

Shelby County Schools  
Extended Learning Guide



**5th Grade**

## Evaluate and Write Expressions

**G Use What You Know**

You know about the order of operations. Now you will see how using parentheses in an expression can change the value of the expression. Take a look at this problem.

Maria and her friend go to a movie. At the snack stand, they each get a drink that costs \$5 and a popcorn that costs \$8. Maria pays for her friend. How much does Maria pay altogether?



- a. What operation do you use to find the cost of a drink and a popcorn for one person?

\_\_\_\_\_

- b. Write an expression for the cost of a drink and popcorn for one person. \_\_\_\_\_

- c. How does the cost for two people compare to the cost for one person?

\_\_\_\_\_

- d. Explain how you can find the cost for two people. What do you need to do first?

\_\_\_\_\_

\_\_\_\_\_

- e. How much does Maria pay for a drink and popcorn for two people? \_\_\_\_\_

- f. Maria thought she could use the equation  $2 \times 5 + 8 = 18$  to find the cost. Explain why she is not correct.

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\_\_\_\_\_

## ► Find Out More

To **evaluate** an expression means to find its value. To evaluate the expression  $2 \times 5 + 8$ , you first multiply  $2 \times 5$ , then add 8. But what if you wanted to add 5 and 8 and then multiply by 2? You could use **parentheses** in the expression to tell which operation to do first.

Parentheses are a type of grouping symbol. Grouping symbols tell which operation to do first. Fraction bars are another type of grouping symbol.

|                     |                        |   |
|---------------------|------------------------|---|
| <b>Parentheses</b>  | $2 \times (5 + 8)$     | First, add $5 + 8$ because it is inside the parentheses. Then multiply by 2.  |
| <b>Fraction Bar</b> | $\frac{2 + 8}{11 - 6}$ | The fraction bar groups the numerator separately from the denominator. First evaluate the numerator and the denominator. Then divide. |

Look at the problem on the previous page. Maria wants to first find the cost of a drink and popcorn for 1 person, then double it to find the cost for 2 people. Maria could write the expression  $2 \times (5 + 8)$  or  $(5 + 8) \times 2$ .

One way to read  $2 \times (5 + 8)$  is "2 times the sum of 5 and 8." Another way is "twice the sum of 5 and 8." You can also think of  $2 \times (5 + 8)$  as "adding 5 and 8, then multiplying by 2."

Adding parentheses into an expression can change its value. The expressions  $2 \times 5 + 8$  and  $2 \times (5 + 8)$  do not have the same value.

|                  |                    |
|------------------|--------------------|
| $2 \times 5 + 8$ | $2 \times (5 + 8)$ |
| $10 + 8$         | $2 \times 13$      |
| 18               | 26                 |

## ► Reflect

- 1 What should you look for to indicate a group? How do you evaluate an expression if you see a grouping symbol?

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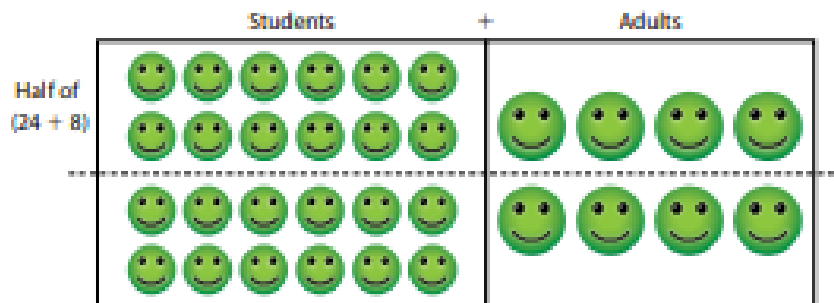
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**Learn About** **Evaluating Expressions**

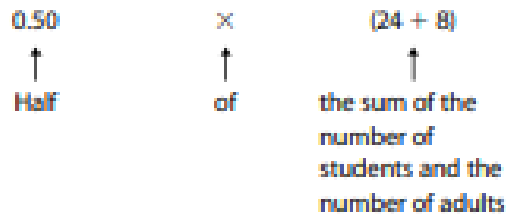
Read the problem below. Then explore how to evaluate expressions that use grouping symbols.

There were 24 students on a field trip to the aquarium. There were also 8 adults on the trip. The expression  $0.50 \times (24 + 8)$  represents the cost in dollars to buy everyone a 50-cent souvenir eraser. What is the total cost of the erasers?

**Picture It** You can use a picture to help understand the problem.



**Model It** You can use words to help understand the problem.



**Connect It** Now you will solve the problem from the previous page using the picture and words.

2 Describe one way you could read the expression  $0.50 \times (24 + 8)$ .

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3 How could you use *Picture It* on the previous page to evaluate  $0.50 \times (24 + 8)$ ?

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4 Evaluate  $0.50 \times (24 + 8)$  to find the cost in dollars of the erasers. \_\_\_\_\_

5 Morgan sees a different way to evaluate  $0.50 \times (24 + 8)$ . She finds half of 24 and half of 8, and then adds those numbers together. Why does her method work?

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6 The expression  $3 \times (\text{number of students} + \text{number of adults})$  represents the cost in dollars for another group to go to the dolphin show at the aquarium. Describe how the cost compares to the total number of students and adults.

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**Try It** Use what you just learned about evaluating expressions to solve these problems. Show your work on a separate sheet of paper.

7 Describe what happens when you multiply a sum by 2.

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8 Sara buys a shirt that regularly costs \$12 and a pair of pants that regularly costs \$26.

They are on sale, so she only needs to pay half the regular cost. Evaluate the expression

$\frac{1}{2} \times (12 + 26)$  to find Sara's cost in dollars. \_\_\_\_\_

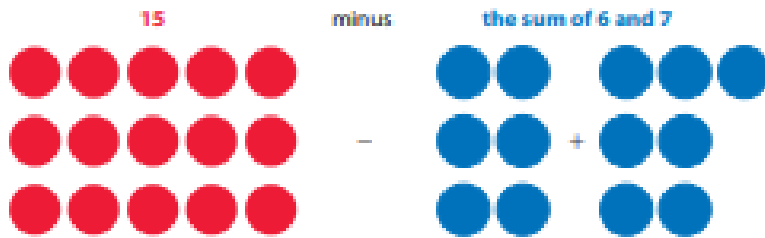


**Learn About** Writing Expressions

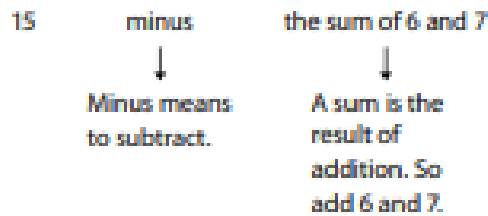
Read the problem below. Then explore how to write numerical expressions.

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.



**▶ Connect It** Now you will solve the problem from the previous page using the picture and words.

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

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**10** When you write a numerical expression, how can you show what operation to do first?

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**11** Write a numerical expression for "15 minus the sum of 6 and 7." \_\_\_\_\_

**12** 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.

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**13** Omar wrote  $3 + (4 \times 6)$  to represent the phrase "3 more than the product of 4 and 6." Did Omar need to use a grouping symbol? Explain.

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**▶ Try It** Use what you just learned about writing numerical expressions to solve these problems. Show your work on a separate sheet of paper.

**14** Write a numerical expression to represent "2 times the difference of 8 and 1." Then evaluate your expression. \_\_\_\_\_

**15** Write a numerical expression to represent "15 divided by the sum of 1 and 4." Then evaluate your expression.

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**Practice** Writing and Evaluating Expressions

Study the example below. Then solve problems 16–18.

**Example**

Insert parentheses to make the following equation true.

$$15 - 7 - 2 = 10$$

Look at how you could show your work.

$$(15 - 7) - 2 = 8 - 2 = 6$$

$$6 \neq 10$$

$$15 - (7 - 2) = 15 - 5 = 10$$

$$10 = 10$$

**Solution**  $15 - (7 - 2) = 10$



The student used trial and error to answer the question.

**Pair/Share**

How many different ways can you group the numbers?

- 16** Carol sells bracelets and pairs of earrings at a craft fair. Each item sells for \$8. Write and evaluate an expression to show how much money Carol will make if she sells 23 bracelets and 17 pairs of earrings.

**Show your work.**



How many items will Carol sell altogether?

**Pair/Share**

What other ways could you solve the problem?

**Solution** \_\_\_\_\_



- 17 Write numerical expressions for “the product of 3 and 2, plus 5” and “3 times the sum of 2 and 5.” Which expression has a greater value?

Show your work.



The comma is a clue to where to put the grouping symbol. In this case, group the math that comes before the comma.

**Pair/Share**

When do you use parentheses in an expression?

**Solution** \_\_\_\_\_

- 18 Which expression represents “the quotient of 10 and 2, plus 3”? Circle the letter of the correct answer.

A  $10 \div (2 + 3)$

B  $\frac{10}{2+3}$

C  $(10 \times 2) + 3$

D  $\frac{10}{2} + 3$

Jason chose **A** as the correct answer. How did he get that answer?

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What does the word “quotient” mean?

**Pair/Share**

Is Jason’s answer reasonable?

**Practice**  **Writing and Evaluating Expressions**

Solve the problems.

- 1** Kris ran 3 miles each day for 7 days in a row. One day, she ran an extra  $\frac{1}{2}$  mile. Which expression represents how many miles Kris ran altogether?
- A**  $3 + 7 + \frac{1}{2}$
- B**  $3 \times 7 + \frac{1}{2}$
- C**  $3 \times 7 + 3\frac{1}{2}$
- D**  $(3 + \frac{1}{2}) \times 7$
- 2** Which expression does NOT represent the statement "divide the difference of 20 and 8 by the sum of 1 and 3"?
- A**  $\frac{20 - 8}{1 + 3}$
- B**  $(20 - 8) \div (1 + 3)$
- C**  $\frac{20}{1 + 3} - \frac{8}{1 + 3}$
- D**  $(20 - 8) \div 1 + 3$
- 3** Which expression has a value of 8? Circle the letter for all that apply.
- A**  $3 \times 8 \div 4 + 2$
- B**  $3 \times (8 \div 4) + 2$
- C**  $(3 \times 8) \div (4 + 2)$
- D**  $(3 \times 8) \div 4 + 2$
- E**  $3 \times 8 \div (4 + 2)$

- 4 Adam is 2 years old. His sister Lina is 1 year less than three times his age. Write a numerical expression for Lina's age. \_\_\_\_\_

- 5 Several expressions are shown below. Decide if the value of the expression is less than, equal to, or greater than 18. Write each expression in the correct category in the chart.

$$\begin{array}{cccc} \frac{1}{5} \times (9 \times 2) & (9 \times 2) \times (4 - 3) & (9 \times 2) + 3 & 22 - (9 \times 2) \\ (9 \times 2) + 7 & 4 \times \frac{1}{4} \times (9 \times 2) & 1 \times (9 \times 2) & 3 \times (9 \times 2) \end{array}$$

| Less than 18 | Equal to 18 | Greater than 18 |
|--------------|-------------|-----------------|
|              |             |                 |

- 6 Compare the expressions  $8 \times 3 + 4$  and  $8 \times (3 + 4)$ . Explain how to evaluate each expression. Then tell which expression has the greater value.

**Show your work.**

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**Self Check** Go back and see what you can check off on the Self Check on page 183.

## Evaluate and Write Expressions

Name: \_\_\_\_\_

## Prerequisite: Solve Multiplication Word Problems

Study the example problem showing multiplication as a way to compare two numbers. Then solve problems 1–5.

**Example**

Isak has 7 baseball cards. He has 3 times as many basketball cards as baseball cards. How many basketball cards does he have?

You can use a bar model to help you understand the relationship between the numbers.

You can describe the relationship two ways.

Use words: What is 3 times as many as 7?

Use an equation:  $? = 3 \times 7$

Solve:  $21 = 3 \times 7$  Isak has 21 basketball cards.



- 1** Draw and label a bar model to show the number that is 7 times as many as 3. Then complete the equation.

$$\underline{\hspace{2cm}} = 7 \times 3$$

- 2** How does 21 compare to 7? How does 21 compare to 3? Write the numbers to describe the relationships.

21 is \_\_\_\_\_ times as many as 7.

21 is \_\_\_\_\_ times as many as 3.



**Solve.**

- 3 Lauren babysat over the summer. In June she had \$20 dollars. At the end of August she had 12 times that amount. How much money did Lauren have at the end of August?

**Show your work.**

Solution: \_\_\_\_\_

- 4 Kyle swam 4 laps in the pool on Monday. He swam 6 times as many laps on Tuesday. Choose *True* or *False* for each statement.

- a. The expression  $6 \times 4$  represents the number of laps Kyle swam on Tuesday.  True  False
- b. The words *6 times as many as 4* represents the number of laps Kyle swam on Tuesday.  True  False
- c. The number of laps Kyle swam on Tuesday can be found by solving the equation  $? = 6 \times 4$ .  True  False
- d. Kyle swam 10 laps on Tuesday.  True  False

- 5 Mrs. Altman's class recycled 72 water bottles in March. The number of juice cans they recycled was  $\frac{1}{4}$  times as many. What is the total number of water bottles and juice cans they recycled in March?

**Show your work.**

Solution: \_\_\_\_\_



## Evaluate Expressions

Study the example problem showing two ways to think about an expression that has parentheses. Then solve problems 1–6.

**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 problem you can:

Use a picture.

$\frac{1}{4}$  of  $(4 + 8)$

| Monday Hours + Tuesday Hours |     |
|------------------------------|-----|
| M                            | T T |
| M                            | T T |
| M                            | T T |
| M                            | T T |

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

Ms. Nakos worked 3 hours that week.

Use words.

|               |          |   |
|---------------|----------|---|
| $\frac{1}{4}$ | $\times$ | $(4 + 8)$   |
| ↑             | ↑        | ↑   |
| One fourth    | of       | the sum of the number of Monday and Tuesday hours |

- 1 Look at the expression in the example. There are parentheses around  $4 + 8$  to show it is to be evaluated first. Are the parentheses necessary? Explain.

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- 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.

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**Vocabulary**

**evaluate** to find the value of an expression.

$3 \times 5$  is 15.



**Solve.**

- 3 Each day, Theo 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 Theo walks his dog each week.

**Show your work.**

Solution: \_\_\_\_\_

- 4 Lin, Mac, and Starr spend \$6 on supplies to set up a lemonade stand. They sell \$21 worth of lemonade. They are going to share the money equally. Evaluate the expression  $(21 - 6) \div 3$  to find how much money each one will make.

**Show your work.**

Solution: \_\_\_\_\_

- 5 Which of the following shows another way to write the expression  $(21 - 6) \div 3$ ?

A  $\frac{21 - 6}{3}$

C  $\frac{21}{3} - 6$

B  $\frac{3}{21 - 6}$

D  $21 - \frac{6}{3}$

- 6 Describe what happens if you divide a difference by 3.

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## Write Expressions

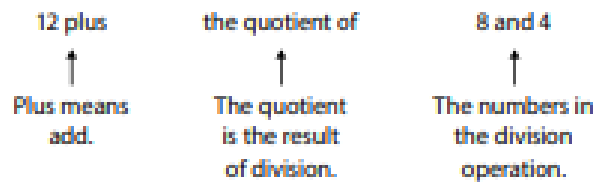
Study the example showing how to write a numerical expression. Then solve problems 1–8.

**Example**

Write a numerical expression to show the following phrase:

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 in 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.

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**Solve.**

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

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- 4 Which expression represents the phrase "16 divided by the product of 4 and 4." Circle the letter for all that apply.

A  $16 \div 4 \times 4$                       C  $\frac{16}{4 \times 4}$   
B  $16 \div (4 \times 4)$                     D  $\frac{4 \times 4}{16}$

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

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

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- 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.

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**Vocabulary**

**evaluate** to find the value of an expression.

$3 \times 5$  is 15.

## Write and Evaluate Expressions

Solve the problems.

- 1 Look at the expression below. Tell whether each statement about its value is *True* or *False*.

$$\frac{1}{2} \times (137 + 87)$$

- a. It is greater than the value of  $\frac{1}{4} \times (137 + 87)$ .  True  False
- b. It is less than the value of  $137 + 87$ .  True  False
- c. It is greater than the value of  $137 + 87$ .  True  False
- d. It is less than the value of  $\frac{1}{8} \times (137 + 87)$ .  True  False

What are the expressions you are comparing in this problem? How are they different?



- 2 Which expression represents "14 minus the difference of 7 and 2?"

- A  $14 - 7 - 2$                       C  $14 - (7 + 2)$   
 B  $14 - (7 - 2)$                     D  $14 - 7 + 2$

Devon chose **C** as the correct answer. How did he get that answer?

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How many steps are described in the word phrase? What is the operation for each step?



Solve.

3 Which expression is not 2 times the value of the expression  $473 + 165$ ?

- A  $2 + (473 + 165)$
- B  $2 \times (473 + 165)$
- C  $(473 + 165) \times 2$
- D  $(2 \times 473) + (2 \times 165)$

How do you represent "2 times" in an expression?



4 Complete each expression to make its value equal to 9.

- a.  $(24 - \square) \div 2$
- b.  $29 - (\square \times 5)$
- c.  $\square \div (2 \times 3)$

I can try substituting different numbers and evaluating the expression.



5 Abbey's cat weighs 18 pounds. Her dog weighs 2 pounds more than half her cat's weight. Write and evaluate an expression to show how much Abbey's dog weighs.

**Show your work.**

Which animal weighs more, the dog or the cat?



Solution: \_\_\_\_\_

## Ready® Center Activity 5.2 ★★★

### Make It True

#### What You Need

- Recording Sheet

#### Check Understanding

Insert parentheses to make the equation true.

$$18 - 2 + 10 - 6 = 4$$

#### What You Do

1. Take turns. Pick an equation on the **Recording Sheet**.
2. Tell where to put the grouping symbols in the equation to make the equation true.
3. Your partner checks your work by evaluating the expression.
4. If you are correct, write the grouping symbols on the **Recording Sheet** and put your initials in the box. If you are incorrect, your turn ends.
5. The first partner with 3 in a row wins.

How can I make this equation true?

$$\frac{5}{4} \times 1.25 + \frac{6}{8} = 1\frac{1}{2}$$

I can rewrite the equation using fractions with like denominators to make it easier to decide where to put the parentheses.

$$\frac{6}{8} \times \frac{10}{8} + \frac{6}{8} = 1\frac{4}{8}$$



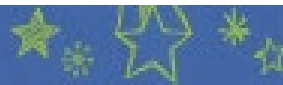
#### Go Further!

Find an equation on the **Recording Sheet** that you could write with parentheses to equal the value 8. Write it. Then find and write another one with the same value.



**Make It True**

|  |   |                                 |
|--|---|---------------------------------|
| $20 - 6 \div 3 + 4 = 2$                      | $0.5 \times 24 + 2 = 13$                              | $15 - 3 \times 2 = 9$           |
| $12.5 - 4\frac{1}{2} \times \frac{1}{4} = 2$ | $20 - 5 \div 5 = 3$                                   | $\frac{1}{2} \times 10 - 8 = 1$ |
| $7 - 2 \times 0.3 = 1.5$                     | $3 + 20 \div 5 \times 4 = 19$                         | $2 + 14 \times 0.5 = 9$         |
| $6.5 - 2.3 + 3\frac{1}{5} = 1$               | $\frac{2}{3} \times 1.4 + \frac{3}{5} = 1\frac{1}{3}$ | $16 \div 4 \div 2 = 2$          |



## Analyze Patterns and Relationships

### Use What You Know

Previously you learned to identify and continue numerical patterns. Now you will describe the relationship between two patterns. Take a look at this problem.

Maria is working at the snack stand at a basketball game. Each frozen yogurt costs \$3, and each sandwich costs \$6. Create a table to show the costs for buying 0, 1, 2, 3, 4, 5, or 6 frozen yogurts. Create another table to show the costs for the same number of sandwiches. How does the cost of a given number of frozen yogurts compare to the cost of the same number of sandwiches?

- What is the cost for buying 1 frozen yogurt? \_\_\_\_\_
- What do you add to the cost of 1 frozen yogurt to get the cost of 2 frozen yogurts?  
\_\_\_\_\_
- Complete the table to show the cost for each number of frozen yogurts.

| Number of Yogurts | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|-------------------|---|---|---|---|---|---|---|
| Cost (\$)         |   |   |   |   |   |   |   |

- What do you add to the cost of 1 sandwich to get the cost of 2 sandwiches?  
\_\_\_\_\_
- Complete the table to show the cost for each number of sandwiches.

| Number of Sandwiches | 0 | 1 | 2 | 3 | 4 | 5 | 6 |
|----------------------|---|---|---|---|---|---|---|
| Cost (\$)            |   |   |   |   |   |   |   |

- How does the cost of sandwiches compare to the cost of the same number of yogurts?

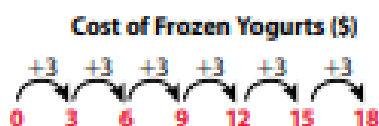
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## Find Out More

The costs of frozen yogurts and the costs of sandwiches form numerical patterns.



You can use a table to write ordered pairs. An **ordered pair** is a pair of numbers. Ordered pairs could help you see relationships between **corresponding terms** in two patterns. For these ordered pairs, the first number is the cost of a certain number of frozen yogurts. The second number is the cost of the same number of sandwiches.

| Cost of Yogurts (\$) | Cost of Sandwiches (\$) | Ordered Pairs |
|----------------------|-------------------------|---------------|
| 0                    | 0                       | (0, 0)        |
| 3                    | 6                       | (3, 6)        |
| 6                    | 12                      | (6, 12)       |
| 9                    | 18                      | (9, 18)       |
| 12                   | 24                      | (12, 24)      |
| 15                   | 30                      | (15, 30)      |
| 18                   | 36                      | (18, 36)      |

There is a relationship between the two numbers of these ordered pairs. Here, the second number is always twice the first number.

### Reflect

- 1 What if the ordered pairs were written as (0, 0), (6, 3), (12, 6), (18, 9), (24, 12), (30, 15), (36, 18). Would this change the relationship between the first number and the second number? Explain.

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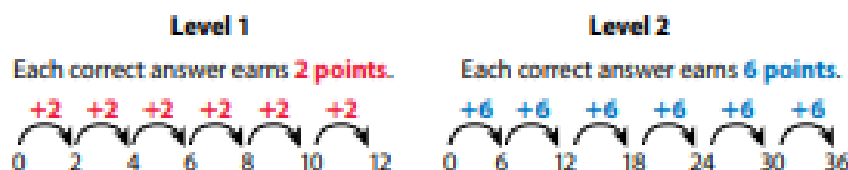
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**Learn About****Comparing Two Numerical Patterns**

Read the problem below. Then explore how to identify relationships between two numerical patterns.

In Level 1 of a game, you earn 2 points for each correct answer. In Level 2, you earn 6 points for each correct answer. Compare the number of points in Level 2 to the number of points in Level 1 if you correctly answer 0, 1, 2, 3, 4, 5, or 6 questions.

**Picture It** You can use a picture to help find each pattern.



**Model It** Use a table to show the number of points you get for correct answers in each level of the game.

Write ordered pairs. Have the first number be from the first pattern. Then have the second number be the corresponding number from the second pattern.

| Points in Level 1 | Points in Level 2 | Ordered Pairs |
|-------------------|-------------------|---------------|
| 0                 | 0                 | (0, 0)        |
| 2                 | 6                 | (2, 6)        |
| 4                 | 12                |               |
| 6                 | 18                |               |
| 8                 | 24                |               |
| 10                | 30                |               |
| 12                | 36                |               |

The total number of points in Level 1 increases by 2 for each correct answer. The total number of points in Level 2 increases by 6 for each correct answer.



**▶ Connect It** Now you will solve the problem from the previous page by looking at the ordered pairs.

- 2** Look at *Picture It* on the previous page. Describe how the total number of points changes with each correct answer in Level 1 and Level 2.

Level 1 rule: \_\_\_\_\_

Level 2 rule: \_\_\_\_\_

- 3** Complete the table on the previous page.

- 4** For each ordered pair, how does the second number compare to the first number?

\_\_\_\_\_

- 5** Suppose the game has a third level. You get 9 points for each correct answer in Level 3. Explain how you could figure out how the points in Level 3 compare with the corresponding points in Level 2.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

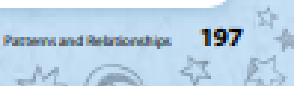
**▶ Try It** Use what you just learned about comparing two number patterns to solve this problem. Show your work on a separate sheet of paper.

- 6** School magnets cost \$4, and shirts cost \$24. Write a pattern for the costs of 0, 1, 2, 3, 4, and 5 magnets and a second pattern for the costs of 0, 1, 2, 3, 4, and 5 shirts. How do the corresponding terms of the two patterns compare?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**Learn About** **Graphing Ordered Pairs**

Read the problem below. Then explore plotting corresponding terms of number patterns on a graph.

The scouts are making model vehicles. They have a choice of making a model plane or a model boat.

- The materials for the plane cost \$2.
- The materials for the boat cost \$4.

Write and graph ordered pairs to compare the cost of making one or more boats to the cost of making the same number of planes.



**Picture It** You can use a picture to find the costs of making various numbers of each model.

Each pattern of numbers below shows the cost of making 0, 1, 2, 3, and 4 models.



**Model It** You can use a table to help understand the problem.

List the cost of materials for the planes and boats in a table. Then write the corresponding costs as ordered pairs.

| Cost of Planes (\$), $x$ | Cost of Boats (\$), $y$ | Ordered Pairs $(x, y)$ |
|--------------------------|-------------------------|------------------------|
| 0                        | 0                       | (0, 0)                 |
| 2                        | 4                       | (2, 4)                 |
| 4                        | 8                       | (4, 8)                 |
| 6                        | 12                      | (6, 12)                |
| 8                        | 16                      | (8, 16)                |

**▶ Connect It** Now you will solve the problem from the previous page by graphing ordered pairs.

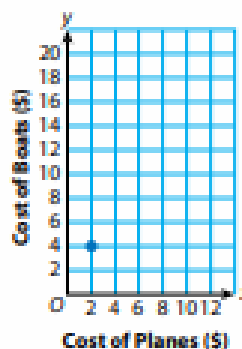
- 7 Explain how to write ordered pairs using the numbers in each pattern.

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- 8 Plot the ordered pairs on the graph to the right.  
The first number tells the location along the horizontal axis.  
The second number tells the location along the vertical axis.  
The point (2, 4) is plotted for you.



- 9 How do the corresponding terms of the patterns compare?

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- 10 Suppose you connect the points. How would this look?

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- 11 What directions would you give to someone to get from one point to the next point to the right on the graph? How do your directions relate to the rules for the patterns?

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**▶ Try It** Use what you just learned about using graphs to compare two patterns to solve this problem. Show your work on a separate sheet of paper.

- 12 Consider the two patterns below. Start each pattern with 0.

**Pattern A:** add 1

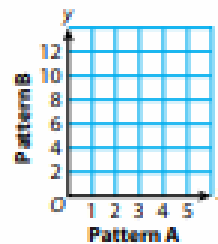
**Pattern B:** add 3

Write five ordered pairs made up of corresponding terms from the two patterns. Plot the points on the graph to the right. Describe the relationship between the two patterns.

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**Practice** Analyzing Patterns and Relationships

Study the example below. Then solve problems 13–15.

**Example**

Look at the following two number patterns.

**Pattern A:** 6, 5, 4, 3, 2, 1, 0

**Pattern B:** 24, 20, 16, 12, 8, 4, 0

What is the relationship between corresponding terms in the two patterns?

Look at how you could show your work using ordered pairs.

The first number is a term from Pattern A. The second number is the corresponding term from Pattern B.

Ordered pairs: (6, 24), (5, 20), (4, 16), (3, 12), (2, 8), (1, 4), (0, 0)

**Solution** Each term in Pattern B is four times the corresponding term in Pattern A.



The student wrote ordered pairs to identify a relationship between corresponding terms.

**Pair/Share**

How are these patterns different from other patterns in this lesson?

- 13** One pattern starts at 0 and has the rule “add 8.” Another pattern starts at 0 and has the rule “add 4.” Write each pattern of numbers. How do the corresponding terms in the patterns compare?

Show your work.



How do I generate the patterns?

**Solution** \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Pair/Share**

Does it matter how many terms you write for each pattern?

- 14 Identify the pattern in each column of the table. Complete the  $x$  and  $y$  columns of the table. Use those columns to write ordered pairs in the last column. Describe the relationship between corresponding terms in the patterns.

Show your work.

| $x$ | $y$ | Ordered Pairs $(x, y)$ |
|-----|-----|------------------------|
| 4   | 1   |                        |
| 8   | 2   |                        |
| 12  | 3   |                        |
|     |     |                        |
|     |     |                        |
|     |     |                        |

**Solution** \_\_\_\_\_  
 \_\_\_\_\_



What is the rule for each pattern?

**Pair/Share**

Find the difference between the numbers in each ordered pair. Do you see another pattern?

- 15 The ordered pairs  $(2, 12)$ ,  $(3, 18)$ , and  $(4, 24)$  are formed by corresponding terms in two patterns. How do the values of the second numbers compare to the values of the first numbers? Circle the letter of the correct answer.

- A 10 more
- B 2 times as much
- C  $\frac{1}{6}$  times as much
- D 6 times as much

Mike chose C as the correct answer. How did he get that answer?

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_



What rule works for all the ordered pairs?

**Pair/Share**

Does Mike's answer make sense?

**Analyzing Patterns and Relationships**

Solve the problems.

- 1 What rule could be used to create the pattern 9, 18, 27, 36, 45, 54, ... ?

- A multiply each term by 2 to get the next term
- B multiply each term by 9 to get the next term
- C add 9 to get the next term
- D add 3 to get the next term

- 2 Look at the patterns below. Choose *True* or *False* for each statement.

**Pattern A:** 3, 6, 9, 12, 15, 18, ...

**Pattern B:** 18, 36, 54, 72, 90, 108, ...

- a. The rule for Pattern A is "multiply by 2."  True  False
- b. The rule for Pattern B is "add 18."  True  False
- c. Each term in Pattern A is 6 times the corresponding term in Pattern B.  True  False
- d. Each term in Pattern B is 3 times the corresponding term in Pattern A.  True  False

- 3 Tickets at a play cost \$2 for students and \$8 for adults. Jason creates two patterns to compare the costs. He writes ordered pairs in the form (student cost, adult cost) for the corresponding numbers of tickets. Which ordered pair could be on Jason's list of ordered pairs? Circle the letter for all that apply.

- A (8, 2)
- B (10, 40)
- C (4, 10)
- D (10, 16)
- E (6, 24)

- 4 Use the rules below to create two patterns each starting with 0. Then describe the relationship between corresponding terms of the two patterns.

**Pattern A:** add 3

**Pattern B:** add 12

Show your work.

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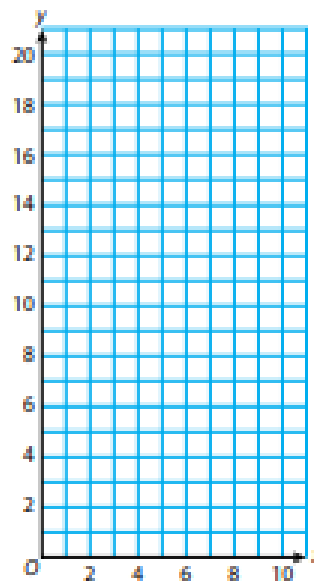


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- 5 Use the rules "add 2" and "add 5" to create two patterns each beginning with 0. Use the patterns to complete the table in Part A.

**Part A**

| Add 2, $x$ | Add 5, $y$ | Ordered Pairs $(x, y)$ |
|------------|------------|------------------------|
|            |            |                        |
|            |            |                        |
|            |            |                        |
|            |            |                        |
|            |            |                        |



**Part B** Graph the ordered pairs and connect the points. How does this look?

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**Part C** Describe the relationship between the corresponding terms of the patterns.

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**Self Check** Go back and see what you can check off on the Self Check on page 183.

## Analyze Patterns and Relationships

Name: \_\_\_\_\_

## Prerequisite: Find Number Patterns

Study the example of using a number line to describe and extend a number pattern. Then solve problems 1–6.

**Example**

Elaine wrote the pattern below.

3, 6, 9, 12, 15

What is the rule for the pattern? What would be the next number in the pattern?

A number line can help you find a pattern.



The rule for the pattern is "add 3." The next number would be  $15 + 3$ , or 18.

- 1 Harry looks at the example and says you multiply 3 by 2 to get 6, so the rule is "multiply by 2." Can you use this rule to describe the pattern in the example problem? Explain.

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- 2 What other pattern(s) do you see in the set of numbers in the example?

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Solve.

- 3 Use the same rule as in the example, "add 3," but start at 1. Write the next 3 numbers in the pattern. Use the number line to show the pattern.

1, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_



- 4 Tell whether each statement is *True* or *False* for the following pattern.

1, 5, 9, 13, 17, 21

- a. The rule is "multiply by 5."  True  False
- b. The rule is "add 4."  True  False
- c. If the pattern continues, the next number will be an even number.  True  False
- d. If the pattern continues, the next number will be an odd number.  True  False

- 5 The rule for a pattern is "multiply by 10." Write the next 3 numbers in the pattern.

7, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

- 6 Look at the pattern below.

45, 39, 33, 27, 21, 15

- a. What is the rule for the pattern?  
\_\_\_\_\_
- b. If the pattern continues, what would be the next number?  
\_\_\_\_\_

## Compare Two Numerical Patterns

Study the example problem showing one way to identify relationships between two numerical patterns. Then solve problems 1–6.

### Example

The school store sells laces and decals in the school colors. Laces cost \$1, and decals cost \$5. Write ordered pairs to compare the cost of laces to decals for selling 0, 1, 2, 3, 4, and 5 of each item.

Use a table to show the two numerical patterns. Then write the corresponding terms as ordered pairs.

The cost of laces pattern follows the rule "add 1."

0, 1, 2, 3, 4, 5

The cost of decals pattern follows the rule "add 5."

0, 5, 10, 15, 20, 25

| Cost of Laces<br>(Add 1) | Cost of Decals<br>(Add 5) | Ordered<br>Pairs |
|--------------------------|---------------------------|------------------|
| 0                        | 0                         | (0, 0)           |
| 1                        | 5                         | (1, 5)           |
| 2                        | 10                        | (2, 10)          |
| 3                        | 15                        | (3, 15)          |
| 4                        | 20                        | (4, 20)          |
| 5                        | 25                        | (5, 25)          |

- 1 Look at the example. What is the cost for 6 decals? Explain how you got your answer.

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- 2 Look at the example. How are the terms in the cost of decals pattern related to the corresponding terms in the cost of laces pattern?

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Solve.

- 3 Suppose school bookmarks cost \$3 each. Complete the table to show how the terms in this pattern compare to the corresponding terms in the pattern for the cost of laces.

| Cost of Laces | Cost of Bookmarks    | Ordered Pairs                                   |
|---------------|----------------------|---|
| 0             | 0                    | (0, 0)  |
| 1             | 3                    | (1, 3)  |
| 2             | <input type="text"/> | ( <input type="text"/> , <input type="text"/> ) |
| 3             | <input type="text"/> | ( <input type="text"/> , <input type="text"/> ) |
| 4             | <input type="text"/> | ( <input type="text"/> , <input type="text"/> ) |
| 5             | <input type="text"/> | ( <input type="text"/> , <input type="text"/> ) |

- 4 Look at problem 3. How do the corresponding terms of the two patterns compare?

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- 5 Look at problem 3. What is the rule for finding the cost of bookmarks?

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- 6 Look at problem 3. If the table was continued, which ordered pair could be in it? Circle the letter for all that apply.

- A (8, 21)                      C (12, 36)  
B (10, 30)                     D (15, 60)

### Vocabulary

**corresponding terms** the numbers that are in the same place in two or more related patterns.

**ordered pair** a pair of numbers that locate a point on a coordinate plane.

## Graph Ordered Pairs

Study the example comparing two patterns on a graph.  
Then solve problems 1–8.

**Example**

Luke compared a numeric pattern with the rule “add 2” to a pattern with the rule “add 6.”

He started at 0 and wrote the first three numbers of each pattern.

add 2: 0, 2, 4

add 6: 0, 6, 12

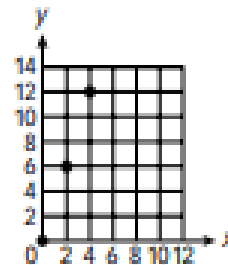
He wrote three ordered pairs:

$(0, 0)$     $(2, 6)$     $(4, 12)$

Then he plotted the ordered pairs on a graph.

The first number in each ordered pair shows the location on the  $x$ -axis.

The second number in each ordered pair shows the location on the  $y$ -axis.



- 1 Look at the ordered pairs in the example. Describe the relationship between corresponding terms of the two patterns.

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- 2 Suppose you connect the points on the graph in the example, what would the graph look like?

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Solve.

At a bake sale, cookies are sold in packages of 4 and fruit bars are sold in packages of 2.

- 3 Complete the table comparing the number of cookies and fruit bars sold for 0, 1, 2, and 3 packages.

| Number of Cookies ( $x$ ) | Number of Fruit Bars ( $y$ ) | Ordered Pairs ( $x, y$ )                        |
|---------------------------|------------------------------|---|
| 0                         | 0                            | (0, 0)  |
| 4                         | 2                            | (4, 2)  |
| <input type="text"/>      | <input type="text"/>         | ( <input type="text"/> , <input type="text"/> ) |
| <input type="text"/>      | <input type="text"/>         | ( <input type="text"/> , <input type="text"/> ) |

- 4 What is the rule for the number of cookies pattern?

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- 5 What is the rule for the number of fruit bars pattern?

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- 6 Plot the ordered pairs on the coordinate plane to the right.

- 7 What directions would you give someone to get from one point to the next on the graph?

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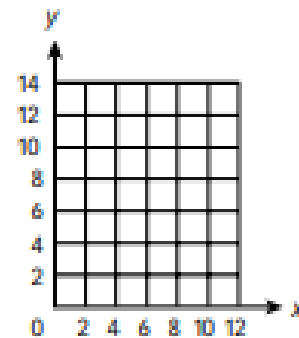
- 8 How do your directions relate to the rules for the patterns?

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## Analyze Patterns and Relationships

Solve the problems.

- 1 How do the corresponding terms compare in a pattern that has the rule "add 3" and a pattern that has the rule "add 9"? Start each pattern at 0.

Show your work.

How do I generate the patterns?



Solution: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

- 2 Peg is counting nickels and dimes and comparing the values for 0, 1, 2, and 3 coins in a table. What ordered pair will Peg write next? Circle the letter of the correct answer.

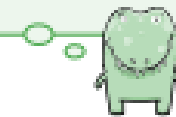
| Value of Nickels ( $x$ ) | Value of Dimes ( $y$ ) | Ordered Pairs ( $x, y$ ) |
|--------------------------|------------------------|--------------------------|
| 0                        | 0                      | (0, 0)                   |
| 5                        | 10                     | (5, 10)                  |
| 10                       | 20                     | (10, 20)                 |

- A** (20, 40)                      **C** (15, 40)  
**B** (20, 30)                      **D** (15, 30)

Leroy chose **A** as the correct answer. How did he get that answer?

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

How many coins does the next row of the table represent?



Solve.

- 3 Complete the table for the rules "add 6" and "add 2."

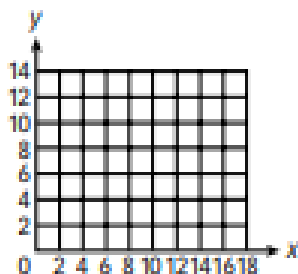
| Add 6                    | Add 2                    | Ordered Pairs (x, y)                                    |
|--------------------------|--------------------------|---|
| 0                        | 0                        | (0, 0)  |
| 6                        | 2                        | (6, 2)  |
| <input type="checkbox"/> | <input type="checkbox"/> | ( <input type="checkbox"/> , <input type="checkbox"/> ) |
| <input type="checkbox"/> | <input type="checkbox"/> | ( <input type="checkbox"/> , <input type="checkbox"/> ) |

How do you know which number to write first in an ordered pair?



- 4 Plot the ordered pairs from problem 3 on the coordinate plane below.

How do the corresponding terms in the patterns compare?



Do you move along the x-axis or y-axis first when you plot ordered pairs on a graph?



- 5 Choose Yes or No to tell whether the sentence describes a way to show relationships between corresponding terms in numerical patterns.

- a. Write ordered pairs.  Yes  No
- b. List numbers in each pattern starting at 0.  Yes  No
- c. Plot the ordered pairs for the patterns on a graph.  Yes  No

Is there more than one way to show relationships between corresponding terms in numerical patterns?



**Ready® Mathematics****Lesson 20 Quiz****Solve the problems.**

- 1 Mason is studying two number patterns. Pattern A starts at 0 and has the rule "add 2." Pattern B starts at 0 and has the rule "add 1."

Fill in the blanks to complete Mason's patterns. Then fill in the blank to complete the comparison of the corresponding terms in each pattern.

Pattern A: 0, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

Pattern B: 0, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_

The terms in Pattern A are \_\_\_\_\_ the corresponding terms in Pattern B.

- 2 Look at the two patterns below.

Pattern A: 4, 8, 12, 16, 20, 24, ...

Pattern B: 16, 32, 48, 64, 80, 96, ...

Tell whether each statement about the patterns is *True* or *False*.

- a. The rule for Pattern A is "multiply by 2."  True  False
- b. Each term in Pattern A is 12 less than the corresponding term in Pattern B.  True  False
- c. The rule for Pattern B is "add 16."  True  False
- d. Each term in Pattern B is four times the corresponding term in Pattern A.  True  False
- 3 An ice cream stand charges \$2 for a kiddie cone and \$6 for a large cone. Clara creates two patterns to compare the costs. She writes ordered pairs in the form (kiddie cone cost, large cone cost) for the corresponding numbers of cones. Which ordered pairs could be on Clara's list?

Circle all the correct answers.

- A** (6, 12)                      **C** (12, 36)  
**B** (8, 24)                      **D** (16, 42)





**Lesson 20 Quiz** *continued*

- 4 At the library book sale, paperback books cost \$2 and hardcover books cost \$3.

**Part A**

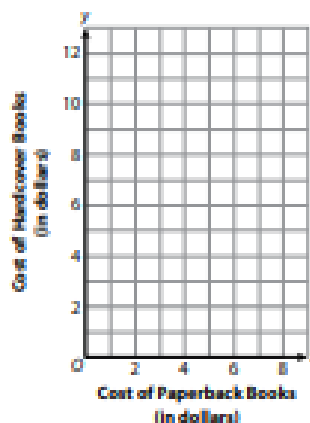
Dominic makes a table to compare the costs of the books.

Complete the pattern in the first two columns for the cost of 0, 1, 2, 3, and 4 books. Write ordered pairs for the corresponding terms in the third column.

| Cost of Paperback Books<br>(in dollars) | Cost of Hardcover Books<br>(in dollars) | Ordered Pairs |
|---|---|---------------|
| 0                                       | 0                                       | (0, 0)        |
| 2                                       | 3                                       | (2, 3)        |
| 4                                       |   |               |
|   | 9                                       |               |
|   |   |               |

**Part B**

Graph the ordered pairs from the table in **Part A**.



**Part C**

Describe the relationship between the corresponding terms of the two patterns.

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## Understand the Coordinate Plane

Name: \_\_\_\_\_

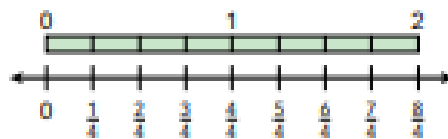
**Prerequisite:** How do number lines show the relationships among numbers?



Study the example showing how to label fractions on a number line. Then solve problems 1 and 2.

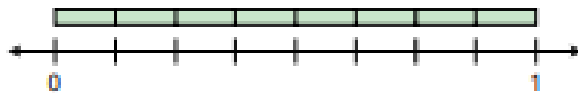
### Example

The rectangles show equal parts between 0 and 1 and between 1 and 2 on the number line.



There are 4 equal parts between each pair of whole numbers. Each part shows  $\frac{1}{4}$ . You can count by fourths on the number line.

- 1** Look at the section between 0 and 1 on the number line.



- How many equal parts are there? \_\_\_\_\_
  - What fraction does each part show? \_\_\_\_\_
  - Label the number line with fractions.
- 2** Look at the number line in problem 1. What happens to the numbers as you move from left to right on the number line? From right to left?

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Solve.

Use the number lines to solve problems 3–8.

- 3 Which is at a greater number, point *A* or point *B*?  
Explain how you know.



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- 4 Which is farther from 0, point *A* or point *B*? \_\_\_\_\_

- 5 Which is at a lesser number, point *C* or point *D*?  
Explain how you know.

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- 6 Which is closer to 0, point *C* or point *D*? \_\_\_\_\_

- 7 Explain how a point's distance from 0 relates to the value of the number that it represents.

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- 8 Describe how the two number lines are alike and different.

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## Name and Locate Points on a Coordinate Plane

Study the example problem that shows how to name ordered pairs on a coordinate plane. Then solve problems 1–9.

### Example

Each point is named with an  $x$ -coordinate and a  $y$ -coordinate.

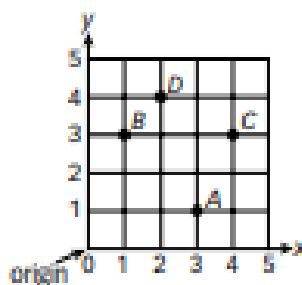
The ordered pair for the origin is  $(0, 0)$ .

The  $x$ -coordinate tells how many units from the origin the point is on the  $x$ -axis. It is the first number in the ordered pair.

The  $y$ -coordinate tells how many units from the origin the point is on the  $y$ -axis. It is the second number in the ordered pair.

The ordered pair for point  $A$  is  $(3, 1)$ .

$(x, y)$



- 1 Point  $B$  is \_\_\_\_\_ unit(s) to the right of the origin and \_\_\_\_\_ unit(s) up from the origin.

The ordered pair for point  $B$  is  $(\underline{\hspace{1cm}}, \underline{\hspace{1cm}})$ .

- 2 Point  $C$  is \_\_\_\_\_ unit(s) to the right of the origin and \_\_\_\_\_ unit(s) up from the origin.

The ordered pair for point  $C$  is  $(\underline{\hspace{1cm}}, \underline{\hspace{1cm}})$ .

- 3 Write the ordered pair for point  $D$ . Explain how you got your answer.

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- 4 Find the ordered pair  $(2, 3)$  on the coordinate plane. Mark and label this point "E."

### Vocabulary

#### coordinate plane

a space formed by two perpendicular number lines called axes.

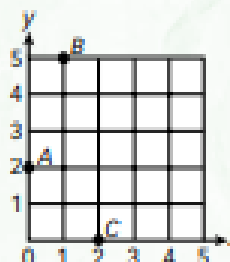
#### ordered pair

a pair of numbers, or coordinates,  $(x, y)$  describing the location of a point on the coordinate plane.



Solve.

| Point | A | B | C | D | E | F |
|-------|---|---|---|---|---|---|
| x     |   |   |   | 3 | 4 | 5 |
| y     |   |   |   | 4 | 4 | 2 |

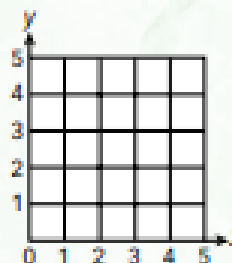


- In the table, write the ordered pairs for points  $A$ ,  $B$ , and  $C$  on the coordinate plane above.
- Find and label points  $D$ ,  $E$ , and  $F$  on the coordinate plane to represent the ordered pairs in the table.
- Choose a point on the coordinate plane above. Describe its location compared to the origin.

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| Point | R | S | T |
|-------|---|---|---|
| x     | 1 | 3 | 4 |
| y     | 4 | 0 | 2 |



- Find and label points  $R$ ,  $S$ , and  $T$  on the coordinate plane to represent the ordered pairs in the table.
- Describe the location of point  $T$  compared to point  $S$  on the coordinate plane.

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## Reason and Write

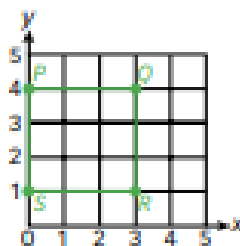
**Study the example.** Underline two parts that you think make it a particularly good answer and a helpful example.

**Example**

Find the ordered pair  $(0, 4)$  on the coordinate plane. Label the point  $P$ . Use point  $P$  as a corner, then draw a square. Label the other corners with letters. List the coordinate pairs for all corners.

Explain how you solved the problem and how you know that you drew a square.

**Show your work.** Use pictures, words, or numbers to explain.



Coordinate pairs:  
 $P(0, 4)$   $Q(3, 4)$   $R(3, 1)$   $S(0, 1)$

I started at the origin and moved 4 units up. I labeled it point  $P(0, 4)$ . Then I drew a vertical segment from point  $P$  3 units down the  $y$ -axis. Then I drew a horizontal segment starting at point  $P$ . Since all sides of a square are equal, I made this segment 3 units long. Opposite sides of a square are parallel. So, I drew segments parallel to the horizontal and vertical segments, each 3 units away.

I labeled the points at the corners of the square  $P$ ,  $Q$ ,  $R$ , and  $S$ . Then I found the distance of each point from the origin and wrote the coordinate pairs. I know the shape is a square because it has 4 equal sides and 4 right angles. All of the sides are 3 units long, and the angles are formed by the perpendicular lines in the coordinate plane, and I know perpendicular lines form right angles.

Where does the example ...

- label each point with a letter?
- connect points to draw a square?
- tell how you solved the problem?
- explain why the shape is a square?

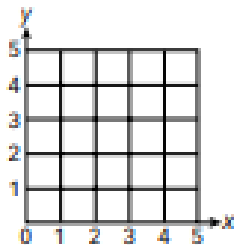


**Solve the problem. Use what you learned from the example.**

Find the ordered pair  $(1, 3)$  on the coordinate plane. Label it point  $A$ . Use point  $A$  as a corner, then draw a right triangle. Label the other corners with letters. List the coordinate pairs for all corners.

Explain how you solved the problem and how you know that you drew a right triangle.

**Show your work.** Use models, words, and numbers to explain your answer.



Did you ...

- label each point with a letter?
- connect points to draw a triangle?
- tell how you solved the problem?
- explain why the shape is a right triangle?



## Ready® Center Activity 5.46 ★

### Find the Point

#### What You Need

- number cube (0–5)
- colored pencil in one color
- colored pencil in a different color
- Game Board



#### Check Understanding

A student rolls a number cube twice and gets (5, 4). Tell how to move to that point from the origin (0, 0).

#### What You Do

1. Players take turns and use different-color pencils. Mark an X on any point on the **Game Board** where grid lines intersect. Repeat until each player has marked 8 points.
2. Player A rolls the number cube twice and uses the numbers to write an ordered pair. The first roll is the  $x$ -coordinate and the second roll is the  $y$ -coordinate.
3. Player A describes the movement from the origin to the ordered pair. Player B checks the location.
4. If the coordinates name the location of an X, Player A circles the X.
5. Take turns. The first player to have 3 of his or her Xs circled on the **Game Board** wins.

I know that the origin is where the  $x$ -axis and the  $y$ -axis meet. The ordered pair  $(0, 0)$  names its location.

If I roll 3 and then 5, the ordered pair is  $(3, 5)$ . I move 3 units to the right of the origin and 5 units up.



#### Go Further!

Take turns. One partner places an X on the **Game Board**. The other partner describes how to move from the origin to that location, and says the coordinates.



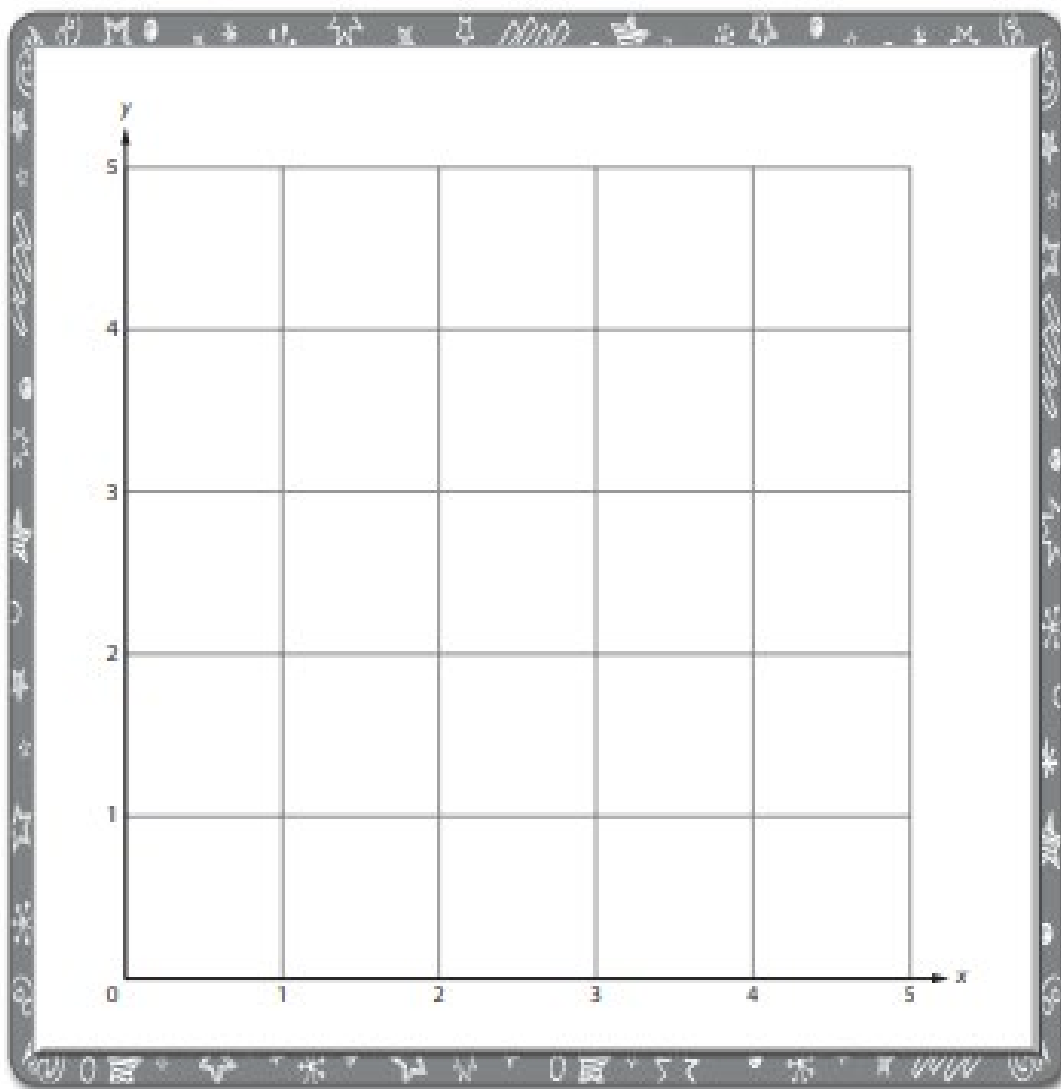


Ready® Center Activity 5.46 ★ Game Board

Partner A \_\_\_\_\_

Partner B \_\_\_\_\_

Find the Point



Name \_\_\_\_\_

Date \_\_\_\_\_

### Ready® Mathematics

## Lesson 28 Quiz

Solve the problems.

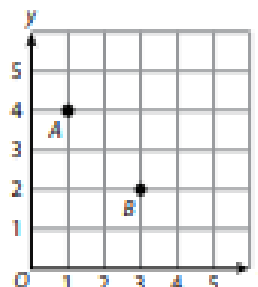
- 1 Look at the coordinate plane shown.

Fill in the blanks to complete the sentences.

To locate a point on the coordinate grid, start at the \_\_\_\_\_ . Then move \_\_\_\_\_ along the \_\_\_\_\_-axis, and then move \_\_\_\_\_ along the \_\_\_\_\_-axis.

The ordered pair for point *A* is (\_\_\_\_\_, \_\_\_\_\_).

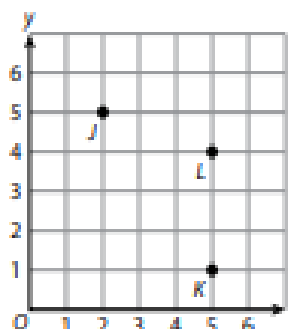
The ordered pair for point *B* is (\_\_\_\_\_, \_\_\_\_\_).



- 2 Look at the coordinate plane at the right.

Choose *True* or *False* for each statement about the points in the coordinate plane.

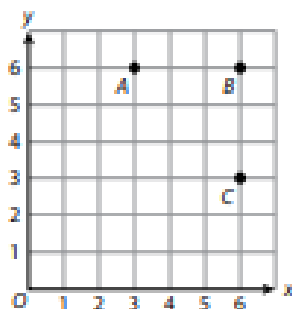
- a. Point *J* and point *K* have the same *y*-coordinate.  True  False
- b. Point *K* and point *L* have the same *x*-coordinate.  True  False
- c. Point *J* and point *L* are the same distance up from the origin.  True  False
- d. The *y*-coordinate of point *L* is 5.  True  False
- e. Point *J* is the nearest point to the right of the origin.  True  False



Name \_\_\_\_\_ Date \_\_\_\_\_

**Lesson 28 Quiz** *continued*

**3** Look at the coordinate plane below.

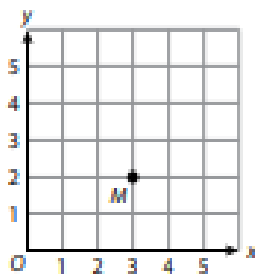


Fill in the blanks to complete the statements.

The ordered pair  $(3, 6)$  tells you to start at the origin and move right \_\_\_\_\_ units and up \_\_\_\_\_ units. The letter \_\_\_\_\_ represents this point on the coordinate plane.

The ordered pair  $(6, 3)$  tells you to start at the origin and move right \_\_\_\_\_ units and up \_\_\_\_\_ units. The letter \_\_\_\_\_ represents this point on the coordinate plane.

**4** Hailey identifies the ordered pair for point  $M$  on the coordinate plane as  $(2, 3)$ .



Explain Hailey's error and tell how to correctly identify the ordered pair for point  $M$ .

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## Graph Points in the Coordinate Plane

Name: \_\_\_\_\_

## Prerequisite: Identify Ordered Pairs

Study the example showing how to name a point on a coordinate plane. Then solve problems 1–3.

**Example**

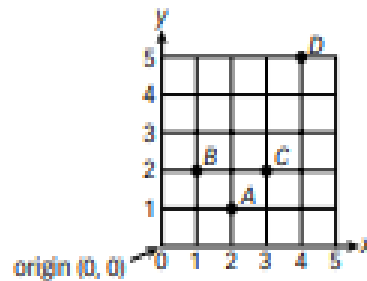
What is the ordered pair for point  $A$ ?

The location of a point is named with an  $x$ -coordinate and a  $y$ -coordinate. The coordinates are written as an ordered pair, ( $x$ -coordinate,  $y$ -coordinate).

Start at the  $y$ -axis. Point  $A$  is 2 units to the right of the origin.

Start at the  $x$ -axis. Point  $A$  is 1 unit up from the origin.

The ordered pair for point  $A$  is  $(2, 1)$ .



- 1 Starting at the  $y$ -axis, point  $B$  is \_\_\_\_\_ unit(s) to the right of the origin.

Starting at the  $x$ -axis, point  $B$  is \_\_\_\_\_ unit(s) up from the origin.

The ordered pair for point  $B$  is (\_\_\_\_\_, \_\_\_\_\_).

- 2 Write the ordered pairs.

point  $C$  (\_\_\_\_\_, \_\_\_\_\_)    point  $D$  (\_\_\_\_\_, \_\_\_\_\_)

- 3 Explain how you found the ordered pair for point  $C$  or point  $D$ .

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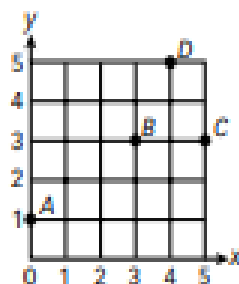
**Vocabulary**

**$x$ -coordinate** a point's horizontal distance from the origin in units along the  $x$ -axis.

**$y$ -coordinate** a point's vertical distance from the origin in units along the  $y$ -axis.



Use the coordinate plane to solve problems 4–6.



- 4 Complete the table to show the ordered pairs on the coordinate plane.

| Point | A | B | C | D |
|-------|---|---|---|---|
| $x$   |   |   |   |   |
| $y$   |   |   |   |   |

- 5 Start at  $(0, 0)$ . Move 3 units right and 0 units up. Label this point  $E$ . Write the ordered pair for  $E$ .

$E$  ( \_\_\_\_\_ , \_\_\_\_\_ )

- 6 Find the ordered pair  $(1, 5)$  on the coordinate plane above. Label it point  $F$ .

- 7 Choose 4 points and draw a rectangle on the coordinate plane to the right. Label the points with letters. Write the letters and ordered pairs you used to draw your rectangle.

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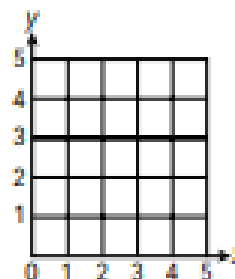
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## Show Relationships on a Coordinate Plane

Study the example problem showing how to represent and use relationships between quantities. Then solve problems 1–7.

**Example**

Holly is playing a crane game at the arcade. With each quarter, she gets 2 tries to grab a stuffed animal with the crane. Holly wants to know how many tries she will get using different numbers of quarters.

Show the relationship between quarters and numbers of tries.

You can use equations.

You can use a table.

$$1 \times 2 = 2 \text{ tries}$$

$$2 \times 2 = 4 \text{ tries}$$

$$3 \times 2 = 6 \text{ tries}$$

$$4 \times 2 = 8 \text{ tries}$$

$$5 \times 2 = 10 \text{ tries}$$

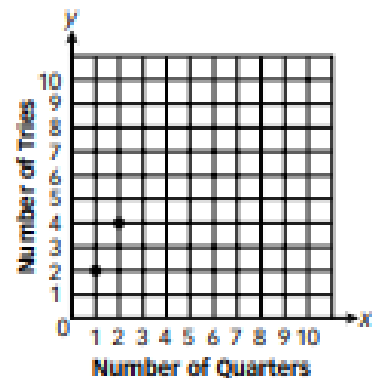
|                    |   |   |   |   |    |
|--------------------|---|---|---|---|----|
| Number of Quarters | 1 | 2 | 3 | 4 | 5  |
| Number of Tries    | 2 | 4 | 6 | 8 | 10 |

- Use the table in the example above. Finish plotting the ordered pairs from the table in the coordinate plane to the right.
- What is the meaning of the ordered pair (3, 6)?

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- Describe a path from (1, 2) to (2, 4) and from (2, 4) to (3, 6). If you continue from point to point, what do you notice?

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Solve.

Holly plays a different game at the arcade. It takes 2 tokens to play the game. She starts with 10 tokens.

- 4 Write an equation that can be used to determine how many tokens she has left after playing the game each time. Fill in the blanks.

\_\_\_\_\_ tokens  $-$  ( \_\_\_\_\_ tokens  $\times$  number of \_\_\_\_\_ ) = number of tokens left

- 5 Use the equation to complete the table.

| Number of Games Played | 1 | 2 | 3 | 4 | 5 |
|------------------------|---|---|---|---|---|
| Number of Tokens Left  |   |   |   |   |   |

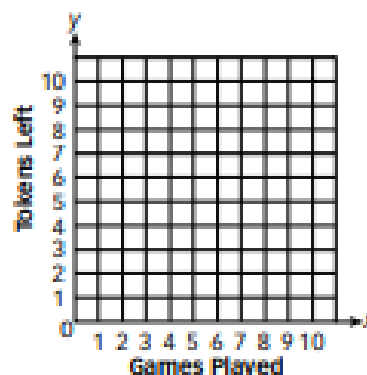
- 6 Plot the ordered pairs from the table on the coordinate plane. Choose a point on the coordinate plane and tell what it means.

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- 7 Compare the table and coordinate plane from this problem with the problem on the previous page. How are they different?

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## Solve Measurement Problems on the Coordinate Plane

Study the example that shows how to solve a measurement problem with a shape on a coordinate plane. Then solve problems 1–6.

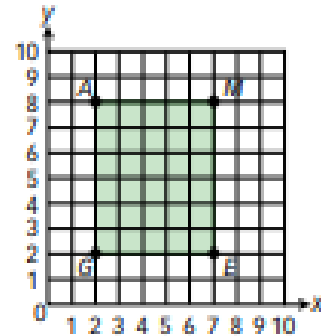
### Example

The owner plans to add a new game room to the arcade. He draws a rectangle on the coordinate plane to represent the room. What is the area of the rectangle?

From point  $G$  to point  $A$ , go up 6 units.  
From point  $A$  to point  $M$ , go right 5 units.  
Length of  $\overline{GA}$  is 6 units and length of  $\overline{AM}$  is 5 units.

Area of a rectangle = length  $\times$  width  
Multiply the lengths of the sides to find the area of the rectangle:  $6 \times 5 = 30$ .

Area of rectangle  $GAME = 30$  square units



- 1 Write ordered pairs for each point.

$G$  (\_\_\_\_\_, \_\_\_\_\_)     $A$  (\_\_\_\_\_, \_\_\_\_\_)     $M$  (\_\_\_\_\_, \_\_\_\_\_)     $E$  (\_\_\_\_\_, \_\_\_\_\_)

- 2 Find the lengths of  $\overline{ME}$  and  $\overline{EG}$ . Explain how you can use the coordinates to find the distance between points  $M$  and  $E$  and between points  $E$  and  $G$ .

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- 3 What is the perimeter of rectangle  $GAME$ ? Tell how you found your answer.

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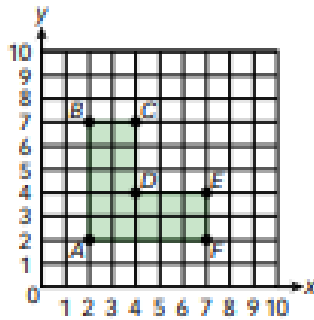


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Use the coordinate plane to solve problems 4 and 5.



4 Write the coordinates of points  $A$ ,  $B$ ,  $C$ ,  $D$ ,  $E$ , and  $F$ .

$A$  (\_\_\_\_, \_\_\_\_)       $B$  (\_\_\_\_, \_\_\_\_)  
 $C$  (\_\_\_\_, \_\_\_\_)       $D$  (\_\_\_\_, \_\_\_\_)  
 $E$  (\_\_\_\_, \_\_\_\_)       $F$  (\_\_\_\_, \_\_\_\_)

5 What is the perimeter of shape  $ABCDEF$ ?

*Show your work.*

*Solution:* \_\_\_\_\_

6 Draw a rectangle with an area of 12 square units in the coordinate plane to the right. Tell how you know the area is 12 square units.

\_\_\_\_\_

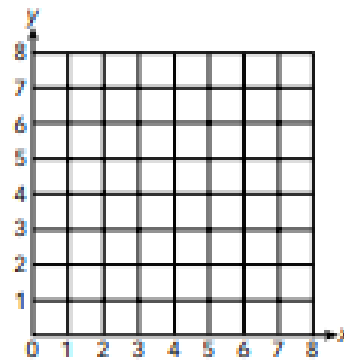
\_\_\_\_\_

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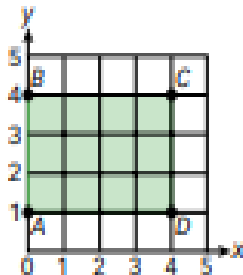
\_\_\_\_\_



## Graph Points in the Coordinate Plane

Solve the problems.

- 1 Look at rectangle  $ABCD$ . Tell whether each statement is *True* or *False*.



You can use  $2(l + w)$  to find the perimeter of a rectangle.



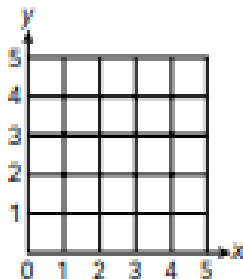
- a. The coordinates of the vertices of the rectangle are  $A(1, 0)$ ,  $B(4, 0)$ ,  $C(4, 4)$ , and  $D(1, 4)$ .  True  False
- b. The coordinates of the vertices of the rectangle are  $A(0, 1)$ ,  $B(0, 4)$ ,  $C(4, 4)$ , and  $D(4, 1)$ .  True  False
- c. The area of rectangle  $ABCD$  is 16 square units.  True  False
- d. The perimeter of rectangle  $ABCD$  is 14 units.  True  False

- 2 Plot the following points on the coordinate plane.

$K(2, 5)$

$L(0, 2)$

$M(4, 3)$

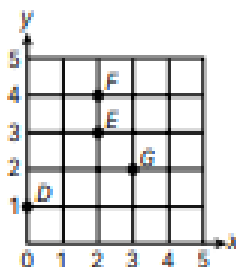


Which is the first number in an ordered pair? The  $x$ -coordinate? The  $y$ -coordinate?



Solve.

- 3 Use the coordinate plane to the right. Start at  $(0, 1)$ . Move 2 units right and 3 units up. Which point shows this location? Circle the letter of the correct answer.



You can move right first or up first.



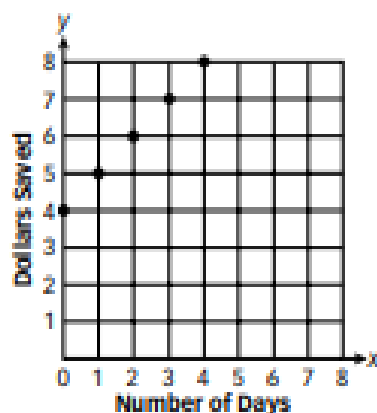
- A Point D
- B Point E
- C Point F
- D Point G

Maya chose **B** as the correct answer. How did Maya get that answer?

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- 4 Look at the graph of Kent's savings. Kent starts with \$4. Each day he saves the money his dad gives him for helping around the house. How much money does Kent get from his dad each day? Tell how you know.



What pattern do you see on the graph?



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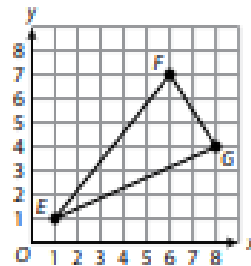
**Ready® Mathematics**

**Lesson 29 Quiz**

**Solve the problems.**

**1** What are the coordinates of points  $E$ ,  $F$ , and  $G$ ?

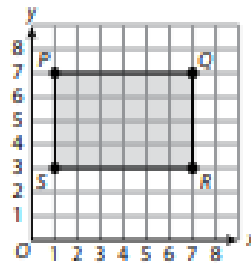
- A**  $E(1, 1), F(7, 6), G(4, 8)$
- B**  $E(1, 1), F(6, 7), G(8, 4)$
- C**  $E(0, 0), F(7, 6), G(4, 8)$
- D**  $E(0, 0), F(6, 7), G(8, 4)$



**2** What is the perimeter of rectangle  $PQRS$  shown on the coordinate grid?

*Show your work.*

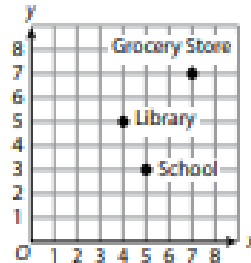
**Answer:** \_\_\_\_\_ units



**3** David uses a coordinate plane to design his model town layout.

David moves the library 3 units left and 2 units down. He says that the ordered pair for the new location of the library is  $(1, 7)$ .

Explain David's mistake and write the correct ordered pair for the new location of the library.




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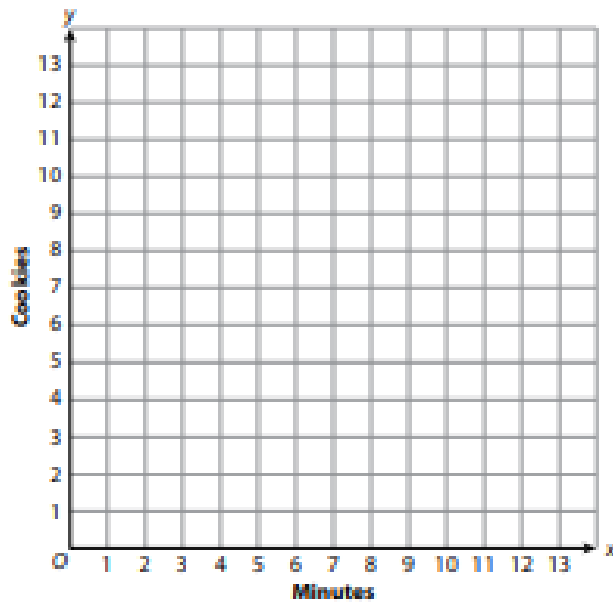
**Lesson 29 Quiz** *continued*

- 4 Lin can decorate 3 cookies in 1 minute. The table shows the number of minutes that it takes Lin to decorate a certain number of cookies.

| Time in Minutes ( $x$ ) | Number of Cookies ( $y$ ) |
|-------------------------|---------------------------|
| 1                       | 3                         |
| 2                       | 6                         |
| 3                       | 9                         |
| 4                       | 12                        |

**Part A**

Plot the ordered pairs from the table on the coordinate plane below.



**Part B**

Lin decorates more cookies. She plots the point  $(7, 21)$  on the coordinate plane. What is the meaning of the point  $(7, 21)$ ?

- A Lin decorates 7 cookies in 7 minutes.
- B Lin decorates 21 cookies in 3 minutes.
- C Lin decorates 21 cookies in 7 minutes.
- D Lin decorates 7 cookies in 21 minutes.



## Ready® Center Activity 5.2 ★★

### Make It True

#### What You Need

- Recording Sheet



#### Check Understanding

Insert parentheses to make the equation true.

$$24 \div 6 \times 2 = 2$$

#### What You Do

1. Take turns. Pick an equation on the **Recording Sheet**.
2. Tell where to put parentheses to make the equation true.
3. Your partner checks your work by evaluating the equation.
4. If you are correct, write the grouping symbols on the **Recording Sheet** and write your initials in the box. If you are incorrect, your turn ends.
5. The first player to get 3 boxes in a row wins.

How can I make this equation true?

$$15 \div 3 + 2 = 3$$

I can use parentheses to show which operation to do first.

$$(15 \div 3) + 2 = 7$$

$$15 \div (3 + 2) = 3$$



#### Go Further!

Pick an equation on the **Recording Sheet**. Rewrite it with the parentheses in a different place and evaluate. Continue until you have found at least one equation with the same value no matter where you place the parentheses.



Ready® Center Activity 5.2 ★★ Recording Sheet

Partner A \_\_\_\_\_

Partner B \_\_\_\_\_

Make It True

|                       |                          |                                 |
|-----------------------|--------------------------|---------------------------------|
| $2 \times 4 + 6 = 20$ | $0.5 \times 24 + 2 = 13$ | $13 - 2 + 5 = 6$                |
| $12 - 2 + 4 = 6$      | $4 \times 5 \div 5 = 4$  | $\frac{1}{2} \times 10 - 4 = 3$ |
| $32 \div 4 + 12 = 2$  | $2 + 14 \times 0.5 = 9$  | $24 \div 4 - 2 = 12$            |
| $6.5 - 2.3 + 3.2 = 1$ | $16 \div 4 + 2 = 2$      | $7 - 2 \times 0.3 = 1.5$        |



## Write a Numerical Expression

### What You Need

- Recording Sheet



### Check Understanding

There are 4 black pencils and 3 red pencils in each pencil box. Write a numerical expression with parentheses that represents the total number of pencils in 5 pencil boxes.

### What You Do

1. Take turns. Pick a word expression on the **Recording Sheet**. Read the word expression aloud.
2. On a separate sheet of paper, write a numerical expression with grouping symbols for the word expression.
3. Your partner checks your work.
4. If your numerical expression is correct, write it on the **Recording Sheet**.
5. If your numerical expression is incorrect, work with your partner to correct it, and then write it on the **Recording Sheet**.
6. Repeat until there is a correct numerical expression for each word expression.

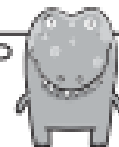
Grouping symbols tell what operation to perform first.

$$\frac{5 + 5}{2}$$

Add first. Divide the sum by 2.

$$3 \times (4 + 10)$$

Add first. Multiply the sum by 3.



### Go Further!

Choose four expressions from the **Recording Sheet**. For each expression you choose, write a matching word expression that is different than the one in the activity. Exchange papers with your partner to check.





**Write a Numerical Expression**

| Word and Numerical Expressions                    |   |
|---|---|
| Add 6 and 9, and then multiply by 3.<br><br>_____ | 2 times the sum of 5 and 6<br><br>_____                               |
| 1 less than 30 divided by 5<br><br>_____          | 21 divided by the sum of 2 and 5<br><br>_____                         |
| 15 minus the sum of 4 and 6<br><br>_____          | half the sum of 18 and 12<br><br>_____                                |
| 3 times the difference of 12 and 9<br><br>_____   | Divide the difference of 20 and 5 by the sum of 4 and 1.<br><br>_____ |



## Plot Points

### What You Need

- 1 colored pencil in one color
- 1 colored pencil in a different color
- Recording Sheet

### Check Understanding

A table starts with 0. The rule for the first sequence is  $+ 2$ . The first four ordered pairs are: (0, 0), (2, 6), (4, 12), (6, 18). What is the second rule? Explain your reasoning. What is the fifth ordered pair?

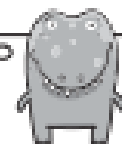
### What You Do

1. Take turns.
2. Look at the first table on the **Recording Sheet**. Say the next number in each sequence. If your partner agrees, write the numbers in the table.
3. Then write an ordered pair using the corresponding terms in the table. Show your partner this location on the graph on the **Recording Sheet**. If your partner agrees, plot the point.
4. Your partner does the same on the second table. Repeat until both tables are complete and all the points are plotted.

(6, 10)

The first term, 6, is the *x*-coordinate. It tells how many places to move right.

The second term, 10, is the *y*-coordinate. It tells how many spaces to move up.



### Go Further!

Work with your partner to make another table with two different number sequences. Take turns plotting the points on the **Recording Sheet**.



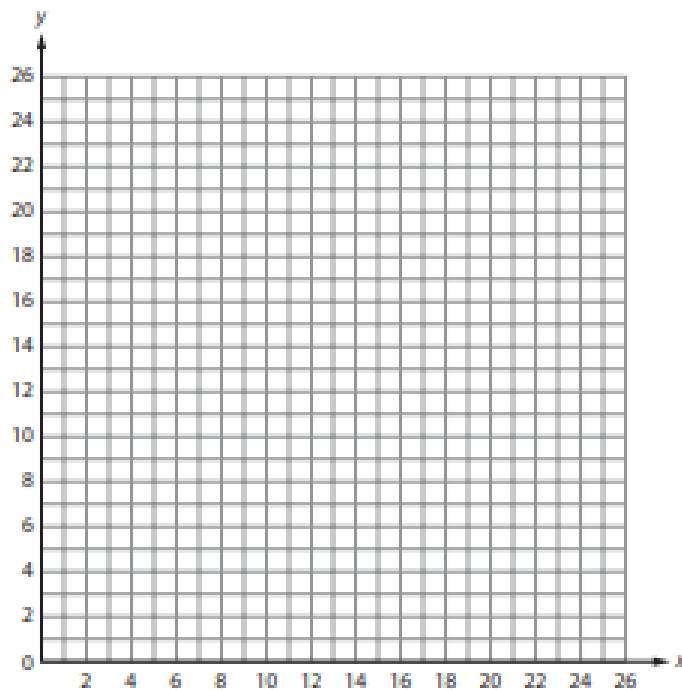
**Plot Points**

**Partner A**

| + 4 | + 3 | Ordered Pair |
|-----|-----|--------------|
| 0   | 0   | (0, 0)       |
|     |     |              |
|     |     |              |
|     |     |              |
|     |     |              |
|     |     |              |

**Partner B**

| + 2 | + 5 | Ordered Pair |
|-----|-----|--------------|
| 0   | 0   | (0, 0)       |
|     |     |              |
|     |     |              |
|     |     |              |
|     |     |              |
|     |     |              |



## Shapes on a Coordinate Plane

### What You Need

- grid paper
- Recording Sheet



### Check Understanding

Plot the points on a coordinate grid: (2, 3), (2, 5), and (6, 4). Connect the points. Name the shape that was formed.

### What You Do

1. Take turns. Choose a letter from the table and read the ordered pairs next to that letter in the table.
2. Plot the points on the **Recording Sheet** and connect the points. Label your shape with the letter name.
3. Your partner checks your work and names the shape formed when the ordered pairs are connected.
4. Repeat until all the letters are used.

|          |                                    |
|----------|------------------------------------|
| <b>A</b> | (1, 10), (6, 10), (1, 12)          |
| <b>B</b> | (8, 8), (11, 11), (10, 6)          |
| <b>C</b> | (8, 2), (10, 2), (9, 6)            |
| <b>D</b> | (12, 6), (14, 6), (14, 4), (12, 4) |
| <b>E</b> | (2, 7), (6, 7), (6, 5), (2, 5)     |
| <b>F</b> | (2, 1), (4, 2), (2, 3), (0, 2)     |

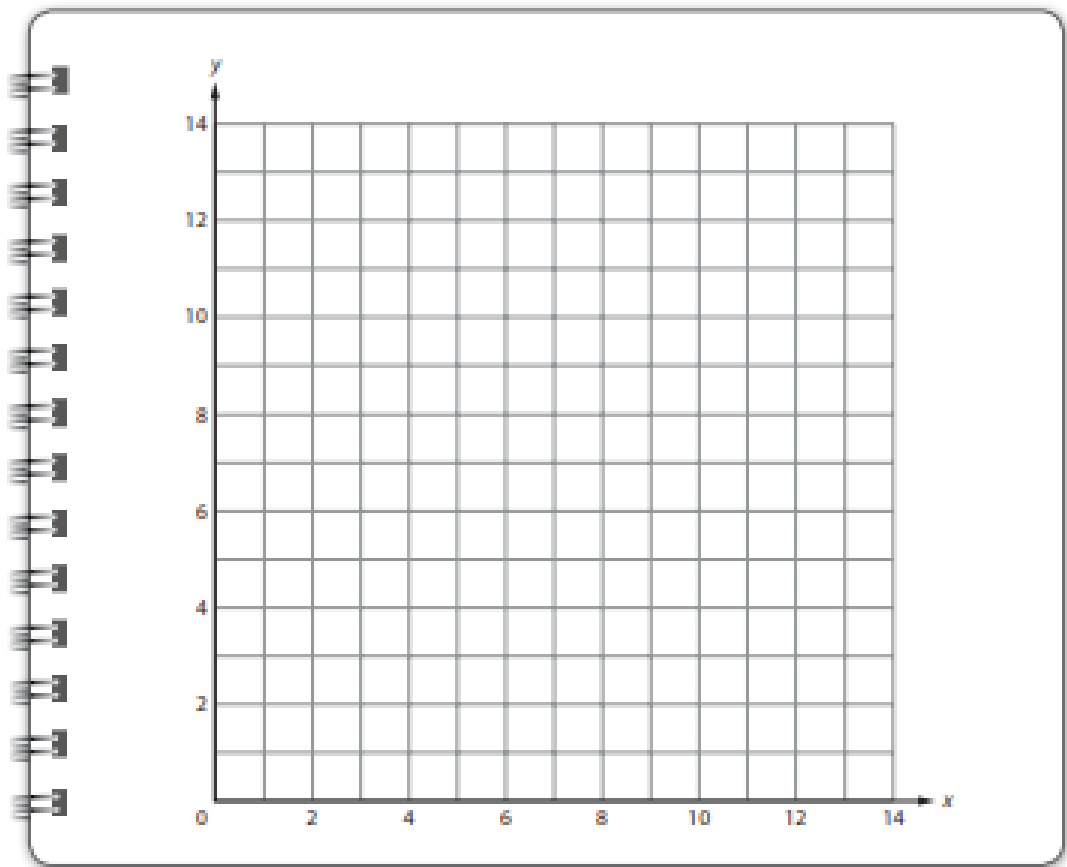
### Go Further!

Choose a set of ordered pairs from the table above. Reverse the order of the coordinates in each ordered pair. For example, (1, 12) becomes (12, 1). Plot the points and connect them to form a shape. With your partner, discuss how the new shape compares to the old shape.



Shapes on a Coordinate Plane

|                      |                 |                |           |
|----------------------|-----------------|----------------|-----------|
| equilateral triangle | obtuse triangle | right triangle | rhombus   |
| isosceles triangle   | rectangle       | square         | trapezoid |



I know the first number in an ordered pair is the  $x$ -coordinate. It names a location along the  $x$ -axis. The second number is the  $y$ -coordinate. It names a location along the  $y$ -axis.



**Ready® Center Activity 5.47 ★★**

**Moves on a Coordinate Plane**

**What You Need**

- Recording Sheet and Game Board

**Check Understanding**

Look at the map on the **Game Board**. A student goes from school to the yogurt shop, to the library, and then home. Describe two paths the student might take. Are the paths the same length?

**What You Do**

1. Take turns. Choose a path described in one of the boxes on the **Recording Sheet**.
2. Start at Home on the **Game Board**. Follow the path described. Name the location where the path ends. Say its coordinates.
3. Your partner checks both your movements along the path and the coordinates you named.
4. If your partner agrees, write the location and its coordinates on the **Recording Sheet**. If you are wrong, your turn ends.
5. Repeat until all locations have been found.

When I move right or left,  
I move along the *x*-axis.

When I move up or down,  
I move along the *y*-axis.



**Go Further!**

A student used coordinates to describe the path from (3, 3) to (7, 2). Here is part of the student's description: *x*-axis move:  $7 - 3 = 4$ . The move is 4 units.  $7 > 3$ , so the move is to the right. Discuss this way of describing a move with your partner. Use this method to find the move along the *y*-axis.



**Ready® Center Activity 5.47 ★★ Recording Sheet and Game Board**

Partner A \_\_\_\_\_

Partner B \_\_\_\_\_

**Moves on a Coordinate Plane**

|   |   |
|---|---|
| Home to: 3 units right, 2 units up<br>_____ (_____, _____)  | Home to: 2 units left, 1 unit down<br>_____ (_____, _____)  |
| Home to: 1 unit right, 3 units down<br>_____ (_____, _____) | Home to: 3 units left, 3 units down<br>_____ (_____, _____) |
| Home to: 2 units left, 3 units up<br>_____ (_____, _____)   | Home to: 4 units left, 2 units up<br>_____ (_____, _____)   |

