

Write Algebraic Expressions



Getting the Idea

An **algebraic expression** is an expression that includes at least one variable. A **variable** is a letter or symbol that represents an unknown value. You can use key words to help you translate phrases or problem situations into algebraic expressions.

Key Words

Addition	Multiplication	Subtraction	Division
more than plus additional sum	per times of product	less less than fewer than difference	half share equally divide by quotient
How many altogether? How many in all? What is the total number?		How many more? How many fewer? How many left? How much change?	How many in each? How many groups?

Key words will help you translate many, but not all, math word problems. You always need to think about which operation makes sense for a particular problem.

Example 1

Write an algebraic expression to represent the phrase below.

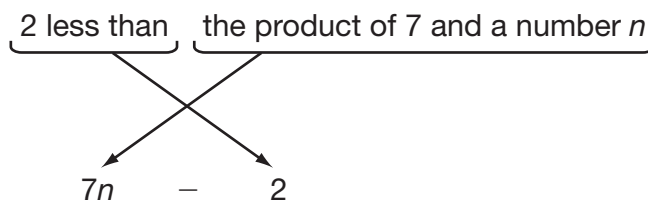
2 less than the product of 7 and a number n

Strategy Use key words to translate the phrase into an algebraic expression.

Step 1 Identify the key words.

The words “less than” indicate subtraction.
The word “product” indicates multiplication.

Step 2 Translate the words into an algebraic expression.



Be sure to subtract the correct term. $7n - 2$ is not the same as $2 - 7n$.

Solution The expression $7n - 2$ represents this phrase.

Example 2

The number of stamps in Ethan's collection is 4 more than half the number of stamps in Helen's collection.

Write an expression to show the number of stamps in Ethan's collection.

Strategy Use key words to translate the phrase into an algebraic expression.

Step 1

Identify the key words.

The words "more than" and "half" indicate addition and division by 2.

Step 2

Translate the words into an algebraic expression.

Let h = the number of stamps in Helen's collection.

The problem can be written as: $4 + \frac{h}{2}$.

Solution The expression $4 + \frac{h}{2}$ represents the number of stamps in Ethan's collection.

Example 3

Lucy babysat for 2 hours on Friday, 3 hours on Saturday, and 2.5 hours on Sunday. She earns d dollars per hour for babysitting.

Write an expression to represent her total earnings for the three babysitting jobs.

Strategy Use key words to translate the phrase into an algebraic expression.

Step 1

Identify the key words.

The word "total" indicates either addition or multiplication.

The words "per hour" mean Lucy gets paid the same rate for each hour.

Use addition and multiplication to write the expression.

Step 2

Add the hours Lucy worked.

$$2 + 3 + 2.5 = 7.5$$

Step 3

Write the algebraic expression.

Lucy worked 7.5 hours at a rate of d dollars per hour.

That can be shown as $7.5d$.

Solution The expression $7.5d$ represents Lucy's total earnings for the three jobs.



Coached Example

Kerrigan is k years old. Mia is twice as old as Kerrigan. William is 3 years younger than Mia.

Write an algebraic expression to represent William's age.

Mia is twice as old as Kerrigan.

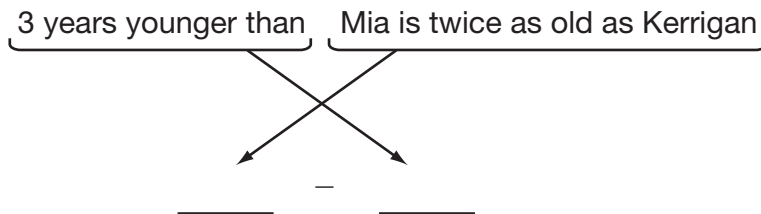
The word "twice" indicates you could _____ by 2.

William is 3 years younger than Mia.

The words "younger than" mean that William's age is _____ than Mia's age.

What operation should you use to show "younger than"? _____

Translate the words into an algebraic expression.



The expression _____ represents William's age.



Lesson Practice

Choose the correct answer.

1. Which expression represents the phrase below?

83 less than a number n

- A. $83 - n$
- B. $n - 83$
- C. $83 \div n$
- D. $n \div 83$

2. If n stands for the unknown number, which expression represents the phrase below?

the sum of a number and three, divided by seven

- A. $n + \frac{7}{3}$
- B. $\frac{7}{n} + 3$
- C. $\frac{7}{n + 3}$
- D. $\frac{n + 3}{7}$

3. Johanna has s yards of string. For an art project, she can cut an equal number of pieces of string if each piece is $\frac{11}{12}$ foot long. Which expression shows the number of pieces she can cut?

- A. $s + \frac{11}{12}$
- B. $s \cdot \frac{11}{12}$
- C. $s \div \frac{11}{12}$
- D. $s - \frac{11}{12}$

4. The Hamied family stayed at a hotel for n nights. The cost was \$80 per night plus a one-time fee of \$20 because they brought their dog. Which expression represents the total cost of their hotel stay?

- A. $80n + 20n$
- B. $80n + 20$
- C. $80 + 20n$
- D. $80 + 20 + n$

5. The number of pledges that Melissa collected for this year's charity walk is 8 less than half the number of pledges she collected last year. She collected p pledges last year. Which expression represents the number of pledges she collected this year?

- A. $2p - 8$
- B. $p - \frac{8p}{2}$
- C. $\frac{p}{2} - 8$
- D. $8 - \frac{p}{2}$

6. Aiden is shopping for school supplies. He has \$35 to spend on a calculator and notebooks. He will buy one calculator for \$18. Let n represent the cost of one notebook. Which expression represents the number of notebooks Aiden can buy with the \$35?

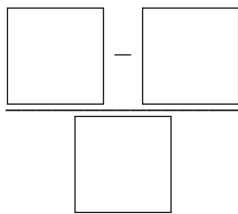
- A. $(35 - 18) \div n$
- B. $(18 - 35) \times n$
- C. $(18 - 35) \div n$
- D. $(35 + 18) \div n$

7. A landscaper charges \$30 for each job plus an additional \$20 for each hour worked.

A. Write an expression to represent the total cost of a landscape job. Explain what the variable used in the expression represents.

B. Explain how you identified the operations used in the expression.

8. Antonia had s stickers. She kept 8 and divided the rest equally among 3 friends. Use values from the box to write an expression to represent the situation.



3
8
s

9. Circle the part that completes each expression.

8 more than 2 times a number n

$$8 + \begin{array}{|c|} \hline 2 + n \\ \hline n \\ \hline 2n \\ \hline \end{array}$$

45 minus the sum of 10 and a number n

$$45 - \begin{array}{|c|} \hline (10 + n) \\ \hline 10 + n \\ \hline 10n \\ \hline \end{array}$$

4 times 15 less than a number n

$$4 \times \begin{array}{|c|} \hline (15 - n) \\ \hline (15 + n) \\ \hline (n - 15) \\ \hline \end{array}$$

10. Maelin raised \$50 plus \$3 for each mile, m , that she walked in a fund-raiser walk. Which expression represents the situation? Circle all that apply.

- A. $50 + 3m$
- B. $50m + 3$
- C. $3 + 50m$
- D. $50 \times 3m$
- E. $3m + 50$
- F. $(50 + 3)m$
- G. $50 - 3m$

11. Select True or False for each statement.

- A. 5 less than a number n is written as $5 - n$. True False
- B. 11 times half of a number n is written as $11\frac{n}{2}$. True False
- C. 25 more than a number n is written as $25 + n$. True False
- D. 40 divided by the sum of a number n and 12 is written as $\frac{12 + n}{40}$. True False

12. Draw a line from each phrase to the numerical expression that it represents.

- | | | |
|-----------------------------|---|---------------------|
| A. 5 less than g | • | • $5 - \frac{g}{2}$ |
| B. 5 less than one-half g | • | • $g - 5$ |
| C. g less than 5 | • | • $5 - g$ |
| D. one-half g less than 5 | • | • $\frac{g}{2} - 5$ |

13. Lonnie earned 10 tickets for each game, g , he played at a carnival. He also received 25 tickets for coming to the carnival. Which expression represents the situation? Circle all that apply.

- A. $10 + 25g$
- B. $(25 + 10)g$
- C. $25 + 10g$
- D. $25 \times 10g$
- E. $25 - 10g$
- F. $25g + 10$
- G. $10g + 25$

14. Brogan earns \$5 per week. He can earn extra money by helping with chores. He earns \$2 per chore, c . Look at each expression. Does the expression represent how much money Brogan earns in a week? Select Yes or No.

- A. $5 + 2c$ Yes No
- B. $2 + 5c$ Yes No
- C. $(5 + 2)c$ Yes No
- D. $2c + 5$ Yes No