

EXAMPLE 1 Using Order of Operations

- a. Evaluate $12 - 2 \times 4$.

$$\begin{aligned} 12 - 2 \times 4 &= 12 - 8 \\ &= 4 \end{aligned}$$

Multiply 2 and 4.

Subtract 8 from 12.

- b. Evaluate $60 \div [(4 + 2) \times 5]$.

$$\begin{aligned} 60 \div [(4 + 2) \times 5] &= 60 \div [6 \times 5] \\ &= 60 \div 30 \\ &= 2 \end{aligned}$$

Perform operation in parentheses.

Perform operation in brackets.

Divide 60 by 30.

Try It Evaluate the expression.

1. $7 \cdot 5 + 3$

2. $(28 - 20) \div 4$

3. $[6 + (15 - 10)] \times 5$

EXAMPLE 2 Using Order of Operations with Exponents

Remember to multiply and divide from left to right. In Example 2, you should divide before multiplying because the division symbol comes first when reading from left to right.

- Evaluate $30 \div (7 + 2^3) \times 6$.

$$\begin{aligned} 30 \div (7 + 2^3) \times 6 &= 30 \div (7 + 8) \times 6 \\ &= 30 \div 15 \times 6 \\ &= 2 \times 6 \\ &= 12 \end{aligned}$$

Evaluate power in parentheses.

Perform operation in parentheses.

Divide 30 by 15.

Multiply 2 and 6.

Try It Evaluate the expression.

4. $6 + 2^4 - 1$

5. $4 \cdot 3^2 + 18 - 9$

6. $16 + (5^2 - 7) \div 3$

The symbols \times and \cdot are used to indicate multiplication. You can also use parentheses to indicate multiplication. For example, $3(2 + 7)$ is the same as $3 \times (2 + 7)$.

EXAMPLE 3 Using Order of Operations

Remember

You can interpret a fraction as division of the numerator by the denominator.

$$\frac{a}{b} = a \div b$$



a. Evaluate $9 + \frac{8-2}{3}$.

$$\begin{aligned} 9 + \frac{8-2}{3} &= 9 + (8-2) \div 3 \\ &= 9 + 6 \div 3 \\ &= 9 + 2 \\ &= 11 \end{aligned}$$

Rewrite fraction as division.

Perform operation in parentheses.

Divide 6 by 3.

Add 9 and 2.

b. Evaluate $10 - 8(13 + 7) \div 4^2$.

$$\begin{aligned} 10 - 8(13 + 7) \div 4^2 &= 10 - 8(20) \div 4^2 \\ &= 10 - 8(20) \div 16 \\ &= 10 - 160 \div 16 \\ &= 10 - 10 \\ &= 0 \end{aligned}$$

Perform operation in parentheses.

Evaluate 4^2 .

Multiply 8 and 20.

Divide 160 by 16.

Subtract 10 from 10.

Try It Evaluate the expression.

7. $50 + 6(12 \div 4) - 8^2$

8. $5^2 - \frac{1}{5}(10 - 5)$

9. $\frac{8(2+5)}{7}$



Self -Assessment

for Concepts & Skills

Solve each exercise. Then rate your understanding of the success criteria in your journal.

USING ORDER OF OPERATIONS Evaluate the expression.

10. $7 + 2 \cdot 4$

11. $8 \div 4 \times 2$

12. $3(5 + 1) \div 3^2$

13. **WRITING** Why does $12 - 8 \div 2 = 8$, but $(12 - 8) \div 2 = 2$?

14. **MP REASONING** Describe the steps in evaluating the expression $8 \div (6 - 4) + 3^2$.

15. **WHICH ONE DOESN'T BELONG?** Which expression does *not* belong with the other three? Explain your reasoning.

$5^2 - 8 \times 2$

$5^2 - (8 \times 2)$

$5^2 - 2 \times 8$

$(5^2 - 8) \times 2$

EXAMPLE 4 Modeling Real Life

The diagram shows landing zones for skydivers. Zone 1 is for experts. The remaining space is divided in half and designated as Zones 2 and 3 for tandem divers. What is the area of Zone 2?

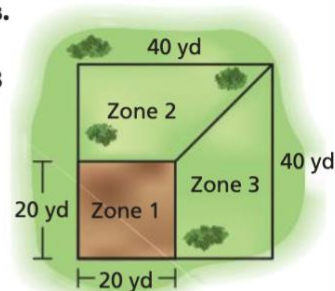
Understand the problem.

Make a plan.

Solve and check.

You are given the dimensions of landing zones and that the areas of Zones 2 and 3 are equal. You are asked to find the area of Zone 2.

Use a verbal model to write an expression. Subtract the area of Zone 1 from the total area to find the combined area of Zones 2 and 3. Then multiply the combined area by one-half.



Verbal Model

$$\text{One-half} \left(\text{Total area} - \text{Area of Zone 1} \right)$$

Expression

$$\frac{1}{2} \left(40^2 - 20^2 \right)$$

Check Verify that the areas of the three zones have a sum equal to the total area.

$$400 + 600 + 600 \stackrel{?}{=} 1600$$

$$1600 = 1600 \quad \checkmark$$

$$\frac{1}{2} (40^2 - 20^2) = \frac{1}{2} (1600 - 400)$$

Evaluate powers in parentheses.

$$= \frac{1}{2} (1200)$$

Perform operation in parentheses.

$$= 600$$

Multiply $\frac{1}{2}$ and 1200.

The area of Zone 2 is 600 square yards.



Self-Assessment

for Problem Solving

Solve each exercise. Then rate your understanding of the success criteria in your journal.

16. A square plot of land has side lengths of 40 meters. An archaeologist divides the land into 64 equal parts. What is the area of each part?
17. A glass block window is made of two different-sized glass squares. The window has side lengths of 40 inches. The large glass squares have side lengths of 10 inches. Find the total area of the small glass squares.
18. **DIG DEEPER!** A square vegetable garden has side lengths of 12 feet. You plant flowers in the center portion as shown. You divide the remaining space into 4 equal sections and plant tomatoes, onions, zucchini, and peppers. What is the area of the onion section?

