

Name _____

Problem Solving • Multiplication and Division

Essential Question How can you use the strategy *solve a simpler problem* to help you solve a division problem?

UNLOCK the Problem REAL WORLD



Mark works at an animal shelter. To feed 9 dogs, Mark empties eight 18-ounce cans of dog food into a large bowl. If he divides the food equally among the dogs, how many ounces of food will each dog get?

Use the graphic organizer below to help you solve the problem.

Read the Problem

What do I need to find?

I need to find _____
_____.

What information do I need to use?

I need to use the number of _____, the number of _____ in each can, and the number of dogs that need to be fed.

How will I use the information?

I can _____ to find the total number of ounces. Then I can solve a simpler problem to _____ that total by 9.

Solve the Problem

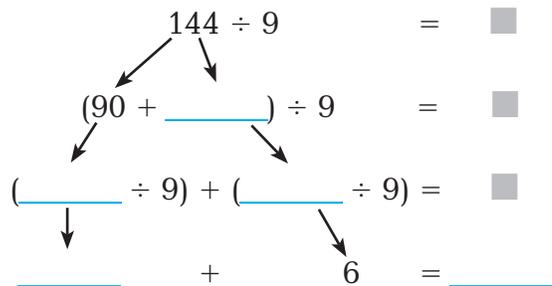
- First, multiply to find the total number of ounces of dog food.

$$8 \times 18 = \underline{\hspace{2cm}}$$

- To find the number of ounces each dog gets, I'll need to divide.

$$144 \div \underline{\hspace{2cm}} = \blacksquare$$

- To find the quotient, I break 144 into two simpler numbers that are easier to divide.



So, each dog gets _____ ounces of food.

Try Another Problem

Michelle is building shelves for her room. She has a plank 137 inches long that she wants to cut into 7 shelves of equal length. The plank has jagged ends, so she will start by cutting 2 inches off each end. How long will each shelf be?



137 inches

Read the Problem

What do I need to find?

What information do I need to use?

How will I use the information?

Solve the Problem

So, each shelf will be _____ inches long.

Math Talk

MATHEMATICAL PRACTICES

Explain how the strategy you used helped you solve the problem.

Name _____

Share and Show



UNLOCK the Problem

- ✓ Underline what you need to find.
- ✓ Circle the numbers you need to use.

1. To make concrete mix, Monica pours 34 pounds of cement, 68 pounds of sand, 14 pounds of small pebbles, and 19 pounds of large pebbles into a large wheelbarrow. If she pours the mixture into 9 equal-size bags, how much will each bag weigh?

First, find the total weight of the mixture.

Then, divide the total by the number of bags. Break the total into two simpler numbers to make the division easier, if necessary.

Finally, find the quotient and solve the problem.

So, each bag will weigh _____ pounds.

2. **What if** Monica pours the mixture into 5 equal-size bags? How much will each bag weigh?

3. Taylor is building doghouses to sell. Each doghouse requires 3 full sheets of plywood which Taylor cuts into new shapes. The plywood is shipped in bundles of 14 full sheets. How many doghouses can Taylor make from 12 bundles of plywood?

4. Eileen is planting a garden. She has seeds for 60 tomato plants, 55 sweet corn plants, and 21 cucumber plants. She plants them in 8 rows, with the same number of plants in each row. How many seeds are planted in each row?

SHOW YOUR WORK

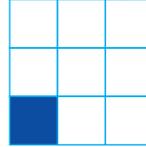
On Your Own

Choose a STRATEGY

- Act It Out
- Draw a Diagram
- Make a Table
- Solve a Simpler Problem
- Work Backward
- Guess, Check, and Revise

5. Starting on day 1 with 1 jumping jack, Keith doubles the number of jumping jacks he does every day. How many jumping jacks will Keith do on day 10?

6. **H.O.T.** Starting in the blue square, in how many different ways can you draw a line that passes through every square without picking up your pencil or crossing a line you've already drawn? Show the ways.



7. On April 11, Millie bought a lawn mower with a 50-day guarantee. If the guarantee begins on the date of purchase, what is the first day on which the mower will no longer be guaranteed?

8. **H.O.T.** A classroom bulletin board is 7 feet by 4 feet. If there is a picture of a student every 6 inches along the edge, including one in each corner, how many pictures are on the bulletin board?

9. Dave wants to make a stone walkway. The rectangular walkway is 4 feet wide and 12 feet long. Each 2 foot by 2 foot stone covers an area of 4 square feet. How many stones will Dave need to make his walkway?

10. **Test Prep** Dee has 112 minutes of recording time. How many 4-minute songs can she record?

- (A) 28 (C) 18
- (B) 27 (D) 17

Name _____

Numerical Expressions

Essential Question How can you use a numerical expression to describe a situation?

UNLOCK the Problem REAL WORLD

A **numerical expression** is a mathematical phrase that has numbers and operation signs but does not have an equal sign.

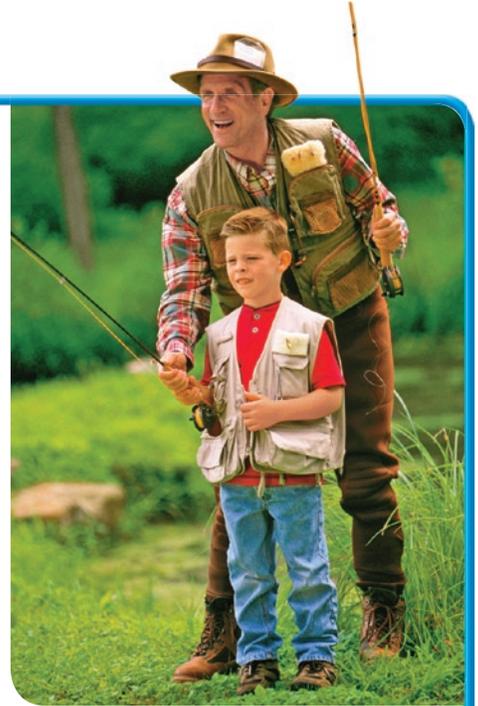
Tyler caught 15 small bass, and his dad caught 12 small bass in the Memorial Bass Tourney in Tidioute, PA. Write a numerical expression to represent how many fish they caught in all.

Choose which operation to use.

You need to join groups of different sizes, so use addition.

15 small bass	plus	12 small bass
↓	↓	↓
15	+	12

So, $15 + 12$ represents how many fish they caught in all.



Example 1 Write an expression to match the words.

A Addition

Emma has 11 fish in her aquarium. She buys 4 more fish.

fish	plus	more fish
↓	↓	↓
11	+	4

B Subtraction

Lucia has 128 stamps. She uses 38 stamps on party invitations.

stamps	minus	stamps used
↓	↓	↓
128	-	_____

C Multiplication

Karla buys 5 books. Each book costs \$3.

books	multiplied by	cost per book
↓	↓	↓
_____	×	_____

D Division

Four players share 52 cards equally.

cards	divided by	players
↓	↓	↓
_____	÷	_____

Math Talk

MATHEMATICAL PRACTICES

Describe what each expression represents.

Expressions with Parentheses The meaning of the words in a problem will tell you where to place the parentheses in an expression.

Example 2 Which expression matches the meaning of the words?

Doug went fishing for 3 days. Each day he put \$15 in his pocket. At the end of each day, he had \$5 left. How much money did Doug spend by the end of the trip?

Think: Each day he took \$15 and had \$5 left. He did this for 3 days.

$(\$15 - \$5)$ ← **Think:** What expression can you write to show how much money Doug spends in one day?

$3 \times (\$15 - \$5)$ ← **Think:** What expression can you write to show how much money Doug spends in three days?

- Underline the events for each day.
- Circle the number of days these events happened.

Example 3 Which problem matches the expression $\$20 - (\$12 + \$3)$?

Kim has \$20 to spend for her fishing trip. She spends \$12 on a fishing pole. Then she finds \$3. How much money does Kim have now?

List the events in order.

First: Kim has \$20.

Next: _____.

Then: _____.

Do these words match the expression? _____

Kim has \$20 to spend for her fishing trip. She spends \$12 on a fishing pole and \$3 on bait. How much money does Kim have now?

List the events in order.

First: Kim has \$20.

Next: _____.

Then: _____.

Do these words match the expression? _____

Math Talk **MATHEMATICAL PRACTICES** Explain how the expression of what Doug spent in three days compares to the expression of what he spent in one day?

Share and Show



Circle the expression that matches the words.

1. Teri had 18 worms. She gave 4 worms to Susie and 3 worms to Jamie.

$(18 - 4) + 3$ $18 - (4 + 3)$

2. Rick had \$8. He then worked 4 hours for \$5 each hour.

$\$8 + (4 \times \$5)$ $(\$8 + 4) \times \5

Name _____

Write an expression to match the words.

3. Greg drives 26 miles on Monday and 90 miles on Tuesday.

4. Lynda has 27 fewer fish than Jack. Jack has 80 fish.

Write words to match the expression.

5. $34 - 17$

6. $6 \times (12 - 4)$

Math Talk

MATHEMATICAL PRACTICES

Is $4 \times 8 = 32$ an expression? **Explain** why or why not.

On Your Own

Write an expression to match the words.

7. José shared 12 party favors equally among 6 friends.

8. Braden has 14 baseball cards. He finds 5 more baseball cards.

9. Isabelle bought 12 bottles of water at \$2 each.

10. Monique had \$20. She spent \$5 on lunch and \$10 at the bookstore.

Write words to match the expression.

11. $36 \div 9$

12. $35 - (16 + 11)$

Draw a line to match the expression with the words.

13. Fred catches 25 fish. Then he releases 10 fish and catches 8 more. •

Nick has 25 pens. He gives 10 pens to one friend and 8 pens to another friend. •

Jan catches 15 fish and lets 6 fish go. •

Libby catches 15 fish and lets 6 fish go for three days in a row. •

• $3 \times (15 - 6)$

• $15 - 6$

• $25 - (10 + 8)$

• $(25 - 10) + 8$

Problem Solving REAL WORLD

Use the rule and the table for 14.

- 14. Write a numerical expression to represent the total number of lemon tetras that could be in a 20-gallon aquarium.

- 15. **H.O.T.** Write a word problem for an expression that is three times as great as $(15 + 7)$. Then write the expression.

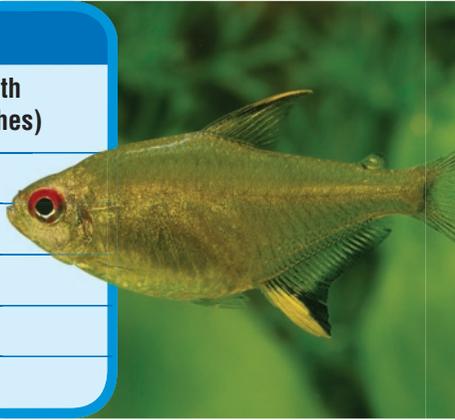
- 16. **What's the Question?** Lu has 3 swordtails in her aquarium. She buys 2 more swordtails.

- 17. **H.O.T.** Tammy gives 45 stamps to her 9 friends. She shares them equally among her friends. Write an expression to match the words. How many stamps does each friend get?

- 18. **Test Prep** Josh has 3 fish in each of 5 buckets. Then he releases 4 fish. Which expression matches the words?

- (A) $(3 \times 4) - 5$
- (B) $(5 \times 4) - 3$
- (C) $(5 \times 3) - 4$
- (D) $(5 - 3) \times 4$

Aquarium Fish	
Type of Fish	Length (in inches)
Lemon Tetra	2
Strawberry Tetra	3
Giant Danio	5
Tiger Barb	3
Swordtail	5



▲ The rule for the number of fish in an aquarium is to allow 1 gallon of water for each inch of length.

SHOW YOUR WORK

A large area for showing work, bounded by a dotted line and a pencil icon.

Name _____

Evaluate Numerical Expressions

Essential Question In what order must operations be evaluated to find the solution to a problem?

CONNECT Remember that a numerical expression is a mathematical phrase that uses only numbers and operation symbols.

$(5 - 2) \times 7$ $72 \div 9 + 16$ $(24 - 15) + 32$

To **evaluate**, or find the value of, a numerical expression with more than one operation, you must follow rules called the **order of operations**. The order of operations tells you in what order you should evaluate an expression.

Order of Operations

1. Perform operations in parentheses.
2. Multiply and divide from left to right.
3. Add and subtract from left to right.

UNLOCK the Problem REAL WORLD

A cake recipe calls for 4 cups of flour and 2 cups of sugar. To triple the recipe, how many cups of flour and sugar are needed in all?



Evaluate $3 \times 4 + 3 \times 2$ to find the total number of cups.

A Heather did not follow the order of operations correctly.

	Heather
○	$3 \times 4 + 3 \times 2$ First, I added.
○	$3 \times 7 \times 2$ Then, I multiplied.
○	42

Explain why Heather's answer is not correct.

B Follow the order of operations by multiplying first and then adding.

	Name _____
○	$3 \times 4 + 3 \times 2$
○	
○	

So, _____ cups of flour and sugar are needed.

Evaluate Expressions with Parentheses To evaluate an expression with parentheses, follow the order of operations. Perform the operations in parentheses first. Multiply from left to right. Then add and subtract from left to right.

Example

Each batch of cupcakes Lena makes uses 3 cups of flour, 1 cup of milk, and 2 cups of sugar. Lena wants to make 5 batches of cupcakes. How many cups of flour, milk, and sugar will she need in all?

Write the expression. $5 \times (3 + 1 + 2)$

First, perform the operations in parentheses. $5 \times (\underline{\quad})$

Then multiply. $\underline{\quad}$

So, Lena will use $\underline{\quad}$ cups of flour, milk, and sugar in all.



-  **What if** Lena makes 4 batches? Will this change the numerical expression? **Explain.**

Try This! Rewrite the expression with parentheses to equal the given value.

A $6 + 12 \times 8 - 3$; value: 141

- Evaluate the expression without the parentheses. $\underline{\quad}$
- Try placing the parentheses in the expression so the value is 141.

Think: Will the placement of the parentheses increase or decrease the value of the expression?

- Use order of operations to check your work.

$$6 + 12 \times 8 - 3$$

B $5 + 28 \div 7 - 4$; value: 11

- Evaluate the expression without the parentheses. $\underline{\quad}$
- Try placing the parentheses in the expression so that the value is 11.

Think: Will the placement of the parentheses increase or decrease the value of the expression?

- Use order of operations to check your work.

$$5 + 28 \div 7 - 4$$

Name _____

Share and Show



Evaluate the numerical expression.

1. $10 + 36 \div 9$

Think: I need to divide first.



2. $10 + (25 - 10) \div 5$



3. $9 - (3 \times 2) + 8$

Math Talk

MATHEMATICAL PRACTICES

Raina evaluated the expression $5 \times 2 + 2$ by adding first and then multiplying. Will her answer be correct? **Explain.**

On Your Own

Evaluate the numerical expression.

4. $(4 + 49) - 4 \times 10$

5. $5 + 17 - 100 \div 5$

6. $36 - (8 + 5)$

7. $125 - (68 + 7)$

8. $(4 \times 6) - 12$

9. $3 \times (22 - 2)$

10. $23 + (16 - 7)$

11. $(25 - 4) \div 3$

Rewrite the expression with parentheses to equal the given value.

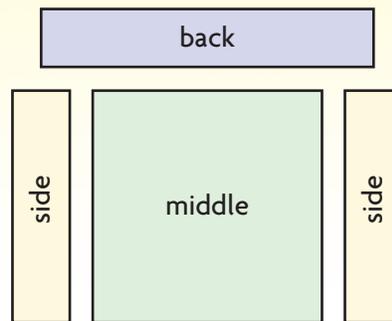
12. $100 - 30 \div 5$
value: 14

13. $12 + 17 - 3 \times 2$
value: 23

14. $9 + 5 \div 5 + 2$
value: 2

UNLOCK the Problem REAL WORLD

15. A movie theater has 4 groups of seats. The largest group of seats, in the middle, has 20 rows, with 20 seats in each row. There are 2 smaller groups of seats on the sides, each with 20 rows and 6 seats in each row. A group of seats in the back has 5 rows, with 30 seats in each row. How many seats are in the movie theater?



a. What do you need to know? _____

b. What operation can you use to find the number of seats in the back group of seats? Write the expression. _____

c. What operation can you use to find the number of seats in both groups of side seats? Write the expression.

d. What operation can you use to find the number of seats in the middle group? Write the expression.

e. Write an expression to represent the total number of seats in the theater.

f. How many seats are in the theater? Show the steps you use to solve the problem.

16. **Test Prep** In the wild, an adult giant panda eats about 30 pounds of food each day. Which expression shows how many pounds of food 6 pandas eat in 3 days?

- (A) $3 + (30 \times 6)$
- (B) $3 \times (30 \times 6)$
- (C) $(30 \times 6) \div 3$
- (D) $(30 \times 6) - 3$

17. **Test Prep** Which expression has a value of 6?

- (A) $(6 \div 3) \times 4 + 8$
- (B) $27 - 9 \div 3 \times (4 + 1)$
- (C) $(18 + 12) \times 6 - 4$
- (D) $71 - 5 \times (9 + 4)$

Name _____

Grouping Symbols

Essential Question In what order must operations be evaluated to find a solution when there are parentheses within parentheses?

UNLOCK the Problem REAL WORLD

Mary's weekly allowance is \$8 and David's weekly allowance is \$5. Every week they each spend \$2 on lunch. Write a numerical expression to show how many weeks it will take them together to save enough money to buy a video game for \$45.

- Underline Mary's weekly allowance and how much she spends.
- Circle David's weekly allowance and how much he spends.

Use parentheses and brackets to write an expression.

You can use parentheses and brackets to group operations that go together. Operations in parentheses and brackets are performed first.

STEP 1 Write an expression to represent how much Mary and David save each week.

- How much money does Mary save each week?

Think: Each week Mary gets \$8 and spends \$2.

(_____)

- How much money does David save each week?

Think: Each week David gets \$5 and spends \$2.

(_____)

- How much money do Mary and David save together each week? _____

STEP 2 Write an expression to represent how many weeks it will take Mary and David to save enough money for the video game.

- How many weeks will it take Mary and David to save enough for a video game?

Think: I can use brackets to group operations a second time. \$45 is divided by the total amount of money saved each week.

_____ ÷ [_____]

Math Talk

MATHEMATICAL PRACTICES

Explain why brackets are placed around the part of the expression that represents the amount of money Mary and David save each week.

Evaluate Expressions with Grouping Symbols When evaluating an expression with different grouping symbols (parentheses, brackets, and braces), perform the operation in the innermost set of grouping symbols first, evaluating the expression from the inside out.



Example

John gets \$6 for his weekly allowance and spends \$4 of it. His sister Tina gets \$7 for her weekly allowance and spends \$3 of it. Their mother's birthday is in 4 weeks. If they spend the same amount each week, how much money can they save together in that time to buy her a present?

- Write the expression using parentheses and brackets. $4 \times [(\$6 - \$4) + (\$7 - \$3)]$
- Perform the operations in the parentheses first. $4 \times [\underline{\hspace{1cm}} + \underline{\hspace{1cm}}]$
- Next perform the operations in the brackets. $4 \times \underline{\hspace{1cm}}$
- Then multiply. $\underline{\hspace{1cm}}$

So, John and Tina will be able to save for their mother's birthday present.

-  **What if** only Tina saves any money? Will this change the numerical expression? **Explain.**

Try This! Follow the order of operations.

A $4 \times \{[(5 - 2) \times 3] + [(2 + 4) \times 2]\}$

- Perform the operations in the parentheses. $4 \times \{[3 \times 3] + [\underline{\hspace{1cm}} \times \underline{\hspace{1cm}}]\}$
- Perform the operations in the brackets. $4 \times \{9 + \underline{\hspace{1cm}}\}$
- Perform the operations in the braces. $4 \times \underline{\hspace{1cm}}$
- Multiply. $\underline{\hspace{1cm}}$

B $32 \div \{[(3 \times 2) + 7] - [(6 - 4) + 7]\}$

- Perform the operations in the parentheses. $32 \div \{[\underline{\hspace{1cm}} + \underline{\hspace{1cm}}] - [\underline{\hspace{1cm}} + \underline{\hspace{1cm}}]\}$
- Perform the operations in the brackets. $32 \div \{ \underline{\hspace{1cm}} - \underline{\hspace{1cm}} \}$
- Perform the operations in the braces. $32 \div \underline{\hspace{1cm}}$
- Divide. $\underline{\hspace{1cm}}$