Figure It Out!

LESSON ORGANIZER

80–100 min

Curriculum Focus: Cross Strand Performance Assessment: Measurement, Data Management and Probability, Number Concepts, and Patterns and Relations

Teacher Materials

Optional

- 12 Colour Tiles

Student Materials

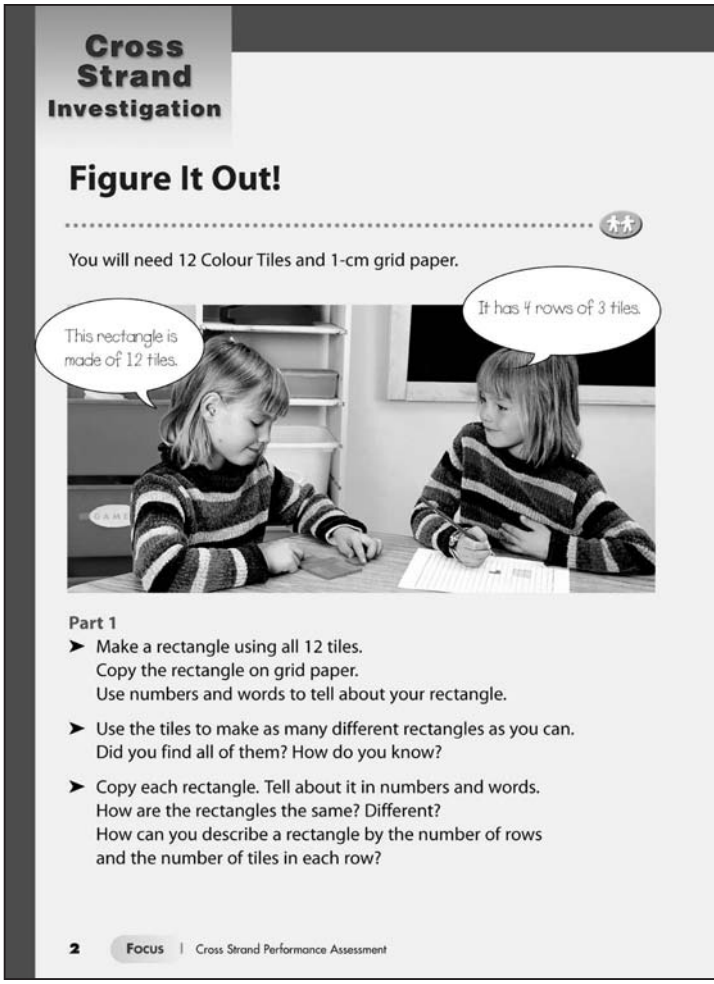
- 12 Colour Tiles
- 1-cm grid paper (PM 20)
- 4-column charts (PM 19)

Vocabulary: figure, perimeter, area, units, rectangle, table

Assessment: Cross Strand Observations Check List: Figure It Out!, PM 9 Work Sample Records

Key Math Learnings

1. Area remains constant when the same number of tiles is rearranged. The perimeter can change when tiles are rearranged. More compact shapes have smaller perimeters.
2. Recording data in a table helps identify patterns.



Cross Strand Investigation

Figure It Out!

You will need 12 Colour Tiles and 1-cm grid paper.

This rectangle is made of 12 tiles.

It has 4 rows of 3 tiles.

Part 1

- Make a rectangle using all 12 tiles. Copy the rectangle on grid paper. Use numbers and words to tell about your rectangle.
- Use the tiles to make as many different rectangles as you can. Did you find all of them? How do you know?
- Copy each rectangle. Tell about it in numbers and words. How are the rectangles the same? Different? How can you describe a rectangle by the number of rows and the number of tiles in each row?

2 Focus | Cross Strand Performance Assessment

BEFORE Get Started

At the beginning of the school year, you may wish to remind students that the area of a figure is the amount of surface covered, and the perimeter of a figure is the distance around the outside. Remind students of the procedures they have used when working with area and perimeter.

Gather students in a circle. Show students 6 Colour Tiles. Arrange the tiles in a row to form a rectangle. Ask:

- How do you know it is a rectangle? (*It has 4 sides and 4 square corners.*)
- How can you find the area? (*Count the tiles.*)

Encourage alternative ways for students to count and keep track of the number of tiles. Invite a volunteer to demonstrate how to find the perimeter of the rectangle.

Ask:

- If we were to make a new rectangle using all 6 tiles, what do you think the area would be? (*6 square units*)
- What do you think the perimeter would be? (*It could be 14 units.*)

Invite volunteers to describe how they estimated. Record student predictions in a chart on the board.

Have volunteers find the area and the perimeter.

Ask:

- Are there other rectangles that could be made with 6 tiles? (*No, a 2 by 3 rectangle and a 3 by 2 rectangle are the same, just in different positions. A 1 by 6 rectangle and a 6 by 1 rectangle are the same, just in different positions.*)

Present the *Investigation*.

Part 2

➤ Find the area of each rectangle.
What ways can you count the units?

➤ Estimate the perimeter of each rectangle.
Then find the perimeter.
How does your estimate compare with the actual perimeter?

➤ Record your results in a table.

Rectangle	Area	Perimeter Estimate	Perimeter
1	12 units	12 units	14 units
2			

➤ What do you notice about the areas of the rectangles?
Their perimeters? What patterns do you see in the table?

Display Your Work

Report your findings using words, pictures, or numbers.

Take It Further

➤ Arrange the rectangles in order from greatest perimeter to least.

➤ Look at the rectangle in the photo. It has a hole. How many different rectangles with holes can you make with 12 tiles?
Copy each rectangle on grid paper.

➤ Use the tiles to make other figures.
Copy each figure on grid paper.

Cross-Strand Investigation: Figure It Out 3

REACHING ALL LEARNERS

Early Finishers

Challenge students to find rectangles with the greatest and smallest perimeters using 18 Colour Tiles.

Common Misconceptions

➤Students count corner squares twice when determining area.
How to Help: When counting tiles, use markers or dots to indicate that the tile has been counted.

➤Students often do not count all the exposed edges on corners when determining perimeter.
How to Help: When finding perimeter, make marks on the edges of the tiles as you count to ensure they are all counted.

➤Students take wild guesses, or actually count when estimating.
How to Help: Suggest different ways to estimate, or ask other students for their methods. For example, students could: count rows and columns; look for patterns; count one side only then guess; estimate the number of exposed edges.

ESL Strategies

Pair students for whom English is a second language with a good reader to help follow the instructions in the text.

DURING Investigation

Ongoing Assessment: Observe and Listen

Ask questions, such as:

- How did you estimate the perimeter? (*I estimated the number of edges of tiles I could see around the outside.*)
- How did you find the area? (*I counted the tiles.*) Perimeter? (*I counted the edges of each tile around the outside.*)

Look for students who are confusing area with perimeter. Remind them of the meaning of the words by relating them to an everyday object such as the tabletop.

Encourage students to check, then explain, their answers with a partner or with another group.

AFTER

Have volunteers share their findings. Encourage students to relate the patterns in the table to the models. Ask:

- Why is the perimeter different? (*When there are more rows, with not so many tiles in each row, the perimeter is smaller because more tiles touch each other along more edges.*)
- How do you know that a 3 by 4 rectangle is the same as a 4 by 3 rectangle? (*I can rotate one rectangle and place it on top of the other rectangle. They are the same shape and size.*)

Invite pairs of students to share the results from *Take It Further*. Encourage discussion about the perimeters and any physical patterns they discover in their creations.

Sample Response

Part 1

➤I put my tiles in a row to make a rectangle. 

➤I made 2 other rectangles. I know I found them all because when I increased the number of rows, I made rectangles exactly the same as the ones I already had, but in different positions.

➤There are 3 possible rectangles.
All the rectangles were made from 12 tiles.
All the rectangles have a different number of rows.

1 row of 12 tiles 

2 rows of 6 tiles 

3 rows of 4 tiles 

Part 2

➤Each rectangle has an area of 12 square units. I can count the tiles by counting along each row, or by counting down each column.

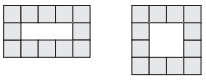
Rectangle	Area	Perimeter Estimate	Perimeter
1 by 12	12	20	26
2 by 6	12	14	16
3 by 4	12	10	14

Each of my estimates was less than the actual perimeter.

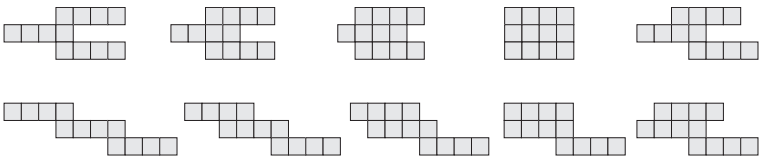
➤ The area of the rectangles is always the same. The perimeter of the rectangles decreases as the number of rows increases.

Take It Further

➤From greatest to least perimeter:1 by 12; 2 by 6; and 3 by 4 rectangles

➤I could make 2 rectangles with holes. 

➤I made these figures with rows of 4 tiles each.



ASSESSMENT FOR LEARNING

What to Look For

Understanding concepts

✔ Student notices that the perimeter can change with different shapes while the area stays the same.

Applying procedures

✔ Student can find the area and perimeter of a figure made with tiles.

Problem solving

✔ Student uses findings to estimate perimeter.

Communicating

✔ Student uses mathematical terminology to describe why the area remains the same while the perimeter changes.

Recording and Reporting

PM 9 Work Sample Records

Cross Strand Observations Check List: Figure It Out!

Name	Measurement		Data Analysis	Number		Patterns
	Estimates and measures the area of shapes using uniform non-standard units, and compares the shapes by area RAC/AP	Estimates, measures, and records the perimeter and the area of 2-D shapes, and compares the perimeters and areas RAC/AP	Interprets displays of data, presents the information, and discusses using mathematical language CM	Counts and/or adds accurately AP	Uses various estimation strategies to solve problems, then checks results for reasonableness PS/AP	Uses physical patterns and number patterns to estimate PS/AP

PS – Problem solving **RAC** – Reasoning; Applying concepts **AP** – Application of procedures **CM** – Communication