

## Real-World Example 5 Use Factoring

**AGILITY** Penny is a Fox Terrier who competes with her trainer in the agility course. Within the course, Penny must leap over a hurdle. Penny's jump can be modeled by the equation  $h = -16t^2 + 20t$ , where  $h$  is the height of the leap in inches at  $t$  seconds. Find the values of  $t$  when  $h = 0$ .

$h = -16t^2 + 20t$	Original equation
$0 = -16t^2 + 20t$	Substitution, $h = 0$
$0 = 4t(-4t + 5)$	Factor by using the GCF.
$4t = 0$ or $-4t + 5 = 0$	Zero Product Property
$t = 0$ $-4t = -5$	Solve each equation.
$t = \frac{5}{4}$ or 1.25	Divide each side by $-4$ .

Penny's height is 0 inches at 0 seconds and 1.25 seconds into the jump.

## Guided Practice

5. **KANGAROOS** The hop of a kangaroo can be modeled by  $h = 24t - 16t^2$  where  $h$  represents the height of the hop in meters and  $t$  is the time in seconds. Find the values of  $t$  when  $h = 0$ .

## Real-WorldLink

Dog agility tests a person's skills as a trainer and handler. Competitors race through an obstacle course that includes hurdles, tunnels, a see-saw, and line poles.

Source: United States Dog Agility Association

## Check Your Understanding

Step-by-Step Solutions begin on page R13.

**Example 1** Use the Distributive Property to factor each polynomial.

- |                              |                               |
|------------------------------|-------------------------------|
| 1. $21b - 15a$               | 2. $14c^2 + 2c$               |
| 3. $10g^2h^2 + 9gh^2 - g^2h$ | 4. $12jk^2 + 6j^2k + 2j^2k^2$ |

**Examples 2–3** Factor each polynomial.

- |                          |                          |
|--------------------------|--------------------------|
| 5. $np + 2n + 8p + 16$   | 6. $xy - 7x + 7y - 49$   |
| 7. $3bc - 2b - 10 + 15c$ | 8. $9fg - 45f - 7g + 35$ |

**Example 4** Solve each equation. Check your solutions.

- |                       |                            |
|-----------------------|----------------------------|
| 9. $3k(k + 10) = 0$   | 10. $(4m + 2)(3m - 9) = 0$ |
| 11. $20p^2 - 15p = 0$ | 12. $r^2 = 14r$            |

**Example 5** 13. **SPIDERS** Jumping spiders can commonly be found in homes and barns throughout the United States. A jumping spider's jump can be modeled by the equation  $h = 33.3t - 16t^2$ , where  $t$  represents the time in seconds and  $h$  is the height in feet.

- When is the spider's height at 0 feet?
- What is the spider's height after 1 second? after 2 seconds?

14. **CCSS REASONING** At a Fourth of July celebration, a rocket is launched straight up with an initial velocity of 125 feet per second. The height  $h$  of the rocket in feet above sea level is modeled by the formula  $h = 125t - 16t^2$ , where  $t$  is the time in seconds after the rocket is launched.

- What is the height of the rocket when it returns to the ground?
- Let  $h = 0$  in the equation and solve for  $t$ .
- How many seconds will it take for the rocket to return to the ground?