

OPDS

$$1. \quad a^2 + 2a - 3 = 0$$

Factor

OR

complete the Square

$$(a+3)(a-1) = 0$$

$$\begin{array}{l} \downarrow \qquad \downarrow \\ a+3=0 \qquad a-1=0 \\ \boxed{a=-3} \qquad \boxed{a=1} \end{array}$$

$$\begin{aligned} a^2 + 2a &= 3 \\ a^2 + 2a + 1 &= 3 + 1 \end{aligned}$$

$$(a+1)(a+1) = 4$$

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

$$a+1 = \pm 2$$

$$a = \pm 2 - 1$$

$$\boxed{a=1} + \boxed{a=-3}$$

$$3. \quad p^2 + 16p - 22 = 0$$

complete the square

(doesn't factor)

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

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

$$(p+8)(p+8) = 86$$

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

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

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

$$5. \quad r^2 + 2r - 33 = 0$$

(doesn't factor)

↓
complete to square

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

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

$$(r+1)(r+1) = 34$$

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

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

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

$$7. \quad m^2 - 12m + 26 = 0$$

(doesn't factor)

↓
complete the square

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

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

$$m^2 - 12m + 36 = 10$$

$$(m-6)(m-6) = 10$$

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

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

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

$$9. \quad k^2 - 8k - 48 = 0$$

Factor

OR

complete the square

$$(a-12)(a+4) = 0$$

$$a-12=0$$

$$a=12$$

$$a+4=0$$

$$a=-4$$

$$k^2 - 8k - 48 = 0$$

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

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

$$(k-4)(k-4) = 64$$

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

$$k-4 = \pm 8$$

$$k = \pm 8 + 4$$

$$k = 12$$

$$k = -4$$

$$11. \quad m^2 + 2m - 48 = -6$$

complete the square

(doesn't factor)

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

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

$$(m+1)(m+1) = 43$$

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

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

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

$$2. \underline{a^2 - 2a - 8 = 0}$$

EVEN

Factor

Complete the square

$$(a-4)(a+2) = 0$$

$$a-4=0$$

$$a=4$$

$$a+2=0$$

$$a=-2$$

OR

$$a^2 - 2a = 8$$

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

$$(a-1)(a-1) = 9$$

$$(a-1)^2 = 9$$

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

$$a-1 = \pm 3$$

$$a = \pm 3 + 1$$

$$a = +3 + 1 = 4$$

$$a = -3 + 1 = -2$$

$$4. \underline{k^2 + 8k + 12 = 0}$$

Factor

complete the square

$$(k+6)(k+2) = 0$$

$$k+6=0$$

$$k=-6$$

$$k+2=0$$

$$k=-2$$

OR

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

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

$$(k+4)(k+4) = 4$$

$$(k+4)^2 = 4$$

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

$$k+4 = \pm 2$$

$$k = \pm 2 - 4$$

$$k = +2 - 4$$

$$k = -2$$

$$k = -2 - 4$$

$$k = -6$$

$$6. a^2 - 2a - 48 = 0$$

Factor

complete the square

$$(a+6)(a-8) = 0$$

$$a+6=0$$

$$a=-6$$

$$a-8=0$$

$$a=8$$

OR

$$a^2 - 2a = 48$$

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

$$(a-1)(a-1) = 49$$

$$(a-1)^2 = 49$$

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

$$a-1 = \pm 7$$

$$+1 \quad +1$$

$$a = \pm 7 + 1$$

$$a = +7 + 1 = 8$$

$$a = -7 + 1 = -6$$

$$8. x^2 + 12x + 20 = 0$$

Factor

complete the square

$$(x+10)(x+2) = 0$$

$$x+10=0$$

$$x=-10$$

$$x+2=0$$

$$x=-2$$

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

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

$$(x+6)(x+6) = 16$$

$$(x+6)^2 = 16$$

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

$$x+6 = \pm 4$$

$$-6 \quad -6$$

$$x = \pm 4 - 6$$

$$x = +4 - 6$$

$$x = -2$$

$$x = -4 - 6$$

$$x = -10$$

$$10. \quad p^2 + 2p - 63 = 0$$

factor

complete the square

$$(p+9)(p-7) = 0$$

$$p+9=0$$

$$p = -9$$

$$p-7=0$$

$$p = 7$$

OR

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

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

$$(p+1)(p+1) = 64$$

$$(p+1)^2 = 64$$

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

$$p+1 = \pm 8$$

$$p = \pm 8 - 1$$

$$p = +8 - 1 = 7$$

$$p = -8 - 1 = -9$$

$$12. \quad p^2 - 8p + 21 = 6$$

Factor

complete the square

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

$$-6 \quad -6$$

$$p^2 - 8p + 15 = 0$$

$$(p-3)(p-5) = 0$$

$$p = 3 \quad p = 5$$

OR

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

$$-21 \quad -21$$

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

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

$$(p-4)(p-4) = 1$$

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

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

$$p-4 = \pm 1$$

$$+4 \quad +4$$

$$p = \pm 1 + 4$$

$$p = +1 + 4$$

$$p = 5$$

$$p = -1 + 4$$

$$p = 3$$