Topic: Radical equations

Question: Solve for the variable.

$$\sqrt{x} + 5 = 9$$

Answer choices:

A $\sqrt{x}$

B 16

C $\pm\sqrt{4}$

D 4

Solution: B

We have to keep the equation balanced, so when we subtract 5 from the left side, we'll also subtract it from the right side.

$$\sqrt{x} + 5 = 9$$

$$\sqrt{x} + 5 - 5 = 9 - 5$$

$$\sqrt{x} = 4$$

Squaring both sides, we get

$$(\sqrt{x})^2 = 4^2$$

$$x = 16$$

To determine whether this is actually a solution, we'll substitute 16 for x in the original equation:

$$\sqrt{x} + 5 = 9$$

$$\sqrt{16} + 5 = 9$$

$$4 + 5 = 9$$

$$9 = 9$$

This equation is true, so $x = 16$ is indeed a solution.

Topic: Radical equations

Question: Solve for the variable.

$$\sqrt{x^2 + 3x - 10} + 2 = x$$

Answer choices:

A 2

B 4

C -2

D -14

Solution: A

We'll first get the radical by itself.

$$\sqrt{x^2+3x-10}+2=x$$

$$\sqrt{x^2+3x-10}+2-2=x-2$$

$$\sqrt{x^2+3x-10}=x-2$$

Squaring both sides, we get

$$(\sqrt{x^2+3x-10})^2=(x-2)^2$$

$$x^2+3x-10=x^2-4x+4$$

Next, we'll subtract x^2 from both sides.

$$x^2-x^2+3x-10=x^2-x^2-4x+4$$

$$3x-10=-4x+4$$

To solve for x, we'll need to collect all terms containing x on one side of the equation. to do this, we'll move the $-4x$ to the left side, and the -10 to the right side.

$$3x+4x-10=-4x+4x+4$$

$$7x-10=4$$

$$7x-10+10=4+10$$

$$7x=14$$

$$\frac{7x}{7} = \frac{14}{7}$$

$$x = 2$$

To determine whether this is actually a solution, we'll substitute 2 for x in the original equation:

$$\sqrt{x^2 + 3x - 10} + 2 = x$$

$$\sqrt{2^2 + 3(2) - 10} + 2 = 2$$

$$\sqrt{4 + 6 - 10} + 2 = 2$$

$$\sqrt{0} + 2 = 2$$

$$0 + 2 = 2$$

$$2 = 2$$

This equation is true, so $x = 2$ is indeed a solution.

Topic: Radical equations

Question: Solve the equation.

$$\sqrt{3-2x}-x=0$$

Answer choices:

A 1 and -3

B -3

C 1

D -1 and 3

Solution: C

Isolate the radical by adding x to both sides.

$$\sqrt{3-2x}-x=0$$

$$\sqrt{3-2x}=x$$

Square both sides.

$$3-2x=x^2$$

Collect all terms on one side. Once we do that, we'll have a quadratic polynomial on one side of the equation. We'd like the coefficient of the x^2 term in that quadratic polynomial to be positive, so we want to keep the x^2 on the right side of the equation. Therefore, we'll move the $3-2x$ to the right side.

$$3-2x-(3-2x)=x^2-(3-2x)$$

$$0=x^2-3+2x$$

Now factor the quadratic polynomial x^2-3+2x, and then solve the resulting equation for x.

$$0=(x-1)(x+3)$$

Set each factor equal to 0 and solve for x.

$x-1=0$ gives $x=1$

$x+3=0$ gives $x=-3$

Check each result by plugging into the original equation.

For $x = 1$:

$$\sqrt{3 - 2x} - x = 0$$

$$\sqrt{3 - 2(1)} - 1 = 0$$

$$\sqrt{1} - 1 = 0$$

$$1 - 1 = 0$$

$$0 = 0$$

This equation is true, so $x = 1$ is a solution.

For $x = -3$:

$$\sqrt{3 - 2x} - x = 0$$

$$\sqrt{3 - 2(-3)} - (-3) = 0$$

$$\sqrt{9} + 3 = 0$$

$$3 + 3 = 0$$

$$6 = 0$$

This equation is false, so $x = -3$ is not a solution.