NAME _____ DATE _____

3–3 Using Several Transformations

Objective: To solve equations by using more than one transformation.

Vocabulary

Inverse operations Operations that "undo" each other. For example, multiplication and division are inverse operations. Likewise, addition and subtraction are inverse operations.

Tips for solving an equation in which the variable is on one side.

1. Simplify each side of the equation as needed.
2. Use inverse operations to "undo" the operations in the equation.

Example 1 Solve $3n - 7 = 8$.

Solution

	Use inverse operations:
$3n - 7 + 7 = 8 + 7$	To undo the subtraction of 7 from $3n$, add 7 to each side.
$3n = 15$	
$\frac{3n}{3} = \frac{15}{3}$	To undo the multiplication of n by 3, divide each side by 3.
$n = 5$	The solution set is $\{5\}$.

Example 2 Solve $\frac{1}{2}x + 1 = 7$.

Solution

	Use inverse operations:
$\frac{1}{2}x + 1 - 1 = 7 - 1$	Subtract 1 from each side.
$\frac{1}{2}x = 6$	
$2\left(\frac{1}{2}x\right) = 6 \cdot 2$	Multiply each side by 2, the reciprocal of $\frac{1}{2}$.
$x = 12$	The solution set is $\{12\}$.

Solve.

1. $2y + 1 = 15$ **2.** $2x - 7 = 13$ **3.** $26 = 5y + 1$ **4.** $58 = 3y - 2$

5. $-11 + 4y = 25$ **6.** $13 + 6y = -23$ **7.** $\frac{1}{2}x - 3 = 5$ **8.** $\frac{1}{3}x + 5 = 7$

9. $3 = \frac{1}{4}x - 1$ **10.** $6 = \frac{1}{5}x + 2$ **11.** $\frac{x}{2} + 7 = 1$ **12.** $\frac{x}{5} - 2 = 4$

Example 3 Solve $\frac{x - 2}{3} = 4$.

Solution

$3\left(\frac{x - 2}{3}\right) = 3 \cdot 4$	Multiply each side by 3.
$x - 2 = 12$	
$x - 2 + 2 = 12 + 2$	Add 2 to each side.
$x = 14$	The solution set is $\{14\}$.

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3–3 *Using Several Transformations* *(continued)*

Solve.

13. $\frac{x-1}{2} = 5$ **14.** $\frac{3-x}{4} = 2$ **15.** $\frac{x-6}{6} = -1$

16. $-3 = \frac{x-1}{5}$ **17.** $\frac{2-x}{3} = -4$ **18.** $-2 = \frac{1-x}{7}$

Example 4 Solve $28 = 9a + 5a$.

Solution

$28 = 9a + 5a$ Combine $9a$ and $5a$.

$28 = 14a$

$\frac{28}{14} = \frac{14a}{14}$ Divide each side by 14.

$2 = a$ The solution set is $\{2\}$.

Solve.

19. $4w - w = -12$ **20.** $20 = 2a + 3a$ **21.** $y - 4y = -18$

22. $5t + 3t = -16$ **23.** $-7v + 3v = -12$ **24.** $24 = -3n + 9n$

Example 5 Solve $3(y + 2) - 1 = 11$.

Solution

$3(y + 2) - 1 = 11$ Use the distributive property to rewrite the left side.

$3y + 6 - 1 = 11$

$3y + 5 = 11$

$3y + 5 - 5 = 11 - 5$ Subtract 5 from each side.

$3y = 6$

$\frac{3y}{3} = \frac{6}{3}$ Divide each side by 3.

$y = 2$ The solution set is $\{2\}$.

Solve.

25. $2(x - 1) = 16$ **26.** $3(y - 5) = 12$ **27.** $20 = 4(x + 3)$

28. $5(n + 2) - 3 = -18$ **29.** $6(x - 4) + 5 = 11$ **30.** $-3 = 7(h - 2) + 11$

Mixed Review Exercises

Solve.

1. $\frac{1}{4}x = -17$ **2.** $\frac{x}{6} = \frac{2}{3}$ **3.** $\frac{1}{4}x = 2\frac{1}{4}$

4. $-4 + x = -1$ **5.** $x + 7 = 16$ **6.** $30 = y + 12$

7. $-10 + x = -18$ **8.** $24 - x = 26$ **9.** $0.5x = -5$

10. $3.2 = n + 3$ **11.** $0 = 5x$ **12.** $14y = 280$