

Evaluate, Write, and Interpret Expressions



Dear Family,

This week your child is learning to evaluate, write, and interpret expressions.

When you **evaluate** an expression, you are finding the value of the expression. There are rules about the order in which you do the operations.

Your child might see an expression like this:

$$\frac{1}{2} \times (24 + 8)$$

To evaluate the expression, you first do the operation inside the parentheses.

So, first add $24 + 8$. Then multiply that sum by $\frac{1}{2}$.

$$\frac{1}{2} \times (24 + 8)$$

$$\frac{1}{2} \times 32$$

$$16$$

The value of the expression is 16.

The same expression can be stated in words: *half of the sum of 24 and 8*.

Your child might also see a written phrase that describes an expression. He or she can write the expression using numbers and symbols:

$$15 \text{ minus the sum of 6 and 7} \quad 15 - (6 + 7)$$

Because you need to first find the sum $6 + 7$, there are parentheses around that part of the expression. To evaluate the expression, add 6 and 7 and subtract the sum from 15:

$$15 - (6 + 7)$$

$$15 - 13$$

$$2$$

Invite your child to share what he or she knows about evaluating and writing expressions by doing the following activity together.

ACTIVITY WRITING AND EVALUATING EXPRESSIONS

Do this activity with your child to write and evaluate expressions.

With your child, play a game called “Evaluate That Expression!”

- One person uses some of the math words in the box below to describe an expression in words and phrases.

sum	one less than	quotient
plus	product	difference
times	minus	divided by
triple	double	half

- The other person writes the expression using numbers and symbols. Remember to use parentheses if they are needed!
- Evaluate the expressions together. Take turns.
- Some examples of expressions:
 1. The sum of 8 and one less than 8
 2. Triple the difference of 5 and 2



Answers: 1. $8 + (8 - 1)$; 2. $3 \times (5 - 2)$

Explore Evaluating, Writing, and Interpreting Expressions

You know that more than one operation may be needed to solve a multi-step problem. You also need to decide the order in which to do the steps. Use what you know to try to solve the problem below.



Learning Targets

- Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
- Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.

SMP 1, 2, 3, 4, 5, 6, 7

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?

TRY IT



Math Toolkit

- base-ten blocks
- counters
- number lines



DISCUSS IT

Ask your partner: Why did you choose that strategy?

Tell your partner: At first, I thought...



CONNECT IT

1 LOOK BACK

Explain how you found how much money Maria spent in all.

2 LOOK AHEAD

The problem on the previous page is a multi-step problem. It can be represented by an expression that contains **grouping symbols**—braces { }, brackets [], and parentheses (). When you **evaluate** an expression, you find the value of the expression. If an expression contains grouping symbols, you do the operation inside the grouping symbols first. The most commonly-used grouping symbols are parentheses.

To evaluate an expression, use the following rules, which are called the *order of operations*.

- First, do the operation inside grouping symbols.
- Next, multiply and divide from left to right.
- Last, add and subtract from left to right.

a. Evaluate $2 \times 5 + 8$.

b. Evaluate $2 \times (5 + 8)$.

c. How are the expressions in parts a and b the same? How are they different?

3 REFLECT

Can both expressions from problems 2a and 2b be used to find the amount of money Maria spent in all? Explain.

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Prepare for Evaluating, Writing, and Interpreting Expressions

- 1 Think about what you know about evaluating expressions. Fill in each box. Use words, numbers, and pictures. Show as many ideas as you can.

Word	In My Own Words	Example
expression		
evaluate		
order of operations		

- 2 Explain the order of operations that you use to evaluate the expression $10 + (6 - 2) \times 2$.

- 3 Solve the problem. Show your work.

Ramon and his brother go to an amusement park. They each go on the Ferris wheel that costs \$6 per ticket and a roller coaster that costs \$9 per ticket. Ramon pays for all the tickets. How much does Ramon pay altogether?

Solution

- 4 Check your answer. Show your work.

Develop Evaluating Expressions

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



DISCUSS IT

Ask your partner: How did you get started?

Tell your partner: A model I used was . . . It helped me . . .

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.

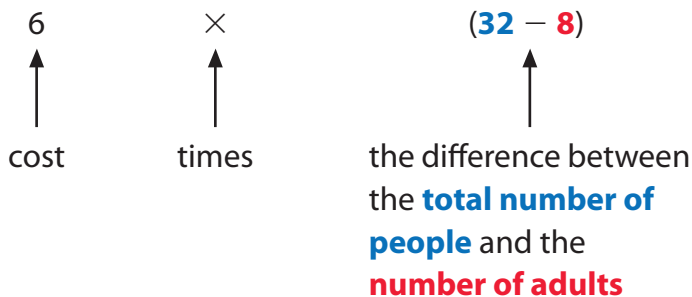
Each poster costs \$6.

	\$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	\$6	\$6	\$6	\$6	\$6	\$6	\$6

$6 \times (32 - 8)$

MODEL IT

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



CONNECT IT

Now you will 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

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for evaluating expressions with grouping symbols? Explain.

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Practice Evaluating Expressions

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.
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Vocabulary

evaluate to find the value of an expression.

3×5 is 15.



- 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 chooses a shirt that costs \$12 and a pair of pants that costs \$26. The clothes are on sale. Sara only needs to pay half the regular 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

Develop Writing and Interpreting Expressions

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

- counters
- base-ten blocks



DISCUSS IT

Ask your partner: Do you agree with me? Why or why not?

Tell your partner: At first, I thought . . .

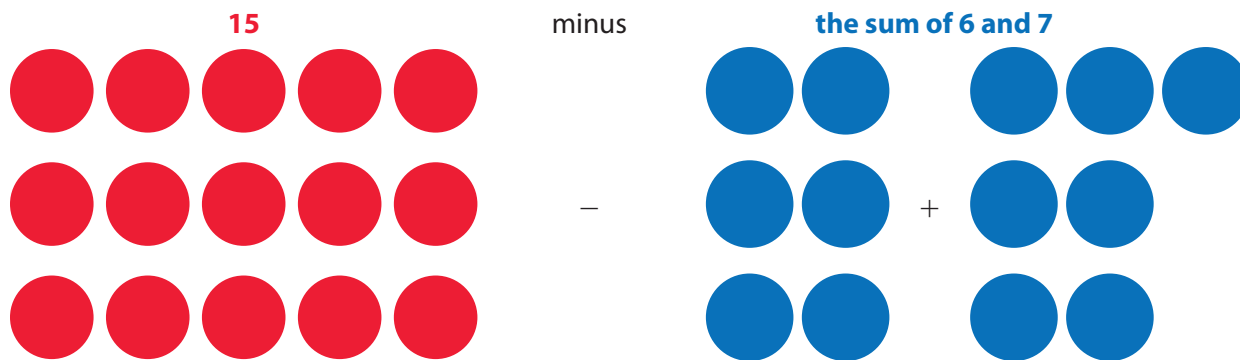
Explore different ways to understand writing numerical expressions.

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.

CONNECT IT

Now you will 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

Look back at your **Try It**, strategies by classmates, and **Picture It** and **Model It**. Which models or strategies do you like best for writing expressions? Explain.

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APPLY IT

Use what you just 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?

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

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

Practice Writing and Interpreting Expressions

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:

12 plus	the quotient of	8 and 4
↑	↑	↑
Plus means add.	A quotient is the result of division.	The numbers in the division operation

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.

- 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 ...*
- Ⓐ one-fifth as large as $23,432 + 10,816$.
 - Ⓑ five times as large as $23,432 + 10,816$.
 - Ⓒ five more than $23,432 + 10,816$.
 - Ⓓ 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?
- Ⓐ $5 + (7 \times 3)$
 - Ⓑ $(5 + 7) \times 3$
 - Ⓒ $(5 + 7) + 3$
 - Ⓓ $5 \times (7 \times 3)$
- 8 Look at your answer to problem 7. Evaluate the expression to find the number of craft sticks Shana has.
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Refine Evaluating, Writing, and Interpreting Expressions

Complete the Example below. Then solve problems 1–9.

EXAMPLE

Insert parentheses to make the following equation true.

$$15 - 7 - 2 = 10$$

Look at how you could show your work.

Try different placements of the parentheses.

$$(15 - 7) - 2 \stackrel{?}{=} 10 \qquad 15 - (7 - 2) \stackrel{?}{=} 10$$

$$8 - 2 \stackrel{?}{=} 10 \qquad 15 - 5 \stackrel{?}{=} 10$$

$$6 \neq 10 \qquad 10 = 10$$

Solution

The student used trial and error to answer the question.



PAIR/SHARE

Why did the student write question marks above the equal signs? What does the equals sign with a slash through it mean?

APPLY IT

- Aniyah sells bracelets and pairs of earrings at a craft fair. Each item sells for \$8. Write a word phrase that describes the calculations you would do to find how much money Aniyah makes by selling 23 bracelets and 17 pairs of earrings. Then write and evaluate an expression to find how much money she makes. Show your work.

How many items will Aniyah sell altogether?

Solution

PAIR/SHARE

What other ways could you solve the problem?

- 2 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.



Solution

- 3 Which expression represents *the quotient of 2,375 and 125, plus 5*?
- Ⓐ $2,375 \div (125 + 5)$
 - Ⓑ $2,375 \times 125 \div 5$
 - Ⓒ $(2,375 \times 125) + 5$
 - Ⓓ $2,375 \div 125 + 5$

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

PAIR/SHARE

When do you use grouping symbols in an expression?

What does the word "quotient" mean?

PAIR/SHARE

Is Jason's answer reasonable?

- 4 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) $(3 + \frac{1}{2}) \times 7$
- 5 Which expressions have a value of 8?
- (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) $3 \times 8 \div (4 + 2)$
- 6 Which phrase is a correct interpretation of the expression below?
- $$\frac{1}{2} \times [10 + 6] - [3 + 2]$$
- (A) Half of 10 plus 6 plus 3 and 2
- (B) The sum of 3 and 2 times half the sum of 10 and 6
- (C) The sum of 10 and 6 minus the sum of 3 and 2 times $\frac{1}{2}$
- (D) Half the sum of 10 and 6 minus the sum of 3 and 2
- 7 Insert parentheses into the expression below so that the value of the expression is 5. Show your work.
- $$20 - 3 \times 4 + 1$$

- 8 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.
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- 9 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 table.

$$\frac{1}{5} \times (9 \times 2) \quad (9 \times 2) \times (4 - 3) \quad (9 \times 2) \div 3 \quad 22 - (9 \times 2)$$

$$(9 \times 2) + 7 \quad 4 \times \frac{1}{4} \times (9 \times 2) \quad 1 \times (9 \times 2) \quad 3 \times (9 \times 2)$$

Less than 18	Equal to 18	Greater than 18

10 MATH JOURNAL

Without evaluating the expressions $8 \times 18,432 - 247$ and $8 \times (18,432 - 247)$, explain how you know which expression has a value that is 8 times as great as $18,432 - 247$.

 **SELF CHECK** Go back to the Unit 5 Opener and see what you can check off.