ECUACIONES, INECUACIONES Y SISTEMAS.

(2) a) $x^2-6x=11$; $x^2-6x+9=11+9$; $(x-3)^2=20$; $x-3=\pm\sqrt{20} \Rightarrow x=3\pm 2\sqrt{5}$

b) $x^2-2x=5$; $x^2-2x+1=5+1$; $(x-1)^2=6$; $x-1=\pm\sqrt{6} \Rightarrow x=1\pm\sqrt{6}$

c) $x^2+x=42$; $x^2+x+\frac{1}{4}=42+\frac{1}{4}$; $\left(x+\frac{1}{2}\right)^2=\frac{169}{4}$; $x+\frac{1}{2}=\pm\frac{13}{2} \Rightarrow$

$\Rightarrow x=-\frac{1}{2}\pm\frac{13}{2}=\begin{cases}6\\-7\end{cases}$

d) $2\left(x^2-2x-\frac{9}{2}\right)=0$; $x^2-2x=\frac{9}{2}$; $x^2-2x+1=\frac{9}{2}+1$; $(x-1)^2=\frac{11}{2}$; $x-1=\pm\sqrt{\frac{11}{2}}$

$\Rightarrow x=1\pm\frac{\sqrt{11}}{\sqrt{2}}=1\pm\frac{\sqrt{22}}{2}$

e) $x^2-4x=-12$; $x^2-4x+4=-12+4$; $(x-2)^2=-8$; $x-2=\pm\sqrt{-8}$ $\nexists$ sol. real.

f) $x^2+5x=84$; $x^2+5x+\frac{25}{4}=84+\frac{25}{4}$; $\left(x+\frac{5}{2}\right)^2=\frac{361}{4}$; $x+\frac{5}{2}=\pm\frac{19}{2} \Rightarrow$

$\Rightarrow x=-\frac{5}{2}\pm\frac{19}{2}=\begin{cases}7\\-12\end{cases}$

---

(3) a) $x(3x+2)=0 \Rightarrow \begin{cases}x=0\\x=-\frac{2}{3}\end{cases}$

b) $5x^2=20 \Rightarrow x^2=4 \Rightarrow x=\pm 2$

c) $3x^2-9x=30 \Rightarrow x^2-3x=10$; $x^2-3x+\frac{9}{4}=10+\frac{9}{4}$; $\left(x-\frac{3}{2}\right)^2=\frac{49}{4}$;

$x-\frac{3}{2}=\pm\frac{7}{2} \Rightarrow x=\frac{3}{2}\pm\frac{7}{2}=\begin{cases}5\\-2\end{cases}$

d) $10x^2+15x-8x-12=5$; $10x^2+7x-17=0 \Rightarrow x=\frac{-7\pm\sqrt{49+680}}{20}=\frac{-7\pm 27}{20}=$

$=\begin{cases}1\\-\frac{34}{20}=-\frac{17}{10}\end{cases}$

e) $7x-x^2=0 \Rightarrow x(7-x)=0 \nearrow \begin{matrix}x=0\\ \searrow x=7\end{matrix}$

$16x^2-9=0 \Rightarrow x^2=\frac{9}{16} \Rightarrow x=\pm\frac{3}{4}$

f) $4x^2+4x+1+6x+3=0 \Rightarrow 4x^2+10x+4=0 \Rightarrow 2x^2+5x+2=0 \Rightarrow$

$\Rightarrow x=\frac{-5\pm\sqrt{25-16}}{4}=\frac{-5\pm 3}{4}=\begin{cases}-2\\-\frac{1}{2}\end{cases}$

g) $x^4 - 13x^2 + 36 = 0$; $x^2 = t \Rightarrow t^2 - 13t + 36 = 0 \Rightarrow t = \dfrac{13 \pm \sqrt{169 - 144}}{2} = \begin{cases} 9 \\ 4 \end{cases}$

$t = 9 \Rightarrow x = \pm\sqrt{9} = \pm 3$

$t = 4 \Rightarrow x = \pm\sqrt{4} = \pm 2$

h) $x^2 + 1 = \dfrac{1}{x^2} \Rightarrow x^4 + x^2 = 1 \Rightarrow x^4 + x^2 - 1 = 0$; $x^2 = t \Rightarrow t^2 + t - 1 = 0$

$\Rightarrow t = \dfrac{-1 \pm \sqrt{1+4}}{2} = \dfrac{-1 \pm \sqrt{5}}{2} = \begin{cases} \frac{-1+\sqrt{5}}{2} = 0'6180339\ldots \Rightarrow x = \pm\, 0'786 \\ \frac{-1-\sqrt{5}}{2} = -1'6180339\ldots \Rightarrow \not\exists \text{ sol. real para } x. \end{cases}$

i) $\dfrac{9x+15}{12} - \dfrac{8x+20}{12} = \dfrac{x^2 - 6x + 5}{12} \Rightarrow 9x + 15 - 8x - 20 = x^2 - 6x + 5 \Rightarrow$

$\Rightarrow x^2 - 7x + 10 = 0 \Rightarrow x = \begin{cases} 2 \\ 5 \end{cases}$

j) $x^3 = t \Rightarrow t^2 - 28t + 27 = 0 \Rightarrow t = \begin{cases} 1 \Rightarrow x = \sqrt[3]{1} = 1 \\ 27 \Rightarrow x = \sqrt[3]{27} = 3 \end{cases}$

---

④ a) $\Delta = 0 \Rightarrow 64 - 4 \cdot 3 \cdot (-3k) = 0 \Rightarrow 64 + 36k = 0 \Rightarrow 36k = -64 \Rightarrow k = \dfrac{-64}{36} = \dfrac{-16}{9}$

b) $4(k+1)^2 - 4 \cdot (k-1) \cdot k = 0 \Rightarrow 4k^2 + 8k + 4 - 4k^2 + 4k = 0 \Rightarrow 12k = -4 \Rightarrow k = -\dfrac{1}{3}$

NO ○

a) $p^2 - 4 > 0 \Rightarrow p^2 > 4 \Rightarrow p > 2$ ó $p < -2 \Rightarrow (-\infty, 2) \cup (2, +\infty)$

b) $p^2 - 4 = 0 \Rightarrow p = \pm 2$

c) $p^2 - 4 < 0 \Rightarrow p \in (-2, 2)$

---

⑤ $16k^2 - 4 \cdot 4 \cdot 9 = 0 \Rightarrow 16k^2 - 144 = 0 \Rightarrow k^2 = 9 \Rightarrow k = 3$ (sólo la +)

---

⑦ $k^2 - 36 > 0 \Rightarrow k^2 > 36 \Rightarrow k > 6$ ó $k < -6$; luego:

$k \in (-\infty, -6) \cup (6, +\infty)$

---

⑧ a) $(k-3)^2 - 4k = 0 \Rightarrow k^2 - 6k + 9 - 4k = 0 \Rightarrow k^2 - 10k + 9 = 0 \Rightarrow k = \begin{cases} 1 \\ 9 \end{cases}$

b) $k = 1$ ó $k = 9$

---

(11) a) $28+2x = 16+x+8\sqrt{x} \Rightarrow 12+x = 8\sqrt{x} \Rightarrow (12+x)^2 = 64x \Rightarrow$

$\Rightarrow 144+24x+x^2 = 64x \Rightarrow x^2-40x+144=0 \Rightarrow x = \begin{cases} 4 \ \checkmark \\ 36 \ \checkmark \end{cases}$

b) $\sqrt{2x-1} = 6-\sqrt{x+4}$; $2x-1 = 36+x+4-12\sqrt{x+4} \Rightarrow$

$\Rightarrow x-41 = -12\sqrt{x+4} \Rightarrow (x-41)^2 = 144(x+4) \Rightarrow x^2-82x+1681 = 144x+576;$

$x^2-226x+1105=0 \Rightarrow x = \begin{cases} 5 \ \checkmark \\ \cancel{221} \text{ (No válida).} \end{cases}$

c) $1+\sqrt{2+\sqrt{x}} = 9 \Rightarrow \sqrt{2+\sqrt{x}} = 8 \Rightarrow 2+\sqrt{x} = 64 \Rightarrow \sqrt{x} = 62 \Rightarrow$

$\Rightarrow x = 62^2 \Rightarrow x = 3844 \ \checkmark$

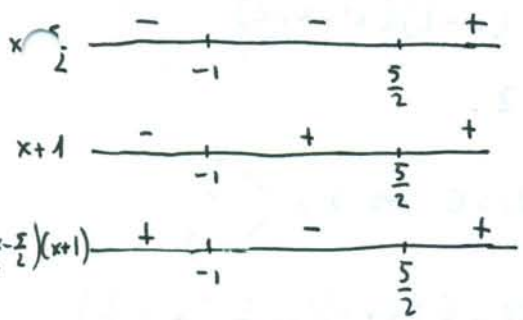
d) $2+\sqrt{x-5} = 13-x \Rightarrow \sqrt{x-5} = 11-x \Rightarrow x-5 = 121-22x+x^2 \Rightarrow$

$\Rightarrow x^2-23x+126=0 \Rightarrow x = \begin{cases} 9 \ \checkmark \\ \cancel{14} \text{ (No válida).} \end{cases}$

---

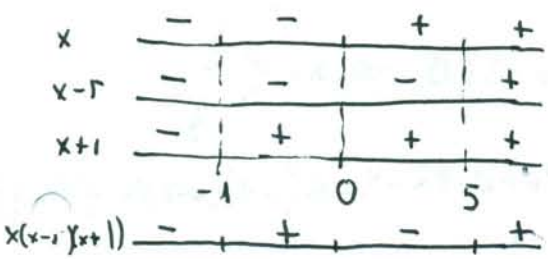
(15) a) $x^2-3x-1 < x^2+x-2 \Rightarrow -4x < -1 \Rightarrow 4x > 1 \Rightarrow x > \frac{1}{4}$

b) $-2x^2+3x+5 \geq 0 \Rightarrow 2x^2-3x-5 \leq 0 \Rightarrow 2\left(x-\frac{5}{2}\right)(x+1) \leq 0$



Sol: $x \in [-1, \frac{5}{2}]$

c) $x^3-4x^2-5x > 0 \Rightarrow x(x^2-4x-5) > 0 \Rightarrow x(x-5)(x+1) > 0$



Sol: $(-1, 0) \cup (5, +\infty)$

d) $x^2 - 5x + 4 \geq 0 \Rightarrow (x-1)(x-4) \geq 0$

	$-\infty$		1		4	$+\infty$
$x-1$		−	0	+		+
$x-4$		−		−	0	+
$(x-1)(x-4)$		+	0	−	0	+

Sol: $(-\infty, 1] \cup [4, +\infty)$.

---

(16) a) $\dfrac{x+4}{(x-3)(x+3)} < 0$

	$-\infty$		-4		-3		3	$+\infty$
$x+4$		−	0	+		+		+
$x-3$		−		−		−	0	+
$x+3$		−		−	0	+		+
$\dfrac{x+4}{(x-3)(x+3)}$		−	0	+	∄	−	∄	+

Sol: $(-\infty, -4) \cup (-3, 3)$

b) $\dfrac{2-x}{x+3} < 2 \Rightarrow \dfrac{2-x}{x+3} - 2 < 0 \Rightarrow \dfrac{2-x-2x-6}{x+3} < 0 \Rightarrow$

$\Rightarrow \dfrac{-3x-4}{x+3} < 0$

	$-\infty$		-3		$-\frac{4}{3}$	$+\infty$
$-3x-4$		+	∄	+	0	−
$x+3$		−	0	+		+
$\dfrac{-3x-4}{x+3}$		−	∄	+	0	−

Sol: $(-\infty, -3) \cup (-\frac{4}{3}, +\infty)$

---

(17) a)

	1	−1	0	−4
2		2	2	4
	1	1	2	0

$x^2 + x + 2 = 0 \Rightarrow$ ~~$\exists$~~ sol. real.

$x^3 - x^2 - 4 = (x-2)(x^2+x+2)$

Sol: $x = 2$.

b)

	6	1	−26	−21
−1		−6	5	21
	6	−5	−21	0

$6x^2 - 5x - 21 = 0 \Rightarrow x = \begin{cases} \frac{7}{3} \\ -\frac{3}{2} \end{cases}$

$6x^3 + x^2 - 26x - 21 = 6(x+1)(x-\frac{7}{3})(x+\frac{3}{2})$

Sol: $x = -1;\ \frac{7}{3};\ -\frac{3}{2}$

c)

	6	−17	7	8	−4
1		6	−11	−4	4
	6	−11	−4	4	0
2		12	2	−4	
	6	1	−2	0	

$6x^2 + x - 2 = 0 \Rightarrow x = \begin{cases} \frac{1}{2} \\ -\frac{2}{3} \end{cases}$

$6x^4 - 17x^3 + 7x^2 - 8x - 4 = 6(x-1)(x-2)(x-\frac{1}{2})(x+\frac{2}{3})$

Sol: $x = 1;\ 2;\ \frac{1}{2};\ -\frac{2}{3}$.

d)

	1	-2	-10	4	16
-2		-2	8	4	-16
	1	-4	-2	8	0
4		4	0	-8	
	1	0	-2	0	

$x^2-2=0 \Rightarrow x^2=2 \Rightarrow x=\pm\sqrt{2}$

$x^4-2x^3-10x^2+4x+16=(x+2)(x-4)(x-\sqrt{2})(x+\sqrt{2})$

Sol: $x=-2;\ 4;\ \sqrt{2};\ -\sqrt{2}$.

NO ○ $7x\cdot(7x+7)=8918 \Rightarrow$ ~~$x=13$~~ / -14

Luego, los números son: $7x=7\cdot 13=91$ y $7x+7=98$, o bien:

$7x=7\cdot(-14)=-98$ y $7x+7=-91$.

---

(20) $60+4'5x<600 \Rightarrow x<120$: por debajo de 120 h. de programación es más interesante la 1ª empresa.

---

(21) $S=\dfrac{x\cdot 3x}{2}=\dfrac{3x^2}{2}>37'5 \Rightarrow x>5$

---

(22) $x-3=\sqrt{x+3} \Rightarrow x=6$

---

(23) $(24+x)^2=(22+x)^2+(8+x)^2 \Rightarrow x=2$; luego las medidas son: 10, 24, 26.

---

(24) $x^3=(x-3)^3+(x-2)^3+(x-1)^3 \Rightarrow x=6$ (ec. polinómica de grado 3).

---

(25) $\left.\begin{array}{l}0'05A+0'10B=10\\0'03A+0'01B=3\end{array}\right\} \left.\begin{array}{l}5A+10B=1000\\3A+B=300\end{array}\right\} \left.\begin{array}{l}A+2B=200\\3A+B=300\end{array}\right\} \Rightarrow$

$\Rightarrow \begin{array}{r}A+2B=200\\-6A-2B=-600\\\hline -5A=-400\end{array}$ $\Rightarrow A=80$ g.

$B=300-3A \Rightarrow B=60$ g.

---

(29) x = nº ejemplares ; y = precio/ejemplar

$$\left.\begin{array}{l} x\cdot y = 252 \\ (x-4)(y+0'3) = 252 \end{array}\right\} \quad \begin{array}{l} x\cdot y = 252 \\ xy + 0'3x - 4y - 1'2 = 252 \end{array}$$

$\Rightarrow \cancel{252} + 0'3x - 4y - 1'2 = \cancel{252} \Rightarrow 0'3x - 4y = 1'2$; $y = \frac{252}{x} \Rightarrow$

$\Rightarrow 0'3x - 4\cdot\frac{252}{x} = 1'2 \Rightarrow 0'3x - \frac{1008}{x} = 1'2 \Rightarrow 0'3x^2 - 1008 = 1'2x$

$\Rightarrow 0'3x^2 - 1'2x - 1008 = 0 \Rightarrow x = \begin{cases} 60 \\ \cancel{-56} \text{ (sin sentido en el contexto del problema)} \end{cases}$

Luego: $x = 60$ ejemplares.

$y = \frac{252}{60} = 4'2$ € / ejemplar.

---

(30) $\left.\begin{array}{l} 240x = y \\ 300(x-3) = y \end{array}\right\}$ (siendo x = nº vecinos ; y = precio de la Sra).

Sol: $x = 15$ vecinos ; $y = 3600$ €.

---

(31) x = nº turistas ; y = coste/persona

$$\left.\begin{array}{l} x\cdot y = 36000 \\ (x-6)(y+225) = 0'95\cdot 36000 \end{array}\right\} \quad \begin{array}{l} x = 30 \text{ pers.} \\ y = 1200 \text{ €.} \end{array}$$

(Resolución similar al sistema del ejercicio ~~29~~).

---

(1) a) $\frac{3}{4}(2x-4) = x-5 \Rightarrow 3(2x-4) = 4(x-5) \Rightarrow 6x-12 = 4x-20$

$\Rightarrow 6x-4x = 12-20 \Rightarrow 2x = -8 \Rightarrow \boxed{x=-4}$

b) $\frac{x-1}{4} - \frac{x-5}{36} = \frac{x+5}{9} \Rightarrow \frac{9x-9}{36} - \frac{x-5}{36} = \frac{4x+20}{36} \Rightarrow$

$\Rightarrow 9x-9-x+5 = 4x+20 \Rightarrow 9x-x-4x = 20+9-5 \Rightarrow 4x = 24 \Rightarrow \boxed{x=6}$

c) $6\left(\frac{1}{8} - \frac{2x-3}{16}\right) - \frac{9}{4}x = \frac{9x-6}{8} \Rightarrow \frac{6}{8} - \frac{12x-18}{16} - \frac{9}{4}x = \frac{9x-6}{8} \Rightarrow$

$\Rightarrow 12 - 12x + 18 - 36x = 18x - 12 \Rightarrow -12x - 36x - 18x = -12 - 12 - 18$ (4)

$\Rightarrow -66x = -42 \Rightarrow x = \frac{42}{66} = \boxed{\frac{7}{11} = x}$

---

(3) k) $4x^4 - 37x^2 + 9 = 0 \Rightarrow x^2 = t \Rightarrow 4t^2 - 37t + 9 = 0 \Rightarrow$

$\Rightarrow t = \frac{37 \pm \sqrt{1369 - 4 \cdot 4 \cdot 9}}{2 \cdot 4} = \frac{37 \pm 35}{8} = \begin{cases} 9 \Rightarrow x = \pm\sqrt{9} = \pm 3 \\ \frac{1}{4} \Rightarrow x = \pm\sqrt{\frac{1}{4}} = \pm\frac{1}{2} \end{cases}$

l) $25x^2(x^2-1) + 11(x^4+1) - 7 = 0 \Rightarrow 25x^4 - 25x^2 + 11x^4 + 11 - 7 = 0$

$\Rightarrow 36x^4 - 25x^2 + 4 = 0 \Rightarrow x^2 = t \Rightarrow 36t^2 - 25t + 4 = 0 \Rightarrow$

$\Rightarrow t = \frac{25 \pm \sqrt{625 - 4 \cdot 36 \cdot 4}}{2 \cdot 36} = \frac{25 \pm 7}{72} = \begin{cases} \frac{32}{72} = \frac{4}{9} \Rightarrow x = \pm\sqrt{\frac{4}{9}} = \pm\frac{2}{3} \\ \frac{18}{72} = \frac{1}{4} \Rightarrow x = \pm\sqrt{\frac{1}{4}} = \pm\frac{1}{2} \end{cases}$

---

(6) $\Delta = 9 - 4K = 0 \Rightarrow 9 = 4K \Rightarrow K = \frac{9}{4}$.

---

(9) $\Delta = (K-1)^2 - 4 = 0 \Rightarrow (K-1)^2 = 4 \Rightarrow K - 1 = \pm 2 \Rightarrow K = \begin{cases} 1+2=3 \\ 1-2=-1 \end{cases}$

---

(10) $\Delta = 9 - 4K^2 > 0 \Rightarrow (3-2K)(3+2K) > 0 \Rightarrow K = \pm\frac{3}{2}$

	$-\infty$		$-\frac{3}{2}$		$\frac{3}{2}$		$+\infty$
$3-2K$	+	+	0	+	0	−	−
$3+2K$	−	−	0	+	+	+	+
$(3-2K)(3+2K)$	−	−	0	+	0	−	−

$\Rightarrow K \in \left(-\frac{3}{2}, \frac{3}{2}\right)$.

---

(11) e) $x - \sqrt{25 - x^2} = 1 \Rightarrow x - 1 = \sqrt{25 - x^2} \Rightarrow (x-1)^2 = 25 - x^2 \Rightarrow$

$\Rightarrow x^2 - 2x + 1 = 25 - x^2 \Rightarrow 2x^2 - 2x - 24 = 0 \Rightarrow x^2 - x - 12 = 0 \Rightarrow$

$\Rightarrow x = \begin{cases} -3 & \text{No válida.} \\ 4 & \checkmark \end{cases}$

f) $\sqrt{7+2x} - \sqrt{3+x} = 1 \Rightarrow \sqrt{7+2x} = 1 + \sqrt{3+x} \Rightarrow$

$\Rightarrow 7+2x = 1+3+x+2\sqrt{3+x} \Rightarrow 3+x = 2\sqrt{3+x} \Rightarrow$

$\Rightarrow 9+x^2+6x = 4(3+x) \Rightarrow 9+x^2+6x = 12+4x \Rightarrow x^2+2x-3=0$

$\Rightarrow x = \begin{cases} 1 & \checkmark \\ -3 & \checkmark \end{cases}$

---

(12) a) $\frac{2-x}{2} + \frac{4}{x+2} = 1 \Rightarrow \frac{(2-x)(x+2)+8}{2(x+2)} = 1 \Rightarrow$

$\Rightarrow (2-x)(2+x)+8 = 2(x+2) \Rightarrow 4 - x^2 + 8 = 2x + 4 \Rightarrow x^2+2x-8=0$

$\Rightarrow x = \begin{cases} 2 & \checkmark \\ -4 & \checkmark \end{cases}$

b) $x - \frac{9}{x} = \frac{3}{x} - 1 \Rightarrow \frac{x^2-9}{x} = \frac{3-x}{x} \Rightarrow x^3 - 9x = 3x - x^2$

$\Rightarrow x^3 + x^2 - 12x = 0 \Rightarrow x(x^2+x-12)=0 \Rightarrow x = \begin{cases} 0 & \text{(No válida)} \\ 3 & \checkmark \\ -4 & \checkmark \end{cases}$

---

(13) a) $\left.\begin{array}{l} 2x+3y=3 \\ 5x+7y=8 \end{array}\right| \begin{array}{l} 10x+15y=15 \\ -10x-14y=-16 \\ \hline \boxed{y=-1} \end{array}$

$2x-3=3$

$2x=6 \Rightarrow \boxed{x=3}$

b) $\left.\begin{array}{l} x+\frac{6}{y}=2 \\ 3x-y=-5 \end{array}\right| \begin{array}{l} y=3x+5 \\ x+\frac{6}{3x+5}=2 \Rightarrow \frac{x(3x+5)+6}{3x+5}=2 \end{array}$

$\Rightarrow 3x^2+5x+6 = 6x+10 \Rightarrow 3x^2-x-4=0 \Rightarrow x = \begin{cases} 4/3 \\ -1 \end{cases}$

Si $x = \frac{4}{3} \Rightarrow y = 3\cdot\frac{4}{3}+5 = 9$

Si $x = -1 \Rightarrow y = -3+5 = 2.$

c) $\left.\begin{matrix} x^2+y=3 \\ 2x-y=5 \end{matrix}\right\}$ $y=2x-5$

$x^2+2x-5=3 \Rightarrow x^2+2x-8=0 \Rightarrow x=\begin{cases}2\\-4\end{cases}$

Si $x=2 \Rightarrow y=4-5=-1$

Si $x=-4 \Rightarrow y=-8-5=-13$.

---

(14) $\frac{5}{6}(3-x)-\frac{1}{2}(x-4) \geq \frac{2x-3}{3}-x \Rightarrow \frac{15-5x}{6}-\frac{x-4}{2} \geq \frac{2x-3}{3}-x$

$\Rightarrow 15-5x-3x+12 \geq 4x-6-6x \Rightarrow -8x+27 \geq -2x-6 \Rightarrow -6x \geq -33$

$\Rightarrow 6x \leq 33 \Rightarrow x \leq \frac{33}{6}=\frac{11}{2} \Rightarrow x \in (-\infty, \frac{11}{2}]$

---

(18) $\left.\begin{matrix} \frac{2}{3}-x \leq 2x+\frac{1}{2} \\ \frac{x}{3}-\frac{2-x}{2} \geq x \end{matrix}\right\}$ $\left.\begin{matrix} 4-6x \leq 12x+3 \\ 2x-6+3x \geq 6x \end{matrix}\right\}$ $\left.\begin{matrix} -18x \leq -1 \\ -x \geq 6 \end{matrix}\right\}$ $\left.\begin{matrix} 18x \geq 1 \\ x \leq -6 \end{matrix}\right\}$

$\left.\begin{matrix} x \geq \frac{1}{18} \\ x \leq -6 \end{matrix}\right\}$

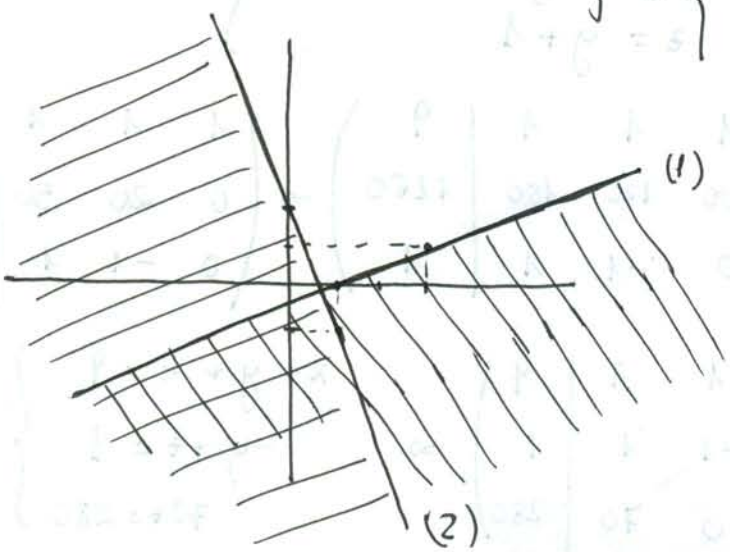
$\nexists$ solución (no hay puntos comunes)

---

(19) $\left.\begin{matrix} x-2y<1 \\ 3x+y \geq 2 \end{matrix}\right\}$

$\Rightarrow x-2y=1 \begin{cases} x=3;\ y=1 \Rightarrow (3,1) \\ y=0;\ x=1 \Rightarrow (1,0) \end{cases}$ (1)

$\Rightarrow 3x+y=2 \begin{cases} x=0;\ y=2 \Rightarrow (0,2) \\ y=-1;\ x=1 \Rightarrow (1,-1) \end{cases}$ (2)



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(26) $x \to$ edad de Ana
$y \to$ edad de Benito

$$\left.\begin{array}{l} 2x+y=44 \\ x+2=2(y+2) \end{array}\right\} \left.\begin{array}{l} 2x+y=44 \\ x+2=2y+4 \end{array}\right\}$$

$$\left.\begin{array}{l} 2x+y=44 \\ x-2y=2 \end{array}\right\} \begin{array}{l} 4x+2y=88 \\ x-2y=2 \\ \hline 5x=90 \end{array}$$

$x=\frac{90}{5}=18$; $y=44-2x=44-2\cdot 18=8$

---

(27)
$$\left.\begin{array}{l} \frac{x+3}{y+5}=\frac{2}{3} \\ \frac{x-2}{y-1}=\frac{1}{2} \end{array}\right\} \begin{array}{l} 3x+9=2y+10 \\ 2x-4=y-1 \end{array} \left\} \begin{array}{l} 3x-2y=1 \\ 2x-y=3 \end{array}\right\} \begin{array}{l} 3x-2y=1 \\ -4x+2y=-6 \\ \hline -x=-5 \end{array}$$

$\Rightarrow \boxed{x=5}$ $\quad y=2x-3 \Rightarrow \boxed{y=7}$ $\quad \Rightarrow \boxed{\frac{5}{7}}$

---

(28) $x \to$ nº respuestas correctas
$y \to$ nº respuestas equivocadas

$$\left.\begin{array}{l} x-0'5y=17'5 \\ y=30-(x+y) \end{array}\right\}$$

$$\left.\begin{array}{l} x-0'5y=17'5 \\ x+2y=30 \end{array}\right\} \begin{array}{l} -x+0'5y=-17'5 \\ x+2y=30 \\ \hline 2'5y=12'5 \end{array} \rightarrow \begin{array}{l} y=5 \\ x=30-2y=30-10=20 \end{array}$$

---

(32) $x \to$ nº Kg patatas
$y \to$ nº Kg manzanas
$z \to$ nº Kg naranjas.

$$\left.\begin{array}{l} x+y+z=9 \\ x+1'20y+1'50z=11'60 \\ z=y+1 \end{array}\right\}$$

$$\left.\begin{array}{l} x+y+z=9 \\ 100x+120y+150z=1160 \\ -y+z=1 \end{array}\right\} \quad \left(\begin{array}{ccc|c} 1 & 1 & 1 & 9 \\ 100 & 120 & 150 & 1160 \\ 0 & -1 & 1 & 1 \end{array}\right) \rightarrow \left(\begin{array}{ccc|c} 1 & 1 & 1 & 9 \\ 0 & 20 & 50 & 260 \\ 0 & -1 & 1 & 1 \end{array}\right)$$

$$\rightarrow \left(\begin{array}{ccc|c} 1 & 1 & 1 & 9 \\ 0 & -1 & 1 & 1 \\ 0 & 20 & 50 & 260 \end{array}\right) \rightarrow \left(\begin{array}{ccc|c} 1 & 1 & 1 & 9 \\ 0 & -1 & 1 & 1 \\ 0 & 0 & 70 & 280 \end{array}\right) \Rightarrow \left.\begin{array}{r} x+y+z=9 \\ -y+z=1 \\ 70z=280 \end{array}\right\}$$

$z = \frac{28\emptyset}{7\emptyset} = 4$ Kg de naranjas; $y = z - 1 = 4 - 1 = 3$ Kg de manzanas.

$x = 9 - y - z = 9 - 3 - 4 = 2$ Kg de patata

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(33) $x \to$ nº puntos 1ª pregunta
$y \to$ " " 2ª "
$z \to$ " " 3ª "

$$\left.\begin{array}{l} x+y+z=8 \\ y=x+2 \\ y=z-1 \end{array}\right\} \quad \left.\begin{array}{l} x+y+z=8 \\ -x+y=2 \\ y-z=-1 \end{array}\right\}$$

$$\left(\begin{array}{ccc|c} 1 & 1 & 1 & 8 \\ -1 & 1 & 0 & 2 \\ 0 & 1 & -1 & -1 \end{array}\right) \longrightarrow \left(\begin{array}{ccc|c} 1 & 1 & 1 & 8 \\ 0 & 2 & 1 & 10 \\ 0 & 1 & -1 & -1 \end{array}\right) \to \left(\begin{array}{ccc|c} 1 & 1 & 1 & 8 \\ 0 & 1 & -1 & -1 \\ 0 & 2 & 1 & 10 \end{array}\right) \to$$

$$\to \left(\begin{array}{ccc|c} 1 & 1 & 1 & 8 \\ 0 & 1 & -1 & -1 \\ 0 & 0 & 3 & 12 \end{array}\right) \Rightarrow \left.\begin{array}{r} x+y+z=8 \\ y-z=-1 \\ 3z=12 \end{array}\right\} \quad \boxed{z=4}$$

$y = -1 + z = \boxed{3 = y}$

$x = 8 - y - z = 8 - 3 - 4 = \boxed{1 = x}$

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(34) $x \to$ nº hombres
$y \to$ nº mujeres
$z \to$ nº niños

$$\left.\begin{array}{l} x+y+z=20 \\ x+y=3z \\ y+1=x \end{array}\right\} \quad \left.\begin{array}{l} x+y+z=20 \\ x+y-3z=0 \\ -x+y=-1 \end{array}\right\}$$

$$\left(\begin{array}{ccc|c} 1 & 1 & 1 & 20 \\ 1 & 1 & -3 & 0 \\ -1 & 1 & 0 & -1 \end{array}\right) \to \left(\begin{array}{ccc|c} 1 & 1 & 1 & 20 \\ 0 & 0 & -4 & -20 \\ 0 & 2 & 1 & 19 \end{array}\right) \to \left(\begin{array}{ccc|c} 1 & 1 & 1 & 20 \\ 0 & 2 & 1 & 19 \\ 0 & 0 & -4 & -20 \end{array}\right)$$

$$\left.\begin{array}{l} x+y+z=20 \\ 2y+z=19 \\ -4z=-20 \end{array}\right\} \quad \boxed{z=5}$$

$2y + 5 = 19 \to 2y = 14 \to \boxed{y=7}$

$x = 20 - y - z = 20 - 7 - 5 = \boxed{8 = x}$

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(35) $x \to$ nº alumnos 1º suc.
$y \to$ " " 2º suc.
$z \to$ " " 3º suc

$$\left.\begin{array}{l} x+y+z=352 \\ z=\frac{1}{4}x \\ x-y=2z-2 \end{array}\right\} \quad \left.\begin{array}{l} x+y+z=352 \\ x-4z=0 \\ x-y-2z=-2 \end{array}\right\}$$

$$\left(\begin{array}{ccc|c} 1 & 1 & 1 & 352 \\ 1 & 0 & -4 & 0 \\ 1 & -1 & -2 & -2 \end{array}\right) \to \left(\begin{array}{ccc|c} 1 & 1 & 1 & 352 \\ 0 & -1 & -5 & -352 \\ 0 & -2 & -3 & -354 \end{array}\right) \to \left(\begin{array}{ccc|c} 1 & 1 & 1 & 352 \\ 0 & -1 & -5 & -352 \\ 0 & 0 & 7 & 350 \end{array}\right)$$

$$\left.\begin{array}{l} x+y+z=352 \\ -y-5z=-352 \\ 7z=350 \end{array}\right\} \quad z=\frac{350}{7}=50$$

$$y=-5z+352=-5\cdot 50+352=102$$

$$x=352-y-z=352-102-50=200.$$

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(36) $x \to$ nº cajas de 250 g.
$y \to$ nº cajas de 500 g.
$z \to$ nº cajas de 1 Kg

$$\left.\begin{array}{l} x+y+z=60 \\ x=y+5 \\ 0'25x+0'5y+z=\frac{1250}{40} \end{array}\right\}$$

$$\left.\begin{array}{l} x+y+z=60 \\ x-y=5 \\ 25x+50y+100z=3125 \end{array}\right\} \to \left(\begin{array}{ccc|c} 1 & 1 & 1 & 60 \\ 1 & -1 & 0 & 5 \\ 25 & 50 & 100 & 3125 \end{array}\right) \to \left(\begin{array}{ccc|c} 1 & 1 & 1 & 60 \\ 0 & -2 & -1 & -55 \\ 0 & 25 & 75 & 1625 \end{array}\right)$$

$$\to \left(\begin{array}{ccc|c} 1 & 1 & 1 & 60 \\ 0 & -2 & -1 & -55 \\ 0 & 0 & 125 & 1875 \end{array}\right) \to \left.\begin{array}{l} x+y+z=60 \\ -2y-z=-55 \\ 125z=1875 \end{array}\right\}$$

$\boxed{z=15}$

$-2y=-55+15 \to \boxed{y=20}$

$x=60-y-z=\boxed{25=x}$