

① a) $2x - 5 + 3x + 1 = 3x - 2$

$$5x - 4 = 3x - 2$$

$$5x - 3x = 4 - 2$$

$$2x = 2$$

$$x = \frac{2}{2} = 1$$

b) $x + 7 = 12x - 3 - 8x + 1$

$$x + 7 = 4x - 2$$

$$x - 4x = -7 - 2$$

$$-3x = -9$$

$$x = \frac{-9}{-3} = 3$$

c) $6x - 1 + x = 4 - 5x + 3$

$$7x - 1 = 7 - 5x$$

$$7x + 5x = 7 + 1$$

$$12x = 8$$

$$x = \frac{8}{12} = \frac{2}{3}$$

d) $x + 2x + 3x - 5 = 4x - 9$

$$6x - 5 = 4x - 9$$

$$6x - 4x = 5 - 9$$

$$2x = -4$$

$$x = \frac{-4}{2} = -2$$

e) $5x + 4 - 6x = 7 - x - 3$

$$-x + 4 = 4 - x$$

$$-x + x = 4 - 4$$

$$0x = 0$$

Infinitas soluciones

f) $4x + 2 + 7x = 10x + 3 + x$

$$11x + 2 = 11x + 3$$

$$11x - 11x = 3 - 2$$

$$0x = 1$$

No tiene solución

② a) $x + 8 = 2 \cdot (x - 5)$

$$x + 8 = 2x - 10$$

$$x - 2x = -8 - 10$$

$$-x = -18$$

$$x = 18$$

b) $x + 6 = 3x + 5 \cdot (x - 2) - 3$

$$x + 6 = 3x + 5x - 10 - 3$$

$$x + 6 = 8x - 13$$

$$x - 8x = -6 - 13$$

$$-7x = -19$$

$$x = \frac{19}{7}$$

c) $-2 \cdot (-3 - x) - 5 \cdot (x - 5) = 4x - 7x + 8$

$$+6 + 2x - 5x + 25 = 4x - 7x + 8$$

$$-3x + 31 = -3x + 8$$

$$-3x + 3x = 8 - 31$$

$$0x = -23$$

No tiene solución

d) $-2x + 8 \cdot (x - 1) - 4x = 3 \cdot (2x - 2)$

$$-2x + 8x - 8 - 4x = 6x - 6$$

$$2x - 8 = 6x - 6$$

$$2x - 6x = 8 - 6$$

$$-4x = 2$$

$$x = -\frac{2}{4} = -\frac{1}{2}$$

$$\textcircled{3} \text{ a) } 2x+1 = \frac{x-6}{5}$$

$$10x+5 = x-6$$

$$10x-x = -5-6$$

$$9x = -11$$

$$x = \frac{-11}{9}$$

$$\text{b) } \frac{x}{2} - 4 = \frac{x}{3} + 3$$

$$3x-24 = 2x+18$$

$$3x-2x = 24+18$$

$$x = 42$$

$$\text{c) } \frac{x}{4} + \frac{5}{3} = \frac{x}{6} - \frac{1}{2}$$

$$3x+20 = 2x-6$$

$$3x-2x = -20-6$$

$$x = -26$$

$$\text{d) } \frac{x-2}{4} - \frac{2}{3} = -\frac{2}{5} - \frac{1-3x}{2}$$

$$15x-30-40 = -24-30+90x$$

$$15x-70 = -54+90x$$

$$15x-90x = -54+70$$

$$-75x = 16$$

$$x = \frac{-16}{75}$$

$$\textcircled{4} \text{ a) } x - \frac{2(x+1)}{3} = 1 - \frac{3x-2}{4}$$

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

$$12x-8x-8 = 12-9x+6$$

$$4x-8 = 18-9x$$

$$4x+9x = 18+8$$

$$13x = 26$$

$$x = \frac{26}{13} = 2$$

$$\text{b) } \frac{x+2}{9} - x = \frac{5 \cdot (x+1)}{6}$$

$$\frac{x+2}{9} - x = \frac{5x+5}{6}$$

$$2x+4-18x = 15x+15$$

$$2x-18x-15x = 15-4$$

$$-31x = 11$$

$$x = \frac{-11}{31}$$

$$\text{c) } \frac{2 \cdot (x+2)}{3} + \frac{3 \cdot (x-3)}{6} - \frac{8(x-1)}{9} = 1$$

$$\frac{2x+4}{3} + \frac{3x-9}{6} - \frac{8x-8}{9} = 1$$

$$12x+24+9x-27-16x+16 = 18$$

$$5x+13 = 18$$

$$5x = 18-13$$

$$5x = 5$$

$$x = \frac{5}{5} = 1$$

$$\text{d) } \frac{-6}{2} \cdot \left(\frac{5+x}{3} \right) = \frac{1}{3} \cdot \left(4 - \frac{4x}{2} \right) + \frac{3x}{2}$$

$$\frac{-30-6x}{6} = \frac{4}{3} - \frac{4x}{6} + \frac{3x}{2}$$

$$-30-6x = 8-4x+9x$$

$$-6x+4x-9x = 8+30$$

$$-11x = 38$$

$$x = \frac{-38}{11}$$

$$e) \frac{3 \cdot (x-2)}{4} - \frac{2(x-3)}{3} = \frac{x}{6} - \frac{3x-6}{4}$$

$$\frac{3x-6}{4} - \frac{2x-6}{3} = \frac{x}{6} - \frac{3x-6}{4}$$

$$9x-18-8x+24=2x-9x+18$$

$$x+6=-7x+18$$

$$x+7x=18-6$$

$$8x=12$$

$$x = \frac{12}{8} = \frac{3}{2}$$

$$g) \frac{4}{3} \left(\frac{2+x}{5} \right) = \frac{1}{5} \left(8 - \frac{6x}{3} \right) + \frac{5x}{3}$$

$$\frac{8+4x}{15} = \frac{8}{5} - \frac{6x}{15} + \frac{5x}{3}$$

$$8+4x=24-6x+25x$$

$$4x+6x-25x=24-8$$

$$-15x=16$$

$$x = -\frac{16}{15}$$

$$f) \frac{1}{2} \left(18 + \frac{5x}{3} \right) - \frac{4}{3} \left(\frac{1-x}{2} \right) = \frac{6x}{3}$$

$$\frac{8}{2} + \frac{5x}{6} = \frac{4-4x}{6} = \frac{6x}{3}$$

$$24+5x-4+4x=12x$$

$$5x+4x-12x=+4-24$$

$$-3x=-20$$

$$x = \frac{-20}{-3} = \frac{20}{3}$$

$$h) \frac{2}{3} \cdot \left[2 \cdot (x+1) - \frac{x+1}{2} \right] = 5 \left(\frac{x}{2} - \frac{2x-1}{6} \right)$$

$$\frac{2}{3} \cdot \left[2x+2 - \frac{x+1}{2} \right] = \frac{5x}{2} - \frac{10x-5}{6}$$

$$\frac{4x+4}{3} - \frac{2x+2}{6} = \frac{5x}{2} - \frac{10x-5}{6}$$

$$8x+8-2x-2=15x-10x+5$$

$$6x+6=5x+5$$

$$6x-5x=-6+5$$

$$x=-1$$

5

1º número $\rightarrow x$

2º número $\rightarrow \frac{x}{8}$

$$x + \frac{x}{8} = 36$$

$$8x+x=288$$

$$9x=288$$

$$x = \frac{288}{9} = 32$$

El primer número es 32
y el segundo 4

6

x: años pasaron.

	Hoy	Hace x años
Juan	50	50-x
Manuel	30	30-x

$$50-x=2 \cdot (30-x)$$

$$50-x=60-2x$$

$$-x+2x=60-50$$

$$x=10$$

Hace 10 años la edad del padre era el doble de la del hijo.

7

X: años pasaron.

	Edad Hoy	Edad en x años.	
Antonio	38	$38 + x$	$38 + x = 8 + x + 5 + x + 1 + x$
Hijo 1	8	$8 + x$	$38 + x = 14 + 3x$
Hijo 2	5	$5 + x$	$38 - 14 = 3x - x$
Hijo 3	1	$1 + x$	$24 = 2x$
			$x = \frac{24}{2} = 12$

Tienen que pasar 12 años.

8

a) $6x^2 = 0$

$$x^2 = \frac{0}{6}$$

$$x^2 = 0$$

$$x = \pm 0$$

$$x = 0$$

b) $x^2 - 25 = 0$

$$x^2 = 25$$

$$x = \pm \sqrt{25}$$

$$x = \pm 5$$

c) $x^2 - 2x = 0$

$$x(x - 2) = 0$$

$$\rightarrow x = 0$$

$$\rightarrow x - 2 = 0$$

$$x = 2$$

d) $5x^2 + 7x = 0$

$$x(5x + 7) = 0$$

$$\rightarrow x = 0$$

$$\rightarrow 5x + 7 = 0$$

$$5x = -7$$

$$x = -\frac{7}{5}$$

e) $9x^2 - 1 = 0$

$$9x^2 = 1$$

$$x^2 = \frac{1}{9}$$

$$x = \pm \sqrt{\frac{1}{9}}$$

$$x = \pm \frac{1}{3}$$

f) $25x^2 - 1 = 0$

$$25x^2 = 1$$

$$x^2 = \frac{1}{25}$$

$$x = \pm \sqrt{\frac{1}{25}}$$

$$x = \pm \frac{1}{5}$$

9 a) $x^2 + 3x - 10 = 0$

$$a = 1 \quad b = 3 \quad c = -10$$

$$x = \frac{-3 \pm \sqrt{3^2 - 4 \cdot 1 \cdot (-10)}}{2 \cdot 1} = \frac{-3 \pm \sqrt{9 + 40}}{2} = \frac{-3 \pm \sqrt{49}}{2} = \frac{-3 \pm 7}{2}$$

$$\rightarrow x = \frac{-3 - 7}{2} = -5$$

$$\rightarrow x = \frac{-3 + 7}{2} = 2$$

b) $x^2 + 2x - 24 = 0$ $a = 1 \quad b = 2 \quad c = -24$

$$x = \frac{-2 \pm \sqrt{2^2 - 4 \cdot 1 \cdot (-24)}}{2 \cdot 1} = \frac{-2 \pm \sqrt{4 + 96}}{2} = \frac{-2 \pm \sqrt{100}}{2} = \frac{-2 \pm 10}{2}$$

$$\rightarrow x = \frac{-2 - 10}{2} = -6$$

$$\rightarrow x = \frac{-2 + 10}{2} = 4$$

c) $3x^2 + x - 2 = 0$ $a = 3$ $b = 1$ $c = -2$

$$x = \frac{-1 \pm \sqrt{1^2 - 4 \cdot 3 \cdot (-2)}}{2 \cdot 3} = \frac{-1 \pm \sqrt{1 + 24}}{2} = \frac{-1 \pm \sqrt{25}}{2} = \frac{-1 \pm 5}{2}$$

$\nearrow x = \frac{-1-5}{2} = -3$
 $\searrow x = \frac{-1+5}{2} = 2$

d) $20x^2 + 10x - 30 = 0$ $a = 20$ $b = 10$ $c = -30$

$$x = \frac{-10 \pm \sqrt{10^2 - 4 \cdot 20 \cdot (-30)}}{2 \cdot 20} = \frac{-10 \pm \sqrt{100 + 2400}}{40} = \frac{-10 \pm \sqrt{2500}}{40} = \frac{-10 \pm 50}{40}$$

$\nearrow x = \frac{-10-50}{40} = \frac{-60}{40} = -\frac{6}{4} = -\frac{3}{2}$

$\searrow x = \frac{-10+50}{40} = \frac{40}{40} = 1$

10

a) $(x-3)(x-1) = 15$

$x^2 - 3x - x + 3 = 15 \Rightarrow x^2 - 4x + 3 - 15 = 0 \Rightarrow x^2 - 4x - 12 = 0$ $a = 1$ $b = -4$ $c = -12$

$$x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4 \cdot 1 \cdot (-12)}}{2 \cdot 1} = \frac{4 \pm \sqrt{16 + 48}}{2} = \frac{4 \pm \sqrt{64}}{2} = \frac{4 \pm 8}{2}$$

$\nearrow x = \frac{4-8}{2} = -2$
 $\searrow x = \frac{4+8}{2} = 6$

b) $(x+1)(x-1) = 2(x+5) + 4$

$x^2 - 1 = 2x + 10 + 4 \Rightarrow x^2 - 2x - 1 - 10 - 4 = 0 \Rightarrow x^2 - 2x - 15 = 0$ $a = 1$ $b = -2$ $c = -15$

$$x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4 \cdot 1 \cdot (-15)}}{2 \cdot 1} = \frac{2 \pm \sqrt{4 + 60}}{2} = \frac{2 \pm \sqrt{64}}{2} = \frac{2 \pm 8}{2}$$

$\nearrow x = \frac{2-8}{2} = -3$
 $\searrow x = \frac{2+8}{2} = 5$

c) $x^2 + \frac{5x}{12} - \frac{1}{6} = 0 \Rightarrow 12x^2 + 5x - 2 = 0$ $a = 12$ $b = 5$ $c = -2$

$$x = \frac{-5 \pm \sqrt{5^2 - 4 \cdot 12 \cdot (-2)}}{2 \cdot 12} = \frac{-5 \pm \sqrt{25 + 96}}{24} = \frac{-5 \pm \sqrt{121}}{24} = \frac{-5 \pm 11}{24}$$

$\nearrow x = \frac{-5+11}{24} = \frac{6}{24} = \frac{1}{4}$
 $\searrow x = \frac{-5-11}{24} = \frac{-16}{24} = -\frac{2}{3}$

$$d) \frac{x^2 - 8x - 2}{3} = \frac{x^2 - 3x + 2}{2} \Rightarrow 2x^2 - 16x - 4 = 3x^2 - 9x + 6 \Rightarrow$$

$$\Rightarrow 2x^2 - 16x - 4 - 3x^2 + 9x - 6 = 0 \Rightarrow -x^2 - 7x - 10 = 0 \quad \begin{matrix} a = -1 \\ b = -7 \\ c = -10 \end{matrix}$$

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4 \cdot (-1) \cdot (-10)}}{2 \cdot (-1)} = \frac{7 \pm \sqrt{49 - 40}}{-2} = \frac{7 \pm \sqrt{9}}{-2} = \frac{7 \pm 3}{-2}$$

$$\nearrow x = \frac{7+3}{-2} = -5$$

$$\searrow x = \frac{7-3}{-2} = -2$$

$$e) \frac{x+1}{2} + \frac{10x^2+3x}{8} = \frac{x^2}{4} + \frac{5}{8} \Rightarrow 4x+4+10x^2+3x = 2x^2+5 \Rightarrow$$

$$\Rightarrow 4x+4+10x^2+3x-2x^2-5=0 \Rightarrow 8x^2+7x-1=0 \quad \begin{matrix} a=8 \\ b=7 \\ c=-1 \end{matrix}$$

$$x = \frac{-7 \pm \sqrt{7^2 - 4 \cdot 8 \cdot (-1)}}{2 \cdot 8} = \frac{-7 \pm \sqrt{49+32}}{16} = \frac{-7 \pm \sqrt{81}}{16} = \frac{-7 \pm 9}{16}$$

$$\nearrow x = \frac{-7-9}{16} = -1$$

$$\searrow x = \frac{-7+9}{16} = \frac{2}{16} = \frac{1}{8}$$