

Name Answer Key Date _____ Class _____

LESSON
5-4 **Practice B**
Completing the Square

Solve each equation.

1. $2x^2 - 6 = 42$

$x = \pm 2\sqrt{6}$

2. $x^2 - 14x + 49 = 18$

$x = 7 \pm 3\sqrt{2}$

Complete the square for each expression. Write the resulting expression as a binomial squared.

3. $x^2 - 4x + \frac{4}{1}$

$(x-2)^2$

4. $x^2 + 12x + \frac{36}{1}$

$(x+6)^2$

Solve each equation by completing the square.

5. $2d^2 = 8 + 10d$

$d = \frac{5}{2} \pm \frac{1}{2}\sqrt{41}$

6. $x^2 + 2x = 3$

$x = -3 \text{ or } 1$

7. $-3x^2 + 18x = -30$

$x = 3 \pm \sqrt{19}$

8. $4x^2 = -12x + 4$

$x = -\frac{3}{2} \pm \frac{\sqrt{13}}{2}$

Write each function in vertex form, and identify its vertex.

9. $f(x) = x^2 - 6x - 2$

$f(x) = (x-3)^2 - 11$ $(3, -11)$

10. $f(x) = x^2 - 4x + 1$

$f(x) = (x-2)^2 - 3$ $(2, -3)$

11. $h(x) = 3x^2 - 6x - 15$

$h(x) = 3(x-1)^2 - 18$ $(1, -18)$

12. $f(x) = -2x^2 - 16x + 4$

$f(x) = -2(x+4)^2 + 36$ $(-4, 36)$

Solve.

13. Nathan made a triangular pennant for the band booster club. The area of the pennant is 80 square feet. The base of the pennant is 12 feet shorter than the height.

- a. What are the lengths of the base and height of the pennant?

base = 8 ft. height = 20 ft.

- b. What are the dimensions of the pennant if the base is only 6 feet shorter than the height?

base = 10 ft. height = 16 ft.

$$\begin{aligned}
 1.) \quad 2x^2 - 6 &= 42 \\
 &\quad +6 \quad +6 \\
 \frac{2x^2}{2} &= \frac{48}{2} \\
 \sqrt{x^2} &= \sqrt{24} \\
 x &= \pm \sqrt{24} \\
 \boxed{x &= \pm 2\sqrt{6}}
 \end{aligned}$$

$$\begin{aligned}
 2.) \quad x^2 - 14x + 49 &= 18 \\
 \sqrt{(x-7)^2} &= \sqrt{18} \\
 x-7 &= \pm \sqrt{18} \\
 &\quad +7 \quad +7 \\
 \boxed{x &= 7 \pm \sqrt{18}} \\
 \boxed{x &= 7 \pm 3\sqrt{2}}
 \end{aligned}$$

$$\begin{aligned}
 5.) \quad \frac{2d^2}{2} &= \frac{8}{2} + \frac{10d}{2} \\
 d^2 &= 4 + 5d \\
 &\quad -5d \quad -5d \\
 d^2 - 5d &= 4 \\
 d^2 - 5d + \frac{25}{4} &= 4 + \frac{25}{4} \\
 \sqrt{\left(d - \frac{5}{2}\right)^2} &= \sqrt{\frac{41}{4}} \\
 d - \frac{5}{2} &= \pm \frac{\sqrt{41}}{2} \\
 \boxed{d &= \frac{5}{2} \pm \frac{1}{2}\sqrt{41}}
 \end{aligned}$$

$$\begin{aligned}
 6.) \quad x^2 + 2x &= 3 \\
 x^2 + 2x + 1 &= 3 + 1 \\
 \sqrt{(x+1)^2} &= \sqrt{4} \\
 x+1 &= \pm 2 \\
 x &= -1 \pm 2 \\
 \boxed{x &= -3 \text{ or } 1}
 \end{aligned}$$

$$\begin{aligned}
 7.) \quad \frac{-3x^2}{-3} + \frac{18x}{-3} &= \frac{-30}{-3} \\
 x^2 - 6x &= 10 \\
 x^2 - 6x + 9 &= 10 + 9 \\
 \sqrt{(x-3)^2} &= \sqrt{19} \\
 x-3 &= \pm \sqrt{19} \\
 \boxed{x &= 3 \pm \sqrt{19}}
 \end{aligned}$$

$$\begin{aligned}
 8.) \quad \frac{4x^2}{4} &= \frac{-12x}{4} + \frac{4}{4} \\
 x^2 &= -3x + 1 \\
 &\quad +3x \quad +3x \\
 x^2 + 3x &= 1 \\
 x^2 + 3x + \frac{9}{4} &= 1 + \frac{9}{4} \\
 x^2 + 3x + \frac{9}{4} &= 1 + \frac{9}{4} \\
 \sqrt{\left(x + \frac{3}{2}\right)^2} &= \sqrt{\frac{13}{4}} \\
 x + \frac{3}{2} &= \pm \frac{\sqrt{13}}{2} \\
 \boxed{x &= -\frac{3}{2} \pm \frac{\sqrt{13}}{2}}
 \end{aligned}$$

$$9.) f(x) = x^2 - 6x - 2$$

$$f(x) = x^2 - 6x + \underline{\quad} - 2 - \underline{\quad}$$

$$f(x) = x^2 - 6x + 9 - 2 - 9$$

$$f(x) = (x-3)^2 - 11$$

$$10.) f(x) = x^2 - 4x + 1$$

$$f(x) = x^2 - 4x + \underline{\quad} + 1 - \underline{\quad}$$

$$f(x) = x^2 - 4x + 4 + 1 - 4$$

$$f(x) = (x-2)^2 - 3$$

$$11.) h(x) = 3x^2 - 6x - 15$$

$$h(x) = 3(x^2 - 2x) - 15$$

$$h(x) = 3(x^2 - 2x + \underline{\quad}) - 15 - \underline{\quad}$$

$$h(x) = 3(x^2 - 2x + 1) - 15 - 3$$

$$h(x) = 3(x-1)^2 - 18$$

$$12.) f(x) = -2x^2 - 16x + 4$$

$$f(x) = -2(x^2 + 8x) + 4$$

$$f(x) = -2(x^2 + 8x + \underline{\quad}) + 4 + \underline{\quad}$$

$$f(x) = -2(x^2 + 8x + 16) + 4 + 32$$

$$f(x) = -2(x+4)^2 + 36$$

$$13.) a. A = \frac{1}{2}bh$$

$$b = h - 12$$

$$A = \frac{1}{2}(h-12)h$$

$$80 = \frac{1}{2}(h-12)h$$

$$160 = (h-12)h$$

$$160 = h^2 - 12h$$

$$0 = h^2 - 12h - 160$$

$$0 = h^2 - 12h + \underline{36} - 160 - \underline{36}$$

$$0 = (h-6)^2 - 196$$

$$\sqrt{196} = \sqrt{(h-6)^2}$$

$$14 = h - 6$$

$$\boxed{20 = h}$$

$$8 = b$$

$$13.) \text{ b. } 80 = \frac{1}{2}(h-6)h$$

$$160 = h^2 - 6h$$

$$\underline{\quad} + 160 = h^2 - 6h + \underline{\quad}$$

$$9 + 160 = h^2 - 6h + 9$$

$$\sqrt{169} = \sqrt{(h-3)^2}$$

$$13 = h - 3$$

$$\begin{array}{cc} +3 & +3 \end{array}$$

$$\boxed{\begin{array}{l} 16 = h \\ b = 10 \end{array}}$$