

Today we will use number sense to solve one-step equations.

Please gather a clicker, your notebook and a pencil

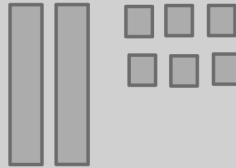
Get ready for the warm-up questions.



Is this drawn correctly to model $2x + 6$? Yes or No

A Yes

B No



Evaluate: $8x$ for $x = 7$

Text in your response.



$$4.432 + 1.09 =$$

Copy down the problem, work it out, and then text in your answer.

Algebra

2-3

Using Number Sense to Solve One-Step Equations

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6.EE.5, 6.EE.6, 6.EE.7

What You'll Learn

To use mental math to estimate and solve problems

🔊 **New Vocabulary** equation, open sentence, solution

Why Learn This?

Part of the fun of collecting is completing your collection. You can use an equation to find the number of items you still need.



An **equation** is a mathematical sentence that has an equal sign, =. An equation is like a balanced scale.



To be in balance, a scale must have weights with the same total on each side.

$$8 + 4 = 3 \times 4 \quad \leftarrow \text{A true equation has equal values on each side of the equal sign.}$$

If each side of the equation does not have the same value, the equation is false. Use \neq to indicate that an equation is false.

EXAMPLE True Equations and False Equations

1 Is the equation $6 + 13 = 18$ true or false?

$6 + 13 \stackrel{?}{=} 18$ ← Write the equation.

19 ← Add 6 + 13.

$19 \neq 18$ ← Compare.

The equation is false.

1 **EXAMPLE** Is the equation $24 - 16 = 8$ true or false?

$24 - 16 \stackrel{?}{=} 8$ ← Write the equation.

8 ← Subtract 16 from 24.

$8 = 8$ ← Compare.

The equation is true.



True or False? $7 \times 9 = 63$

A True

B False



True or False? $4 + 5 = 45$

A True

B False



True or False? $70 - 39 = 41$

A True

B False

An equation with one or more variables is an **open sentence**.

A **solution** of an equation is the value of the variable that makes the equation true. For example, $x - 15 = 12$ is an open sentence. Since $27 - 15 = 12$, the value 27 is the solution to $x - 15 = 12$.

You can use mental math to find the solution of some equations.

EXAMPLE Using Mental Math

Baseball Cards How many baseball cards do you need to add to the 14 cards you already own to have a total of 25 cards? Solve the equation $n + 14 = 25$, which models this situation.

What you think

I need to find a number that I can add to 14 and get 25. Since $11 + 14 = 25$, the solution is 11.

I need 11 more cards.



2 EXAMPLE Use mental math to solve each equation.

a. $y - 7 = 15$

What you think

$22 - 7 = 15$, so the solution is 22.

b. $d \div 9 = 6$

What you think

$54 \div 9 = 6$, so the solution is 54.



**Mental math: Solve this equation:
 $17 - x = 8$ What is x ?**

Text in your response.



Solve: $w \div 4 = 20$

Text in your response.

EXAMPLE Guess, Check, and Revise

3 Use the strategy *Guess, Check, and Revise* to solve $n - 43 = 19$.

Estimate Round the numbers to get a good starting point.

$$\begin{array}{r} n - 43 = 19 \\ \downarrow \quad \downarrow \quad \downarrow \\ n - 40 = 20 \end{array}$$

What you think

Using mental math, I know $60 - 40 = 20$, so n is close to 60.

I can try substituting 60 for n in the equation: $60 - 43 = 17$.

The number 17 is too low. I will try $n = 65$: $65 - 43 = 22$.

The number 22 is too high. I will try $n = 62$: $62 - 43 = 19$.

Since $62 - 43 = 19$ is true, the solution to $n - 43 = 19$ is 62.

3 **EXAMPLE** Use the strategy *Guess, Check, and Revise* to solve $r + 27 = 89$.

Estimate Round the numbers.

$$\begin{array}{r} r + 27 = 89 \\ \downarrow \quad \downarrow \quad \downarrow \\ r + 30 = 90 \end{array}$$

What you think

You know $60 + 30 = 90$, so r is close to 60.

Try $r = 60$. $60 + 27 = 87$ Too low.

Try $r = 61$. $61 + 27 = 88$ Too low.

Try $r = 62$. $62 + 27 = 89$ Right.

The solution to $r + 27 = 89$ is $r = 62$.

There are some open sentences that are true for every value you use for the variable. The algebraic equations that illustrate the number properties are true for all values of a , b , and c .

KEY CONCEPTS Number Properties**Identity Properties**

The sum of 0 and any number is that number.

The product of 1 and any number is that number.

Arithmetic $0 + 9 = 9$

$1 \times 9 = 9$

Algebra $0 + a = a$

$1 \times a = a$

Commutative Properties Changing the order of addends or factors does not change the sum or the product.

Arithmetic $9 + 6 = 6 + 9$

$9 \times 6 = 6 \times 9$

Algebra $a + b = b + a$

$a \times b = b \times a$

Associative Properties Changing the grouping of numbers does not change the sum or the product.

Arithmetic

$9 + (6 + 4) = (9 + 6) + 4$

$9 \cdot (6 \times 4) = (9 \cdot 6) \times 4$

Algebra

$a + (b + c) = (a + b) + c$

$a(bc) = (ab)c$

Extra practice

Find the missing number that makes the equation true.

4. $\blacksquare + 3 = 5$

5. $\blacksquare \times 4 = 12$

Extra practice

Tell whether each equation is true or false.

6. $5 + 14 = 14 + 5$

7. $0 \times 9 = 9$

8. $2 \times 5 = 5 + 2$

9. $0 + 3 = 3$

10. $1 \cdot y = y$

11. $x + 1 = x$

Power down your clickers.

You have an assignment worksheet on this lesson, due tomorrow.

You can put your clickers away now.

Practice 2-3 Using Number Sense to Solve One-Step Equations

Find the missing number that makes the equation true.

1. $7 + \square = 12$ 2. $\square \times 5 = 30$ 3. $13 - \square = 4$
- _____

Tell whether each equation is true or false.

4. $12 + 10 = 10 + 12$ 5. $31 + 4 = 41 + 3$
- _____
6. $(3 \times 5) \times 4 = 3 \times (5 \times 4)$ 7. $0 \times a = a$
- _____

Solve each equation. Use either mental math or the strategy *Guess, Check, and Revise*.

8. $8b = 72$ 9. $n + 14 = 45$
- _____
10. $w \div 12 = 3$ 11. $53 = z - 19$
- _____
12. $153 = 9k$ 13. $4 = m \div 24$
- _____

14. The winners of a slam dunk basketball competition receive T-shirts. The coach spends \$50.40 on shirts for the entire team. Each T-shirt costs \$4.20. Solve the equation $(4.20)n = 50.40$ to find the number of team members.

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