

Solving Equations by Completing the Square

Date _____ Period _____

Solve each equation by completing the square.

1) $a^2 + 2a - 3 = 0$ $\frac{b}{2} = \frac{2}{2} = 1$ $(\frac{b}{2})^2 = 1^2 = 1$

$$a^2 + 2a + 1 = 3 + 1$$

$$\sqrt{(a+1)^2} = \sqrt{4}$$

$$a+1 = \pm 2$$

$$a = -1 \pm 2$$

$$a = -3, 1$$

2) $a^2 - 2a - 8 = 0$ $\frac{b}{2} = \frac{-2}{2} = -1$ $(-1)^2 = 1$

$$a^2 - 2a + 1 = 8 + 1$$

$$\sqrt{(a-1)^2} = \sqrt{9}$$

$$a-1 = \pm 3$$

$$a = 1 \pm 3$$

$$a = 4, -2$$

3) $p^2 + 16p - 22 = 0$ $\frac{b}{2} = \frac{16}{2} = 8$ $8^2 = 64$

$$p^2 + 16p + 64 = 22 + 64$$

$$\sqrt{(p+8)^2} = \sqrt{86}$$

$$p+8 = \pm \sqrt{86}$$

$$p = -8 \pm \sqrt{86}$$

4) $k^2 + 8k + 12 = 0$ $\frac{b}{2} = \frac{8}{2} = 4$ $4^2 = 16$

$$k^2 + 8k + 16 = -12 + 16$$

$$\sqrt{(k+4)^2} = \sqrt{4}$$

$$k+4 = \pm 2$$

$$k = -4 \pm 2$$

$$k = -6, -2$$

5) $r^2 + 2r - 33 = 0$ $\frac{b}{2} = \frac{2}{2} = 1$ $1^2 = 1$

$$r^2 + 2r + 1 = 33 + 1$$

$$\sqrt{(r+1)^2} = \sqrt{34}$$

$$r+1 = \pm \sqrt{34}$$

$$r = -1 \pm \sqrt{34}$$

6) $a^2 - 2a - 48 = 0$ $\frac{b}{2} = \frac{-2}{2} = -1$ $(-1)^2 = 1$

$$a^2 - 2a + 1 = 48 + 1$$

$$\sqrt{(a-1)^2} = \sqrt{49}$$

$$a-1 = \pm 7$$

$$a = 1 \pm 7$$

$$a = 8, -6$$

7) $m^2 - 12m + 26 = 0$ $\frac{b}{2} = \frac{-12}{2} = -6$ $(-6)^2 = 36$

$$m^2 - 12m + 36 = -26 + 36$$

$$\sqrt{(m-6)^2} = \sqrt{10}$$

$$m-6 = \pm \sqrt{10}$$

$$m = 6 \pm \sqrt{10}$$

8) $x^2 + 12x + 20 = 0$ $\frac{b}{2} = \frac{12}{2} = 6$ $6^2 = 36$

$$x^2 + 12x + 36 = -20 + 36$$

$$\sqrt{(x+6)^2} = \sqrt{16}$$

$$x+6 = \pm 4$$

$$x = -6 \pm 4$$

$$x = -10, -2$$

9) $k^2 - 8k - 48 = 0$ $\frac{b}{2} = \frac{-8}{2} = -4$ $(-4)^2 = 16$

$$k^2 - 8k + 16 = 48 + 16$$

$$\sqrt{(k-4)^2} = \sqrt{64}$$

$$k-4 = \pm 8$$

$$k = 4 \pm 8$$

$$k = 12, -4$$

10) $p^2 + 2p - 63 = 0$ $\frac{b}{2} = \frac{2}{2} = 1$ $1^2 = 1$

$$p^2 + 2p + 1 = 63 + 1$$

$$\sqrt{(p+1)^2} = \sqrt{64}$$

$$p+1 = \pm 8$$

$$p = -1 \pm 8$$

$$p = -9, 7$$

11) $m^2 + 2m - 48 = -6$ $\frac{b}{2} = \frac{2}{2} = 1$ $1^2 = 1$

$$m^2 + 2m = -6 + 48$$

$$m^2 + 2m + 1 = 42 + 1$$

$$\sqrt{(m+1)^2} = \sqrt{43}$$

$$m+1 = \pm \sqrt{43}$$

$$m = -1 \pm \sqrt{43}$$

12) $p^2 - 8p + 21 = 6$ $\frac{b}{2} = \frac{-8}{2} = -4$ $(-4)^2 = 16$

$$p^2 - 8p = 6 - 21$$

$$p^2 - 8p + 16 = -15 + 16$$

$$\sqrt{(p-4)^2} = \sqrt{1}$$

$$p-4 = \pm 1$$

$$p = 4 \pm 1$$

$$p = 5, 3$$