

Applying the Opposite Operations

19. The formula $a + e = 85$ is often used to determine when an employee can retire.

- a represents the employee's age
- e represents the number of years of employment

- a) Mrs. Lowry is 51 years old. She has been teaching for 20 years. Can she retire this year? Explain.
- b) Mr. Hudson has been teaching for 30 years. How old does he have to be to retire this year?

$$a) \quad a + e = 85$$

$$51 + 20 = 85$$

$$71 = 85 \quad \times$$

\Rightarrow She cannot retire this year.

$$b) \quad a + e = 85$$

$$a + 30 = 85$$

$$a + 30 - 30 = 85 - 30$$

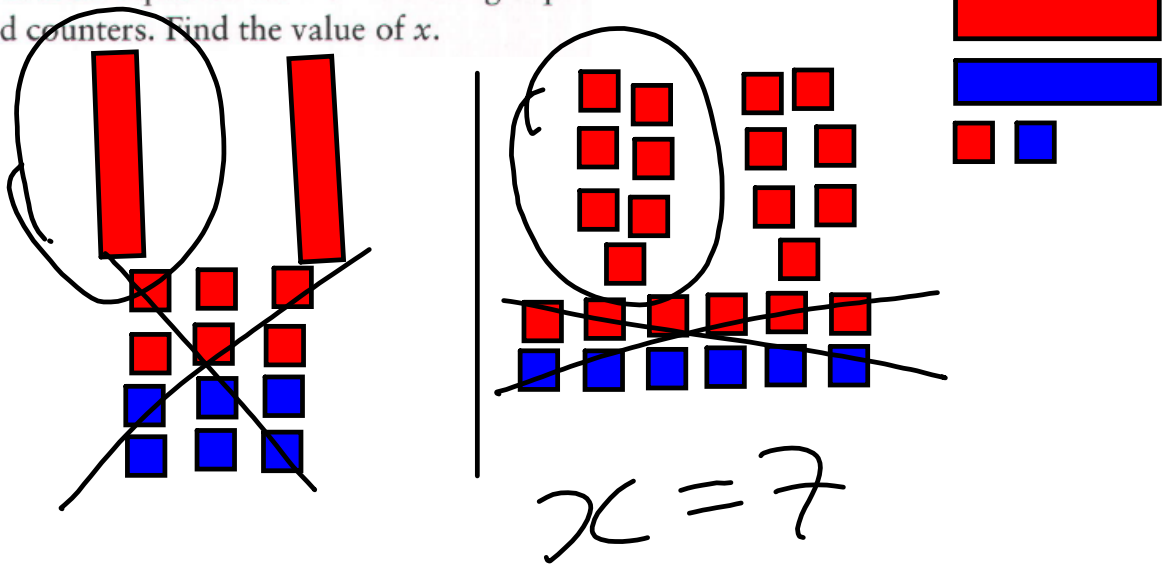
$$a = 55$$

\Rightarrow He needs to be 55.

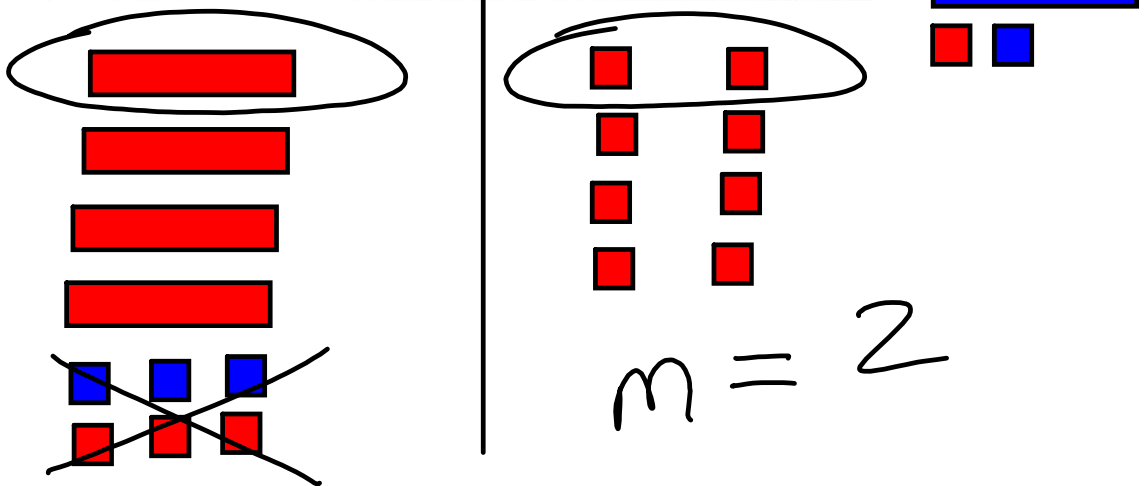
Many things are done in a specific order. For example, you turn on the computer. When it boots up, you open the program you want to use. Then, you open a file and start to work. When you are finished, you save your work, and then close the program and shut down the computer. How is the order of turning on a computer and starting to work related to the order of saving a file and shutting down the computer? How is solving an equation like using a computer?

Opposite processes
in the opposite
order.

1. Model the equation $2x + 6 = 20$ using cups and counters. Find the value of x .

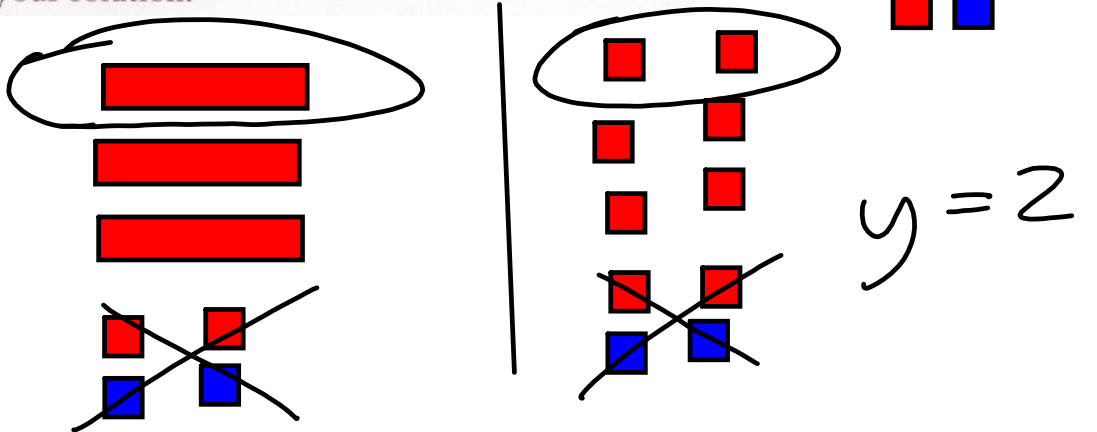


4. Use your strategies to solve the equation $4m - 3 = 5$. Check your solution. Does the right side of the equal sign have the same value as the left side? If not, revise your strategies.



Example 1: Model and Solve an Equation

- a) Model the equation $3y + 2 = 8$.
- b) Solve the equation by applying the opposite operations.
- c) Verify your solution.



Example 2: Apply the Reverse Order of Operations

Jake sees this advertisement in a store. Jake pays \$51.50 for two sweatshirts and three energy bars. What is the price of one sweatshirt?



Let $x = \text{cost of a sweatshirt}$

$$2x + 3(2.50) = 51.50$$

$$2x + 7.50 = 51.50$$

Using **SAMDEB**

$$2x + 7.50 - 7.50 = 51.50 - 7.50$$

$$\frac{2x}{2} = \frac{44}{2} \Rightarrow \text{Sweatshirts cost } \$22 \text{ each}$$

$$x = \$22$$

Verify $\Rightarrow 2(22) + 7.50 = 51.50$
 $44 + 7.50$

Key Ideas

- To solve an equation, get the variable by itself on one side of the equal sign.
- When undoing the operations performed on the variable, follow the reverse order of operations.

S Subtraction
A Addition
M Multiplication
D Division
E Exponents
B Brackets

$$36 = 5c - 4$$

To get c by itself, you need to undo $\times 5$ by dividing and undo $- 4$ by adding. First perform addition. Then, perform division.

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