**Topic**: Zero theorem

**Question**: Solve for the variable.

$$x^2 + 3x - 4 = 0$$

**Answer choices**:

A  $x = -4, \ -1$

B  $x = 1, \ 4$

C  $x = -4, \ 1$

D  $x = -1, \ 4$

**Solution**: C

We'll factor the left-hand side.

$$x^2 + 3x - 4 = 0$$

$$(x + 4)(x - 1) = 0$$

The zero theorem tells us that, in order for the left-hand side to be equal to $0$, one or both of the factors must be $0$. Therefore, we'll set the factors ($x + 4$ and $x - 1$) separately to $0$ and solve for $x$.

$$x + 4 = 0 \quad \rightarrow \quad x = -4$$

$$x - 1 = 0 \quad \rightarrow \quad x = 1$$

The solutions are $x = -4$ and $x = 1$.

**Topic**: Zero theorem

**Question**: Solve for the variable.

$$x^2 - 5x - 6 = 0$$

**Answer choices**:

A  $x = -2, 3$

B  $x = -1, 6$

C  $x = -6, 1$

D  $x = -3, 2$

**Solution**: B

We'll factor the left-hand side.

$$x^2 - 5x - 6 = 0$$

$$(x - 6)(x + 1) = 0$$

The zero theorem tells us that, in order for the left-hand side to be equal to $0$, one or both of the factors must be $0$. Therefore, we'll set the factors ($x - 6$ and $x + 1$) separately to $0$ and solve for $x$.

$$x - 6 = 0 \quad \rightarrow \quad x = 6$$

$$x + 1 = 0 \quad \rightarrow \quad x = -1$$

The solutions are $x = 6$ and $x = -1$.

**Topic**: Zero theorem

**Question**: Solve for the variable.

$$x^2 - 18 = 3x$$

**Answer choices**:

A      $x = -6, 3$

B      $x = -3, 6$

C      $x = -8, 4$

D      $x = 4, 9$

**Solution**: B

First, we'll move the $3x$ to the left-hand side of the equation.

$$x^2 - 18 = 3x$$

$$x^2 - 3x - 18 = 0$$

Then we'll factor the left-hand side.

$$(x - 6)(x + 3) = 0$$

The zero theorem tells us that, in order for the left-hand side to be equal to $0$, one or both of the factors must be $0$. Therefore, we'll set the factors ($x - 6$ and $x + 3$) separately to $0$ and solve for $x$.

$$x - 6 = 0 \quad \rightarrow \quad x = 6$$

$$x + 3 = 0 \quad \rightarrow \quad x = -3$$

The solutions are $x = 6$ and $x = -3$.