Order of Operations and Equations

Solve multiplications and divisions before additions and subtractions.

Solve multiplications and divisions "on the same level," from left to right.

Solve additions and subtractions "on the same level," from left to right.

Parentheses ( ) change the order. *First* solve whatever is inside parentheses.

1. Solve in the right order!

a. $12 \times 5 + 8 =$ _____	**b.** $10 \times 2 + 9 \times 8 =$ _____	**c.** $(8 + 16) \div 3 =$ _____
$45 + 5 \times 7 =$ _____	$10 + 2 \times 9 + 8 =$ _____	$120 - 2 \times 11 =$ _____
$8 \times 5 \div 2 =$ _____	$10 + 2 \times (9 + 8) =$ _____	$2 \times (100 - 80 + 20) =$ _____

Which expression(s) match each problem?

2. Mark bought three light bulbs for $8 each, and paid with $50. What was his change?

a. $3 \times \$8 - \$50$ **b.** $\$50 - \$8 + \$8 + \$8$

c. $\$50 - 3 \times \$8$ **d.** $\$50 - (\$8 - \$8 - \$8)$

3. Andy buys a salad for $8 and a pizza for $13, and shares the cost evenly with his friend. How many dollars is Andy's share of the cost?

a. $\$8 + \$13 \div 2$ **b.** $\$2 \div (\$8 + \$13)$

c. $2 \times \$8 + 2 \times \$13$ **d.** $(\$8 + \$13) \div 2$

4. Melissa shares equally the cost of a new fence with three other neighbors and the cost of road repair with two other neighbors. The fence cost $600 and the road repair cost $1,200. What is Melissa's share of the costs?

a. $\$600 \div 4 + \$1,200 \div 3$

b. $(\$600 + \$1,200) \div 3 \div 2$

c. $\$600 \div 3 + \$1,200 \div 2$

d. $(\$600 + \$1,200) \div 5$

5. Division can also be written with a fraction line. Solve in the right order.

a. $6 + \frac{24}{2} =$ **b.** $\frac{32}{2} - 6 =$ **c.** $\frac{54}{6} - 6 - 2 =$

In this case, we do first the operation that is *above* the line, as though it were written in parentheses:

d. $\frac{6 + 24}{2} =$ **e.** $\frac{32 - 6}{2} =$ **f.** $\frac{54 - 6}{6} - 2 =$

An **equation** has numbers, letters, operation symbols, and one equal sign, "=". It's called an *equa*tion because it contains an *equal* sign.

An **expression** only has numbers, letters, and operation symbols—but no equal sign. For example, "40 × 2 + 6 × 5" is an expression.

6. Equation or expression? (You do not have to solve these.)

a. $4t = 180$ **b.** $2 + 60 \times 345 \div 9$ **c.** $15 = x + y$

d. $\dfrac{5.4 - 2.12}{0.4} = 8.2$ **e.** $1{,}000 = 1{,}000$ **f.** $12 - \dfrac{24 \div 0.8}{189}$

$120 - 75 = 3 \times 15$

This is the left side of the equation. This is the right side of the equation.

Do the left and right sides have the same value? Just calculate 120 − 75, then calculate 3 × 15, and check.

If yes, it's a **true equation**.
If not, it's a **false equation**.

$2 = 5$

left side right side

This is a very simple equation - but it's false!

$4 + 5 = 21 - 3$

left side right side

This is also a false equation!

$18 = x - 3$

left side right side

Solving the equation means finding the value of x (the **unknown**) that makes it true.

The value x = 21 makes this equation true, so we say x = 21 is the solution.

7. Place parenthesis into these equations to make them true.

a. $10 + 40 + 40 \times 2 = 180$ **b.** $144 = 3 \times 2 + 4 \times 8$ **c.** $40 \times 3 = 80 - 50 \times 4$

8. Find a number to fit in the box so the equation is true.

a. $40 = (\square + 9) \times 2$ **b.** $4 \times 8 = 5 \times 6 + \square$ **c.** $4 + 5 = (20 - \square) \div 2$

d. $81 = 9 \times (2 + \square)$ **e.** $\square \times 11 = 12 + 20 \times 6$ **f.** $(4 + 5) \times 3 = \square \div 2$

9. Build at least three true equations using (only) the symbols and numbers given. You may use the same number or symbol many times.

11, 3, 1, −, +, ×, ( ), =