

Completing the Square WS

Solve each equation by completing the square.

1) $x^2 + 4x - 96 = 0$

$$x^2 + 4x = 96$$

$$x^2 + 4x + 4 = 96 + 4$$

$$x^2 + 4x + 4 = 100$$

$$(x+2)^2 = 100$$

$$\sqrt{(x+2)^2} = \sqrt{100}$$

$$x+2 = 10 \text{ or } -10$$

-2 -2 -2

$$x = 8 \text{ or } -12$$

2) $n^2 - 2n - 24 = 0$

$$+24 \quad +24$$

$$n^2 - 2n = 24$$

$$n^2 - 2n + 1 = 24 + 1$$

$$(n-1)^2 = 25$$

$$\sqrt{(n-1)^2} = \sqrt{25}$$

$$n-1 = 5 \text{ or } -5$$

+1 +1 +1

$$n = 6 \text{ or } -4$$

3) $x^2 + 10x - 11 = 0$

$$+11 \quad +11$$

$$x^2 + 10x = 11$$

$$x^2 + 10x + 25 = 11 + 25$$

$$(x+5)^2 = 36$$

$$\sqrt{(x+5)^2} = \sqrt{36}$$

$$x+5 = 6 \text{ or } -6$$

-5 -5 -5

$$x = 1 \text{ or } -11$$

4) $r^2 - 2r - 3 = 0$

$$+3 \quad +3$$

$$r^2 - 2r + 1 = 3 + 1$$

$$(r-1)^2 = 4$$

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

$$r-1 = 2 \text{ or } -2$$

+1 +1 +1

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

$$5) x^2 + 2x - 14 = -5$$

$$\quad \quad \quad +14 \quad +14$$

$$x^2 + 2x = 9$$

$$x^2 + 2x + 1 = 9 + 1$$

$$\sqrt{(x+1)^2} = \sqrt{10}$$

$$x + 1 = 3.16 \quad \text{or} \quad = 3.16$$

$$\quad \quad \quad -1 \quad \quad \quad -1$$

$$\boxed{x = 2.16 \quad \text{or} \quad -4.16}$$

$$7) 3p^2 + 12p - 96 = 0$$

$$p^2 + 4p - 32 = 0$$

$$\quad \quad \quad +32 \quad +32$$

$$p^2 + 4p = 32$$

$$p^2 + 4p + 4 = 32 + 4$$

$$(p+2)^2 = 36$$

$$\sqrt{(p+2)^2} = \sqrt{36}$$

$$p + 2 = 6 \quad \text{or} \quad -6$$

$$\quad \quad \quad -2 \quad \quad \quad -2 \quad \quad -2$$

$$\boxed{p = 4 \quad \text{or} \quad -8}$$

$$9) 4b^2 + 8b - 25 = 5$$

$$\quad \quad \quad +25 \quad +25$$

$$\frac{4b^2 + 8b}{4} = \frac{30}{4}$$

$$b^2 + 2b = 7.5$$

$$b^2 + 2b + 1 = 7.5 + 1$$

$$(b+1)^2 = 8.5$$

$$\sqrt{(b+1)^2} = \sqrt{8.5}$$

$$b + 1 = 2.92 \quad \text{or} \quad -2.92$$

$$\quad \quad \quad -1 \quad \quad \quad -1 \quad \quad -1$$

$$\boxed{b = 1.92 \quad \text{or} \quad -3.92}$$

$$6) v^2 + 10v - 26 = -2$$

$$\quad \quad \quad +26 \quad +26$$

$$v^2 + 10v = 24$$

$$v^2 + 10v + 25 = 24 + 25$$

$$(v+5)^2 = 49$$

$$\sqrt{(v+5)^2} = \sqrt{49}$$

$$v + 5 = 7 \quad \text{or} \quad -7$$

$$\quad \quad \quad -5 \quad \quad \quad -5 \quad \quad -5$$

$$\boxed{v = 2 \quad \text{or} \quad -12}$$

$$8) 8a^2 + 16a - 32 = 0$$

$$a^2 + 2a - 16 = 0$$

$$a^2 + 2a = 16$$

$$a^2 + 2a + 1 = 16 + 1$$

$$(a+1)^2 = 17$$

$$\sqrt{(a+1)^2} = \sqrt{17}$$

$$a + 1 = 4.12 \quad \text{or} \quad -4.12$$

$$\quad \quad \quad -1 \quad \quad \quad -1 \quad \quad -1$$

$$\boxed{a = 3.12 \quad \text{or} \quad -5.12}$$

$$10) 8x^2 - 16x - 47 = -5$$

$$\frac{8x^2 - 16x}{8} = \frac{42}{8}$$

$$x^2 - 2x = 5.25$$

$$x^2 - 2x + 1 = 5.25 + 1$$

$$\sqrt{(x-1)^2} = \sqrt{6.25}$$

$$x - 1 = 2.5 \quad \text{or} \quad -2.5$$

$$\quad \quad \quad +1 \quad \quad \quad +1 \quad \quad +1$$

$$\boxed{x = 3.5 \quad \text{or} \quad -1.5}$$