Using Radicals to Solve Equations

1. Solve $x^2 - 14 = 5x + 67 - 5x$.

2. Solve and simplify: $x(x - 1) = 121 - x$.

3. A square has a side length of $3x$ inches and an area of $324 \ in^2$. What is the value of x?

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1. Solve $x^2 - 14 = 5x + 67 - 5x$.

Check:

$$x^2 - 14 = 5x + 67 - 5x$$
$$x^2 - 14 = 67$$
$$x^2 - 14 + 14 = 67 + 14$$
$$x^2 = 81$$
$$\sqrt{x^2} = \pm\sqrt{81}$$
$$x = \pm\sqrt{81}$$
$$x = \pm 9$$

$$9^2 - 14 = 5(9) + 67 - 5(9)$$
$$81 - 14 = 45 + 67 - 45$$
$$67 = 67$$

$$(-9)^2 - 14 = 5(-9) + 67 - 5(-9)$$
$$81 - 14 = -45 + 67 + 45$$
$$67 = 67$$

2. Solve and simplify: $x(x - 1) = 121 - x$.

Check:

$$x(x - 1) = 121 - x$$
$$x^2 - x = 121 - x$$
$$x^2 - x + x = 121 - x + x$$
$$x^2 = 121$$
$$\sqrt{x^2} = \pm\sqrt{121}$$
$$x = \pm\sqrt{121}$$
$$x = \pm 11$$

$$11(11 - 1) = 121 - 11$$
$$11(10) = 110$$
$$110 = 110$$

$$-11(-11 - 1) = 121 - (-11)$$
$$-11(-12) = 121 + 11$$
$$132 = 132$$

3. A square has a side length of $3x$ inches and an area of $324\ in^2$. What is the value of x?

$$(3x)^2 = 3243^2$$
$$x^2 = 324$$
$$9x^2 = 324$$
$$\frac{9x^2}{9} = \frac{324}{9}$$
$$x^2 = 36$$
$$\sqrt{x^2} = \sqrt{36}$$
$$x = 6$$

Check:

$$\left(3(6)\right)^2 = 324$$
$$18^2 = 324$$
$$324 = 324$$

A negative number would not make sense as a length, so $x = 6$.

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