

## SISTEMES D'EQUACIONS

$$1. \begin{cases} 3x - 2y + z = 2 \\ x + y - 2z = 1 \\ 4x - 2y - 3z = -4 \end{cases}$$

(2, 3, 2)

$$2. \begin{cases} x + y + z = 6 \\ 2x - 3y + 8z = 20 \\ 3x + y - z = 2 \end{cases}$$

(1, 2, 3)

$$3. \begin{cases} 3x - 2y + 4z = -8 \\ 5x + 2y - z = 5 \\ x + y + z = 1 \end{cases}$$

(0, 2, -1)

$$4. \begin{cases} 3x + y - 2z = 2 \\ x + y - z = 1 \\ 2x + 2y - 3z = 1 \end{cases}$$

(1, 1, 1)

$$5. \begin{cases} x + y - z = 1 \\ 2x + 3y - z = 2 \\ 3x + y + 2z = 0 \end{cases}$$

(1/7, 3/7, -3/7)

$$6. \begin{cases} 3x - 2y + 28 = 0 \\ 5y - 6z = 37 \\ 2z + 5x = -19 \end{cases}$$

(-4, 8, 1/2)

$$7. \begin{cases} 3x - 2y + 6z = 11 \\ x + y - 2z = 3 \\ 4x - 2y + z = 9 \end{cases}$$

(3, 2, 1)

$$8. \begin{cases} 3x - 5y + z + 10 = 0 \\ 2x - 3y + 4z + 16 = 0 \\ -x + 2y - 7z - 22 = 0 \end{cases}$$

(-12/5, 0, -14/5)

$$9. \begin{cases} 2x - 3y = 4 \\ 3x + 2y = 19 \end{cases}$$

(5, 2)

$$10. \begin{cases} 5x - y - z = 40 \\ 2x + y + 4z = 39 \\ x + 5y - 3z = 36 \end{cases}$$

(10, 7, 3)

$$11. \begin{cases} 3x - 4y + 2z + 3 = 0 \\ 4x + 2y - 4z = 4 \\ 2x - 3y + z = -3 \end{cases}$$

(1, 2, 1)

$$12. \begin{cases} 2x + 3y + z = 4 \\ x - 2y + z + 2 = 0 \\ 8x + 5y + 5z = 1 \end{cases}$$

incomp.

$$13. \begin{cases} x + 2y + z = 1 \\ 2x - y - 4z = 0 \\ 3x + y - 3z = 1 \end{cases}$$

(x=[1+7z]/5, y=[2-6z]/5)

$$14. \begin{cases} x + 5y - 3z = 3 \\ 2x + y + 4z = 3 \\ 5x - y - z = 4 \end{cases}$$

$$15. \begin{cases} 2x + y - z + t = 3 \\ 3x + 2y + z - 2t = 2 \end{cases}$$

(x=4+3z-4t, y=-5-5z+7t)

$$16. \begin{cases} x + y + z = 2 \\ 2x + 3y + 5z = 11 \\ x - 5y + 6z = 29 \end{cases}$$

(1, -2, 3)

$$17. \begin{cases} 2x + 3y - z + t = 2 \\ x + 2z - 3t = 4 \\ 3x - 2y - 3z + 4t = 9 \\ -x + y - z - t + 7 = 0 \end{cases}$$

(3, -1, 2, 1)

$$18. \begin{cases} 3x - 2y = 4 \\ x + 3y = 2 \\ 2x - 5y = 2 \end{cases}$$

(16/11, 2/11)

$$19. \begin{cases} 2x + y - z = 15 \\ 5x - y + 5z = 16 \\ x + 4y + z = 20 \end{cases}$$

(5, 4, -1)

$$20. \begin{cases} x - y - z = 1 \\ 2x - 5y + 10z = 5 \\ 3x + 2y - 11z = 10 \end{cases}$$

(5, 3, 1)

$$21. \begin{cases} 4x + 2y - z = 5 \\ 5x - 3y + z = 2 \\ 2x - y + z = 3 \end{cases}$$

(1, 2, 3)

$$22. \begin{cases} 4x - 3y + 2z = 8 \\ 5x + y - z = 16 \\ 6x - 2y - 3z = 11 \end{cases}$$

(3, 2, 1)

$$23. \begin{cases} x + y + z = 0 \\ 7x + 2y - z = 5 \\ 3x + 5y + 4z = -2 \end{cases}$$

(1, -1, 0)

$$24. \begin{cases} x + 2y - z = 9 \\ 3x + y + 2z = 2 \\ 2x + z = 6 \end{cases}$$

(7, -3, -8)

$$25. \begin{cases} x + y - z = 1 \\ x + 2y + z = 2 \\ 2x - y + 3z + 1 = 0 \\ x + 10y - 5z = 10 \end{cases}$$

(0, 1, 0)

$$26. \begin{cases} 2x + 3y - z + 5 = 0 \\ x + 2y - z + 5 = 0 \\ 5x + y + z = 11 \end{cases}$$

(2, -2, 3)

$$27. \begin{cases} 5x - 3y - 2z + 7 = 0 \\ 2x + 4y - z = 7 \\ x + 3y + 2z = 13 \end{cases}$$

(1, 2, 3)

$$28. \left. \begin{array}{l} x + y - 9z = 16 \\ x + 2y - 3z = 12 \\ x - 2y + z = 0 \end{array} \right\}$$

(5, 2, -1)

$$29. \left. \begin{array}{l} x + y + z = 50 \\ z = \frac{1}{3}y \\ x + 5y + 25z = 230 \end{array} \right\}$$

(30, 15, 5)

$$30. \left. \begin{array}{l} 3x - 2y = 4 \\ x + 3y = 2 \\ 2x - 5y = 2 \end{array} \right\}$$

(2/11, 16/11)

$$31. \left. \begin{array}{l} 3x + 2y = 1 \\ 2x - 3y = 2 \\ x + y = 0 \end{array} \right\}$$

incomp.

$$32. \left. \begin{array}{l} x + 2y + 3z = 1 \\ -y + z = 0 \\ 3y - z = 2 \\ x + 4y + 3z = 3 \end{array} \right\}$$

(-4, 1, 1)

$$33. \left. \begin{array}{l} 2x - 3y = 4 \\ 3x + 4y = 2 \\ 5x + y = 6 \\ 4x + 11y = 0 \end{array} \right\}$$

(22/17, -8/17)

$$34. \left. \begin{array}{l} 2x + 3y = 1 \\ 5y + 8z = 2 \\ 8z + 13x = 3 \end{array} \right\}$$

$$35. \left. \begin{array}{l} 3x - 5y + z = 4 \\ 2x - 3y + 5z = 3 \\ x - y + 9z = 2 \end{array} \right\}$$

$$36. \left. \begin{array}{l} x + y + z = 2 \\ 2x + 3y + 5z = 11 \\ x - 5y + 6z = 29 \end{array} \right\}$$

$$37. \left. \begin{array}{l} 2x + y - z = 15 \\ 5x - y + 5z = 16 \\ x + 4y + z = 20 \end{array} \right\}$$

$$38. \left. \begin{array}{l} x - 2y - 10z = 13 \\ 2x + y + 5z = 6 \\ 3x + 3y + z = 31 \end{array} \right\}$$

$$39. \left. \begin{array}{l} x + 2y - 3z = -16 \\ 3x + y - 2z = -10 \\ 2x - 3y + z = -4 \end{array} \right\}$$

$$40. \left. \begin{array}{l} 2x + y + z = 24 \\ x - 2y - z = 2 \\ 3x - 4y - 3z = 8 \end{array} \right\}$$

$$41. \left. \begin{array}{l} 5x - 4y + 3z = 28 \\ x + 5y + z = -2 \\ 2x - y + z = 8 \end{array} \right\}$$

$$42. \left. \begin{array}{l} x + y = 10 \\ x + z = 19 \\ y + z = 23 \end{array} \right\}$$

$$43. \left. \begin{array}{l} x + y = 11 \\ x + z = 101 \\ y + z = 110 \end{array} \right\}$$

$$44. \left. \begin{array}{l} x + \frac{y}{2} = 1 \\ y + \frac{z}{3} = 1 \\ z + \frac{x}{4} = 1 \end{array} \right\}$$

((16, 18, 21) / 25)

$$45. \left. \begin{array}{l} x + y - 2z + t = 1 \\ 2x + y + z - t = 2 \end{array} \right\}$$

$$46. \left. \begin{array}{l} 3x + 2y + z = 1 \\ x + 6y + z = 2 \\ x + 2y + 3z = 1 \end{array} \right\}$$

$$47. \left. \begin{array}{l} 2x + 5y + 3z = 17 \\ 3x - 2y - z = 12 \\ 5x + 3y - 2z = 18 \end{array} \right\}$$

$$48. \left. \begin{array}{l} x - 2y - 10z = 13 \\ 2x + y + 5z = 6 \\ 3x + 3y + z = 31 \end{array} \right\}$$

$$49. \left. \begin{array}{l} x + 2y - 3z = -16 \\ 3x + y - 2z = -10 \\ 2x - 3y + z = -4 \end{array} \right\}$$

$$50. \left. \begin{array}{l} 5x - 4y + 3z = 28 \\ x + 5y + z = -2 \\ 2x - y + z = 8 \end{array} \right\}$$

$$51. \left. \begin{array}{l} 2x + y + z = 24 \\ x - 2y - z = 2 \\ 3x - 4y - 3z = 8 \end{array} \right\}$$

$$52. \left. \begin{array}{l} x + y + z = 6 \\ x + y - z = 5 \end{array} \right\}$$

$$53. \left. \begin{array}{l} 3x - 2y = 4 \\ x + 3y = 2 \\ 2x - 5y = 2 \end{array} \right\}$$

$$54. \left. \begin{array}{l} 3x + 4y = 5 \\ x - 3y = 2 \\ 7x + 5y = 12 \end{array} \right\}$$

$$55. \begin{cases} 2x - 3y = 6 \\ 4x + y = -2 \\ 6x - 2y = 3 \end{cases}$$

$$56. \begin{cases} 3x + 2y = 9 \\ 2x - y = -1 \\ 5x + y = 8 \\ 6x + 4y = 18 \end{cases}$$

$$57. \begin{cases} 2x - 3y + 4z - t = 3 \\ 4x + y - 3z + 2t = 5 \\ 2x - 4y - 7z + 3t = 2 \end{cases}$$

$$58. \begin{cases} x - y + 2z = 1 \\ 2x - y + z = 0 \\ 5x - y + 4z = 1 \end{cases}$$

$$59. \begin{cases} 2x + 3y - z = 1 \\ x + y + z = 0 \end{cases}$$

$$60. \begin{cases} 3x - 2y + z = 4 \\ x + 4y - z = 2 \\ 5x + 6y - z = 8 \\ x - 10y + 3z = 0 \end{cases}$$

$$61. \begin{cases} 2x - y + z = 2 \\ 3x + 2y - 4z = 1 \\ x + 3y - 5z = 4 \end{cases}$$

$$62. \begin{cases} 5x + 2y = 1 \\ -x - y = 1 \\ 4x + y = 2 \\ 2x + y = 0 \end{cases}$$

$$63. \begin{cases} x + y = 38 \\ y + z = 50 \\ z + x = 54 \end{cases}$$

$$64. \begin{cases} x - y = -1 \\ x - z = -2 \\ x + z = 13 \end{cases}$$

$$65. \begin{cases} 5x - 3z = 74 \\ 7x + 3y - 2z = 159 \\ x - 2y = 13 \end{cases}$$

$$66. \begin{cases} x + ay - bz = 9 \\ 3x - ay + cz = -2 \\ ax - by - cz = -5 \end{cases}$$

$x=1, y=2, z=-1.$

Calculeu el valor de a, b i c perquè la solució d'aquest sistema sigui

$$67. \begin{cases} 2x + 3y = 0 \\ 4x + 6y = 0 \end{cases}$$

$(x=3y/2)$

$$68. \begin{cases} 2x - 3y + z = 0 \\ 3x + 2y - z = 0 \\ x - 5y - 2z = 0 \end{cases}$$

$(x=y=z=0)$

$$69. \begin{cases} 2x - 3y + 7z = 0 \\ x - y - 3z = 0 \\ 3x - 4y + 4z = 0 \end{cases}$$

$(x=16z, y=13z)$

$$70. \begin{cases} x + 2y - z = 0 \\ 3x + 4y - 3z = 0 \\ 2x + 2y - 2z = 0 \end{cases}$$

$(x=z, y=0)$

$$71. \begin{cases} x + y + z = 0 \\ 2x - y + 3z = 0 \\ 5x - y + 7z = 0 \end{cases}$$

$(x=[4/3]z, y=-[2/3]z)$

$$72. \begin{cases} 3x + 2y - 5z = 0 \\ 2x - y - z = 0 \\ x - 3y + 2z = 0 \end{cases}$$

$$73. \begin{cases} x + y - z = 0 \\ 3x + 2y + z = 0 \\ 2x - y + 3z = 0 \end{cases}$$

$$74. \begin{cases} 4x + 3y + 5z = 0 \\ 3x + 4y + 2z = 0 \\ x - y + 3z = 0 \end{cases}$$

$$75. \begin{cases} 7x - 2y + 6z = 0 \\ 33x - 11y + 28z = 0 \\ 11y + 2z = 0 \end{cases}$$

$$76. \begin{cases} x + y - z = 0 \\ 3x + 2y + 5z = 0 \\ 6x - 3y - 4z = 0 \end{cases}$$

$$77. \begin{cases} x + 2y - z = 0 \\ 4x + y + 2z = 0 \\ 10x - y + 8z = 0 \end{cases}$$

$$\text{I. } \left. \begin{array}{l} 3x - y + z + t = 0 \\ 2x + y + z + 2t = -2 \\ 3x - y + z + 4t = -3 \\ 5x + y - z + t = 6 \end{array} \right\}$$

$$\text{II. } \left. \begin{array}{l} x + 2y + z + t = 0 \\ 2x - y + z - t = 1 \\ -x + 3y + z + t = 0 \\ 3x + 2y + 2z - 3t = 12 \end{array} \right\}$$

$$\text{III. } \left. \begin{array}{l} x + y + z + t = 0 \\ x - y + z - t = 12 \\ x + y - z + t = -8 \\ x - y - z + t = -6 \end{array} \right\}$$

$$\text{IV. } \left. \begin{array}{l} 2x + 2y + z + t = 0 \\ 2x - y + z + t = 0 \\ -x + 3y + 2z + 3t = 0 \\ 3x + 2y + 2z - 3t = 0 \end{array} \right\}$$

$$\text{VI. } \left. \begin{array}{l} 3x - y + z + t = 10 \\ 2x + y + 3z + t = -2 \\ 2x - 2y + 2z + 4t = 22 \end{array} \right\}$$

- Discussiu els següents sistemes per als diferents valors del paràmetre.

$$\text{A. } \left. \begin{array}{l} x + 2y = 10 \\ x - my = 5 \end{array} \right\}$$

$$(m = -2 : \text{incom.}) \\ m \neq -2 : x = (10 + 10m) / (2 + m) \\ y = 5 / (2 + m)$$

$$\text{B. } \left. \begin{array}{l} x - 3y + 5z = 2 \\ 2x - 4y + 2z = 1 \\ 5x - 11y + 9z = k \end{array} \right\}$$

$$(k = 4 : x = 7z - 5/2 \\ y = 4z - 3/2 \\ k \neq 4 : \text{incom.})$$

$$\text{C. } \left. \begin{array}{l} x + y + z = 0 \\ cy + z = 2 \\ y + z = d \end{array} \right\}$$

$$(c = 1, d = 2 : \text{com ind}) \\ c = 1, d \neq 2 : \text{incom} \\ c \neq 1, d \neq 2 : x = (dc - d) / (1 - c) \\ y = (d - 2) / (1 - c) \\ z = (2 - dc) / (1 - c)$$

$$\text{D. } \left. \begin{array}{l} x + ay + z = a + 1 \\ (a + 1)x + y - az = 0 \\ 2x + y - z = 1 - a \end{array} \right\}$$

$$(a = 2 : \text{incom}) \\ a = 1 : x = -2 + 2z \\ y = 4 - 3z \\ a \neq 1, a \neq 2 : x = 2(a + 1) \\ y = 3(a + 2/3) / (a - 2) \\ z = -a(a + 2) / (a - 2)$$

$$\text{E. } \left. \begin{array}{l} 2x - 3y + z = 0 \\ x - ay - 3z = 0 \\ 5x + 2y - z = 0 \end{array} \right\}$$

$$(a = -8 : x = 1/7y \\ z = 19/7y \\ a \neq -8 : x = y = z = 0)$$

$$\text{F. } \left. \begin{array}{l} 2x - 3y - z = 2 \\ x + 2y - 3z = 4 \\ x - 2y - z = 3 \\ kx - 2y + 2z = 1 \end{array} \right\}$$

$$(k = -2 : x = -13/6 \\ y = -7/6 \\ z = -17/6 \\ k \neq -2 : \text{incom})$$

$$\text{78. } \left. \begin{array}{l} x - 2y = 4 \\ 3x + 5y = 1 \\ 4x - y = b \end{array} \right\}$$

$$(b = 9 : x = 2, y = -1 \\ b \neq 9 : \text{incompatible})$$

$$\text{79. } \left. \begin{array}{l} 3x - 2y = 4 \\ 4x + ay = 3 \end{array} \right\}$$

$$(a = -8/3 : \text{incompatible}) \\ a \neq -8/3 : x = [4a + 6] / [3a + 8] \\ y = -7 / [3a + 8]$$

$$\text{80. } \left. \begin{array}{l} 5x - 11y + 9z = a \\ x - 3y + 5z = 2 \\ 2x - 4y + 2z = 1 \end{array} \right\}$$

$$(a = 4 : x = [-5 + 14z] / 2 \\ y = [-3 + 8z] / 2 \\ a \neq 4 : \text{incompatible})$$

$$\text{81. } \left. \begin{array}{l} x + 2y - z = 6 \\ 2x - y + z = 0 \\ 3x + 4y + az = 5 \end{array} \right\}$$

$$(a = -9/5 : \text{incompatible}) \\ a \neq -9/5 : x = [6a + 19] / [5a + 9] \\ y = [12a - 3] / [5a + 9] \\ z = -41 / [5a + 9]$$

$$82. \left. \begin{array}{l} mx - y = 1 \\ -2x + (m-1)y = 2 \end{array} \right\}$$

(m=2: incompatible  
m=-1: x=-1-y  
m≠2, m≠-1: x=1/[2-m]  
y=2/[2-m])

$$83. \left. \begin{array}{l} 3x - 5y = 12 \\ 5x + 2y = 9 \\ x - 12y = 15 \\ 11x - 8y = 33 \\ 4x + ay = 27 \end{array} \right\}$$

(a≠-17: incompatible  
a=-17: x=69/31  
y=-33/31)

$$84. \left. \begin{array}{l} tx + 3y = 2 \\ 3x + 2y = t \\ 2x + ty = 3 \end{array} \right\}$$

(ordre 2eq.prim.  
Δ=-t³+18t-35  
t=-5: x=-1  
y=-1  
t≠-5: incomp.)

$$86. \left. \begin{array}{l} X + Y - AZ = 1 \\ 3X - Y + 2Z = 5 \\ -2X + 6Y - 24Z = 3 \end{array} \right\}$$

(Δ=80-16a  
a=5: incompatible  
a≠5: x=[-33a+18]/[80-16a]  
y=[-19a-58]/[80-16a]  
z=-9/[20-4a])

$$88. \left. \begin{array}{l} 3x + my = 1 \\ 2x - y + mz = 1 \\ mx - 3y + 2z = 1 \end{array} \right\}$$

(m=1: x=[2-z]/5  
y=[3z-1]/5  
m≠1: x=[m+2]/[m²+m+6]  
y=[m-2]/[m²+m+6]  
z=m/[m²+m+6])

$$90. \left. \begin{array}{l} -6x - 6y + (11-a)z + 12 = 0 \\ 3x + (2-a)y - 6z + 3 = 0 \\ (2-a)x + 3y - 6z + 31 = 0 \end{array} \right\}$$

(Δ=a³-15a²-33a-17  
a=-1: incompatible  
a=17: x=[3-z]/12  
y=[1-z]/6  
a≠1, a≠17: x=21/[1+a]  
y=3/[1+a]  
z=12/[1+a])

$$92. \left. \begin{array}{l} ax + 4y = 7 \\ 3x - y + 5 = 0 \end{array} \right\}$$

$$93. \left. \begin{array}{l} x - 3y = 3 \\ ax + (a-1)y = 4 \end{array} \right\}$$

$$94. \left. \begin{array}{l} 2x + 3y = 8 \\ ax - y = 6 \\ 4x - by = 0 \end{array} \right\}$$

$$85. \left. \begin{array}{l} x + y + z = 0 \\ 2x + tz = 1 \\ x + ty = 1 \end{array} \right\}$$

(t=0: incompatible  
t=3: incompatible  
t≠0, t≠3: x=2/[3-t]  
y=[1-t]/[3t-t²]  
z=[1+t]/[t²-3t])

$$87. \left. \begin{array}{l} x + ay + z = a + 2 \\ x + y + az = -2a - 2 \\ ax + y + z = a \end{array} \right\}$$

(Δ=a³-3a+2  
a=1: incompatible  
a=-2: x=[3z+4]/3  
y=[3z+2]/3  
a≠1, a≠-2: x=a/[a-1]  
y=[a+2]/[a-1]  
z=[2a+2]/[1-a])

$$89. \left. \begin{array}{l} x + y + z = 1 \\ tx + 18y + 9z = 3 \\ x + 2ty + 3z = 1 \end{array} \right\}$$

(t=3: x=[5-3z]/5  
y=-2z/5  
t=15/2: incompatible  
t≠3, t≠15/2: x=12/[(15/2)-t]  
y=2/[(15/2)-t]  
z=[t-1/2]/[t-15/2])

$$95. \begin{cases} (t-1)x - ty = 2 \\ 6tx - (t-2)y = 1-t \end{cases}$$

$$96. \begin{cases} (1-t)x + (t+3)y = 3t+1 \\ 2(1-t)x + (t+6)y = t+2 \end{cases}$$

$$97. \begin{cases} 2x - y + 2z + 3t = 5 \\ 2x + ay + (a+3)z - 3at = 5 \end{cases}$$

$$98. \begin{cases} (1-a)x + (1+2a)y + 2(a+1)z = a \\ ax + ay = 2(a+1) \\ 2x + (a+1)y + (a-1)z = a^2 - 2a + 9 \end{cases}$$

$$99. \begin{cases} 2y - z = a \\ 3x - 2z = 11 \\ y + z = 6 \\ 2x + y - 4z = a \end{cases}$$

$$100. \begin{cases} 2x - y + z = 1 \\ 3x + ay + 2z = 3 \\ x + 6y + z = 2 \end{cases}$$

$$101. \begin{cases} 3x - 2y + 3z + 4t = 9 \\ 2x - y + 2z - t = 3 \\ 4x - ay + (a-2)z + 3t = 3 \end{cases}$$

$$102. \begin{cases} 3x + mz = 1 \\ 2x - y + mz = 1 \\ mx - 3y + 2z = 1 \end{cases}$$

$$103. \begin{cases} \sqrt{2}x + \sqrt{3}y + \sqrt{2}z = \sqrt{3} \\ \sqrt{3}x + \sqrt{2}y + \sqrt{3}z = \sqrt{2} \\ ax + ay + z = a^2 \end{cases}$$

$$104. \begin{cases} 2x + 3y - 4z = 0 \\ x - ay + 3z = 0 \\ 3x - ay - 2z = 0 \end{cases}$$

105. Escriviu un sistema d'equacions que tingui per solució única 2, 3 i -5.
106. Escriviu un sistema d'equacions que tingui per solució 1, 2 i 3, però que també tingui per solució -1, 3 i 5.
107. Escriviu un sistema que depengui d'un paràmetre. Si aquest és quatre llavors el sistema sigui incompatible, però si no és quatre llavors el sistema sigui compatible determinat.
108. Formeu un sistema de tres equacions que tingui per solució  $x=1$ ;  $y=2$  i  $z=3$ .
109. Formeu un sistema de dues equacions que tingui per solució  $x=1$ ;  $y=2$  i  $z=3$ .
110. Escriviu un sistema d'equacions que tingui per solució única 2, 3 i -5.
111. Escriviu un sistema d'equacions que tingui per solució 1, 2 i 3, però que també tingui per solució -1, 3 i 5.
112. Escriviu un sistema d'equacions que depengui d'un paràmetre. Si aquest és quatre, que llavors el sistema sigui incompatible, però si no és quatre, llavors que el sistema sigui compatible determinat.
113. Formeu un sistema d'equacions amb dos paràmetres, de tal manera que si un d'ells val 4, el sistema no sigui compatible, excepte quan l'altre valgui 3, i que, en aquest cas, el sistema sigui compatible indeterminat.