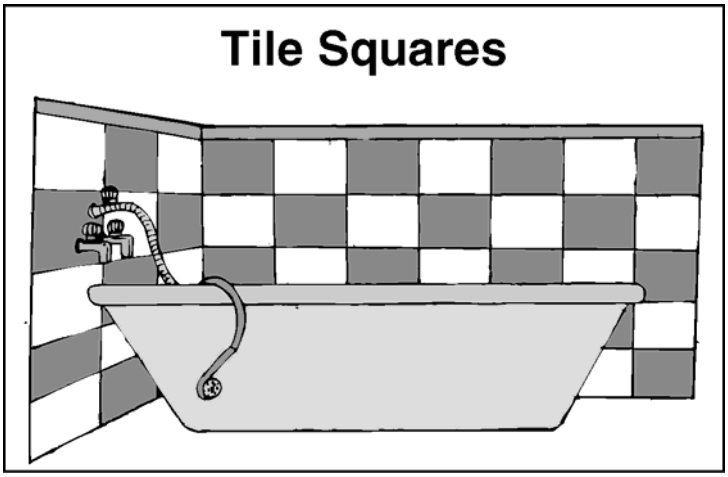
SITES-M Mathematics Challenge



Level: Grade Three

Standard: Geometry and Measurement

Learning Target: Focus on Measurement

Checks for Understanding

0306.4.12 Make and record measurements that use mixed units within the same system of measurement.

State Performance Indicators

SPI 0306.4.4 Calculate the perimeter of shapes made from polygons.
SPI 0306.4.6 Measure length to the nearest centimeter or half inch.

SITES-M Mathematics Challenge

Grade 3–Focus on Measurement

Tile Squares

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 3–Focus on Measurement
Tile Squares
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.

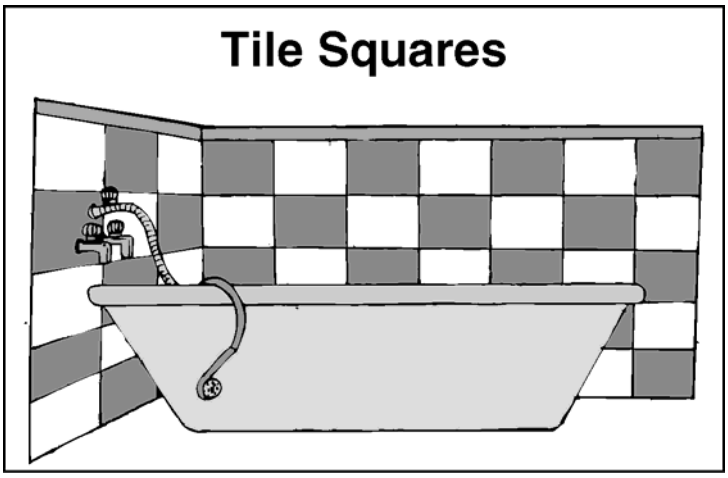
Guiding Questions for Implementing the Mathematics Challenges

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 3–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:

- ✓ Measure length to the nearest centimeter or half inch;
- ✓ Calculate the perimeter of shapes made from polygons;
- ✓ Make and record measurements that use mixed units within the same system of measurement.

Task Preparation:
Each student will need copies of the Student Response Sheet, a copy of the Tile Sheet and the 4 Small Tile Grid sheets at the end of the challenge, a pencil, and a ruler (inches).

Stimulus Cards (Drawing or Word Description):
Each student should have a copy of the Tile Sheet and the 4 Small Tile Grid sheets at the end of the challenge.

Manipulatives/Supplies:
Copies of the Student Response Sheet, a copy of the Tile Sheet, and a copy of the 4 Small Tile Grid sheets
Pencils
Rulers (inches)

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: **Look at the Tile Sheet. Use your ruler to measure the length of one side of a small square tile to the nearest inch. The length of one side of a small tile is (TEACHER NOTE:** Students should write their correct answer on the line.**) Now use your ruler to measure the length of one side of a medium square tile to the nearest half inch. (TEACHER NOTE:** Students should write their correct answer on the line.**) Cut out the small and medium square tiles. You can use them to help answer the questions. (TEACHER NOTE:** Have students cut out both the small and medium squares or cut them out ahead of time.**)**

2. **The picture below shows 2 small tiles horizontally side by side. They make a rectangle. What is the length of the longer side of the rectangle? (TEACHER NOTE:** Students should write their correct answer on the line.**) Put 8 small tiles horizontally side by side to make one long rectangle. What is the length of the longer side of the rectangle? (TEACHER NOTE:** Students should write their correct answer on the line.**) If you put 15 small tiles horizontally side by side to make a very long rectangle, what will be the length of the longer side of the rectangle? Give your answer in feet and inches. (TEACHER NOTE:** Students should write their correct answer on the line.**) Show below how you would get the total distance around the edge of the rectangle that is 15 small tiles long. (TEACHER NOTE:** Students should write their explanation in the box.**) The total distance around the rectangle is (TEACHER NOTE:** Students should write their correct answer on the line.**)**

3. **Put 2 medium tiles side by side to make a rectangle. What is the length of the longer side? (TEACHER NOTE:** Students should write their correct answer on the line.**) If you put 15 medium tiles horizontally side by side to make a very long rectangle, what will be the length of the longer side of the rectangle? Show how you get your answer. (TEACHER NOTE:** Students should write their explanation in the box.**) The length of longer side is (TEACHER NOTE:** Students should write their correct answer on the line.**) Show how you would get the total distance around the edge of the rectangle that is 15 medium tiles long. (TEACHER NOTE:** Students should write their explanation in the box.**) The total distance around the rectangle is (TEACHER NOTE:** Students should write their correct answer on the line.**) If you stacked the 15 medium tiles vertically top to bottom, would the total distance around the rectangle be more, less, or the same? (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 the three shapes A, B, and C on Small Tile grid. Each shape is made from 8 small tiles. Find the perimeter of each shape in feet and inches. The perimeter of shape A is (TEACHER NOTE:** Students should write their correct answer on the line.**) The perimeter of shape B is (TEACHER NOTE:** Students should write their correct answer on the line.**) The perimeter of shape C is (TEACHER NOTE:** Students should write their correct answer on the line.**)**

5. **Use the blank Small Tile Grids to draw the following shapes: Draw a shape on the tile grid that is different from shape A but has the same perimeter as shape A. Label it X. (TEACHER NOTE:** Students should draw the correct figure on one of the Small Tile Grids.**) Draw a shape on the tile grid that is different from shape B but has the same perimeter as shape B. Label it Y. (TEACHER NOTE:** Students should draw the correct figure on one of the Small Tile Grids.**) Draw a shape on the tile grid that is different from shape C but has the same perimeter as shape C. Label it Z. (TEACHER NOTE:** Students should draw the correct figure on one of the Small Tile Grids.**)**

SITES-M Mathematics Challenge

Grade 3–Focus on Measurement

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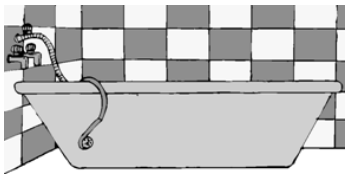
SITES-M Mathematics Challenge

Grade 3–Focus on Measurement

Student Response Sheet



Tile Squares

Name: _____ **Date:** _____

1. **Look at the Tile Sheet. Use your ruler to measure the length of one side of a <u>small</u> square tile to the nearest inch.**

   The length of one side of a small tile is

   _____ **inch(es).**

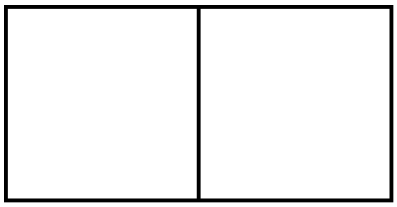
   Now use your ruler to measure the length of one side of a <u>medium</u> square tile to the nearest <u>half</u> inch.

   The length of one side of a medium tile is

   _____ **inch(es).**

   Cut out the small and medium square tiles. You can use them to help answer the questions.

2. The picture below shows 2 small tiles horizontally side by side. They make a rectangle.



What is the length of the longer side of the rectangle?

_____ **inch(es)**

a. Put 8 small tiles horizontally side by side to make one long rectangle. What is the length of the longer side of the rectangle?

_____ **inch(es)**

b. If you put 15 small tiles horizontally side by side to make a very long rectangle, what will be the length of the longer side of the rectangle? Give your answer in feet and inches.

_____foot _____ inches

Show below how you would get the total distance around the edge of the rectangle that is 15 small tiles long.

The total distance around the rectangle is

_____feet _____ inches.

3. Put 2 <u>medium</u> tiles side by side to make a rectangle. What is the length of the longer side?

_____ inches

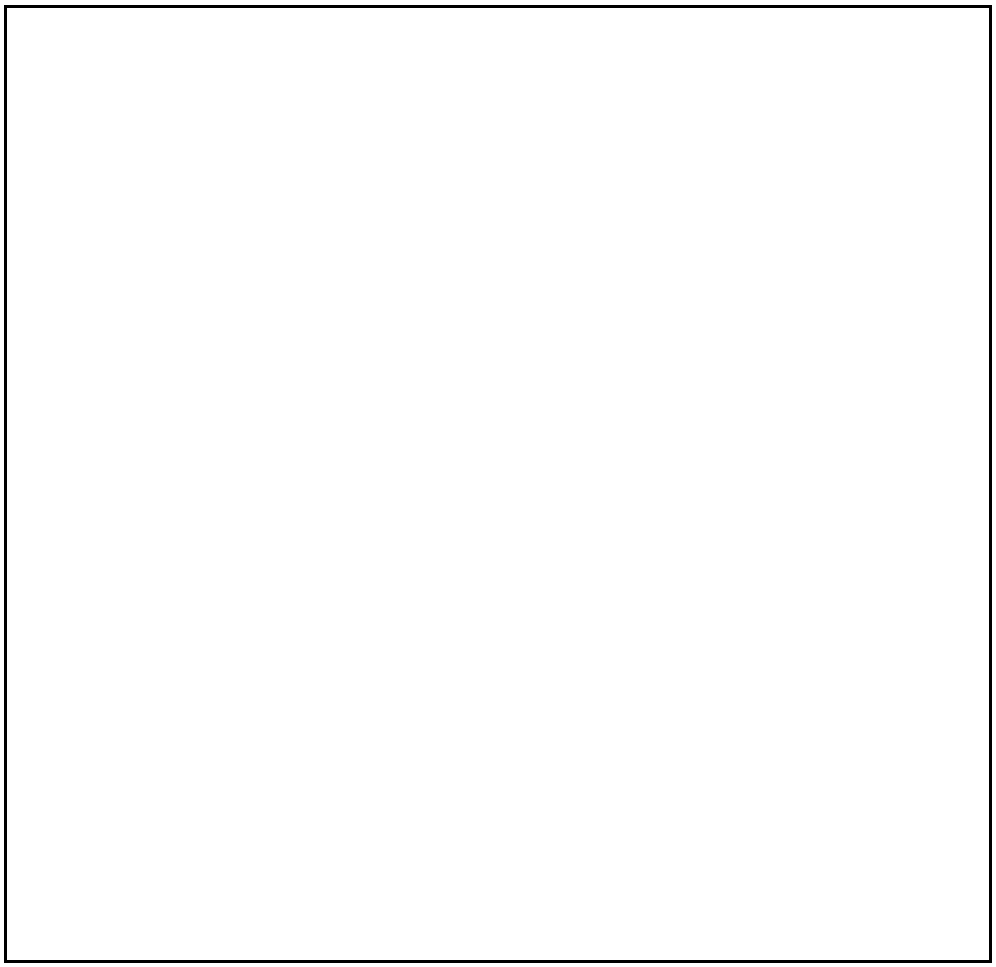
a. If you put 15 medium tiles horizontally side by side to make a very long rectangle, what will be the length of the longer side of the rectangle?

Show how you get your answer.

The length of longer side is

_____foot _____inches.

b. Show how you would get the total distance around the edge of the rectangle that is 15 medium tiles long.



The total distance around the rectangle is

_____feet _____ inches.

c. If you stacked the 15 medium tiles vertically top to bottom, would the total distance around the rectangle be more, less, or the same?

Check one:

- ☐ **More**
- ☐ **Less**
- ☐ **Same**

How do you know?

4. Look at the three shapes A, B, and C on Small Tile grid. Each shape is made from 8 small tiles. Find the perimeter of each shape in feet and inches.

The perimeter of shape A is

_____ foot _____inches.

The perimeter of shape B is

_____ foot _____inches.

The perimeter of shape C is

_____ foot _____inches.

5. Use the blank Small Tile Grids to draw the following shapes

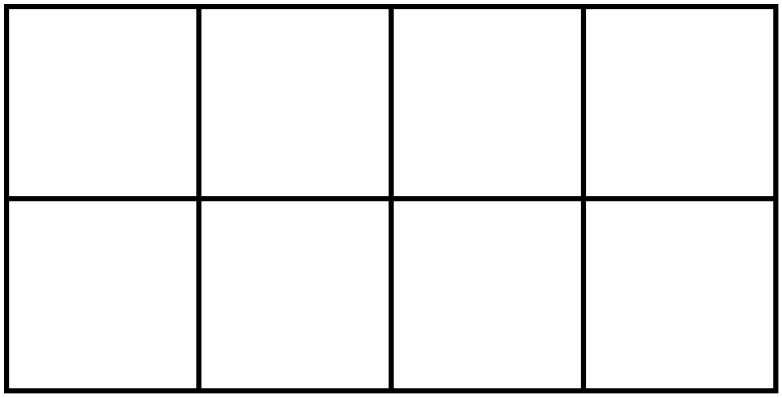
a. Draw a shape on the tile grid that is different from shape A but has the same perimeter as shape A. Label it X.

b. Draw a shape on the tile grid that is different from shape B but has the same perimeter as shape B. Label it Y.

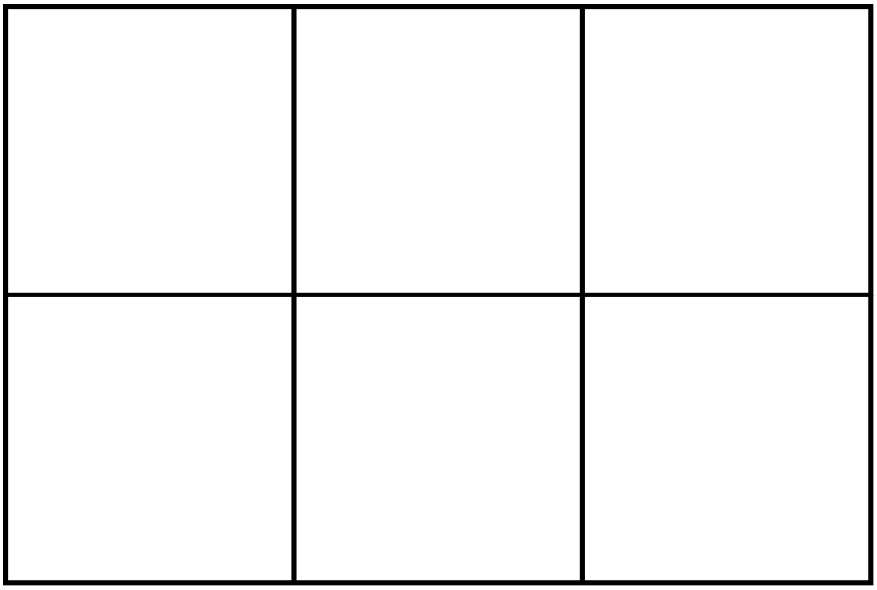
c. Draw a shape on the tile grid that is different from shape C but has the same perimeter as shape C. Label it Z.

Tile Sheet

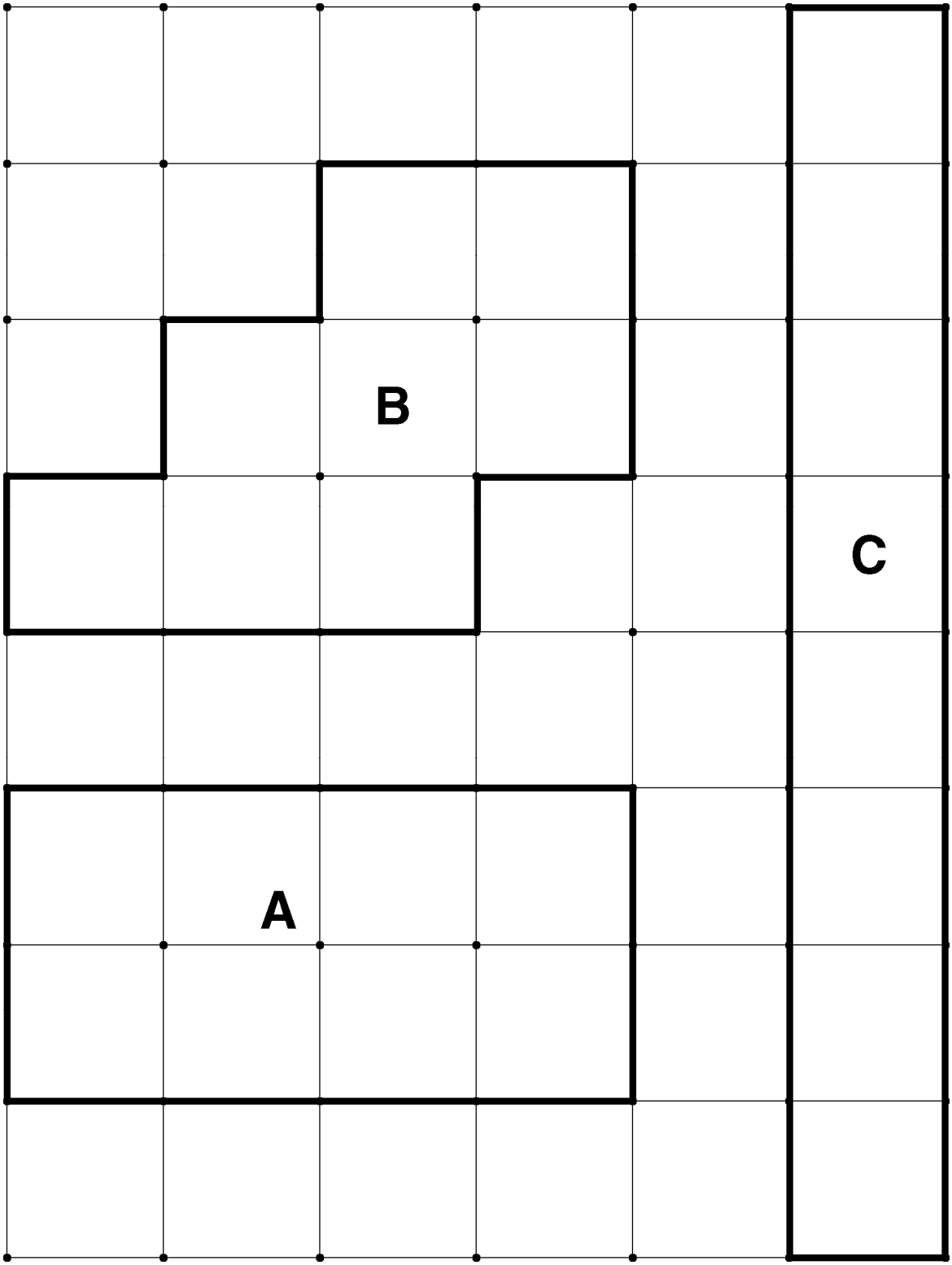
Small Tiles



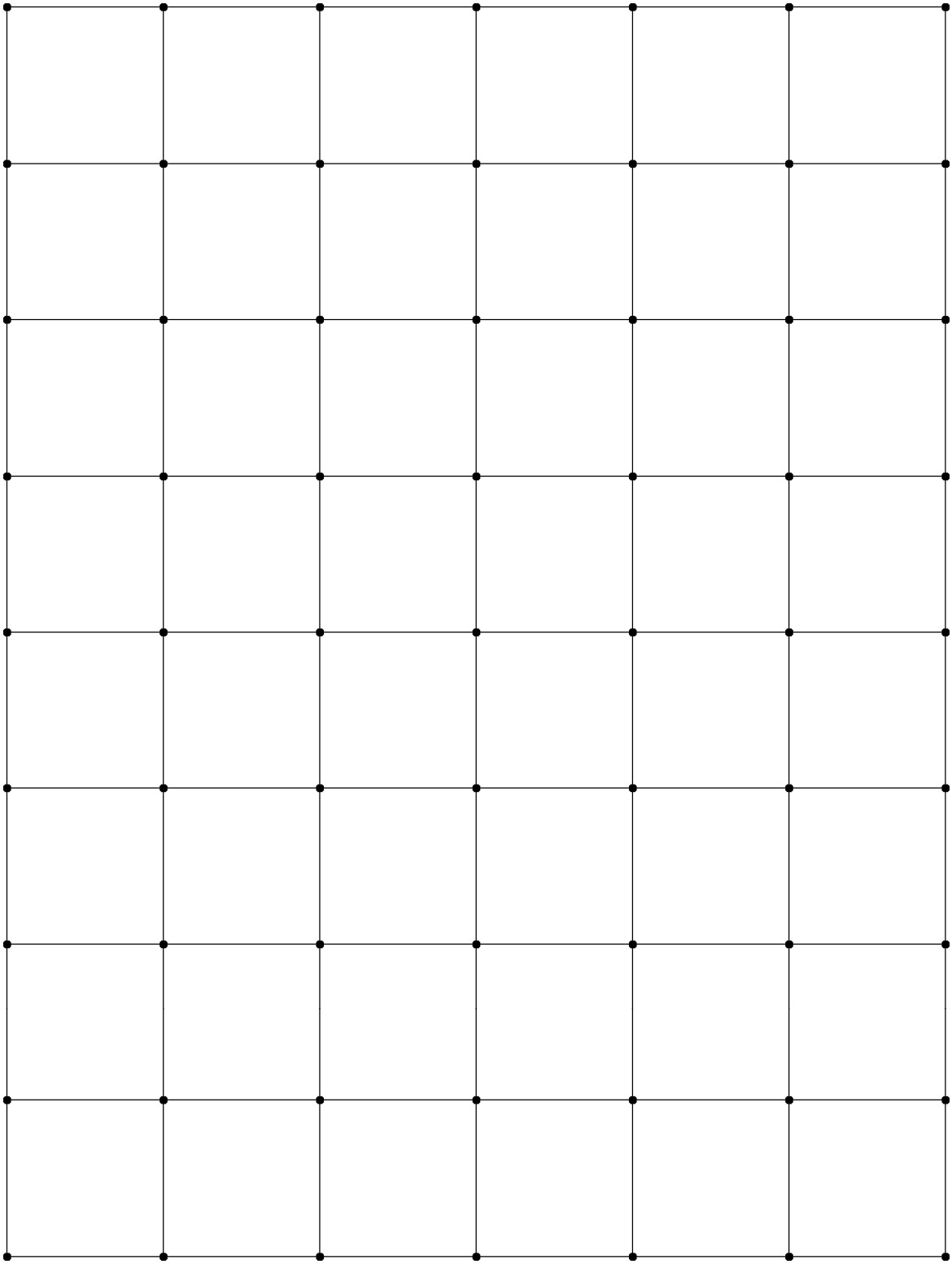
Medium Tiles



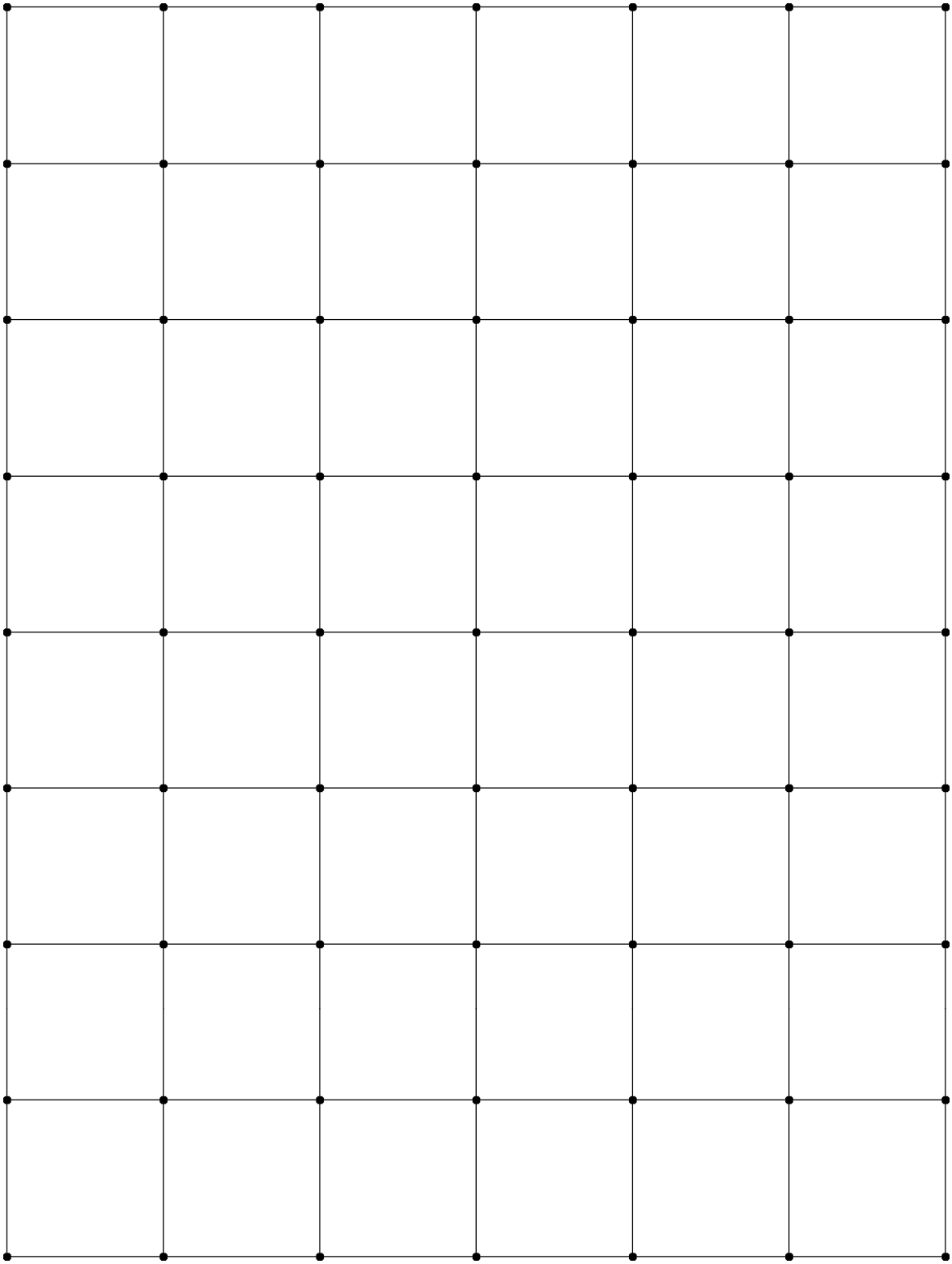
Small Tile Grid



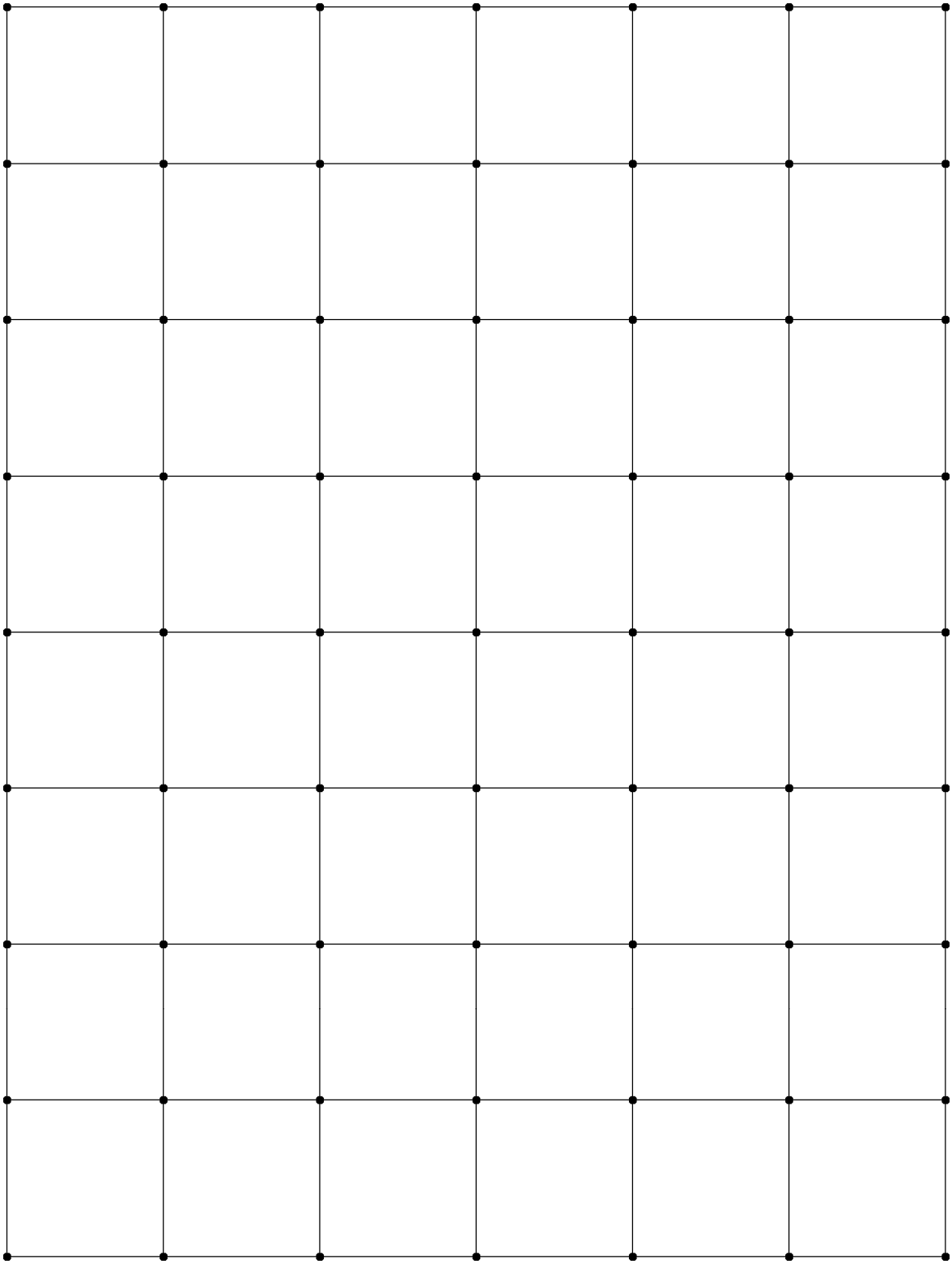
Small Tile Grid (blank)



Small Tile Grid (blank)



Small Tile Grid (blank)



Learning and Teaching Considerations

Task 1:

A) Be sure that students understand that measurement is a number that indicates a comparison between the attribute of the object (or situation or event) being measured and the same attribute of a given unit of measure. Lengths are compared to units of length in this Challenge.

B) Be sure that students understand that to measure means that the attribute being measured is filled or covered or matched with a unit of measure with the same attribute. In this Challenge the attribute is length.

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.

E) Be sure that students have opportunities to become familiar with the unit of measure for the task in a hands-on way. Meaningful measurement and estimation of measurements depend on a personal familiarity with the unit of measure being used.

F) Be sure that students understand that inches are standard units. Teachers can encourage students to explore different rulers and discuss why inches are the same everywhere. Students may explain that the length of an inch was the same on every ruler they explored. Students may explain that people have agreed how long an inch is.

Task 2:

A) Ideally, students should conceptually understand the task and do more than procedurally perform the task. Therefore, be sure that they are given opportunities to discuss the concept of measuring as a process of comparing attributes as well as using measuring units and measuring instruments.

B) Be sure that students are given opportunities to develop relationships between units (e.g., the number of inches in a foot).

C) Students may multiply the measurement of one side of a tile by 2, 8, and 15 or add 1 to itself 2, 8, and 15 times to find the length of the longest side of each rectangle.

D) Students may add the four measurements in inches (to find the perimeter) then divide by 12 to convert to feet and inches.

E) Students may add two sides in feet and inches to the other two sides in inches first, and then convert the extra inches to feet.

F) Students may multiply the length of a side by 2 plus the length of another side by 2.

G) Students may have the misconception that they should count the first line at the end of their inch ruler when finding the total number of inches (which would give them an answer of one extra inch). They may not realize that each inch is the distance from one point to another.

Task 3:

A) Students might know that $1\frac{1}{2}$ plus $1\frac{1}{2}$ equals 3 and work with groups of 3.

B) Students might multiply 15 by 1.5 by using the standard algorithm or by using invented strategies. For example, they might say that 10 times 1.5 equals 15, leaving them with 5 units of 1.5 inches each. Adding 2 of those units together gives 3 inches, adding another 2 units together gives another 3 inches, and the remaining unit is 1.5 inches. All of that is equivalent to saying 16 + 6 + 1.5 = 22.5. To convert 22.5 inches, students might subtract 12 from 22.5 to get 10.5. The result is that 22.5 inches converts to 1 foot and 10.5 inches.

C) To find the perimeter, students might double the length and width then find the sum. For example, 1.5 + 1.5 = 3 and 22.5 + 22.5 = 45, which is 3 feet and 9 inches; adding 3 inches to 3 feet 9 inches gives 3 feet 12 inches, or 4 feet.

D) To find the perimeter, students might add the length to the width and then multiply the answer by 2. For example, 1.5 + 22.5 = 24 inches or 2 feet, and 2 times 2 feet = 4 feet.

E) To find the perimeter, students might add the 4 sides to each other, working with decimals or with fractions.

F) Students may have the misconception that they should multiply the length by the width, which indicates confusion between area and perimeter.

G) Students may have the misconception that if the rectangle is rotated, the perimeter changes.

Task 4:

A) Be sure that students understand that perimeter is the distance around a region.

B) Be sure that students count the length of each side of the polygon before converting to feet and inches.

C) Students may have the misconception that they should count the first line at the end of their inch ruler when finding the total number of inches (which would give them an answer of one extra inch). They may not realize that each inch is the distance from one point to another.

Task 5:

A) Be sure that students know that both area and perimeter involve regions to be measured.

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

C) Students may explore rectangles with a fixed perimeter and notice that as the rectangle approaches a square shape, the area (or number of squares inside) increases.

Student Response Sheet

Tile Squares

Name: ANSWER KEY Date: _____

1. Look at the Tile Sheet. Use your ruler to measure the length of one side of a small square tile to the nearest inch.

NOTE: TILE SHEET SHOULD BE PRINTED TO SCALE TO OBTAIN CORRECT MEASUREMENTS. IF SCALING IS OFF, ADJUST ANSWERS ACCORDINGLY.

The length of one side of a small tile is

1 _____ inch(es).

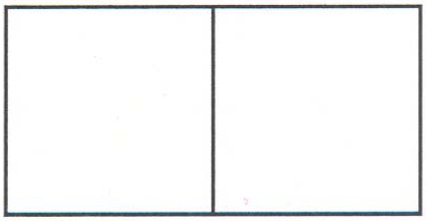
Now use your ruler to measure the length of one side of a medium square tile to the nearest half inch.

The length of one side of a medium tile is

$1\frac{1}{2}$ _____ inch(es).

Cut out the small and medium square tiles. You can use them to help answer the questions.

2. The picture below shows 2 small tiles horizontally side by side. They make a rectangle.



What is the length of the longer side of the rectangle?

2 _____ inch(es)

a. Put 8 small tiles horizontally side by side to make one long rectangle. What is the length of the longer side of the rectangle?

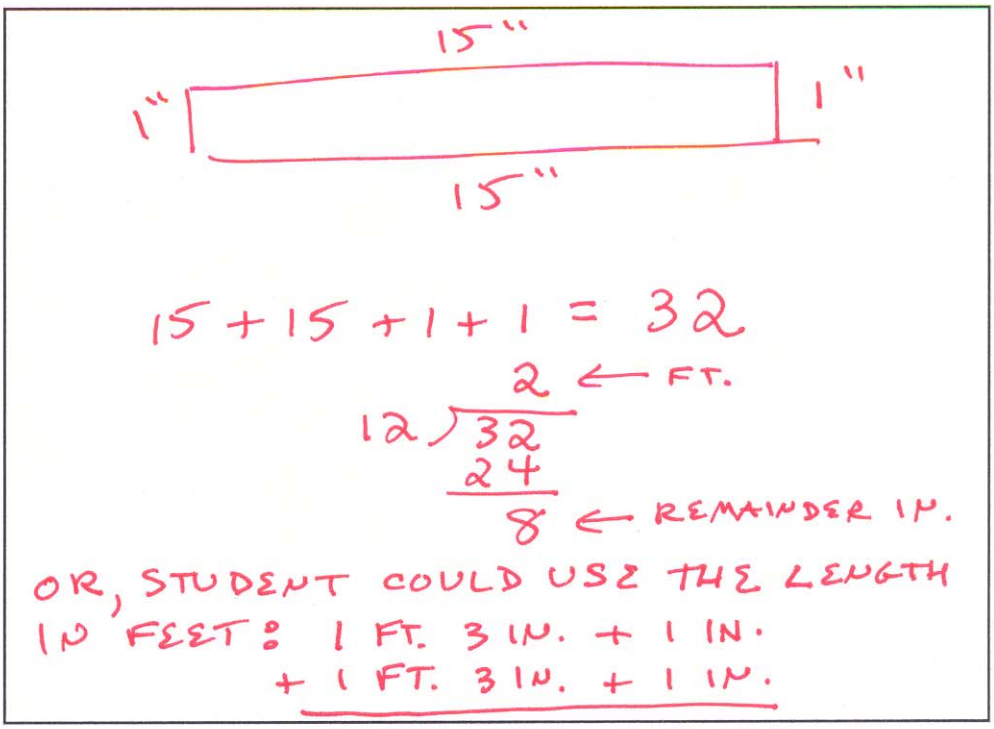
8 _____ inch(es)

b. If you put 15 small tiles horizontally side by side to make a very long rectangle, what will be the length of the longer side of the rectangle? Give your answer in feet and inches.

12 + 3

1 foot 3 inches

Show below how you would get the total distance around the edge of the rectangle that is 15 small tiles long.



The total distance around the rectangle is

2 feet 8 inches.

3. Put 2 medium tiles side by side to make a rectangle. What is the length of the longer side?

3 _____ inches

a. If you put 15 medium tiles horizontally side by side to make a very long rectangle, what will be the length of the longer side of the rectangle?

Show how you get your answer.

THERE ARE MANY WAYS TO DO THIS.
ONE POSSIBILITY: 15 TILES OF 1 $\frac{1}{2}$ IN.

$1 + \frac{1}{2}$

15 OF THIS GIVES 15 IN. OR 1 FT. 3 IN.

15 OF THIS GIVES 7 $\frac{1}{2}$ IN.

1 FT. 3 IN. + 7 $\frac{1}{2}$ IN.
= 1 FT. 10 $\frac{1}{2}$ IN.

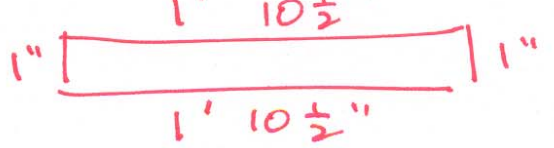
ANOTHER WAY: 2 TILES IS 3 IN., SO 4 TILES IS 6 IN, ETC. 14 TILES GIVES 21 INCHES OR 1 FT. 9 IN. ADD 1 MORE TILE & YOU GET 1 FT 10 $\frac{1}{2}$ INCHES.

The length of longer side is

1 foot 10 $\frac{1}{2}$ inches.

b. Show how you would get the total distance around the edge of the rectangle that is 15 medium tiles long.

AGAIN, MANY WAYS TO DO THIS.
USING THE ANSWER FROM PART (a):



1 FT 10½ IN + 1 IN
+ 1 FT 10½ IN + 1 IN

2 FT. 20 IN + 2 IN.

12 IN 8 IN

2FT + 1FT + 8 IN + 2 in.

The total distance around the rectangle is

3 **feet** 10 **inches.**

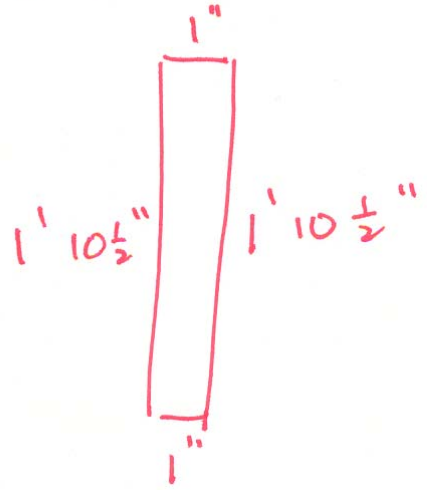
c. If you stacked the 15 medium tiles vertically top to bottom, would the total distance around the rectangle be more, less, or the same?

Check one:

- ☐ More
- ☐ Less
- ☒ Same

How do you know?

THE SHAPE REMAINS THE SAME EVEN IF THE POSITION HAS CHANGED.



THE SAME NUMBERS ARE ADDED AS IN PART (b).

4. Look at the three shapes A, B, and C on Small Tile grid. Each shape is made from 8 small tiles. Find the perimeter of each shape in feet and inches.

The perimeter of shape A is

1 foot 0 inches.

(12 INCHES)

The perimeter of shape B is

1 foot 2 inches.

(14 INCHES)

The perimeter of shape C is

1 foot 6 inches.

(18 INCHES)

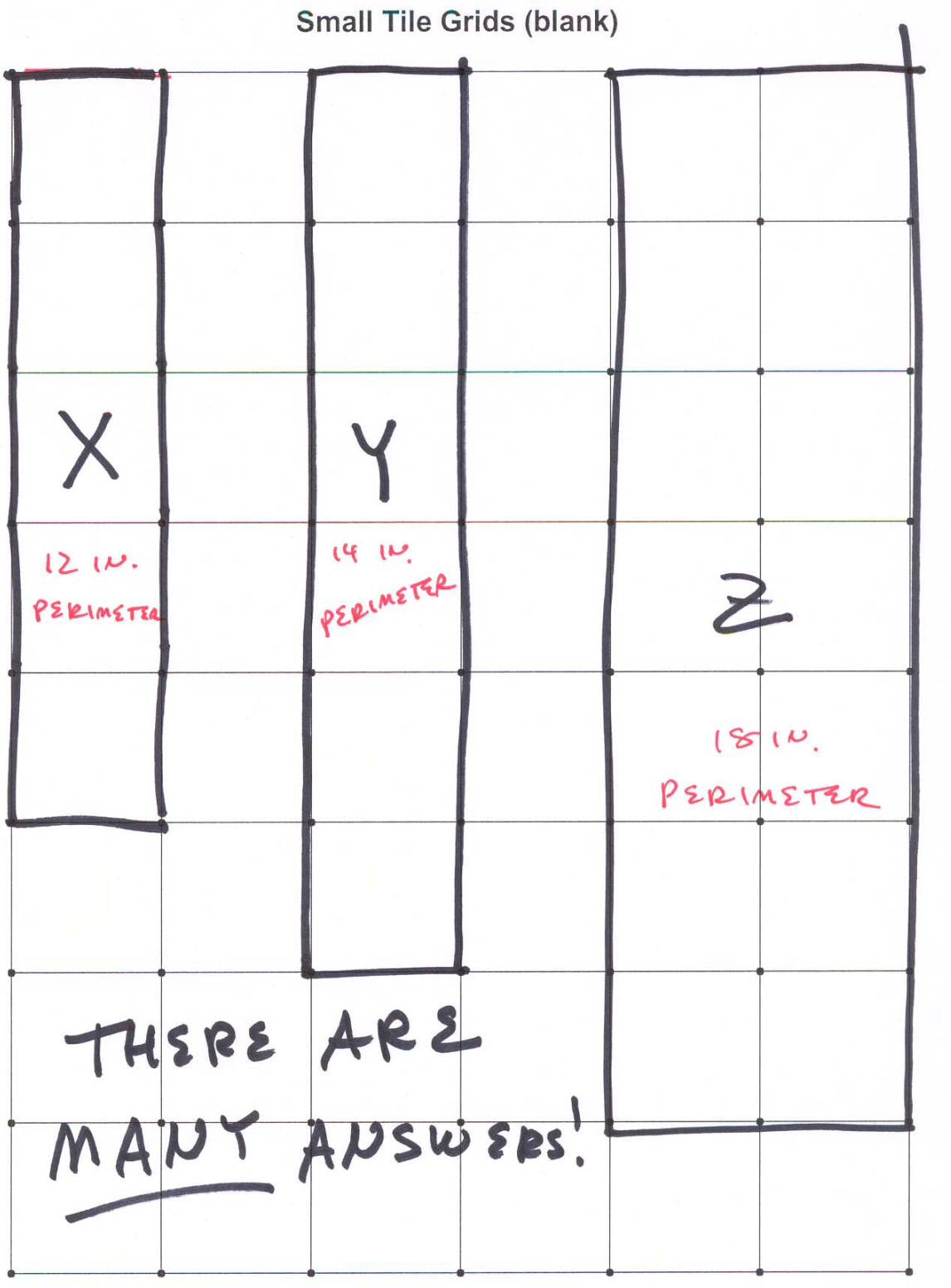
5. Use the blank Small Tile Grids to draw the following shapes

   a. Draw a shape on the tile grid that is different from shape A but has the same perimeter as shape A. Label it X.

   b. Draw a shape on the tile grid that is different from shape B but has the same perimeter as shape B. Label it Y.

   c. Draw a shape on the tile grid that is different from shape C but has the same perimeter as shape C. Label it Z.

Small Tile Grids (blank)



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 answers that the small tile is 1 inch long and the medium tile is $1\frac{1}{2}$ inches long. (Note: Any answer equivalent to $1\frac{1}{2}$ is fine.) **Task 2**. Student answers that the rectangle is 2 inches long. Student answers 8 in part (a). In part (b) student can convert 15 inches to 1 foot 3 inches and can explain how to find the perimeter of the rectangle. Student shows evidence of working either with inches alone or with feet and inches to find the perimeter of 2 feet 8 inches. **Task 3**. Student answers that the rectangle is 3 inches long. In part (a) student answers 1 foot $10\frac{1}{2}$ inches and can show how he or she found the answer. In part (b) student shows evidence of working either with inches alone or with feet and inches to find the perimeter of 3 feet 10 inches. In part (c) student answers same and provides explanation. **Task 4**. Student answers, as shown on answer sheet. **Task 5**. Student draws 3 shapes with correct perimeters.	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 3–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**. Teacher should indicate on response sheet if student is using a ruler correctly. **Task 2**. In part (b) student shows evidence of adding four sides of the rectangle. Evidence may include the addition of four sides (in inches) with the answer converted to feet and inches, the addition of two sides (in feet and inches) plus the addition of another two sides (in inches), or a side multiplied by 2 plus another side multiplied by 2. **Task 3**. In part (a) student shows evidence of determining the length. This may include the addition of $1\frac{1}{2}$ to itself 15 times or the multiplication of $1\frac{1}{2}$ by 15. A proportional approach in which every 2 tiles yields 3 inches shows a higher level of reasoning. In part (b) student shows evidence of adding 4 sides of the rectangle either using inches alone or using feet and inches. In part (c) student shows evidence of drawing rectangle with same measurement as part (b) but with a different orientation. **Task 4**. Student may indicate somewhere on paper counting of squares and dividing final answer by 12 (or subtracting 12 from final answer) to obtain feet and inches. **Task 5**. Student shows evidence somewhere on grid sheet of counting distance around rectangles.	Response shows evidence in only 3 of the tasks described in category 4.	Response shows evidence in only 2 of the tasks described in category 4.	Response shows evidence in 1 or none of the tasks described in category 4.

Grade 3–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 2**. In part (b) student shows or explains that the lengths of the 4 sides of the rectangle need to be added. Student shows or explains converting inches to feet. Student accounts for the unit of measure in the computation. **Task 3**. In part (a) student explains how to find the length of the side. Explanation can include adding $1\frac{1}{2}$ to itself 15 times or adding 1 to itself 15 times and then adding $\frac{1}{2}$ to itself 15 times. A high-level explanation may use a proportional approach in which the length of 3 inches is doubled for every 2 tiles. In part (b) student uses the answer from part(a) in explaining how to find the perimeter. In part (c) student explains that the position (or orientation) of a shape will not change its perimeter.	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.

SITES-M Mathematics Challenge

Grade 3–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 answers 1 and $1\frac{1}{2}$, as shown on answer sheet. **Task 2**. Student answers 2, 8, 1 foot 3 inches, and 2 feet 8 inches, as shown on answer sheet. **Task 3**. Student answers 3, 1 foot $10\frac{1}{2}$ inches, and 3 feet 10 inches, as shown on answer sheet. Student answers same for part (c). **Task 4**. Student answers 1 foot, 1 foot 2 inches, and 1 foot 6 inches, as shown on answer sheet. **Task 5**. Student draws three shapes that are different from A, B, and C but have the correct perimeters.	Student provides correct answers in each of the tasks described in category 4. Student may have a single incorrect answer in each of tasks 3, 4, or 5.	Student provides correct answers for only 3 or 4 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 answers that the small tile is 1 inch long and the medium tile is $1\frac{1}{2}$ inches long. (Note: Any answer equivalent to $1\frac{1}{2}$ is fine.)		Concept
Teacher should indicate on response sheet if student is using a ruler correctly.		Strategy
Student answers 1 and $1\frac{1}{2}$, as shown on answer sheet.		Accuracy
Task 2		
Student answers that the rectangle is 2 inches long. Student answers 8 in part (a). In part (b) student can convert 15 inches to 1 foot 3 inches and can explain how to find the perimeter of the rectangle. Student shows evidence of working either with inches alone or with feet and inches to find the perimeter of 2 feet 8 inches.		Concept
In part (b) student shows evidence of adding four sides of the rectangle. Evidence may include the addition of four sides (in inches) with the answer converted to feet and inches, the addition of two sides (in feet and inches) plus the addition of another two sides (in inches), or a side multiplied by 2 plus another side multiplied by 2.		Strategy
In part (b) student shows or explains that the lengths of the 4 sides of the rectangle need to be added. Student shows or explains converting inches to feet. Student accounts for the unit of measure in the computation.		Explanation
Student answers 2, 8, 1 foot 3 inches, and 2 feet 8 inches, as shown on answer sheet.		Accuracy

Task 3		
Student answers that the rectangle is 3 inches long. In part (a) student answers 1 foot $10\frac{1}{2}$ inches and can show how he or she found the answer. In part (b) student shows evidence of working either with inches alone or with feet and inches to find the perimeter of 3 feet 10 inches. In part (c) student answers same and provides explanation.		Concept
In part (a) student shows evidence of determining the length. This may include the addition of $1\frac{1}{2}$ to itself 15 times or the multiplication of $1\frac{1}{2}$ by 15. A proportional approach in which every 2 tiles yields 3 inches shows a higher level of reasoning. In part (b) student shows evidence of adding 4 sides of the rectangle either using inches alone or using feet and inches. In part (c) student shows evidence of drawing rectangle with same measurement as part (b) but with a different orientation.		Strategy
In part (a) student explains how to find the length of the side. Explanation can include adding $1\frac{1}{2}$ to itself 15 times or adding 1 to itself 15 times and then adding $\frac{1}{2}$ to itself 15 times. A high-level explanation may use a proportional approach in which the length of 3 inches is doubled for every 2 tiles. In part (b) student uses the answer from part(a) in explaining how to find the perimeter. In part (c) student explains that the position (or orientation) of a shape will not change its perimeter.		Explanation
Student answers 3, 1 foot $10\frac{1}{2}$ inches, and 3 feet 10 inches, as shown on answer sheet. Student answers same for part (c).		Accuracy
Task 4		
Student answers, as shown on answer sheet.		Concept
Student may indicate somewhere on paper counting of squares and dividing final answer by 12 (or subtracting 12 from final answer) to obtain feet and inches.		Strategy
Student answers 1 foot, 1 foot 2 inches, and 1 foot 6 inches, as shown on answer sheet.		Accuracy
Task 5		
Student draws 3 shapes with correct perimeters.		Concept
Student shows evidence somewhere on grid sheet of counting distance around rectangles.		Strategy
Student draws three shapes that are different from A, B, and C but have the correct perimeters.		Accuracy

SITES-M Mathematics Challenge

Grade 3–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.