Examples 1–3 Factor each polynomial. Confirm your answers using a graphing calculator.

1. $x^2 + 14x + 24$
2. $y^2 - 7y - 30$
3. $n^2 + 4n - 21$
4. $m^2 - 15m + 50$

Example 4 Solve each equation. Check your solutions.

5. $x^2 - 4x - 21 = 0$
6. $n^2 - 3n + 2 = 0$
7. $x^2 - 15x + 54 = 0$
8. $x^2 + 12x = -32$
9. $x^2 - x - 72 = 0$
10. $x^2 - 10x = -24$

Example 5 11. **FRAMING** Tina bought a frame for a photo, but the photo is too big for the frame. Tina needs to reduce the width and length of the photo by the same amount. The area of the photo should be reduced to half the original area. If the original photo is 12 inches by 16 inches, what will be the dimensions of the smaller photo?

Practice and Problem Solving

Examples 1–3 Factor each polynomial. Confirm your answers using a graphing calculator.

12. $x^2 + 17x + 42$
13. $y^2 - 17y + 72$
14. $a^2 + 8a - 48$
15. $n^2 - 2n - 35$
16. $44 + 15h + h^2$
17. $40 - 22x + x^2$
18. $-24 - 10x + x^2$
19. $-42 - m + m^2$

Example 4 Solve each equation. Check your solutions.

20. $x^2 - 7x + 12 = 0$
(21) $y^2 + y = 20$
22. $x^2 - 6x = 27$
23. $a^2 + 11a = -18$
24. $c^2 + 10c + 9 = 0$
25. $x^2 - 18x = -32$
26. $n^2 - 120 = 7n$
27. $d^2 + 56 = -18d$
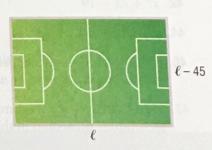28. $y^2 - 90 = 13y$
29. $h^2 + 48 = 16h$

Example 5 30. **GEOMETRY** A triangle has an area of 36 square feet. If the height of the triangle is 6 feet more than its base, what are its height and base?

31. **GEOMETRY** A rectangle has an area represented by $x^2 - 4x - 12$ square feet. If the length is $x + 2$ feet, what is the width of the rectangle?

32. **SOCCER** The width of a high school soccer field is 45 yards shorter than its length.
   a. Define a variable, and write an expression for the area of the field.
   b. The area of the field is 9000 square yards. Find the dimensions.

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CCSS STRUCTURE Factor each polynomial.

33. $q^2 + 11qr + 18r^2$
34. $x^2 - 14xy - 51y^2$
35. $x^2 - 6xy + 5y^2$
36. $a^2 + 10ab - 39b^2$