# Solving Equations in Factored Form

Consider the following products.

7(0) = 0 –3(0) = 0 (2-2)(3+2)=0 (x + 5)(0) = 0

The above products all equal zero. Notice that each case at least one of the factors is zero.

**Zero Product Property**

**If the product of two quantities equals zero, then at least one of the quantities equals zero.**
**For all numbers a and b, if ab= 0 then a = 0 or b = 0.**

You can use this property to solve equations already in factored form.

**Example 1: Use the zero product property to solve the equation. Check your answer.**

$(x+3)(3x-21)=0$

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$x+3=0$ or $3x-21=0$ Use the zero product property

$x=-3$ and $3x=21 \Rightarrow x=7$ Solve each equation

The solution set $=\{-3,7\}$

Check

If $x=-3$, then $(-3+3)(3\bullet(-3)-21)=0 \Rightarrow (0)(-30)=0 \Rightarrow 0=0$ True

If $x=7$, then $(7+3)(3\bullet(7)-21)=0 \Rightarrow (10)(0)=0 \Rightarrow 0=0$ True

**Example 2: Write an equation in factored form if the solution set is $\{0,1,-4\}$.**

$x=0, x=1, x=-4$ Write the factor for each solution.

$(x-0)(x-1)(x-(-4))$ Each factor is $(x-solution)$

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

**Example 3: Tala gave this puzzle to her friends. "The product of 4 times my age and 45 less than 3 times my age is zero. How old am I?"**

EXPLORE This problem can be solved by using an equation and zero product property.
Let y = Tala's age

PLAN 4y(3y – 45) = 0

SOLVE 4y = 0 or 3y – 45 = 0
y = 0 3y = 45 $\Rightarrow$ y = 15

EXAMINE Although 0 is a solution of the equation 4y(3y – 45) = 0,
Tala cannot be 0 years old, so this solution is rejected.
Therefore, Tala is 15 years old.