GRADE 7 · UNIT 10 · LESSON 7

Solving Equations Involving the Distributive Property

MA.7.AR.2.2

I can solve $p(x \pm q) = r$ by dividing first or by distributing first, and choose the quicker way for the numbers given.

Warm-Up

1. Solve: $\frac{2}{3}x - 4 = 6$
2. Solve: $-2.5m < 15$
3. Rewrite with the fewest terms: $-3(2x - 5)$
4. A $60 jacket is 25% off. What do you pay?

Warm-Up

1. Solve: $\frac{2}{3}x - 4 = 6$ $x = 15$
2. Solve: $-2.5m < 15$ **$m > -6$**
3. Rewrite with the fewest terms: $-3(2x - 5)$ $-6x + 15$
4. A \$60 jacket is 25% off. What do you pay? **\$45**

Vocabulary

distributive property

a factor outside parentheses multiplies every term inside: $3(x - 4) = 3x - 12$

factor

a number that multiplies: in $3(x - 4) = 18$ the factor 3 multiplies the whole group

like terms

terms with the same variable part, which combine: $2x + 3x = 5x$

Notes

I. Two routes for p(x – q) = r

$$3(x - 4) = 18$$

Divide first: $x - 4 = 6$, so $x = 10$.

Distribute first: $3x - 12 = 18$, then $3x = 30$, so $x = 10$.

The same answer either way. Here dividing is quicker: 18 divides by 3.

Notes

II. Let the numbers choose

$4(x+2)=10$: divide first, $x+2=2.5$, so $x=0.5$.

Or distribute: $4x+8=10$, then $4x=2$, so $x=0.5$.

$\frac{2}{3}(x+6)=10$: multiply by $\frac{3}{2}$ first, $x+6=15$, so $x=9$.

Notes

III. A negative factor reaches every term

$$-2(x - 5) = 14$$

Distribute: $-2x + 10 = 14$ — not $-2x - 5$, and not $-2x - 10$.

Subtract 10: $-2x = 4$, so $x = -2$. Or divide first: $x - 5 = -7$, so $x = -2$.

Notes

IV. Like terms first

$$2x + 3x - 4 = 21$$

Combine like terms: $5x - 4 = 21$

Then the two moves: $5x = 25$, so $x = 5$.

Example 1

$$5(x + 1.2) = 21$$

Solve it both ways.

Example 1

$$5(x + 1.2) = 21$$

Divide first: $x + 1.2 = 21 \div 5 = 4.2$, so $x = 3$.

Distribute first: $5x + 6 = 21$, then $5x = 15$, so $x = 3$.

Check: $5(3 + 1.2) = 5(4.2) = 21$.

Answer: $x = 3$

Your Turn

$$4(y - 0.5) = 18$$

Solve it both ways.

Your Turn

$$4(y - 0.5) = 18$$

Solve it both ways.

Divide first: $18 \div 4 = 4.5$, so $y - 0.5 = 4.5$ and $y = 5$

Distribute first: $4y - 2 = 18$, so $4y = 20$ and $y = 5$

Answer: $y = 5$

Example 2

$$-3(k - 2) = 15$$

Solve it.

Example 2

$$-3(k - 2) = 15$$

Distribute the −3 to both terms: $-3k + 6 = 15$.

Subtract 6: $-3k = 9$. Divide by −3: $k = -3$.

Or divide first: $k - 2 = -5$, so $k = -3$.

Answer: $k = -3$

Your Turn

$$-4(m - 3) = 8$$

Solve it.

Your Turn

$$-4(m - 3) = 8$$

Solve it.

Distribute: $-4m + 12 = 8$, so $-4m = -4$ and $m = 1$

Or divide first: $8 \div (-4) = -2$, so $m - 3 = -2$ and $m = 1$

Answer: $m = 1$

Whiteboards · Question 1 of 9

$2(x + 7) = 18$

Solve it.

Answer it.

Whiteboards · Question 1 of 9

$2(x + 7) = 18$

Solve it.

Divide both sides by 2: $18 \div 2 = 9$, so $x + 7 = 9$

Subtract 7: $9 - 7 = 2$, so $x = 2$

Answer: $x = 2$

Whiteboards · Question 2 of 9

$2(x - 7) = 18$

Solve it.

Answer it.

Whiteboards · Question 2 of 9

$2(x - 7) = 18$

Solve it.

Divide both sides by 2: $18 \div 2 = 9$, so $x - 7 = 9$

Add 7: $9 + 7 = 16$, so $x = 16$

Answer: $x = 16$

Whiteboards · Question 3 of 9

$-5(w + 2) = 30$

Solve it.

A. $w = -5.6$

B. $w = 4$

C. $w = -4$

D. $w = -8$

Answer it.

Whiteboards · Question 3 of 9

$-5(w + 2) = 30$

Solve it.

Divide both sides by -5: $30 \div (-5) = -6$, so $w + 2 = -6$

Subtract 2: $-6 - 2 = -8$, so $w = -8$

Answer: D — w = −8

Whiteboards · Question 4 of 9

$$\frac{1}{2}(x - 6) = 4$$

Solve it.

Answer it.

Whiteboards · Question 4 of 9

$\frac{1}{2}(x - 6) = 4$

Solve it.

Multiply both sides by 2: $4 \times 2 = 8$, so $x - 6 = 8$

Add 6: $8 + 6 = 14$, so $x = 14$

Answer: $x = 14$

Whiteboards · Question 5 of 9

$$-\frac{2}{3}(y+9)=4$$

Solve it.

Answer it.

Whiteboards · Question 5 of 9

$$-\frac{2}{3}(y+9)=4$$

Solve it.

Multiply both sides by $-\frac{3}{2}$, sign and all: $4\times\left(-\frac{3}{2}\right)=-6$, so $y+9=-6$

Subtract 9: $-6-9=-15$, so $y=-15$

Answer: $y=-15$

Whiteboards · Question 6 of 9

$7.5 = 2.5(n - 1)$

Solve it. Write the answer with the variable first.

Answer it.

Whiteboards · Question 6 of 9

$7.5 = 2.5(n - 1)$

Solve it. Write the answer with the variable first.

Divide both sides by 2.5: $7.5 \div 2.5 = 3$, so $3 = n - 1$

Add 1: $3 + 1 = 4$, so $n = 4$

Answer: $n = 4$

Whiteboards · Question 7 of 9

$5(x - 1.4) = 13$

Solve it.

A. $x = 1.2$

B. $x = 2.88$

C. $x = 4$

D. $x = 66.4$

Answer it.

Whiteboards · Question 7 of 9

$5(x - 1.4) = 13$

Solve it.

Distribute — the numbers stay whole: $5x - 7 = 13$

Add 7, then divide by 5: $20 \div 5 = 4$, so $x = 4$

Answer: C — $x = 4$

Whiteboards · Question 8 of 9

Five friends each buy a movie ticket and a $4 snack, spending $72.50 in all on a 2-hour movie.

What does one ticket cost?

Answer it.

Whiteboards · Question 8 of 9

Five friends each buy a movie ticket and a $4 snack, spending $72.50 in all on a 2-hour movie.

What does one ticket cost?

Five of (a ticket and a snack): $5(t + 4) = 72.50$

Divide by 5: $72.50 \div 5 = 14.50$, so $t + 4 = 14.50$ and $t = 10.50$

Answer: $10.50

Whiteboards · Question 9 of 9

Dev rewrote $3(x + 4) = 27$ as $3x + 4 = 27$.

What is Dev's mistake? Solve the equation.

Write your answer in sentences.

Whiteboards · Question 9 of 9

Dev rewrote $3(x + 4) = 27$ as $3x + 4 = 27$.

What is Dev's mistake? Solve the equation.

The 3 multiplies both terms: $3x + 12 = 27$

Subtract 12, divide by 3: $15 \div 3 = 5$, so $x = 5$

Answer: The 3 did not reach the 4: x = 5

Independent Practice

1. Solve: $6(x - 3) = 24$
2. Solve: $6(x + 3) = 24$
3. Solve: $-2(y + 1.5) = 9$
4. Solve: $\frac{2}{5}(n - 10) = 4$
5. Solve: $12 = -4(k - 1)$
6. Solve: $3x + 5x + 2 = 34$

Before You Go

Divide first or distribute first: choose by the numbers.

A factor outside reaches every term inside.

Monday: writing equations from stories.

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 60. Due by the Unit 10 test.

Today's skills — all required

Solve two-step equations with parentheses (NSH)
Solve equations of the form p(x + q) = r with fractions (A8D)
Solve two-step equations with integers (QEB)
Solve equations involving like terms (VSW)