Solving Multi-step Equations

Learning Goal

Minds on Math...Part 1

Below is an equation that has terms with the same variable: 3*x* on the left side; *2x* on the right.

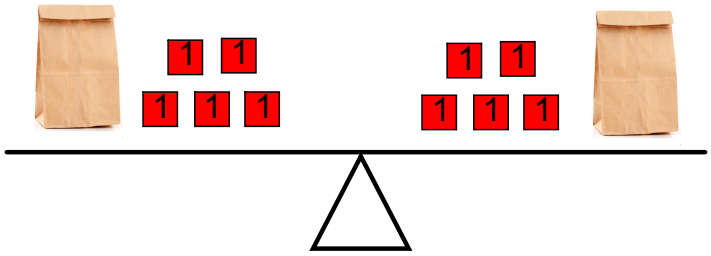
Solve the equation for x.

$$3x - 2 = 2x + 3$$

Note: Once you've finished, check the answer key. If you were successful, move onto "*Take Action*". If not, complete the "*Minds on...*" problems, Parts 2 to 5.

Minds on Math...Part 2

Consider the image below.



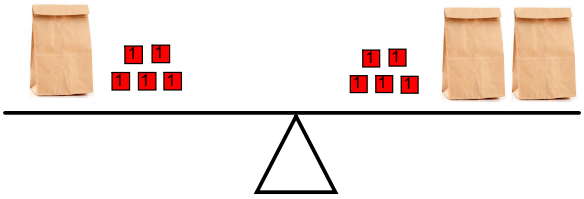
a) *How many tiles do you expect in the 'mystery bag'?*

HOW DO YOU KNOW?

b) Write an algebraic equation to represent the balance example

Minds on Math...Part 3

Consider the image below.



a) *How many tiles do you expect in the 'mystery bag'?*

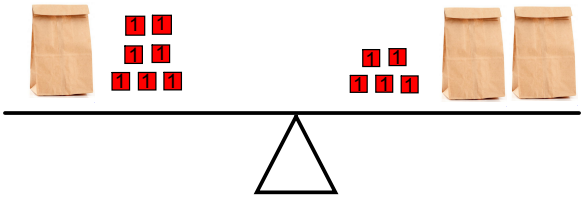
HOW DO YOU KNOW?

b) Write an algebraic equation to represent the balance example

c) Represent the thinking you performed in part a) using your equation in part b). Solve your equation.

Minds on Math...Part 4

Consider the image below.



a) *How many tiles do you expect in the 'mystery bag'?*

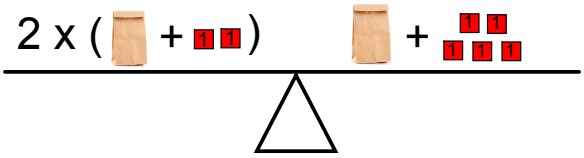
HOW DO YOU KNOW?

b) Write an algebraic equation to represent the balance example

c) Represent the thinking you performed in part a) using your equation in part b). Solve your equation.

Minds on Math...Part 5

Consider the image below.



a) *How many tiles do you expect in the 'mystery bag'?*

HOW DO YOU KNOW?

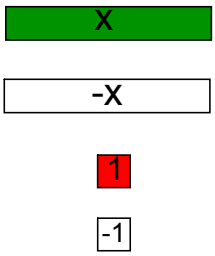
b) Write an algebraic equation to represent the balance example

c) Represent the thinking you performed in part a) using your equation in part b). Solve your equation.

Take Action! (Take 1)

Solve the equation. You may choose to use opposite operations or model your solution with algebra tiles.

$6x + 5 = 4x - 7$

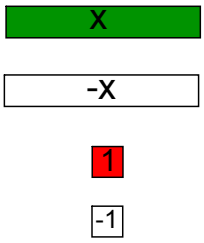


Once you've completed your solution, check the key on p165 of your textbook. Make changes where necessary.

Take Action! (Take 2)

Solve the equation. You may choose to use opposite operations or model your solution with algebra tiles.

$3(x - 1) = 5(x - 2)$



Once you've completed your solution, check the key on pp. 165-66 of your textbook. Make changes where necessary.

Take Action! (Take 3)

Consider the following expression:

$$\frac{1}{8} + \frac{1}{3}$$

What would this expression become if you multiplied each of its fractions by 24? [Try this out, and then check the key at the end of the package.]

NOTE: 24 is the LCM (lowest common multiple) of the denominators, 3 and 8.

Take Action! (Take 4)

Solve the equation. Start by clearing the denominator by multiplying each term in the equation by the LCM.

$$\frac{x + 3}{8} + \frac{x + 1}{3} = 3$$

Once you've completed your solution, check the key on p166 of your textbook. Make changes where necessary.

PRACTICE (MSIP & HW)

p169 #3, 4, 5ij, 8, 9, 14

Answer Key

Minds on...Part 1

3x - 2 = 2x + 3 ---> 3x **- 2x** - 2 = 2x **- 2x** + 3 ---> x - 2 **+ 2** = 3 **+ 2** ---> x = 5

Minds on...Part 2

a) any number of tiles so long as the number of tiles in each of the bags is the same.

b) If *n* is the number of tiles, then ...

$n + 5 = n + 5$

Minds on...Part 3

a) no tiles. Since each bag has the same value, one bag from each side can be removed. This leaves 5 tiles on the left and 5 tiles + 1 bag on the right. To maintain balance (i.e., equality), the remaining bag would contain no tiles.

b) $n + 5 = 2n + 5$

c) subtract $1n$ from both sides. This leaves $5 = n + 5$. Subtract 5 from both sides. This leaves $0 = n$.

Answer Key (contd.)

Minds on...Part 4

a) 2 tiles. Again, remove one bag from each side as they would contain the same number of tiles. To balance the 7 tiles with the 5 tiles, the bag on the right side would need 2 tiles.

b) If n is the number of tiles, then ...

$n + 7 = 2n + 5$

c) subtract $1n$ from both sides. This leaves $7 = n + 5$. Subtract 5 from both sides. This leaves $2 = n$.

Minds on...Part 5

a) 1 tile. On the left, double the number of bags and tiles--2 bags, 4 tiles. Remove a bag from each side. With 5 tiles on the right, you'll need 1 tile more on the left to keep the sides of the scale balanced.

b) $2(n + 2) = n + 5$

c) On the left, there are two groups of $n + 2$. Expanding, $2(n + 2) = 2n + 4$. Subtracting $1n$ from both sides gives $n + 4 = 5$; $n = 1$.

Answer Key (contd.)

Take Action: Take 1

$$24 \times \frac{1}{8} + 24 \times \frac{1}{3}$$

Consider how 24 one-eighth units have been grouped below.

$\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ <---one group of 8 eighths

$\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ <---2nd group of 8 eighths

$\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ $\frac{1}{8}$ <---3rd group of 8 eighths

$$24 \times \frac{1}{8} = 3$$

Answer Key (contd.)

Take Action: Take 1

$$24 \times \frac{1}{8} + 24 \times \frac{1}{3}$$

Consider how 24 one-third units have been grouped below.

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ <---one group of 8 eighths

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ <---2nd group of 8 eighths

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ <---3rd group of 8 eighths

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ <---4th group of 8 eighths

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ <---5th group of 8 eighths

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ <---6th group of 8 eighths

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ <---7th group of 8 eighths

$\frac{1}{3}$ $\frac{1}{3}$ $\frac{1}{3}$ <---8th group of 8 eighths

$$24 \times \frac{1}{3} = 8$$

Answer Key (contd.)

$$24 \times \frac{1}{8} + 24 \times \frac{1}{3}$$

$$= 3 + 8$$

$$= 11$$