

Using a Two-Region Equation Mat

Students combined two Expression Mats to figure out what value(s) of the variable make(s) one expression greater than the other. Now two Expression Mats are combined into an Equation Mat as a concrete model for solving equations. Practicing solving equations using this model will help students transition to solving equations abstractly with better accuracy and understanding.

In general, and as shown in the example below, start by simplifying the Expression Mat. Next, isolate the variables on one side of the Equation Mat and the non-variables (unit tiles) on the other by adding/removing balanced sets and zeros. Then determine the value of the variable. Students are expected to be able to record and explain their steps.

For additional information, see the Math Notes box in Lesson 6.2.1 of the *Core Connections, Course 2* text. For additional examples and practice, see the *Core Connections, Course 2* Checkpoint 8 materials.

Procedure and Example

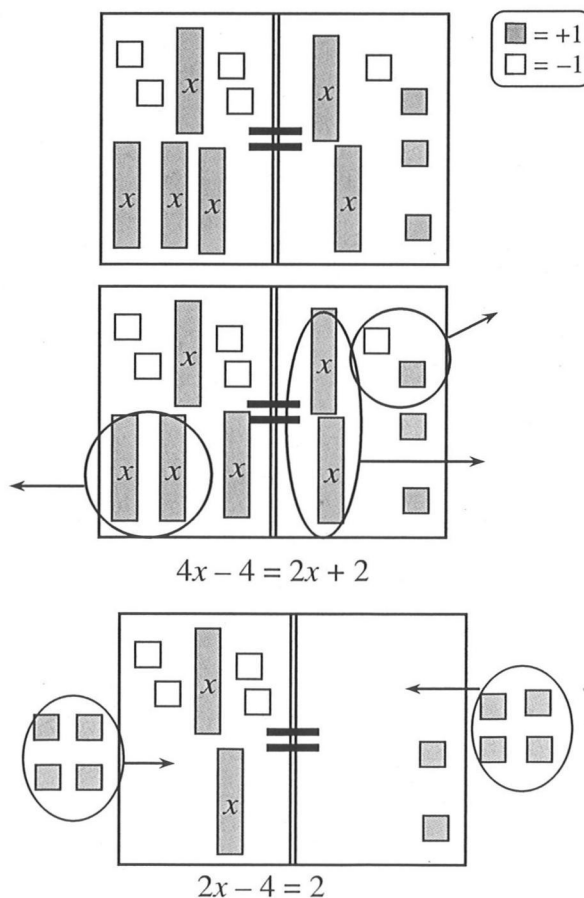
Solve: $x + (-4) + 3x = 2x - 1 + 3$

First build the equation on the Equation Mat.

Second, simplify by removing zeros
(-1 and +1 on the right side of the mat).

Third, remove a balanced set ($2x$) from both sides.

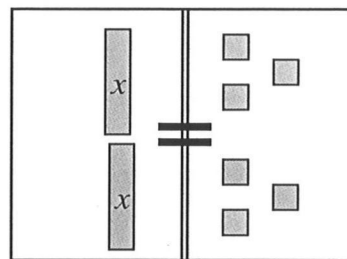
Isolate the variable by adding a balanced set
(+4) to both sides and remove the zeros on the left side.



Example continues on next page →

Example continued from previous page.

Finally, since both sides of the equation are equal, determine the value of x by dividing.



$$2x = 6$$

$$x = 3$$

Once the students understand how to solve equations using an Equation Mat, they may use the visual experience of moving the tiles to solve equations with variables and numbers. The procedures for moving variables and numbers in the solving process follow the same rules.

Note: When the process of solving an equation ends with different numbers on each side of the equal sign (for example $2 = 4$), there is *no solution* to the problem. When the result is the same expression or number on each side of the equation (for example, $x + 2 = x + 2$) it means that *all numbers* are solutions. For more information about these special cases, see the Math Notes box in Lesson 6.2.6 of the *Core Connections, Course 2* text.

Example 1

Solve: $3x + 3x - 1 = 4x + 9$

Solution:

$$3x + 3x - 1 = 4x + 9$$

$$6x - 1 = 4x + 9$$

$$2x = 10$$

$$x = 5$$

problem
simplify by combining like terms
add 1, subtract $4x$ on each side
divide by 2

Example 2

Solve: $-2x + 1 + 3(x - 1) = -4 + -x - 2$

Solution:

$$-2x + 1 + 3(x - 1) = -4 + -x - 2$$

$$-2x + 1 + 3x - 3 = -x - 6$$

$$x - 2 = -x - 6$$

$$2x = -4$$

$$x = -2$$

problem
distribute the 3 on the left side
simplify by combining like terms
add x , add 2 to each side
divide by 2

Problems

Solve each equation.

- | | |
|-------------------------|--------------------------------|
| 1. $3x + 2 + x = x + 5$ | 2. $4x - 2 - 2x = x - 5$ |
| 3. $2x - 3 = -x + 3$ | 4. $1 + 3x - x = x - 4 + 2x$ |
| 5. $4 - 3x = 2x - 6$ | 6. $3 + 3x - x + 2 = 3x + 4$ |
| 7. $-x - 3 = 2x - 6$ | 8. $-4 + 3x - 1 = 2x + 1 + 2x$ |
| 9. $-x + 3 = 6$ | 10. $5x - 3 + 2x = x + 2 + x$ |
| 11. $2x - 7 = -x - 1$ | 12. $-2 + 3x = x - 2 - 4x$ |
| 13. $-3x + 7 = x - 1$ | 14. $1 + 2x - 4 = -3 + x$ |
| 15. $3(x + 2) = x + 2$ | 16. $2(x - 2) + x = 5$ |
| 17. $10 = x + 5 + x$ | 18. $-x + 2 = x - 5 - 3x$ |
| 19. $3(4 + x) = x + 6$ | 20. $6 - x - 3 = 4(x - 2)$ |

Answers

- | | | | | |
|-------|--------------------|--------|--------|--------------------|
| 1. 1 | 2. -3 | 3. 2 | 4. 5 | 5. 2 |
| 6. 1 | 7. 1 | 8. -6 | 9. -3 | 10. 1 |
| 11. 2 | 12. 0 | 13. 2 | 14. 0 | 15. -2 |
| 16. 3 | 17. $2\frac{1}{2}$ | 18. -7 | 19. -3 | 20. $2\frac{1}{5}$ |