

8-6 Study Guide and Intervention *(continued)***Solving $x^2 + bx + c = 0$**

Solve Equations by Factoring Factoring and the Zero Product Property can be used to solve many equations of the form $x^2 + bx + c = 0$.

Example 1 Solve $x^2 + 6x = 7$. Check your solutions.

$x^2 + 6x = 7$	Original equation
$x^2 + 6x - 7 = 0$	Rewrite equation so that one side equals 0.
$(x - 1)(x + 7) = 0$	Factor.
$x - 1 = 0$ or $x + 7 = 0$	Zero Product Property
$x = 1$ $x = -7$	Solve each equation.

The solution set is $\{1, -7\}$. Since $1^2 + 6(1) = 7$ and $(-7)^2 + 6(-7) = 7$, the solutions check.

Example 2 **ROCKET LAUNCH** The formula $h = vt - 16t^2$ gives the height h of a rocket after t seconds when the initial velocity v is given in feet per second. If a rocket is fired with initial velocity 2288 feet per second, how many seconds will it take for the rocket to reach a height of 6720 feet?

$h = vt - 16t^2$	Formula
$6720 = 2288t - 16t^2$	Substitute.
$0 = -16t^2 + 2288t - 6720$	Rewrite equation so that one side equals 0.
$0 = -16(t - 143t + 420)$	Factor out GCF.
$0 = -16(t - 3)(t - 140)$	Factor
$t - 3 = 0$ or $t - 140 = 0$	Zero Product Property
$t = 3$ $t = 140$	Solve each equation.

The rocket reaches 6720 feet in 3 seconds and again in 140 seconds, or 2 minutes 20 seconds after launch.

Exercises

Solve each equation. Check the solutions.

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| 1. $x^2 - 4x + 3 = 0$ | 2. $y^2 - 5y + 4 = 0$ | 3. $m^2 + 10m + 9 = 0$ |
| 4. $x^2 = x + 2$ | 5. $x^2 - 4x = 5$ | 6. $x^2 - 12x + 36 = 0$ |
| 7. $t^2 - 8 = -7t$ | 8. $p^2 = 9p - 14$ | 9. $-9 - 8x + x^2 = 0$ |
| 10. $x^2 + 6 = 5x$ | 11. $a^2 = 11a - 18$ | 12. $y^2 - 8y + 15 = 0$ |
| 13. $x^2 = 24 - 10x$ | 14. $a^2 - 18a = -72$ | 15. $b^2 = 10b - 16$ |

Use the formula $h = vt - 16t^2$ to solve each problem.

- 16. FOOTBALL** A punter can kick a football with an initial velocity of 48 feet per second. How many seconds will it take for the ball to first reach a height of 32 feet?
- 17. ROCKET LAUNCH** If a rocket is launched with an initial velocity of 1600 feet per second, when will the rocket be 14,400 feet high?