[Objective]
The student will read, write, and evaluate algebraic expressions using the order of operations.

[Prerequisite Skills]
order of operations, writing and evaluating numerical expressions

[Materials]
Student pages **S247 – S259**
Algebra tiles
Copy Master **T495** (1 per student pair)
Foldable from Lesson 20
Overhead algebra tiles

[Essential Questions]
1. Explain the meaning of a variable expression and give an example.
2. Explain the difference between an expression and an equation.
3. Explain how to evaluate the expression $5 + 9x$ if x is equal to 8.

[Words For Word Wall]
variable, verbal expression, equation, algebraic expression, numerical expression, coefficient, constant, term

[Grouping]
Cooperative Pairs (CP), Whole Group (WG), Individual (I)
*For Cooperative Pairs (CP) activities, assign the roles of Partner A and Partner B to students. This allows each student to be responsible for designated tasks within the lesson.

[Levels of Teacher Support]
Modeling (M), Guided Practice (GP), Independent Practice (IP)

[Multiple Representations]
SOLVE, Algebraic Formula, Verbal Description, Pictorial Representation, Graphic Organizer, Concrete Representation

[Warm-Up] (IP, I, WG) S247 (Answers are on T489.)
- Have students turn to S247 in their books to begin the Warm-Up. Students will evaluate numerical expressions using the order of operations. Monitor students to see if any of them need help during the Warm-Up. Give students time to complete the problems and then review the answers as a class. **{Algebraic Formula}**

[Homework]

Take time to go over the homework from the previous night.

[Lesson] [1 – 2 Days (1 day = 80 minutes) – M, GP, WG, CP, IP]

SOLVE Problem (WG, GP) S248 (Answers on T490.)

Have students turn to S248 in their books. The first problem is a SOLVE problem. You are only going to complete the S step with students at this point. Tell students that during the lesson they will learn how to write and evaluate variable expressions. They will use this knowledge to complete this SOLVE problem at the end of the lesson. **{SOLVE, Graphic Organizer, Verbal Description}**

Representing Expressions (M, WG, GP, CP, IP) S248, S249 (Answers on T490, T491.)

M, WG, GP, CP: Pass out algebra tiles to students. Students will explore representations of numerical and variable expressions using algebra tiles. They will also translate between verbal and variable expressions. Students will complete the Pictorial Representation of each expression, filling in only Column 2 on the charts on S248 and S249. Make sure students know their designation as Partner A or Partner B. **{Concrete Representation, Pictorial Representation, Graphic Organizer, Algebraic Formula, Verbal Description}**

MODELING

Representing Expressions

Step 1: Introduce the representation of the algebra unit tile.
One unit tile is equal to 1.

- Have student pairs work together to complete Problems 1 – 3. They should use the unit tiles to represent the value in the second column and then write the **numerical expression** in the third column.
- Partner A, what is the first value we will represent? (four) How can we represent that value using the algebra tiles. (4 yellow unit tiles)
- Have students remove the algebra tiles and draw the pictorial representation.
- Review the answers for Problems 2 and 3 using the same question strategies.

Step 2: Talk about the value of the two types of algebra tiles. Each yellow square represents 1 unit. Ask student pairs to see if they can identify the value of the long yellow tile. (Some students may try to determine that the long tile is the length of a number of the shorter tiles.)

- Do we know the exact length of the long tile? (No)
- How can we represent a value that we do not know? (using a **variable** such as x)
- What is a variable? (a letter that stands for an unknown value)
- What is the width of the long tile? (1 unit)
- How can we represent the area of the long tile? ($1 \cdot x$ which is equal to x)

Step 3: Have students work with the algebra tiles to discover how they can represent the value in Problem 4.

- Partner A, how can we represent the value of any number? (using a long yellow tile)
- Have students draw the representation of the long yellow tile which is positive.
- Have student pairs model the representations for Problems 5 and 6.
- Partner B, how do we show addition with manipulatives? (Make the first amount, make the second amount, and then push them together.)
- Partner A, how could we represent four with algebra tiles? (four small squares) Have students place four small squares on their desk, then record by drawing them in the table.
- Partner B, how could we represent a number with algebra tiles? (one long rectangle) Have students place one long rectangle near the four small squares on their desk.
- Partner A, what do we do with these two groups to show that we are adding? (push them together)
- Have student pairs remove the algebra tiles and draw the representation for Problem 5.
- Partner A, how can we model "a number plus 3"? (one long tile and 3 unit tiles)
- Explain your answer. (We use the long tile to represent the value that is unknown.)
- Have student pairs remove the algebra tiles and draw the representation for Problem 6.
- How are Problem 5 and Problem 6 different? (The variable is in a different place in the expression.)
- Partner B, why is this important? (We want to represent the expression in the order of the words.)

Step 4: Have students discuss the models for Problems 7 and 8.

- What is different about these two problems from Problems 5 and 6? (They use multiplication.)
- Partner A, how can we represent four times a number? (by using 4 long algebra tiles)
- Have students remove the tiles for Problem 7 and draw the representation.
- Partner B, what is different about Problem 8? (It has two operations.) How do we know how to create the model? (We follow the order of the words.)
- Partner A, how can we represent two times a number plus three? (two long yellow tiles and three unit tiles)
- Have students remove the tiles for Problem 8 and draw the pictorial representation.

IP, CP, WG	Have student pairs complete the pictorial representation column of the chart on the top of S249. Ask students how this chart is different from the chart on S248. (The numerical or variable expression is given and they must draw the model.) Have students use the tiles and create the pictorial representation of each expression and then discuss the answers as a whole group. **{Concrete Representation, Pictorial Representation, Verbal Description, Algebraic Formula}**
Writing Expressions	**(M, GP, WG, CP, IP) S248, S249 (Answers on T490, T491.)**
M, GP, WG, CP:	Have students turn back to page S248 in their books. Students will use the pictorial models to help to translate from verbal to variable and variable to verbal expressions. Make sure students know their designation as Partner A or Partner B. **{Algebraic Formula, Verbal Description, Graphic Organizer, Pictorial Representation}**

MODELING

Writing Expressions

Step 1: Have students write the numerical expression for Problems 1 – 3 on S248 and then review the answers as a whole group.

Step 2: Have students look at Problem 4.
- Partner A, what is the **verbal expression**? (a number)
- Partner B, how did we represent the value with algebra tiles? (one long rectangle)
- Partner A, how would we write this as an **algebraic expression** if we do not know the value of the tile? (using a variable: x) Record.

Step 3: Have students discuss Problems 5 and 6.
- Partner B, what is the verbal expression for Problem 5? (four plus a number)
- Partner A, what does plus mean in the verbal expression? (add)
- Partner B, how would we write this numerical expression? ($4 + x$) Record.
- Partner B, what is the verbal expression for Problem 6? (a number plus three)
- Partner A, what does plus mean in the verbal expression? (add)
- Partner B, how would we write this numerical expression? ($x + 3$) Record.

***Teacher Note:** Some students may want to write $3 + x$. This is where it may be beneficial to discuss the order of the addends. Because of the commutative property of addition, the order is not important when evaluating just addition, but students need to understand that we write the expression in the order it is read in order to be able to correctly evaluate the expression using multiple operations in more complicated expressions.

Step 4: Have students discuss Problems 7 and 8.
- Partner B, what is the verbal expression for Problem 7? (four times a number)
- Partner A, what operation is represented by the word "times?" (multiplication)
- Partner B, how would we write this variable expression? (4*x*) Record.
- Partner A, why don't we use the "×" or • symbol in our expression to show multiplication? (The "×" would be confusing because it can look like a variable. The dot can look like a decimal.)

Step 5: Partner B, what is the verbal expression in Problem 8? (two times a number plus three)
- Partner A, what two operations are represented in the expression? (multiplication and addition)
- Partner B, how would we write this variable expression? (2*x* + 3) Record.

IP, CP, WG

Have student pairs complete the last column of the chart on the top of S249. Ask students how this chart is different from the chart on S248. (The numerical or variable expression is given, and they must write the verbal expression.) Have students use the pictorial model and the numerical or variable expressions to write the verbal expression for each problem. Complete the conclusion section at the bottom of S249 and discuss the answers as a whole group. **{Pictorial Representation, Verbal Description, Algebraic Formula}**

Expressions in Real-World Situations

(M, GP, WG, CP, IP) S250, S251 (Answers on T492, T493.)

M, GP, WG, CP:

Have students turn to S250 in their books. Students will write variable expressions and equations to model real-world situations. They will also work with the vocabulary for expressions. Make sure students know their designation as Partner A or Partner B. **{Algebraic Formula, Verbal Description, Graphic Organizer}**

MODELING

Expressions in Real-World Situations

Step 1: Have student pairs read Problem 1.
- Partner A, what would you do if you knew she bought three packages? (Multiply 8 by 3.)
- Partner B, what would you do if you knew she bought four packages? (Multiply 8 by 4.)
- Partner A, what can we use if we don't know how many packages she is going to buy? (a variable)

- Partner B, what variable do we often use? (x)
- Partner A, what variable expression represents the number of drinks you have? ($8x$) Record.

Step 2: Have student pairs read Problem 2.

- Partner B, what would you do if you knew Baxter had spent two hours at your house? (Multiply 2 by 25 and add 50.)
- Partner A, what would you do if you knew he spent three hours at your house? (Multiply 3 by 25 and add 50.)
- Partner B, what can we use if we don't know how many hours he is spending at your house? (a variable)
- Partner B, what variable should we use? (h)
- Partner A, what variable expression represents the amount of money he charges? ($50 + 25h$) Record.

Step 3: Read Problem 3 together.

- Partner A, what would you do if you knew the width of the rectangle was 5? (Add 8.5 plus 5 and multiply the sum by 2.)
- Partner B, what would you do if you knew the width of the rectangle was 10? (Add 8.5 plus 10 and multiply the sum by 2.)
- Partner A, what can we use if we don't know the width of the rectangle? (a variable)
- Partner B, what variable might we use to represent the width? (w)

***Teacher Note:** Explain to students than when using expressions with geometry, we often see the beginning letter of the dimension used as the variable.

- Partner A, what variable expression can we use to represent the perimeter of the rectangle if the width is unknown? [$2(8.5 + w)$] Record.

Step 4: There are four vocabulary words listed in the word bank for the graphic organizer.

- Partner A, read the definition for Problem 4. (a letter that stands for an unknown value)
- Partner B, which of the four vocabulary words fits that definition? (variable) Record.
- Partner A, if we look at the expression from Problem 2, can you identify the variable? (h) Record.

Step 5: Use the questioning from Step 4 to complete the Vocabulary Chart with the students.

IP, CP, WG

Have student pairs complete the table at the bottom of S250 and the matching activity and table on S251. Review the answers as a whole group. **{Verbal Description, Algebraic Formula, Graphic Organizer}**

Evaluating Expressions

(M, GP, WG, CP, IP) S252

(Answers on T494.) Copy Master page T495.

M, GP, WG, CP: Direct students' attention to page S252 in their books. Students will evaluate variable expressions. Make sure students know their designation as Partner A or Partner B. **{Algebraic Formula, Verbal Description, Graphic Organizer}**

MODELING

Evaluating Expressions

Step 1: Have student pairs read and discuss Question 1.

- Partner B, where have you heard the word evaluate before? (Ex: teachers evaluate your work, a boss evaluates an employee, etc.)
- Partner A, what does it mean to evaluate a numeric expression? (find the value after completing all of the operations) Record.
- Have students evaluate the number expression. (54) Record.

Step 2: Have student pairs read and discuss Question 2.

- Partner B, how is evaluating a variable expression different from evaluating a numerical expression? (The variable expression contains an unknown value which is represented by a variable.) Record.
- Let's look at the expression from page S250.
- There are eight yogurt drinks in a package. Write an expression that tells how many yogurt drinks there are if you buy x number of packages.
- Partner A, what did the x stand for in the yogurt problem? (the number of packages of yogurt) Record.
- Partner B, if Tina bought four packages of yogurt, how could you evaluate the expression $8x$ to determine how many yogurt drinks that Tina has? (Substitute in the numerical value of 4 for the variable and evaluate the expression. $8x = 8(4)$ or 32 yogurt drinks) Record.

Step 3: Read Problem 6 together.

- Partner A, how can we figure out how much we owe Baxter? (Substitute 6 for the variable "h" and evaluate.)
- Partner B, how much do you owe Baxter for six hours of work? ($200) Record.

Step 4: Have students look at Problem 7 in the table.

- Partner A, how do you know what order to perform the operations in when you are evaluating an expression? (the order of operations)
- Partner B, if there is a term with a coefficient and a variable, what operation does it represent? (multiplication)
- Partner A, when should this operation be performed? (before you add or subtract)

Step 5: Have students evaluate the expressions in Problems 8 – 10 and review the answers as a class.

Conclusion: When evaluating expressions you need to apply the (order of operations). When you have a term with a coefficient and a variable it represents the operation of (multiplication). Record.

IP, CP, WG

Have a copy of Copy Master T495 for each student pair. Students will put the cards into two piles face down. Each pair will pick one card from each pile – one expression and one constant. They will evaluate their expression using the constant they chose. Once both partners have a value, the partner with the highest value will get a point. At the end of five rounds, the partner who has the most points wins. **{Algebraic Formula, Verbal Description}**

Foldable on Writing and Evaluating Expressions (M, WG)

M, WG:

Use the following directions to model creating a foldable for Writing and Evaluating Expressions. **{Algebraic Formula, Verbal Description, Graphic Organizer}**

MODELING

Foldable on Writing and Evaluating Expressions

Step 1: Take out your foldable from Lesson 20.

Step 2: Label the third flap on the left with "Write Algebraic Expressions". On the inside, complete the section with the given information. (Refer to your foldable.)

Step 3: Label the fourth flap with "Evaluate Algebraic Expressions". On the inside, complete the section with the given information. (Refer to your foldable.)

SOLVE Problem (GP, WG) S253 (Answers on T496.)

Remind students that the SOLVE problem on S253 is the same one from the beginning of the lesson. Complete the SOLVE problem with your students. Ask them for possible connections from the SOLVE problem to the lesson. Students should say that they need to write a variable expression from the verbal expression, and use the order of operations to find the value. **{SOLVE, Algebraic Formula, Verbal Description, Graphic Organizer}**

Real-World Application with Writing and Evaluating Algebraic Expressions (CP, IP, WG) S254, S255, S256, S257(Answers on T497, T498, T499, T500.)

This activity includes four SOLVE problems that give students the opportunity to practice writing and evaluating algebraic expressions with real-world applications. **{SOLVE, Graphic Organizer, Verbal Description}**

There are a variety of ways to complete these problems. Here are a few suggestions which are alternatives to having students complete all 5 problems in student pairs:

- Have students work in groups of 4 or 5 and assign them one of the SOLVE problems to complete as a group. Students can then transfer answers to chart paper and present to the whole group.
- Have students work in 4 different groups. Post each SOLVE problem on a chart around the room. Students can start at one poster and complete the S step. After a few minutes, have student groups move to the next poster, read the S step, and then complete the O step. After a few minutes, have students move to the next poster, read the S and O steps, and complete the L step. Continue with this procedure until student groups have returned to their original problem. They can also present their problem to the whole group.
- Have a copy of one of the SOLVE problems at each table or group (4 groups). Have students complete the S Step and then pass the problem on to the next group when you give a signal. Students will continue this process until they get back their original problem.
- Pass Back Activity: This activity works well if students are sitting in rows or it can be adapted to a group. Each row or group is given a SOLVE problem. The first student completes the S Step and then passes the paper back or to the next student. The second student checks the S Step and marks it with initials and then completes the O Step. The SOLVE problem is then passed to the next person who checks and initials the S and O step and completes the L Step. This continues until the problem goes back to the first person who reviews all steps. Student groups can then share their responses as a whole group.

If time permits... **(CP, IP) S258 (Answers on T501.)**
Have students complete Problems 1 - 5 on S258.

[Closure]

To wrap up the lesson, go back to the essential questions and discuss them with students.

- Explain the meaning of a variable expression and give an example. *(A variable expression is an expression that has a variable. It can also include numbers and symbols. An example is 5x + 10.)*
- Explain the difference between an expression and an equation. *(An equation has an equal sign, and the expression before and after it are equal.)*
- Explain how to evaluate the expression 5 + 9*x* if *x* is equal to 8. *(First, substitute 8 for the x. Then using the order of operations, multiply 9 and 8. This gives you 72. Lastly, add 5 and 72 to get the final answer of 77.)*

[Homework] Assign S259 for homework. (Answers on T502.)

[Quiz Answers] T503 – T504

1. **B** 2. **B** 3. **D** 4. **D** 5. **C** 6. **B** 7. **C** 8. **D** 9. **C** 10. **A**

The quiz can be used at any time as extra homework or to assess how students progress on understanding algebraic expressions, and how to evaluate them using the order of operations.

Here is the key to **S247**.

Warm–Up

Directions: Evaluate each numerical expression.

1. $7 + 10 \bullet 3 - 6$

31

2. $18 \div 3 \bullet (4 + 1.5)$

33

3. $100 \div 5^2 - (10 - 8) + 2\frac{1}{2}$

$4\frac{1}{2}$

4. $29 + \{18 \div (2 \bullet 3)\}$

32

5. $120 - (10 - 8)^2 + 5$

121

Here is the key to **S248**.

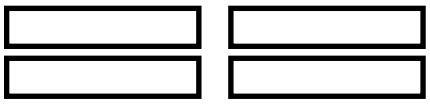
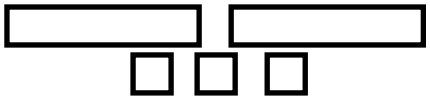
Directions: Complete the following SOLVE problem with your teacher. You will only complete the S step.

Bailey walks dogs for her neighbors. She charges a fee of $10 per week, as well as $3 for every walk. She currently walks eight different dogs. Ms. Walker and her dog, Genevieve, are one of Bailey's customers. Write and use an expression to determine how much Ms. Walker owes Bailey if she walks Genevieve six times this week.

S Underline the question.
This problem is asking me to find **the expression that could determine how much money Ms. Walker owes Bailey, evaluated for six walks.**

Directions: Complete this page with your teacher and partner.

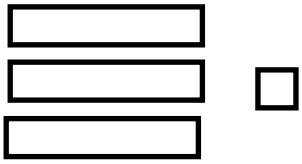
Writing Expressions – Verbal to Numerical and Variable Expressions

Verbal Expression	Pictorial Representation	Numerical and Variable Expressions
1. Four		**4**
2. Two plus three		**2 + 3**
3. Three groups of two		**3 • 2**
4. A number		***x***
5. Four plus a number		**4 + *x***
6. A number plus three		***x* + 3**
7. Four times a number		**4*x***
8. Two times a number plus three		**2*x* + 3**

Here is the key to **S249**.

Directions: Complete this page with your teacher and partner.

Writing Expressions – Numeric and Variable to Verbal Expressions

Numerical and Variable Expressions		Pictorial Representation	Verbal Expression
1.	3		**three**
2.	1 + 2		**one plus two**
3.	2 • 4		**two groups of four**
4.	3 + *x*		**three plus a number**
5.	*x* + 1		**a number plus one**
6.	3x		**three times a number**
7.	3x + 1		**three times a number plus one**

Conclusions:

When we write an expression with a value that is not identified we can use a variable which is represented by a **letter.**

Look at the expression: 9 + 6

What type of expression is this? **numerical** Explain your answer. **A numerical expression is made up of numbers, operations, and grouping symbols.**

Look at the expression: *x* – 3

What type of expression is this? **variable** Explain your answer. A **variable expression** is any expression that has a **variable**, and may also have **numbers and symbols.**

Here is the key to **S250**.

Directions: Complete this page with your teacher and your partner.

Expressions in real-world situations

1. There are eight yogurt drinks in a package. Write an expression that tells how many yogurt drinks there are if you buy *x* number of packages.

8*x*

2. Baxter is an electrician. He charges a fifty dollar fee to come to your house and charges twenty-five dollars an hour. Write an expression to show how much money he charges.

50 + 25*h*

3. A rectangle has a length of 8.5 inches. Write an expression to show how to determine the perimeter if the width is represented by *w*.

2(8.5 + *w*)

Directions: Use the word bank below to complete the vocabulary chart.

coefficient term variable constant

Vocabulary	Example from Problem 2: 50 + 25*h*	Definition
4. Variable	***h***	a letter that stands for an unknown value
5. Constant	**50**	the numeric term that does not change
6. Coefficient	**25**	the numeric factor in a term that includes a variable
7. Term	**50 and 25*h***	part of an expression that is separated from other parts by addition or subtraction

Directions: Fill in the table below to identify coefficients, terms, constants and variables.

Expression	Coefficients	Terms	Constants	Variables
8. 7*m* + 8 + *x*	**7, 1**	***7m*, 8, *x***	**8**	***m, x***
9. 12 – 5*n*	**5**	**12 ,*5n***	**12**	***n***
10. 25 + 2*p* + 12	**2**	**25, *2p*, 12**	**25, 12**	***p***

Here is the key to **S251**.

Directions: Complete this page with your partner.

1. The sum of four plus a number, divided by three

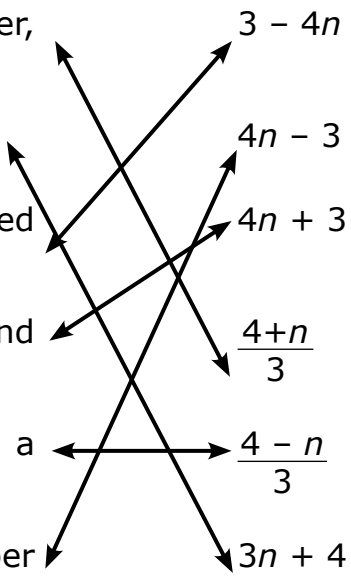
2. Three times a number plus four

3. Four times a number subtracted from three

4. The sum of four times a number and three

5. The difference of four minus a number, divided by three

6. The difference of four times a number and three



Directions: Write the variable or verbal expression.

7.	Write an expression that can be used to determine the area of a rectangle with a length of 9.2 units and an unknown width of w.	**$9.2w$**
8.	Write an expression to represent the sum of 5 times a number and fourteen.	**$5n + 14$**
9.	**Six times the sum of two and a number**	$6(2 + n)$
10.	Write an expression to represent how to find the area of square with a side length of s.	**$s \bullet s$ or s^2**
11.	**Four and one half times a number subtracted from 15; Answers will vary.**	$15 - 4\frac{1}{2}x$

12. Write a real-world situation that can be represented by the expression:

$15(x + 10)$

Answers will vary.

Here is the key to **S252**.

Directions: Complete this page with your teacher and partner.

Evaluating Expressions

1. What does it mean to evaluate a numerical expression? **Find the value after completing all of the operations.**

Evaluate the following expression: $(4 + 5)2 + 6^2$ **54**

2. How is evaluating a variable expression different from evaluating a numerical expression? **The variable expression contains an unknown value which is represented by a variable.**

3. Let's look at the expression from page S250.
There are eight yogurt drinks in a package. Write an expression that tells how many yogurt drinks there are if you buy *x* number of packages.

8*x*

4. What did the *x* stand for? **the number of packages**

5. If Tina bought 4 packages of yogurt drinks, how could you evaluate the expression 8*x* to determine how many yogurt drinks that Tina has? **Substitute in the numerical value of 4 for the variable and evaluate the expression. 8*x* = 8(4) or 32 yogurt drinks**

6. In Problem 2 on S250, the expression of 50 + 25*h* represents how much money Baxter charges for his work as an electrician. What if Baxter spent six hours at your home?

How much would you owe him? **50 + 25(6) = 50 + 150 = 200 $200**

Directions: Evaluate the following expressions.

7. Find the value of 6*m* + 12 if *m* is equal to 5.	**6(5) + 12 = 30 + 12 = 42**
8. Find the value of 6*m* + 12 if *m* is equal to 3.2.	**6(3.2) + 12 = 19.2 + 12 = 31.2**
9. Find the value of 7*m* + 8 + *x* if *m* is equal to 3 and *x* is equal to 4.	**7(3) + 8 + 4 = 21 + 8 + 4 = 29 + 4 = 33**
10. Find the value of 3*x* – 5*y* if *x* is equal to 10 and *y* is equal to 3.	**3(10) – 5(3) = 30 – 15 = 15**

Conclusion: When evaluating expressions you need to apply the **order of operations**. When you have a term with a coefficient and a variable it represents the operation of **multiplication**.

COPY MASTER

Directions: Play the following game with your partner.

1. Cut apart the cards below.
2. Put the cards face down in two piles – one with algebraic expressions, one with constants.
3. Each partner will pick one card from each pile. Evaluate your expression with the constant you choose. The partner with the larger value wins one point.
4. After five rounds, the partner with the most points win.

$2x + 5$	$100 - 5x$	$x^2 + 4$	$(4x - 2)^3$	$4x \div 2 + 5$
$90 + 3x - 14$	$60 - 3x$	$2x + 3x$	$7x - 5$	$8x \div 4 + 2x$
1	2	3	4	6
8	10	12	15	16

Here is the key to **S253**.

Directions: Complete the following SOLVE problem with your teacher.

~~Bailey walks dogs for her neighbors~~. | She charges a fee of $10 per week, | as well as $3 for every walk |. ~~She currently walks eight different dogs~~.| ~~Ms. Walker and her dog, Genevieve, are one of Bailey's customers.~~ | Write and use an expression to determine how much Ms. Walker owes Bailey if she walks Genevieve six times this week.

S Underline the question.

This problem is asking me to find **the expression that could determine how much money Ms. Walker owes Bailey, evaluated for six walks.**

O Identify the facts.

Eliminate the unnecessary facts.

List the necessary facts. **$10 fee per week**
$3 per walk
Walked Genevieve six times

L Write in words what your plan of action will be. **Write an algebraic expression to find out how much money Bailey charges to walk dogs. Then substitute the number of walks in the expression to evaluate it.**

Choose an operation or operations. **Multiplication, addition**

V Estimate your answer. **I think Ms. Walker will owe Bailey about $30.**

Carry out your plan. **$10 + 3w$**

$10 + 3(6) = 10 + 18 = \$28$

E Does your answer make sense? (Compare your answer to the question.) **Yes, I wrote an expression to find how much Bailey charges for walking dogs, and then found how much Ms. Walker owes her.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, $28 is close to the estimate of about $30.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **An expression that Bailey can use to decide how much her customers owe her is $10 + 3w$. If she walks Ms. Walker's dog six times this week, Ms. Walker will owe her $28.**

Here is the key to **S254**.

Directions: Complete the following SOLVE problem.

~~Tom is creating a geometric design for his math project~~. | His design is composed of quadrilaterals, pentagons, and hexagons. | As he is creating his design, Tom needs to determine the perimeter of each figure. | What expression can Tom use to represent the perimeter of each hexagon?

S Underline the question.

This problem is asking me to find **the expression Tom can use to represent the perimeter of the hexagons.**

O Identify the facts.

Eliminate the unnecessary facts.

List the necessary facts. **shape of a hexagon**

side length is unknown

L Write in words what your plan of action will be. **Write an algebraic expression to represent the perimeter of the hexagon using the number of sides in a hexagon and representing the length of each side with a variable.**

Choose an operation or operations. **Multiplication**

V Estimate your answer. **A variable expression**

Carry out your plan. **6*s***

E Does your answer make sense? (Compare your answer to the question.) **Yes, I wrote an expression to represent the length of each side of the hexagon.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, I wrote a variable expression.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **Tom can use the expression 6*s* to represent the measure of the perimeter of a hexagon where 6 represents the number of sides and *s* represents the side measure.**

Here is the key to **S255**.

Directions: Complete the following SOLVE problem.

~~The sixth-grade students are going on a field trip to the art museum~~. | The cost for each student ticket is $6.00, | and each adult ticket costs $12.50. | Write an expression that can be used to determine the total cost for the trip.

S Underline the question.

This problem is asking me to find **the expression that can be used to determine the total cost for the trip.**

O Identify the facts.

Eliminate the unnecessary facts.

List the necessary facts. **Student ticket $6.00**

Adult ticket $12.50

Unknown number of each type of ticket.

L Write in words what your plan of action will be. **Write an algebraic expression to represent the total cost of the trip using the known cost of tickets and representing each type of ticket with variables.**

Choose an operation or operations. **Multiplication, addition**

V Estimate your answer. **A variable expression**

Carry out your plan. **6*s* + 12.5*a***

(Students may choose other variables.)

E Does your answer make sense? (Compare your answer to the question.) **Yes, I wrote an expression to determine the total cost of the trip.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, I wrote a variable expression.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **The expression of 6*s* + 12.5*a* can be used to determine the total cost of the trip.**

Here is the key to **S256**.

Directions: Complete the following SOLVE problem.

~~Deanna has a cell phone~~. | She pays a fee of $15.00 per month | and that pays for 100 texts. | After the first 100 text messages, | she has to pay 1.5 cents per text. | Write an expression and evaluate the expression to determine what her monthly bill was if she had a total of 400 texts last month.

S Underline the question.
This problem is asking me to find **the cost of her bill last month.**

O Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts. **$15 monthly fee**
100 texts included
Total of 400 texts
Additional texts cost 1.5 cents per text

L Write in words what your plan of action will be. **Write an expression to determine her total monthly bill. Substitute in the given values for the variables and evaluate the expression.**

Choose an operation or operations. **Multiplication, subtraction, addition**

V Estimate your answer. **About $18**

Carry out your plan. **$15 + 0.015*t***
15 + 0.015(400 – 100)
15 + 0.015(300)
15 + 4.5 = 19.5 = $19.50

E Does your answer make sense? (Compare your answer to the question.) **Yes, I wrote and evaluated the expression to determine the cost of the phone last month.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, $19.50 is close to my estimate of about $18.00.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **Deanna can use the expression 15 + 0.015*t* to represent the cost of her phone last month. The total cost of her phone last month was $19.50.**

Here is the key to **S257**.

Directions: Complete the following SOLVE problem.

~~Stephanie and her family are going out to eat for her sister's birthday.~~ | The total cost of the dinner is $48.00. | The restaurant charges an additional fee of $12.00 for the birthday cake. | Stephanie's dad asks her to figure out the tip for the dinner and cake. | Write an expression than can be used to determine the tip. | Find the total amount of the meal if Stephanie's dad wants her to use 18% for the tip.

S Underline the question.
This problem is asking me to find **an expression to determine the tip and the total cost of the meal.**

O Identify the facts.
Eliminate the unnecessary facts.
List the necessary facts. **Dinner cost $48.00**
Cake cost $12.00
Tip of 18%

L Write in words what your plan of action will be. **Write an algebraic expression to represent the total cost of the meal. Evaluate the expression using the given value of the tip and then add the cost of the dinner, the cake, and the tip.**

Choose an operation or operations. **Multiplication, addition**

V Estimate your answer. **About $70**

Carry out your plan. **$(48 + 12)t + (48 + 12)$**
$60t + 60$
$60(0.18) + 60$
$10.80 + 60 = 70.80 = \$70.80$

E Does your answer make sense? (Compare your answer to the question.) **Yes, I wrote and evaluated an expression to determine the total cost of the meal.**

Is your answer reasonable? (Compare your answer to the estimate.) **Yes, $70.80 is close to my estimate of about $70.00.**

Is your answer accurate? (Check your work.) **Yes**

Write your answer in a complete sentence. **An expression that Stephanie can use to determine the cost of the meal is $(48 + 12)t + (48 + 12)$ where t represents the cost of the tip. The total cost of the meal is $70.80.**

Here is the key to **S258**.

Directions: Complete this page with your partner.

1. The formula to find the surface area of a cube is $6s^2$, where s stands for the side length of the cube. What is the surface area of the cube if its side length is 10 cm?

600 cm²

2. The distance traveled by a car can be found using the formula $D = st$, where s is the speed of the car and t is the total amount of time traveled. If a car traveled at 55 mph for 4 hours, how far did the car travel?

220 miles

3. We can use the formula $C = \frac{5}{9}(F - 32)$ to convert a temperature given in degrees Fahrenheit to degrees Celsius. If the temperature is 86° F, what is the temperature in degrees Celsius?

30° C

4. The formula $2lw + 2wh + 2hl$ can be used to find the surface area of a rectangular prism, where l is the length, w is the width, and h is the height of the prism. What is the surface area of a rectangular prism that has a length of 7 cm, width of 5 cm, and a height of 6 cm?

214 cm²

5. To find the volume of a cylinder, you use the formula $V = \pi r^2 h$, where π is 3.14, r is the radius of the cylinder, and h is the height of the cylinder. What is the volume of the cylinder if the radius is 8 inches and the height is 12 inches?

2411.52 in.³

Here is the key to **S259**.

Homework

Name _____ **Date** _____

Directions: Write a verbal or algebraic expression for Problems 1 - 4.

1. $3x + 4$
Triple a number plus four

2. $10 \div (x - 2)$
ten divided by the quantity of a number minus two

3. Five times the quantity of seven plus a number
$5(7 + x)$

4. Twelve divided by a number subtracted from four
$12 \div (4 - x)$

5. What is the difference between an algebraic expression and an algebraic equation?
An equation has an equal sign, and an expression does not.

6. Fred is going to a carnival. There is an $8 entrance fee, and rides cost $3 a piece. Write an algebraic expression that will give the amount of money Fred spent if he rode r number of rides.
$8 + 3r$

7. If Fred rode 13 rides, how much money did he spend?
$47

8. Evaluate the following if $x = 7$ and $y = \frac{3}{4}$: $6x + 12y$
51

9. Evaluate the following if $p = 15$: $500 - p^2$
275

10. The formula $A = 0.5bh$ will give the area of a triangle. What is the area of the triangle if the base, b, is 18 in. and the height, h, is 20 in.?
180 in.^{2}

Name _____ Date _____

Quiz

1. Which is an algebraic expression?
A. $10 + 8 \div 2$
B. $5x + 3y$
C. $2(9 - 3) = 12$
D. $50 = 14x$

---

2. Which expression matches the following verbal expression: "The product of seventeen and the quantity of a number minus eight"?
A. $17x - 8$
B. $17(x - 8)$
C. $17 - x - 8$
D. $17 \div (x - 8)$

---

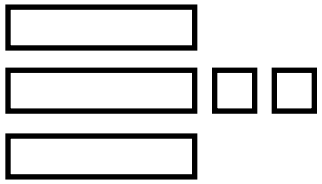
3. Which verbal expression matches the following: $m + 8 - 2m$
A. three times a number plus eight
B. the sum of a number, eight, and two times a number
C. the sum of a number and eight subtracted from two times a number
D. two times a number subtracted from the sum of a number and eight

---

4. Which expression matches the following verbal expression: "The quotient of five times a number and ten"?
A. $5x \bullet 10$
B. $5x - 10$
C. $5x + 10$
D. $5x \div 10$

---

5. Which algebraic expression is modeled by the algebra tiles below?
A. 5x
B. 3x + 2y
C. 3x + 2
D. 3x - 2



6. Mario is purchasing some plants for the front of his house. He is purchasing begonias and daffodils. Each pot of begonias is four dollars, and each pot of daffodils is seven dollars. Write an expression to show how much money Mario spent if he bought b pots of begonias and d pots of daffodils.

A. $11(b + d)$
B. $4b + 7d$
C. $4d + 7b$
D. $7b - 4d$

7. How much did Mario spend if he purchased 8 pots of begonias and 9 pots of daffodils?

A. $20
B. $92
C. $95
D. $137

8. What is the value of $49 - (b^2 + 3)$ if b is equal to 6.3?

A. 3.61
B. 6
C. 6.13
D. 6.31

9. What is the value of $\frac{m}{5} + 7(2)$, if m is 95?

A. 21
B. 28
C. 33
D. 35

10. The formula $D = st$ can be used to find the distance a train travels. If the speed, s, of the train is 80 mph, and the time, t, it travels is 7 hours, how far did the train go?

A. 560 miles
B. 600 miles
C. 650 miles
D. 700 miles