Justifying Steps in Solving Equations Worksheet

Algebra 1 · Common Core HSA-REI.A.1

> Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

Practice

Builds the skill step by step.

1. In solving $3x + 5 = 20$, the next line is $3x = 15$. Which reason justifies this step?
   A. Division property of equality: both sides were divided by 3.
   B. Distributive property
   C. Addition property of equality: 5 was added to both sides.
   D. Subtraction property of equality: 5 was subtracted from both sides.

2. The step from $3x = 15$ to $x = 5$ uses which reason?
   A. Multiplication property of equality
   B. Commutative property of multiplication
   C. Division property of equality
   D. Subtraction property of equality

3. The step from $2(x + 4) = 18$ to $2x + 8 = 18$ uses which property?
   A. Distributive property
   B. Associative property of addition
   C. Commutative property of addition
   D. Addition property of equality

4. Solve $4x - 7 = 21$.

5. Why is it allowed to add 9 to both sides of $x - 9 = 4$?

   A. Because 9 is a positive number.

   B. Adding the same number to two equal quantities keeps them equal.

   C. Because x has to be greater than 9.

   D. Because it makes the equation longer.

6. A student rewrites $5x + 2 = 3x + 10$ as $2x + 2 = 10$. What expression was subtracted from both sides?

7. Rewriting $7 + x = 12$ as $x + 7 = 12$ uses which property?

   A. Associative property of addition

   B. Commutative property of addition

   C. Identity property of addition

   D. Distributive property

8. Solve $6 = 2(x - 1)$.

9. Maria divides both sides of $4x = 0$ by 4 and gets $x = 0$. Is her step valid?

   A. No. x must equal 4.

   B. No. She should subtract 4 from both sides.

   C. Yes. Dividing both sides by the same nonzero number keeps them equal.

   D. No. You can't divide 0 by a number.

10. Solve $\frac{x}{3} + 2 = 6$.

Justifying Steps in Solving Equations Worksheet

Algebra 1 · Common Core HSA-REI.A.1

On Level

Grade-level practice.

1. Here are the steps for solving $5(x - 2) = 3x + 4$.

   Step 1: $5x - 10 = 3x + 4$

   Step 2: $2x - 10 = 4$

   Step 3: $2x = 14$

   Step 4: $x = 7$

   Which list gives the reasons for Steps 1 to 4 in order?

   A. Distributive, subtraction, addition, division

   B. Distributive, addition, subtraction, division

   C. Subtraction, distributive, addition, division

   D. Distributive, subtraction, division, addition

2. Solve $3(x + 2) - x = 18$.

3. Which equation comes from dividing both sides of $4x + 6 = 18$ by 2?

   A. $4x + 3 = 9$

   B. $2x + 3 = 18$

   C. $2x + 6 = 9$

   D. $2x + 3 = 9$

4. A student solves $2x + 5 = 2x + 9$ and gets $5 = 9$. What does this show?

   A. Every number is a solution.

   B. The solution is $x = 4$.

   C. The equation has no solution, because the steps lead to a false statement.

   D. The solution is $x = 0$.

5. Leo divides both sides of $x^2 = 5x$ by x and gets $x = 5$. What did he miss?

   A. $x = 0$ is also a solution, and dividing by x assumes x is not 0.

   B. $x = -5$ is also a solution.

   C. Nothing. $x = 5$ is the only solution.

   D. He should have subtracted 5 from both sides.

6. Find every solution of $x^2 = 5x$.

7. Which step uses the multiplication property of equality?

   A. From $x + 4 = 12$ to $x = 8$

   B. From $\frac{x}{4} = 3$ to $x = 12$

   C. From $4x = 12$ to $x = 3$

   D. From $\frac{x}{4} - 1 = 2$ to $\frac{x}{4} = 3$

8. Solve $7x - 4 = 3x + 16$.

9. Ana checks $x = 3$ in $2x + 1 = 7$ and gets $7 = 7$. What does this show?

   A. $x = 7$ is the solution.

   B. Every number is a solution.

   C. The equation has no solution.

   D. $x = 3$ makes the equation true, so it is a solution.

10. Solve $0.5(4x - 6) = x + 7$.

ALBERT

Name _____ Date _____

Justifying Steps in Solving Equations Worksheet

Algebra 1 · Common Core HSA-REI.A.1

Challenge

Multi-step and word problems that stretch it.

1. Kai solved $3(x - 4) = 2x + 1$.

   Step 1: $3x - 4 = 2x + 1$

   Step 2: $x - 4 = 1$

   Step 3: $x = 5$

   Which step has an error?

   A. Step 3: 4 should have been subtracted.

   B. There is no error.

   C. Step 2: $2x$ was added instead of subtracted.

   D. Step 1: 3 was not multiplied by the 4.

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

3. While solving an equation, a student ends up with $0 = 0$. What does this mean?

   A. The only solution is $x = 0$.

   B. Every real number is a solution.

   C. The equation has no solution.

   D. The student made an error.

4. For what value of b does $3x + b = 3x + 7$ have infinitely many solutions?

5. Which argument correctly justifies that if $2x + 7 = 15$, then $x = 4$?

   A. Subtracting 7 from both sides gives $2x = 8$ (subtraction property), and dividing both sides by 2 gives $x = 4$ (division property).

   B. Dividing both sides by 2 gives $x + 7 = 7.5$, so $x = 0.5$.

   C. Subtracting 2 from both sides gives $x + 7 = 13$, so $x = 6$.

   D. Since $4 + 7 = 11$, x must be 4.

6. Solve $7 - 2(x + 1) = 3x - 10$.

7. Which first step would NOT give an equation with the same solution as $3x + 6 = 12$?

   A. Subtracting 6 from both sides

   B. Subtracting 12 from both sides

   C. Dividing only the 6 by 3, to get $3x + 2 = 12$

   D. Dividing every term on both sides by 3

8. Solve $\frac{3}{4}(x - 8) = \frac{1}{2}x + 1$.

9. Ty divides both sides of $6x = 3x$ by x and gets $6 = 3$, so he says there is no solution. Which statement is correct?

   A. The solution is $x = 2$.

   B. Ty is right: there is no solution.

   C. $x = 0$ is a solution; dividing by x isn't allowed when x could be 0.

   D. The solution is $x = 3$.

10. For what value of a does $a(x - 2) = 4x - 8$ have infinitely many solutions?