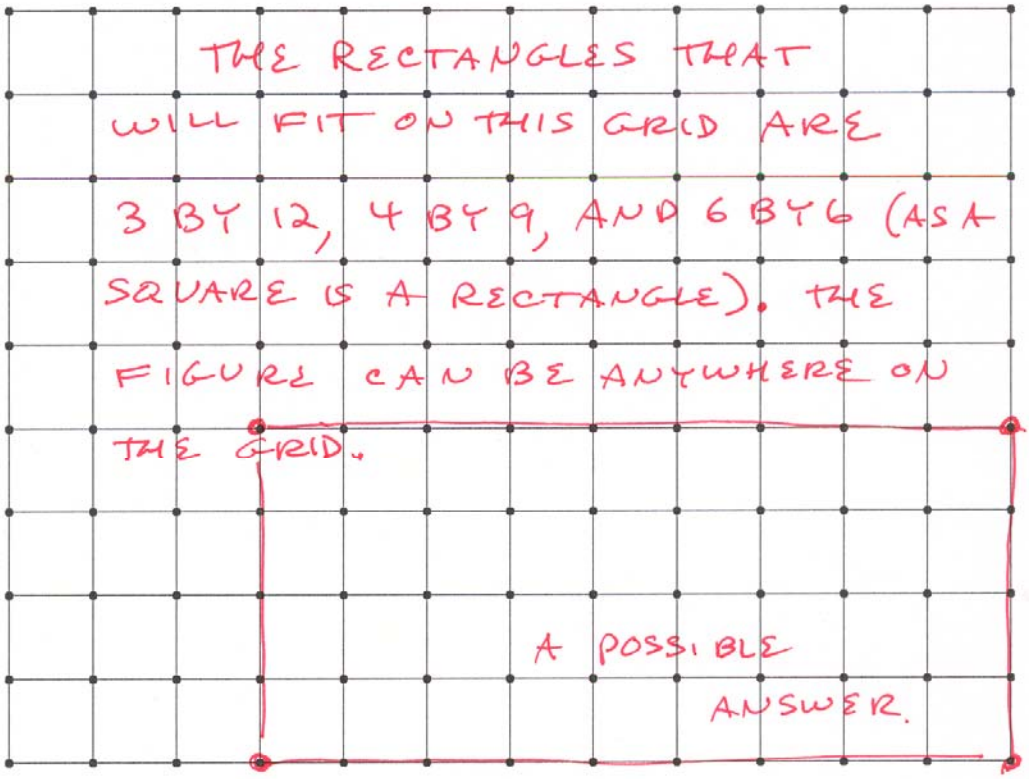
Student Response Sheet

Rectangular Gardens

Name: ANSWER KEY Date: _____

The students in Mr. Garfield's fourth-grade class are making plans for an organic garden. There is enough land for the garden to have an area of 36 square feet.

1. The students are making drawings to help plan the shape of the garden. They are using a grid of unit squares like the one below.



Draw a rectangle on the grid so that it has an area of 36 square units. Use the grid lines for sides and the points for corners.

How do you know your rectangle has an area of 36 square units?

STUDENT SHOULD SAY THAT 36 SQUARES ARE INSIDE THE RECTANGLE, STUDENT MAY REFER TO MULTIPLICATION OF LENGTH BY WIDTH.

The students plan to put a fence around the garden to keep out animals. On the grid, 1 square unit represents 1 square foot of land. Suppose your shape is used for the garden. How many <u>feet</u> is it around your garden?

24 IF 6 BY 6
26 IF 4 BY 9 (OR 9 BY 4)
30 IF 12 BY 3

_____ **feet**

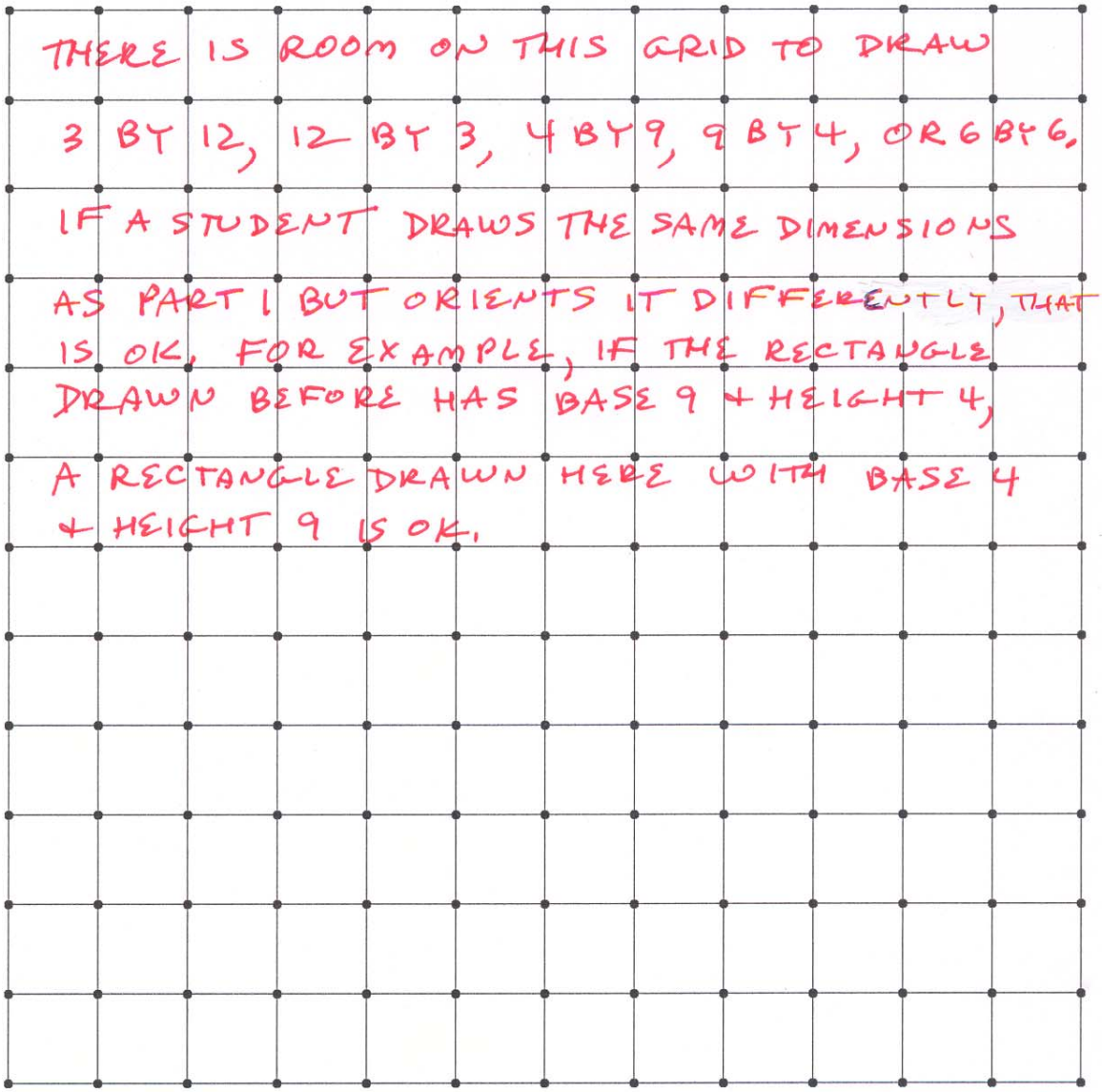
How do you know?

ANSWER MUST MATCH STUDENT'S RECTANGLE AND SHOULD SHOW ADDITION OF LENGTHS OF 4 SIDES.

FOR A 4 BY 9: 4+4+9+9 = 26

STUDENT MAY ALSO INDICATE THAT IN A SCALE DRAWING, IF IT IS 26 UNITS AROUND THE DRAWING IT WILL BE 26 FEET AROUND THE GARDEN. IF 1 SQUARE UNIT = 1 SQ. FT, THE 1 UNIT = 1 FOOT,

2. Draw 2 <u>different</u> rectangles on the grid below. Make sure the area of each is 36 square units, and make both rectangles different from your drawing in task 1. Label your new rectangles A and B.



a. Complete the table below in grid units for your rectangles. THE TABLE NEEDS TO MATCH THE STUDENT'S WORK.

	Length	Width	Perimeter
Rectangle A	4 OR 9	9 4	26
Rectangle B	3 OR 12	12 13	30
	6	6	24

b. Is there a rectangle that is 36 square units that does not fit on the grid?

Check one: [X] Yes [ ] No

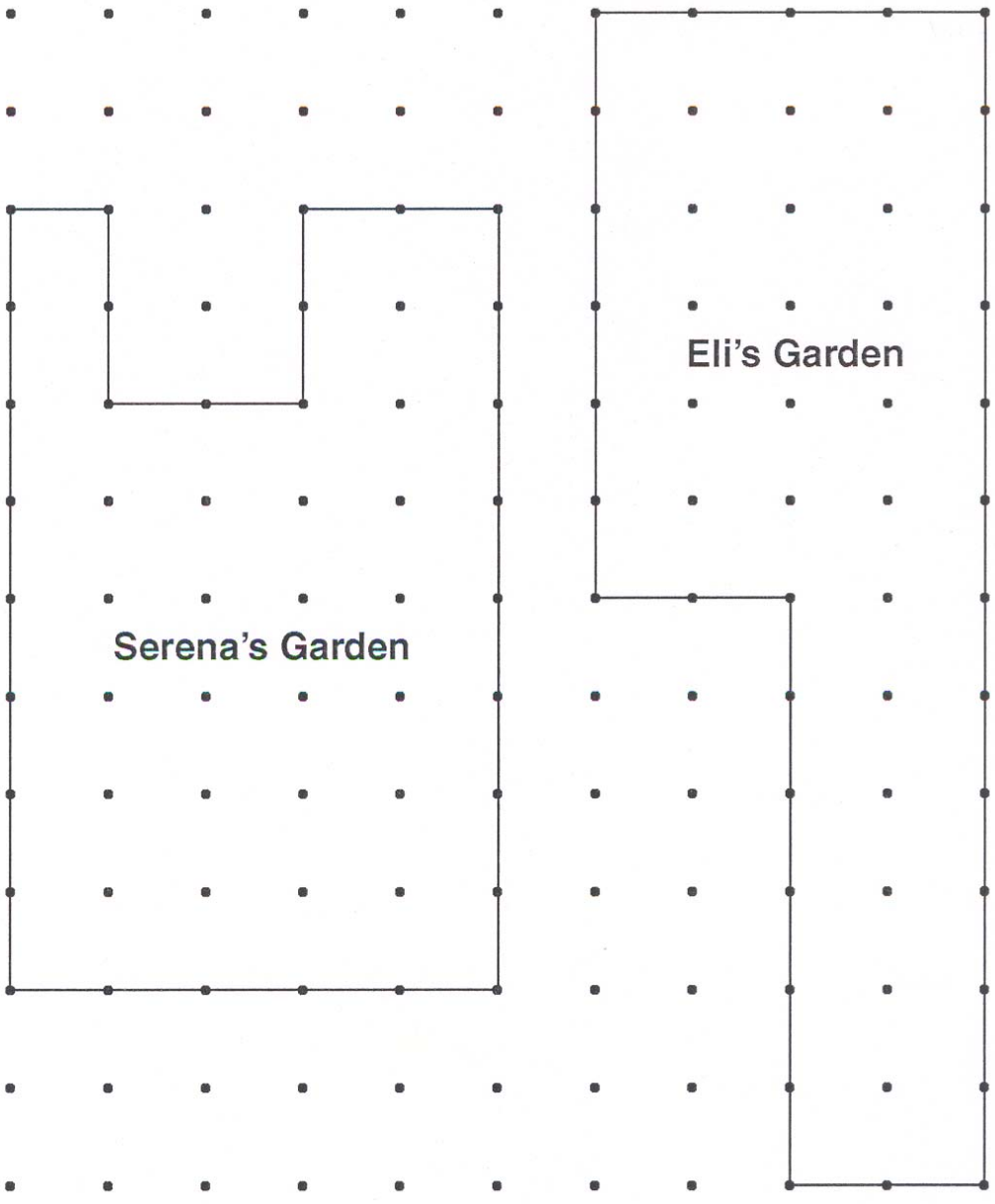
How do you know?

A 2 BY 18 RECTANGLE (OR 18 BY 2) HAS AN AREA OF 36 SQUARE UNITS.

ALSO A 1 BY 36 (OR 36 BY 1) HAS THE SAME AREA.

THERE ARE AN INFINITE NUMBER OF RECTANGLES WITH AREA 36 IF ONE ALLOWS DIMENSIONS THAT ARE NOT INTEGERS.

3. Eli and Serena each drew a plan for the garden that was not a rectangle. Look at their plans on the grid of unit squares below.



a. Eli says his garden will have an area of 36 square feet. Is he right or wrong?

Check one: [X] **Right** [ ] **Wrong**

How do you know?

IF YOU COVER THE AREA IN SQUARE GRID UNITS, THE SHAPE CONTAINS 36 SQUARES. IF 1 SQ. UNIT = 1 SQ. FOOT, THEN A GARDEN WITH THAT SHAPE IN FEET WILL HAVE AN AREA OF 36 SQ. FEET.

b. Serena says her garden will have an area of 36 square feet. Is she right or wrong?

Check one: [X] **Right** [ ] **Wrong**

How do you know?

IF YOU COVER THE AREA IN SQUARE GRID UNITS, THE SHAPE CONTAINS 36 SQUARES. IF 1 SQ UNIT = 1 SQ. FOOT, THEN A GARDEN WITH THAT SHAPE IN FEET WILL HAVE AN AREA OF 36 SQ. FEET.

c. Look at the plans again that Eli and Serena drew. Which garden needs more fence around it?

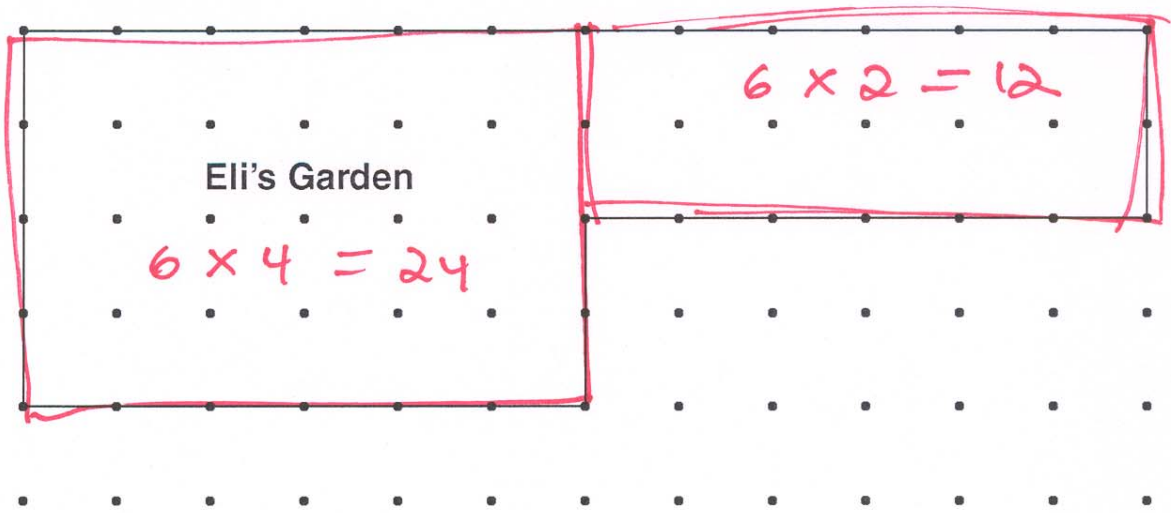
Check one: [X] **Eli** [ ] **Serena**

How can you tell?

THE DISTANCE AROUND ELI'S GARDEN IS 32 UNITS. SO IT WOULD TAKE 32 FEET OF FENCE TO PUT AROUND IT. SERENA'S GARDEN HAS A PERIMETER OF 30 UNITS & THE GARDEN ONLY NEEDS 30 FEET OF FENCING.

THE PERIMETER OF ELI'S GARDEN IS GREATER THAN THE PERIMETER OF SERENA'S GARDEN.

4. Look at Eli's garden again.



a. Some students say the shape can be broken into two small rectangles. Outline the two rectangles on the drawing.

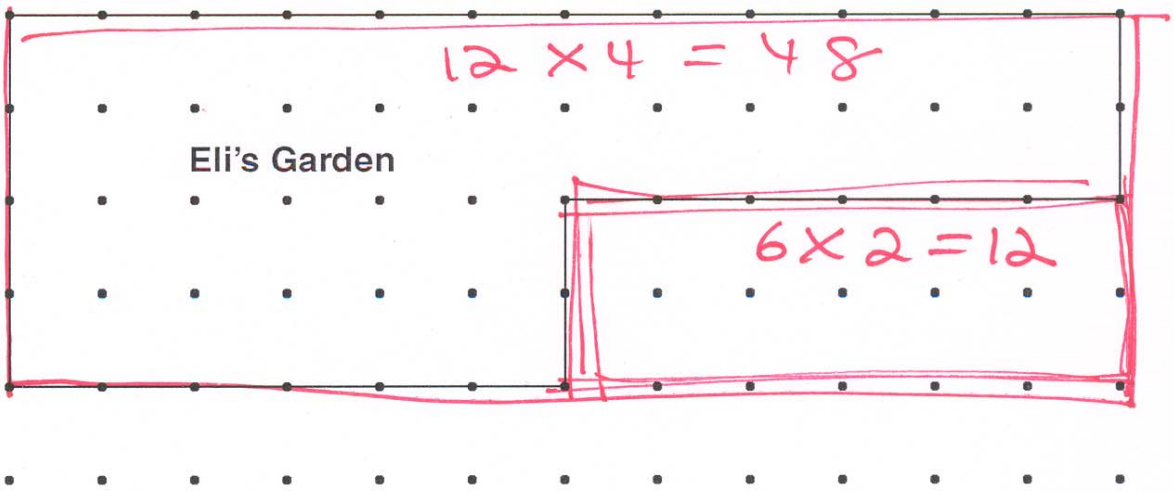
Write a number sentence that tells how to get the area of Eli's garden from the area of the two rectangles you outlined.

$24 + 12 = 36$

OR

$(6 \times 4) + (6 \times 2) = 36$

b. Look at Eli's garden one last time. Some students say the shape is one big rectangle with a smaller rectangle removed. Outline the two rectangles on the drawing below.



Write a number sentence that tells how to get the area of Eli's garden from the area of the two rectangles you outlined.

48 − 12 = 36

OR

(12 x 4) − (6 x 2) = 36

5. Mr. Garfield says they have 24 feet of fencing to use for the garden. Can the students make a garden that is 36 square feet and put 24 feet of fence around it?

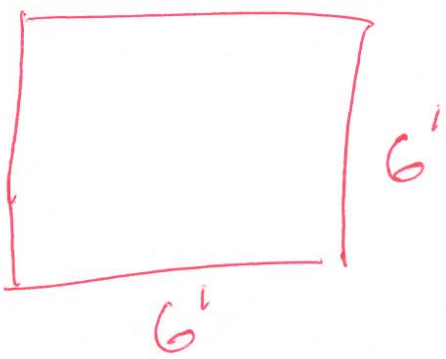
Check one: [X] **Yes** [ ] **No**

How do you know?

IF THE SHAPE OF THE GARDEN IS A SQUARE MEASURING 6 FEET BY 6 FEET, THE AREA WILL BE 36 SQUARE FEET AND THE PERIMETER WILL BE 24 FEET.

AREA 6 X 6 = 36

FENCE
6+6+6+6 =
24



CATEGORY	4	3	2	1
Mathematical concepts	**Response shows complete understanding of the mathematical concepts used to solve the problem(s).**	**Response shows substantial understanding of the mathematical concepts used to solve the problem(s).**	**Response shows some understanding of the mathematical concepts needed to solve the problem(s).**	**Response shows very limited understanding of the underlying concepts needed to solve the problem(s), OR the response is not written.**
	Response shows evidence in ALL of the following tasks. **Task 1**. Student draws a rectangle with an area of 36 square units, explains why the rectangle has an area of 36, and explains how to find its perimeter. **Task 2**. Student draws two different rectangles each with an area of 36. Rectangles with the same dimensions but different orientations are OK, and a square is OK. (Note: Although unlikely, if a student draws a rectangle with area 36 using fractional lengths, such as 8 by $4\frac{1}{2}$, the answer is correct.) Student finds the perimeter of the two rectangles in part (a). In part (b) student identifies the dimensions of at least 1 rectangle with an area of 36 that does not fit on the grid. **Task 3**. Student answers both shapes have an area of 36, but the perimeter of Eli's garden is greater than the perimeter of Serena's garden. **Task 4**. In part (a) student divides rectangle, as shown on answer sheet, and gives a correct equation. In part (b) student draws two rectangles, as shown on answer sheet, and gives a correct equation. **Task 5**. Student explains that a 6 by 6 square will meet the needed conditions.	Response shows evidence in only 4 of the tasks described in category 4.	Response shows evidence in only 3 of the tasks described in category 4.	Response shows evidence in only 2 or fewer of the tasks described in category 4.

SITES-M Mathematics Challenge

Grade 4–Focus on Measurement
Rubric

CATEGORY	4	3	2	1
Strategy and procedures	**Student typically uses an efficient and effective strategy to solve the problem(s).**	**Student typically uses an effective strategy to solve the problem(s).**	**Student sometimes uses an effective strategy to solve the problem(s), but not consistently.**	**Student rarely uses an effective strategy to solve the problem(s).**
	Response shows evidence in ALL of the following tasks. **Task 1**. Student shows evidence of finding an area of 36 by counting squares, by multiplying length by width, or by another method. Student shows evidence of finding a perimeter by counting segments around the rectangle or by adding the lengths of sides. **Task 2**. Student shows evidence of trying different sizes to obtain an area of 36. Student shows evidence of finding the perimeter of the rectangles. **Task 3**. Student shows evidence of finding the areas of the two shapes by counting squares or by another method. Student shows evidence of finding perimeters of the two shapes by counting around the edges or by another method. **Task 4**. Student shows evidence of finding the area of two rectangles in part (a) and in part (b). **Task 5**. Student shows evidence of exploring different dimensions of rectangles to obtain desired area and perimeter.	Response shows evidence in only 4 of the tasks described in category 4.	Response shows evidence in only 3 of the tasks described in category 4.	Response shows evidence in 2 or fewer of the tasks described in category 4.

SITES-M Mathematics Challenge

Grade 4–Focus on Measurement
Rubric

CATEGORY	4	3	2	1
Explanation and communication	**Explanation is detailed and clear; uses appropriate terminology and/or notation.**	**Explanation is clear; uses some appropriate terminology and/or notation.**	**Explanation is a little difficult to understand, but includes critical components; shows little use of appropriate terminology and/or notation.**	**Explanation is difficult to understand, is missing several components, and does not use or include appropriate terminology and/or notation.**
	Response shows evidence in ALL parts of the following tasks for a total of 4 explanations. **Task 1**. Student explains why the rectangle is 36 square units and explains why the garden will have the appropriate perimeter. A high-level response will mention the scaling of 1 unit to 1 foot. **Task 2**. Student identifies at least one rectangle with dimensions giving an area of 36 that will not fit on the grid and explains why it will not fit. **Task 3**. Student explains why both Eli and Serena have gardens each with an area of 36. Student explains that the perimeter of Eli's garden is greater than the perimeter of Serena's garden, thus requiring more fence. **Task 5**. Student explains that a square measuring 6 feet by 6 feet will meet the necessary conditions.	Response shows evidence in only 3 explanations described in category 4.	Response shows evidence in only 2 explanations described in category 4.	Response shows evidence in only 1 or none of the explanations described in category 4.

Grade 4–Focus on Measurement
Rubric

CATEGORY	4	3	2	1
Mathematical accuracy	**All or almost all of the steps and solutions have no mathematical errors.**	**Most of the steps and solutions have no mathematical errors.**	**Some of the steps and solutions have no mathematical errors.**	**Few of the steps and solutions have no mathematical errors.**
	Student provides correct answers for ALL of the following tasks. **Task 1**. Student draws a rectangle with an area of 36 and finds its perimeter. **Task 2**. Student draws two more rectangles each with an area of 36 and finds each perimeter. Student answers yes in part (b). **Task 3**. Student answers right in part (a), right in part (b), and Eli in part (c). **Task 4**. In part (a) student divides the shape, as shown on answer sheet. Student writes an addition equation using the appropriate areas. In part (b) student outlines two rectangles, as shown on answer sheet. Student writes a subtraction equation using the appropriate areas. **Task 5**. Student answer yes and identifies a square measuring 6 by 6.	Student provides correct answers for only 4 of the tasks described in category 4.	Student provides correct answers for only 3 of the tasks described in category 4.	Student provides correct answers for 2 or fewer of the tasks described in category 4.

Scoring notes checklist

Task	Check Yes	Category
Task 1		
Student draws a rectangle with an area of 36 square units, explains why the rectangle has an area of 36, and explains how to find its perimeter.		Concept
Student shows evidence of finding an area of 36 by counting squares, by multiplying length by width, or by another method. Student shows evidence of finding a perimeter by counting segments around the rectangle or by adding the lengths of sides.		Strategy
Student explains why the rectangle is 36 square units and explains why the garden will have the appropriate perimeter. A high-level response will mention the scaling of 1 unit to 1 foot.		Explanation
Student draws a rectangle with an area of 36 and finds its perimeter.		Accuracy
Task 2		
Student draws two different rectangles each with an area of 36. Rectangles with the same dimensions but different orientations are OK, and a square is OK. (Note: Although unlikely, if a student draws a rectangle with area 36 using fractional lengths, such as 8 by $4\frac{1}{2}$, the answer is correct.) Student finds the perimeter of the two rectangles in part (a). In part (b) student identifies the dimensions of at least 1 rectangle with an area of 36 that does not fit on the grid.		Concept
Student shows evidence of trying different sizes to obtain an area of 36. Student shows evidence of finding the perimeter of the rectangles.		Strategy
Student identifies at least one rectangle with dimensions giving an area of 36 that will <u>not</u> fit on the grid and explains why it will not fit.		Explanation
Student draws two more rectangles each with an area of 36 and finds each perimeter. Student answers yes in part (b).		Accuracy
Task 3		
Student answers both shapes have an area of 36, but the perimeter of Eli's garden is greater than the perimeter of Serena's garden.		Concept
Student shows evidence of finding the areas of the two shapes by counting squares or by another method. Student shows evidence of finding perimeters of the two shapes by counting around the edges or by another method.		Strategy
Student explains why both Eli and Serena have gardens each with an area of 36. Student explains that the perimeter of Eli's garden is greater than the perimeter of Serena's garden, thus requiring more fence.		Explanation
Student answers right in part (a), right in part (b), and Eli in part (c).		Accuracy

Task 4		
In part (a) student divides rectangle, as shown on answer sheet, and gives a correct equation. In part (b) student draws two rectangles, as shown on answer sheet, and gives a correct equation.		Concept
Student shows evidence of finding the area of two rectangles in part (a) and in part (b).		Strategy
In part (a) student divides the shape, as shown on answer sheet. Student writes an addition equation using the appropriate areas. In part (b) student outlines two rectangles, as shown on answer sheet. Student writes a subtraction equation using the appropriate areas.		Accuracy
Task 5		
Student explains that a 6 by 6 square will meet the needed conditions.		Concept
Student shows evidence of exploring different dimensions of rectangles to obtain desired area and perimeter.		Strategy
Student explains that a square measuring 6 feet by 6 feet will meet the necessary conditions.		Explanation
Student answer yes and identifies a square measuring 6 by 6.		Accuracy

SITES-M Mathematics Challenge

Grade 4–Focus on Measurement

Analyzing Student Responses Protocol

The purpose of the Mathematics Challenges is to provide opportunities for students to develop and demonstrate understanding of important mathematical concepts and standards. They include extended responses, open-ended tasks, and tasks that require higher-order thinking skills. Because these types of tasks may be novel for students and they will have varying levels of understanding, the student responses will vary.

The guiding questions below were designed to assist you in analyzing your class' response to the Challenge and determining appropriate next steps for your teaching and learning. Responses to these questions are for your reflection and documentation and will not be collected.

Guiding Questions for Analyzing Student Responses to the Mathematics Challenges

1. When completing the Challenge, what did your students do well? How do you know?

2. When completing the Challenge, what did your students struggle with? How do you know?

3. When your students completed the Challenge, did they implement multiple correct solutions strategies? What insightful approaches to problem solving did you observe?

4. What, if any, patterns (e.g., common errors/misconceptions) did you observe across your student responses?

5. What questions or concerns did your students have when working through this Challenge or a particular task? Are these things you should address for the class as a whole?

6. What, if any, feedback did you provide to your class? How did you provide it?

7. What did you learn about your students' mathematical understanding based on their responses to this Challenge?

Reminders:

1) After you have completed the Challenge with your class and responded to these Guiding Questions for Analyzing Student Responses, please complete the Challenge Feedback Log. A link to this Log is e-mailed to you each month. Responses will be used to improve the Challenges and to provide recommendations for teachers implementing the Challenges in future years.

2) Please provide copies of all student work to the Assessment Coordinator.