

Tiling a Rectangle to Find Area

Name: _____

Unit 1
Lesson 0

► Read and try to solve the problem below.

A rectangular postage stamp has a length of $\frac{3}{2}$ inches and a width of $\frac{3}{4}$ inch.
What is the area of the stamp in square inches?

**TRY
IT**



Math Toolkit grid paper, index cards, rulers

Tiling a Rectangle to Find Area

Name: _____

- Explore different ways to understand modeling the area of a rectangle through tiling and equations.

A rectangular postage stamp has a length of $\frac{3}{2}$ inches and a width of $\frac{3}{4}$ inch.

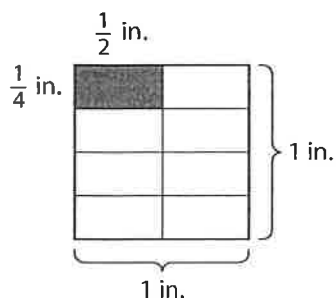
What is the area of the stamp in square inches?

Picture It

You can picture tiling the rectangular stamp with smaller rectangles that have unit fractions as side lengths.

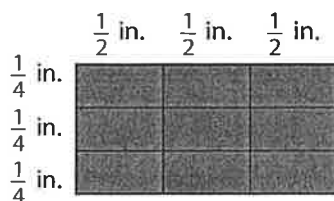
You can tile a unit square with rectangles that have unit fractions as side lengths.

Each rectangular tile is $\frac{1}{2}$ inch by $\frac{1}{4}$ inch.



You can also use $\frac{1}{2}$ inch-by- $\frac{1}{4}$ inch tiles to tile a rectangular stamp with length

$\frac{3}{2}$ inches and width $\frac{3}{4}$ inch.



Model It

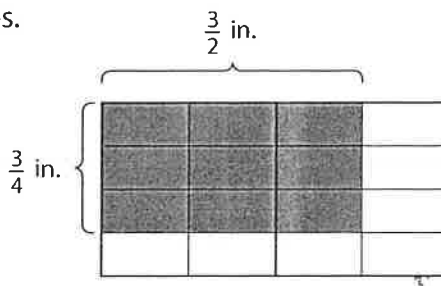
You can model the area of the rectangular stamp with an equation.

Think of the stamp as part of two whole square inches.

Use the area formula to multiply the side lengths.

$$\text{area} = \text{length} \times \text{width}$$

$$\text{area} = \frac{3}{2} \times \frac{3}{4}$$



Tiling a Rectangle to Find Area

Name: _____

CONNECT IT

► Use the problem from the previous page to help you understand how to use tiling or equations to find area.

- 1 Use the unit square in **Picture It** to explain how to find the area of one tile.
- 2 Look at the model of the stamp in **Picture It**. Explain why nine $\frac{1}{2}$ inch-by- $\frac{1}{4}$ inch rectangles tile the $\frac{3}{2}$ inches-by- $\frac{3}{4}$ inch stamp.

3 Write an equation that uses the area of one tile to find the area of the stamp.

_____ square inches = _____ square inches

4 Now look at the area formula equation in **Model It**. Complete the equation to find the area of the stamp as shown in this model.

$$\frac{3}{2} \times \frac{3}{4} = \frac{\square}{\square} \times \frac{\square}{\square} = \text{_____} \text{ The area is } \text{_____} \text{ square inches.}$$

5 Does using the area formula equation result in the same area as you found by tiling the rectangle? Why?

6 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to find the area of a rectangle with fractional side lengths.

Tiling a Rectangle to Find Area

Name: _____

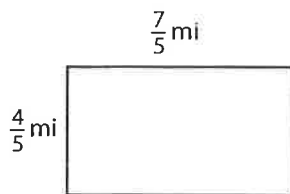
Apply It

► Use what you learned to solve these problems.

- 7 Bernice's rectangular math workbook is $\frac{2}{3}$ foot wide and $\frac{5}{6}$ foot long. What is the area of a page in her workbook? Show your work.

SOLUTION _____

- 8 Show one way to use tiles to find the area of the rectangle below. What are the length and width of one of your tiles? What is the area of the rectangle? Show your work.



SOLUTION _____

- 9 John's rectangular poster is $\frac{7}{4}$ yards in length and $\frac{2}{3}$ yard in width. What is the area of John's poster?

- A $\frac{2}{3}$ square yard
- B $\frac{14}{12}$ square yards
- C $\frac{9}{7}$ square yards
- D $\frac{7}{4}$ square yards

Tiling a Rectangle to Find Area Practice Pages

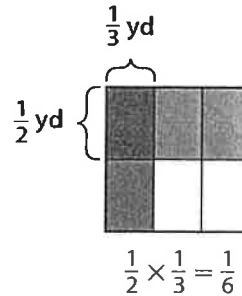
Name: _____

- Study the Example showing how to tile a rectangle to find its area. Then solve problems 1–6.

Example

What is the area of a rectangle that is $\frac{1}{2}$ yard wide and $\frac{4}{3}$ yards long?

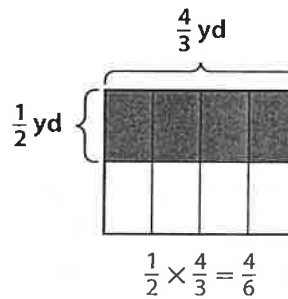
The top area model shows that the area of a $\frac{1}{2}$ yard-by- $\frac{1}{3}$ yard rectangle is $\frac{1}{6}$ square yard.



The bottom model uses the same $\frac{1}{6}$ -square-yard parts to show an area that is $\frac{1}{2}$ yard by $\frac{4}{3}$ yards.

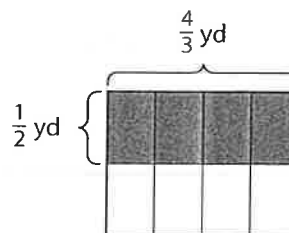
Four $\frac{1}{6}$ -square-yard parts are shaded.

So, a $\frac{1}{2}$ yard-by- $\frac{4}{3}$ yards rectangle has an area of $\frac{4}{6}$ square yard.



- 1 How many $\frac{1}{2}$ -yard lengths are in 1 yard?
- 2 How many $\frac{1}{3}$ -yard lengths are in 1 yard?
- 3 The final model from the Example is shown. Draw a line around the part of the model that represents 1 square yard.

Does $\frac{4}{6}$ square yard cover more area or less area than 1 square yard? Explain.



Tiling a Rectangle to Find Area Practice Pages

Name: _____

- 4 Danah has a rectangular strawberry patch in her garden. Its border is $\frac{7}{8}$ yard wide and $\frac{3}{2}$ yards long. Use a visual model to find the area of Danah's strawberry patch. Then write an equation to describe your model. Show your work.

SOLUTION

- 5 Danah is planting a second rectangular strawberry patch and wants it to have an area of exactly 1 square yard. Which of the following could be the width and length of its borders? Select all that apply.
- A $\frac{1}{2}$ yard wide and $\frac{3}{2}$ yards long
 - B $\frac{2}{3}$ yard wide and $\frac{3}{2}$ yards long
 - C $\frac{4}{5}$ yard wide and $\frac{5}{4}$ yards long
 - D $\frac{2}{3}$ yard wide and $\frac{6}{4}$ yards long
 - E $\frac{3}{4}$ yard wide and $\frac{12}{8}$ yards long
- 6 Look at problem 5. Suppose Danah wants the area of her rectangular strawberry patch to be exactly 1 square yard. Can the length of the strawberry patch be greater than 1 yard? Explain.

Evaluating Expressions

Name: _____

► Read and try to solve the problem below.

There are 32 people on a field trip to the aquarium. This includes 8 adults. The expression $6 \times (32 - 8)$ represents the cost, in dollars, to buy the students but not the 8 adults a \$6 souvenir poster. What is the total cost of the posters?

**TRY
IT**



Math Toolkit base-ten blocks, counters, number lines

Evaluating Expressions

Name: _____

► Explore different ways to understand expressions with grouping symbols.

There are 32 people on a field trip to the aquarium. This includes 8 adults. The expression $6 \times (32 - 8)$ represents the cost, in dollars, to buy the students but not the 8 adults a \$6 souvenir poster. What is the total cost of the posters?

Picture It

You can use a picture to help understand how the expression represents the cost.

Think about what the posters for everyone and posters for students only would look like.

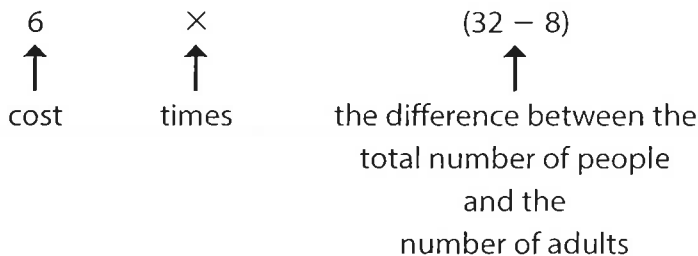
Each poster costs \$6.

	\$6	\$6	\$6	\$6	\$6	\$6	\$6	\$6
32 people	\$6	\$6	\$6	\$6	\$6	\$6	\$6	\$6
	\$6	\$6	\$6	\$6	\$6	\$6	\$6	\$6
8 adults								

$$6 \times (32 - 8)$$

Model It

You can use words to help understand how the expression represents the cost.



Evaluating Expressions

Name: _____

CONNECT IT

► Use the problem from the previous page to help you understand how to interpret and evaluate expressions with grouping symbols.

- 1 Using the order of operations, what are the steps in evaluating $6 \times (32 - 8)$? What is the total cost of the posters?
- 2 Suppose you omit the parentheses from the expression for the total cost of the posters. What is the value of the expression $6 \times 32 - 8$? Explain why the grouping symbols are needed for this problem.
- 3 Morgan says you can evaluate $6 \times (32 - 8)$ using three steps: multiply 32 by 6, multiply 8 by 6, and subtract the two products. Why does Morgan's method work?
- 4 Suppose the group also pays \$75 for admission to the aquarium and that the cost for posters is \$4 instead of \$6. The expression that represents the total cost would be $75 + 4 \times (32 - 8)$. Evaluate the expression, explaining each of your steps.
- 5 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand evaluating expressions with grouping symbols.

Evaluating Expressions Practice Pages

Name: _____

- Study the Example showing two ways to think about an expression that has parentheses. Then solve problems 1–5.

Example

Ms. Nakos works 4 hours on Mondays and 8 hours on Tuesdays in the school library. During one week in May, she worked $\frac{1}{4}$ of her regular hours. Evaluate the expression $\frac{1}{4} \times (4 + 8)$ to find the number of hours she worked that week.

To understand the expression, you can use words.

$\frac{1}{4}$	×	$(4 + 8)$
↑	↑	↑
one fourth	of	the sum of the number of Monday and Tuesday hours

Evaluate the expression.

$$\frac{1}{4} \times (4 + 8)$$
$$\frac{1}{4} \times 12$$
$$\frac{12}{4}$$
$$3$$

Ms. Nakos worked 3 hours that week.

- 1 Look at the expression in the Example. There are parentheses around $4 + 8$ to show that it is to be evaluated first. Are the parentheses necessary? Explain.
- 2 The expression $\frac{1}{2} \times (4 + 8)$ represents the number of hours Ms. Nakos works the last week of school. Evaluate the expression to find the number of hours she works that week. Show your work.

SOLUTION _____

Vocabulary

evaluate

to find the value of an expression.

Evaluating Expressions Practice Pages

Name: _____

- 3 Each day, Darius walks his dog 15 minutes in the morning and 25 minutes in the afternoon. Evaluate the expression $7 \times (15 + 25)$ to find how many minutes Darius walks his dog each week. Show your work.

SOLUTION _____

- 4 Evaluate the expression $9 + (21 - 6) \div 3$. Show your work.

SOLUTION _____

- 5 Sara has \$50. While shopping, Sara buys a shirt with a price of \$12 and a pair of pants with a price of \$26. The clothes are on sale, so Sara only needs to pay half the price. Evaluate the expression $50 - \frac{1}{2} \times \{12 + 26\}$ to find how much money Sara has left after buying the clothes. Show your work.

SOLUTION _____

Writing and Interpreting Expressions

Name: _____

► Read and try to solve the problem below.

Write a numerical expression to represent the following phrase.

15 minus the sum of 6 and 7

**TRY
IT**



Math Toolkit base-ten blocks, counters

Writing and Interpreting Expressions

Name: _____

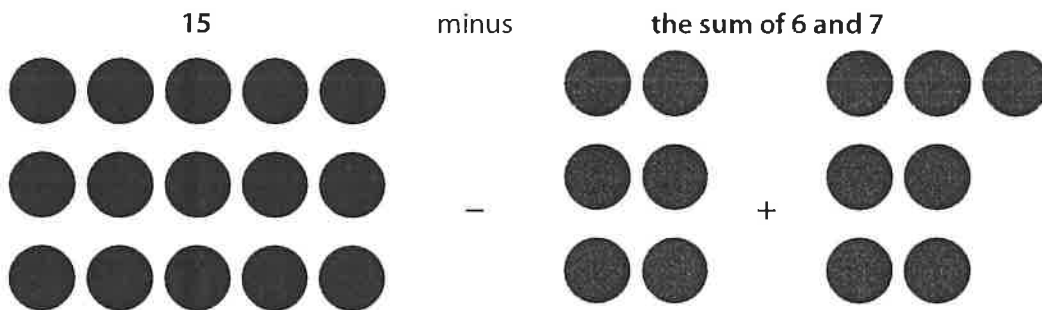
► Explore different ways to understand writing numerical expressions.

Write a numerical expression to represent the following phrase.

15 minus the sum of 6 and 7

Picture It

You can use a picture to help understand the problem.



Model It

You can think about what the words mean to help understand the problem.

15 minus
 ↓
 Minus means
 to subtract.

the sum of 6 and 7
 ↓
 A *sum* is the result
 of addition. So, add
 6 and 7.

Writing and Interpreting Expressions

Name: _____

CONNECT IT

➤ Use the problem from the previous page to help you understand how to write and interpret numerical expressions.

1 In the expression *15 minus the sum of 6 and 7*, do you add or subtract first? Why?

2 When you write a numerical expression, how can you show which operation to do first?

3 Write a numerical expression for *15 minus the sum of 6 and 7*.

4 Harper wrote the expression $15 - 6 + 7$ to represent *15 minus the sum of 6 and 7*. Evaluate $15 - 6 + 7$ and then explain why Harper's expression is incorrect.

5 Write a word phrase to show how to interpret Harper's expression, $15 - 6 + 7$.

6 **Reflect** Think about all the models and strategies you have discussed today. Describe how one of them helped you better understand how to solve the **Try It** problem.

Writing and Interpreting Expressions

Name: _____

Apply It

► Use what you learned to solve these problems.

- 7 Draw a picture to show what the phrase *2 times the difference of 8 and 1* means. Then write an expression. Show your work.

SOLUTION _____

- 8 Write an expression for the phrase *6 plus the quotient of 15 and 3*. Draw a picture to help, if needed. Show your work.

SOLUTION _____

- 9 Which phrase correctly interprets the expression below?

$$24 - \frac{1}{2} \times (3 + 5)$$

- A Twenty-four plus half the sum of 3 and 5
- B Twenty-four minus a half of 3 and then add 5
- C Half the sum of 3 and 5 subtracted from 24
- D Half of 3 subtracted from 24 and then add 5

Writing and Interpreting Expressions Practice Pages

Name: _____

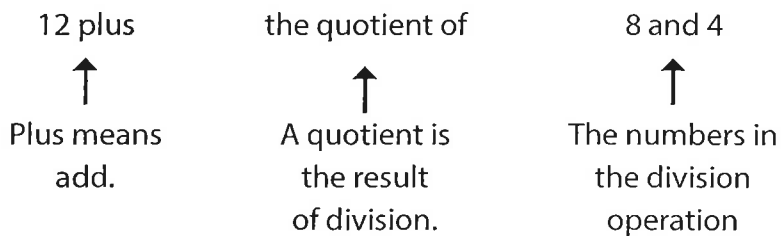
- Study the Example showing how to write and interpret a numerical expression. Then solve problems 1–8.

Example

Write a numerical expression for the phrase below.

12 plus the quotient of 8 and 4

Think about what the words mean:



Since you add 12 to the quotient of 8 and 4, you need to first divide 8 by 4. Use parentheses to show that you do the division first.

The numerical expression is $12 + (8 \div 4)$.

- 1 Draw a picture to show what the word phrase from the Example means.

12 plus the quotient of 8 and 4

- 2 Suppose you wrote a numerical expression for the phrase *20 minus the product of 5 and 2*. To evaluate the expression, should you subtract or multiply first? Explain.

Writing and Interpreting Expressions Practice Pages

Name: _____

- 3 Write a numerical expression to represent *20 minus the product of 5 and 2*. Then evaluate your expression.

- 4 Complete the statement: *The value of $5 \times (23,432 + 10,816)$ is ...*

- A one-fifth as large as $23,432 + 10,816$.
- B five times as large as $23,432 + 10,816$.
- C five more than $23,432 + 10,816$.
- D five less than $23,432 + 10,816$.

- 5 Write a numerical expression to represent *6 times the difference of 9 and 3*. Then evaluate your expression.

- 6 Write a word phrase for the expression $10 + (6 - 4)$.

- 7 Shana is doing a craft project using yarn and craft sticks. She has 5 green yarn pieces and 7 blue yarn pieces. She has 3 times as many craft sticks as yarn pieces.

Which expression can you use to find the number of craft sticks Shana has?

- A $5 + (7 \times 3)$
- B $(5 + 7) \times 3$
- C $(5 + 7) + 3$
- D $5 \times (7 \times 3)$

- 8 Look at your answer to problem 7. Evaluate the expression to find the number of craft sticks Shana has. Show your work.

SOLUTION