Soluciones Ecuaciones 2º Grado

■□□ Observa, razona y resuelve.

a) $x^2 = 100$ **b)** $x^2 = 20$

c) $5x^2 = 45$ **d)** $12x^2 = 3$

e) $x(x - 3) = 0$ **f)** $(x + 5)x = 0$

g) $x(3x - 1) = 0$ **h)** $3x(5x + 2) = 0$

i) $x^2 - 7x = 0$ **j)** $x^2 + 4x = 0$

k) $3x^2 = 2x$ **l)** $5x^2 = x^2 - 2x$

a) $x = \pm 10$

b) $x = \pm\sqrt{20} = \pm 2\sqrt{5}$

c) $x = \pm 3$

d) $x = \pm\frac{1}{2}$

e) $x = 0;\ x = 3$

f) $x = 0;\ x = -5$

g) $x = 0;\ x = \frac{1}{3}$

h) $x = 0;\ x = -\frac{2}{5}$

i) $x = 0;\ x = 7$

j) $x = 0;\ x = -4$

k) $x = 0;\ x = \frac{2}{3}$

l) $x = 0;\ x = -\frac{1}{2}$

■□□ Resuelve aplicando la fórmula.

a) $x^2 - 10x + 21 = 0$ **b)** $x^2 + 2x - 3 = 0$

c) $x^2 + 9x + 40 = 0$ **d)** $5x^2 + 14x - 3 = 0$

e) $15x^2 - 16x + 4 = 0$ **f)** $14x^2 + 5x - 1 = 0$

g) $x^2 - 10x + 25 = 0$ **h)** $9x^2 + 6x + 1 = 0$

i) $6x^2 - 5x + 2 = 0$ **j)** $6x^2 - x - 5 = 0$

a) $x = \dfrac{10 \pm \sqrt{100 - 84}}{2} \rightarrow x = 7;\ x = 3$

b) $x = \dfrac{-2 \pm \sqrt{4 + 12}}{2} \rightarrow x = 1;\ x = -3$

c) $x = \dfrac{-9 \pm \sqrt{81 - 160}}{2} \rightarrow$ Sin solución.

d) $x = \dfrac{-14 \pm \sqrt{196 + 60}}{10} \rightarrow x = \frac{1}{5};\ x = -3$

e) $x = \dfrac{16 \pm \sqrt{256 - 240}}{30} \rightarrow x = \frac{2}{3};\ x = \frac{2}{5}$

f) $x = \dfrac{-5 \pm \sqrt{25 + 56}}{28} \rightarrow x = \frac{1}{7};\ x = -\frac{1}{2}$

g) $x = \dfrac{10 \pm \sqrt{100 - 100}}{2} \rightarrow x = 5;\ x = 5$

h) $x = \dfrac{-6 \pm \sqrt{36 - 36}}{18} \rightarrow x = -\frac{1}{3};\ x = -\frac{1}{3}$

i) $x = \dfrac{5 \pm \sqrt{25 - 48}}{12} \rightarrow$ Sin solución.

j) $x = \dfrac{1 \pm \sqrt{1 + 120}}{2} \rightarrow x = 6;\ x = -5$

■■□ **Resuelve, primero, mentalmente. Después, reduce a la forma general y aplica la fórmula.**

a) $(x-4)^2=0$ **b)** $(2x-5)^2=0$

c) $(x-1)\cdot(x-7)=0$ **d)** $(x+2)\cdot(x+4)=0$

e) $(x-5)\cdot(x+7)=0$ **f)** $(2x-1)\cdot(2x+1)=0$

a) $x^2-8x+16=0 \rightarrow x=4;\ x=4$

b) $4x^2-20x+25=0 \rightarrow x=\frac{5}{2};\ x=\frac{5}{2}$

c) $x^2-8x+7=0 \rightarrow x=1;\ x=7$

d) $x^2+6x+8=0 \rightarrow x=-2;\ x=-4$

e) $x^2+2x-35=0 \rightarrow x=5;\ x=-7$

f) $4x^2-1=0 \rightarrow x=\frac{1}{2};\ x=-\frac{1}{2}$

■■■ **Reduce a la forma general y aplica la fórmula.**

a) $x^2-\frac{1}{4}=\frac{1}{5}\left(\frac{x}{4}-1\right)$

b) $\frac{x}{2}\left(x+\frac{1}{30}\right)=\frac{x}{3}\left(x+\frac{2}{5}\right)$

c) $\frac{x}{3}\left(x-\frac{1}{20}\right)=\frac{x^2}{2}-\frac{1}{15}\left(2x-\frac{1}{2}\right)$

d) $\frac{x^2}{2}+x=\frac{2x^2-5}{3}-1$

a) $20x^2-x-1=0 \rightarrow x=\frac{1}{4};\ x=-\frac{1}{5}$

b) $10x^2-7x=0 \rightarrow x=0;\ x=\frac{7}{10}$

c) $10x^2-7x+2=0 \rightarrow$ Sin solución.

d) $x^2-6x-16=0 \rightarrow x=8;\ x=-2$

■□□ **Resuelve las siguientes ecuaciones de segundo grado sin utilizar la fórmula de resolución:**

a) $3x^2-12x=0$ b) $x-3x^2=0$

c) $2x^2-5x=0$ d) $2x^2-8=0$

e) $9x^2-25=0$ f) $4x^2+100=0$

g) $16x^2=100$ h) $3x^2-6=0$

a) $3x^2 - 12x = 0 \rightarrow 3x(x-4) = 0 \begin{cases} x = 0 \\ x = 4 \end{cases}$

b) $x - 3x^2 = 0 \rightarrow x(1-3x) = 0 \begin{cases} x = 0 \\ x = 1/3 \end{cases}$

c) $2x^2 - 5x = 0 \rightarrow x(2x-5) = 0 \begin{cases} x = 0 \\ x = 5/2 \end{cases}$

d) $2x^2 - 8 = 0 \rightarrow 2x^2 = 8 \rightarrow x^2 = 4 \begin{cases} x = 2 \\ x = -2 \end{cases}$

e) $9x^2 - 25 = 0 \rightarrow 9x^2 = 25 \rightarrow x^2 = \frac{25}{9} \begin{cases} x = 5/3 \\ x = -5/3 \end{cases}$

f) $4x^2 + 100 = 0 \rightarrow 4x^2 = -100$ No tiene solución.

g) $16x^2 = 100 \rightarrow x^2 = \frac{100}{16} \begin{cases} x = 10/4 = 5/2 \\ x = -10/4 = -5/2 \end{cases}$

h) $3x^2 - 6 = 0 \rightarrow 3x^2 = 6 \rightarrow x^2 = 2 \begin{cases} x = \sqrt{2} \\ x = -\sqrt{2} \end{cases}$

■□□ **Resuelve.**

a) $x^2 + 4x - 21 = 0$ **b)** $x^2 + 9x + 20 = 0$

c) $9x^2 - 12x + 4 = 0$ **d)** $x^2 + x + 3 = 0$

e) $4x^2 + 28x + 49 = 0$ **f)** $x^2 - 2x + 3 = 0$

g) $4x^2 - 20x + 25 = 0$ **h)** $-2x^2 + 3x + 2 = 0$

a) $x^2 + 4x - 21 = 0 \rightarrow x = \frac{-4 \pm \sqrt{16 + 21 \cdot 4}}{2} = \frac{-4 \pm 10}{2} \begin{cases} x = 3 \\ x = -7 \end{cases}$

b) $x^2 + 9x + 20 = 0 \rightarrow x = \frac{-9 \pm \sqrt{81 - 4 \cdot 20}}{2} = \frac{-9 \pm 1}{2} \begin{cases} x = -4 \\ x = -5 \end{cases}$

c) $9x^2 - 12x + 4 = 0 \rightarrow x = \frac{12 \pm \sqrt{144 - 4 \cdot 9 \cdot 4}}{18} = \frac{12 \pm 0}{18} = \frac{2}{3}$

d) $x^2 + x + 3 = 0 \rightarrow x = \frac{-1 \pm \sqrt{1 - 4 \cdot 3}}{2}$ No tiene solución.

e) $4x^2 + 28x + 49 = 0 \rightarrow x = \frac{-28 \pm \sqrt{784 - 4 \cdot 4 \cdot 49}}{8} = \frac{-28 \pm 0}{8} = -\frac{7}{2}$

f) $x^2 - 2x + 3 = 0 \rightarrow x = \frac{2 \pm \sqrt{4 - 4 \cdot 3}}{2}$ No tiene solución.

g) $4x^2 - 20x + 25 = 0 \rightarrow x = \frac{20 \pm \sqrt{400 - 4 \cdot 4 \cdot 25}}{8} = \frac{20 \pm 0}{8} = \frac{5}{2}$

h) $-2x^2 + 3x + 2 = 0 \rightarrow x = \frac{-3 \pm \sqrt{9 - 4(-2) \cdot 2}}{-4} = \frac{-3 \pm 5}{-4} \begin{cases} x = -2/4 = -1/2 \\ x = 2 \end{cases}$

■■□ **Resuelve las siguientes ecuaciones:**

a) $(2x + 1)(x - 3) = (x + 1)(x - 1) - 8$

b) $(2x - 3)(2x + 3) - x(x + 1) - 5 = 0$

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

d) $(x + 4)^2 - (2x - 1)^2 = 8x$

a) $(2x + 1)(x - 3) = (x + 1)(x - 1) - 8 \rightarrow$

$\rightarrow 2x^2 - 6x + x - 3 = x^2 - 1 - 8 \rightarrow$

$\rightarrow x^2 - 5x + 6 = 0 \rightarrow x = \dfrac{5 \pm \sqrt{25 - 4 \cdot 6}}{2} \rightarrow x = \dfrac{5 \pm 1}{2} \begin{cases} x = 3 \\ x = 2 \end{cases}$

b) $(2x - 3)(2x + 3) - x(x + 1) - 5 = 0 \rightarrow$

$\rightarrow 4x^2 - 9 - x^2 - x - 5 = 0 \rightarrow 3x^2 - x - 14 = 0 \rightarrow$

$\rightarrow x = \dfrac{1 \pm \sqrt{1 - 4 \cdot 3 \cdot (-14)}}{6} = \dfrac{1 \pm \sqrt{169}}{6} = \dfrac{1 \pm 13}{6} \begin{cases} x = 7/3 \\ x = -2 \end{cases}$

c) $(2x + 1)^2 = 4 + (x + 2)(x - 2) \rightarrow$

$\rightarrow 4x^2 + 1 + 4x = 4 + x^2 - 4 \rightarrow 3x^2 + 4x + 1 = 0 \rightarrow$

$\rightarrow x = \dfrac{-4 \pm \sqrt{16 - 4 \cdot 3 \cdot 1}}{6} = \dfrac{-4 \pm \sqrt{4}}{6} = \dfrac{-4 \pm 2}{6} \begin{cases} x = -1/3 \\ x = -1 \end{cases}$

d) $(x + 4)^2 - (2x - 1)^2 = 8x \rightarrow$

$\rightarrow x^2 + 16 + 8x - (4x^2 + 1 - 4x) - 8x = 0 \rightarrow$

$\rightarrow x^2 + 16 + 8x - 4x^2 - 1 + 4x - 8x = 0 \rightarrow -3x^2 + 4x + 15 = 0 \rightarrow$

$\rightarrow x = \dfrac{-4 \pm \sqrt{16 - 4 \cdot (-3) \cdot 15}}{-6} = \dfrac{-4 \pm \sqrt{196}}{-6} = \dfrac{-4 \pm 14}{-6} \begin{cases} x = -5/3 \\ x = 3 \end{cases}$

■■□ Resuelve las ecuaciones siguientes:

a) $\frac{(5x-4)(5x+4)}{4} = \frac{(3x-1)^2-9}{2}$

b) $\frac{x}{3}(x-1) - \frac{x}{4}(x+1) + \frac{3x+4}{12} = 0$

c) $\frac{(x-1)(x+2)}{12} - \frac{(x+1)(x-2)}{6} - 1 = \frac{x-3}{3}$

d) $\frac{(x-1)^2-3x+1}{15} + \frac{x+1}{5} = 0$

e) $\frac{x+1}{2} - \frac{(x-1)^2}{4} - \frac{x+2}{3} + \frac{(x-2)^2}{6} = \frac{1}{6}$

a) $\frac{(5x-4)(5x+4)}{4} = \frac{(3x-1)^2-9}{2} \rightarrow$

$\rightarrow \frac{25x^2-16}{4} = \frac{2(9x^2+1-6x-9)}{4} \rightarrow$

$\rightarrow 25x^2-16 = 18x^2+2-12x-18 \rightarrow 7x^2+12x = 0 \rightarrow$

$\rightarrow x(7x+12) = 0 \begin{cases} x = 0 \\ x = -12/7 \end{cases}$

b) $\frac{x}{3}(x-1) - \frac{x}{4}(x+1) + \frac{3x+4}{12} = 0 \rightarrow$

$\rightarrow 12\left(\frac{x}{3}(x-1) - \frac{x}{4}(x+1) + \frac{3x+4}{12}\right) \rightarrow$

$\rightarrow 4x(x-1) - 3x(x+1) + 3x + 4 = 0 \rightarrow$

$\rightarrow 4x^2-4x-3x^2-3x+3x+4 = 0 \rightarrow x^2-4x+4 = 0 \rightarrow$

$\rightarrow x = \frac{4 \pm \sqrt{16-4\cdot 4}}{2} = 2$

c) $\frac{(x-1)(x+2)}{12} - \frac{(x+1)(x-2)}{6} - 1 = \frac{x-3}{3} \rightarrow$

$\rightarrow \frac{x^2+x-2}{12} - \frac{x^2-x-2}{6} - 1 = \frac{x-3}{3} \rightarrow$

$\rightarrow 12\left(\frac{x^2+x-2}{12} - \frac{x^2-x-2}{6} - 1\right) = 12\left(\frac{x-3}{3}\right) \rightarrow$

$\rightarrow x^2+x-2-2(x^2-x-2)-12 = 4(x-3) \rightarrow$

$\rightarrow x^2+x-2-2x^2+2x+4-12 = 4x-12 \rightarrow -x^2-x+2 = 0 \rightarrow$

$\rightarrow x^2+x-2 = 0 \rightarrow x = \frac{-1 \pm \sqrt{1-4(-2)}}{2} = \frac{-1 \pm 3}{2} \begin{cases} x = 1 \\ x = -2 \end{cases}$

d) $\frac{(x-1)^2-3x+1}{15}+\frac{x+1}{5}=0 \rightarrow$

$\rightarrow 15\left[\frac{(x-1)^2-3x+1}{15}+\frac{x+1}{5}\right]=0 \rightarrow$

$\rightarrow x^2-2x+1-3x+1+3x+3=0 \rightarrow$

$\rightarrow x^2-2x+5=0 \rightarrow x=\frac{2\pm\sqrt{4-4\cdot 5}}{2} \rightarrow$ No tiene solución.

e) $\frac{x+1}{2}-\frac{(x-1)^2}{4}-\frac{x+2}{3}+\frac{(x-2)^2}{6}=\frac{1}{6} \rightarrow$

$\rightarrow 12\left(\frac{x+1}{2}-\frac{(x-1)^2}{4}-\frac{x+2}{3}+\frac{(x-2)^2}{6}\right)=12\cdot\frac{1}{6} \rightarrow$

$\rightarrow 6(x+1)-3(x^2-2x+1)-4(x+2)+2(x^2-4x+4)=2 \rightarrow$

$\rightarrow 6x+6-3x^2+6x-3-4x-8+2x^2-8x+8=2 \rightarrow$

$\rightarrow -x^2+3=0 \rightarrow x^2=3 \begin{cases} x=\sqrt{3} \\ x=-\sqrt{3} \end{cases}$