

## 4.4

$$\begin{array}{l}
 1) \quad (I) \quad a - 2b + c = 5 \\
 \quad \quad (II) \quad 2a + b - c = -1 \\
 \quad \quad (III) \quad 3a + 3b - 2c = -4
 \end{array}$$

$$A: -1(3a - b) = 4(-1)$$

$$B: 5a - b = 6$$

$$\frac{-3a + b = -4}{\phantom{000000}}$$

$$\frac{2a}{2} = \frac{2}{2}$$

$$a = 1$$

$$(1, -1, 2)$$

$$\begin{array}{l}
 (I) \quad a - 2b + c = 5 \\
 (II) \quad 2a + b - c = -1 \\
 A: \quad 3a - b = 4
 \end{array}$$

$$A: 3(1) - b = 4$$

$$3 - b = 4$$

$$\frac{-3 \quad -3}{\phantom{000000}}$$

$$\frac{-b}{-1} = \frac{1}{-1}$$

$$b = -1$$

$$\begin{array}{l}
 (I) \quad 2(a - 2b + c) = (5)2 \\
 (III) \quad 3a + 3b - 2c = -4 \\
 \quad \quad \quad \underline{2a - 4b + 2c = 10} \\
 B: \quad 5a - b = 6
 \end{array}$$

$$(I) \quad (1) - 2(-1) + c = 5$$

$$1 + 2 + c = 5$$

$$3 + c = 5$$

$$\frac{-3 \quad -3}{\phantom{000000}}$$

$$c = 2$$

$$\begin{array}{l}
 3) \quad (I) \quad 3x + y - z = 11 \\
 \quad \quad (II) \quad x + 3y = z + 13 \\
 \quad \quad (III) \quad x + y - 3z = 11
 \end{array}$$

$$(II) \quad x + 3y = z + 13$$

$$\frac{\phantom{000000} - z - z}{\phantom{000000}}$$

$$(II) \quad x + 3y - z = 13$$

$$A: -2x + 2y = 2$$

$$B: \frac{-8x - 2y = -22}{\phantom{000000}}$$

$$\frac{-\frac{10x}{-10} = -\frac{20}{-10}}{\phantom{000000}}$$

$$x = 2$$

$$(2, 3, -2)$$

$$(I) -1(3x + y - z) = 11(-1)$$

$$(II) \quad x + 3y - z = 13$$

$$\frac{-3x - y + z = -11}{\phantom{000000}}$$

$$A: -2x + 2y = 2$$

$$A: -2(2) + 2y = 2$$

$$-4 + 2y = 2$$

$$\frac{+4 \quad +4}{\phantom{000000}}$$

$$\frac{2y}{2} = \frac{6}{2}$$

$$y = 3$$

$$(I) -3(3x + y - z) = 11(-3)$$

$$(III) \quad x + y - 3z = 11$$

$$\frac{-9x - 3y + 3z = -33}{\phantom{000000}}$$

$$B: -8x - 2y = -22$$

$$(I) \quad 3(2) + 3 - z = 11$$

$$6 + 3 - z = 11$$

$$9 - z = 11$$

$$\frac{-9 \quad -9}{\phantom{000000}}$$

$$\frac{-z}{-1} = \frac{2}{-1}$$

$$z = -2$$

$$\begin{array}{l}
 5) \quad (I) \quad x + 6y + 3z = 4 \\
 \quad \quad (II) \quad 2x + y + 2z = 3 \\
 \quad \quad (III) \quad 3x - 2y + z = 0
 \end{array}$$

$$A: -5(10x + 6z) = 4(-5)$$

$$B: 6(7x + 5z) = 6(6)$$

$$-50x - 30z = -20$$

$$\frac{42x + 30z = 36}{\phantom{000000}}$$

$$\frac{-8x}{-8} = \frac{16}{-8}$$

$$x = -2$$

$$(I) \quad x + 6y + 3z = 4$$

$$(III) \quad 3(3x - 2y + z) = (0)3$$

$$x + 6y + 3z = 4$$

$$\frac{9x - 6y + 3z = 0}{\phantom{000000}}$$

$$A: 10x + 6z = 4$$

$$A: 10(-2) + 6z = 4$$

$$-20 + 6z = 4$$

$$\frac{+20 \quad +20}{\phantom{000000}}$$

$$\frac{6z}{6} = \frac{24}{6}$$

$$z = 4$$

$$(-2, -1, 4)$$

$$(II) \quad 2(2x + y + 2z) = (3)2$$

$$(III) \quad 3x - 2y + z = 0$$

$$\frac{4x + 2y + 4z = 6}{\phantom{000000}}$$

$$B: 7x + 5z = 6$$

$$(I) \quad (-2) + 6y + 3(4) = 4$$

$$-2 + 6y + 12 = 4$$

$$10 + 6y = 4$$

$$\frac{-10 \quad -10}{\phantom{000000}}$$

$$\frac{6y}{6} = \frac{-6}{6}$$

$$y = -1$$

$$\begin{aligned}
7) \quad (I) \quad & x + y + z = 6 \\
& (II) 2x - y - z = -3 \\
& (III) x - 2y + 3z = 6
\end{aligned}$$

$$\begin{aligned}
A: \quad & 3(-y - z) = (-5)3 \\
B: \quad & -2y + 3z = 5 \\
& \underline{-3y - 3z = -15} \\
& -\frac{5y}{-5} = -\frac{10}{-5} \\
& y = 2
\end{aligned}$$

(1, 2, 3)

$$\begin{aligned}
(I) \quad & x + y + z = 6 \\
(II) \quad & \underline{2x - y - z = -3} \\
& \frac{3x}{3} = \frac{3}{3} \\
& x = 1
\end{aligned}$$

$$\begin{aligned}
A: \quad & -(2) - z = -5 \\
& \underline{+2 \qquad +2} \\
& -\frac{z}{-1} = -\frac{3}{-1} \\
& z = 3
\end{aligned}$$

$$\begin{aligned}
(II) \quad & 2(1) - y - z = -3 \\
& 2 - y - z = -3 \\
& \underline{-2 \qquad -2} \\
A: \quad & -y - z = -5
\end{aligned}$$

$$\begin{aligned}
(III) \quad & 1 - 2y + 3z = 6 \\
& \underline{-1 \qquad -1} \\
B: \quad & -2y + 3z = 5
\end{aligned}$$

$$\begin{aligned}
9) \quad (I) \quad & x + y - z = 0 \\
& (II) x - y - z = 0 \\
& (III) x + y + 2z = 0
\end{aligned}$$

$$\begin{aligned}
A: \quad & (-1)(2x - 2z) = 0(-1) \\
B: \quad & 2x + z = 0 \\
& \underline{-2x + 2z = 0} \\
& \frac{3z}{0} = 0 \\
& x = 0
\end{aligned}$$

$$\begin{aligned}
(I) \quad & x + y - z = 0 \\
(II) \quad & \underline{x - y - z = 0} \\
A: \quad & 2x - 2z = 0 \\
& \frac{2x}{2} = \frac{0}{2} \\
& x = 0
\end{aligned}$$

(0, 0, 0)

$$\begin{aligned}
(II) \quad & x - y - z = 0 \\
(III) \quad & \underline{x + y + 2z = 0} \\
B: \quad & 2x + z = 0
\end{aligned}$$

$$\begin{aligned}
(I) \quad & 0 + y - 0 = 0 \\
& y = 0
\end{aligned}$$

$$\begin{aligned}
11) \quad (I) \quad & -2x + y - 3z = 1 \\
& (II) x - 4y + z = 6 \\
& (III) 4x + 16y + 4z = 24
\end{aligned}$$

$$\begin{aligned}
A: \quad & -2(-7y - z) = 13(-2) \\
B: \quad & 18y - 2z = 26 \\
& \underline{14y + 2z = -26} \\
& \frac{32y}{32} = \frac{0}{32} \\
& y = 0
\end{aligned}$$

$$\begin{aligned}
(I) \quad & -2x + y - 3z = 1 \\
(II) \quad & \underline{2(x - 4y + z) = 6(2)} \\
& -2x + y - 3z = 1 \\
& \underline{2x - 8y + 2z = 12} \\
A: \quad & -7y - z = 13
\end{aligned}$$

$$\begin{aligned}
A: \quad & -7(0) - z = 13 \\
& -\frac{z}{-1} = \frac{13}{-1} \\
& z = -13
\end{aligned}$$

(19, 0, -13)

$$\begin{aligned}
(I) \quad & 2(-2x + y - 3z) = (1)2 \\
(III) \quad & 4x + 16y + 4z = 24 \\
& \underline{-4x + 2y - 6z = 2} \\
B: \quad & 18y - 2z = 26
\end{aligned}$$

$$\begin{aligned}
(I) \quad & -2x + 0 - 3(-13) = 1 \\
& -2x + 39 = 1 \\
& \underline{-39 \quad -39} \\
& -\frac{2x}{-2} = -\frac{38}{-2} \\
& x = 19
\end{aligned}$$

$$\begin{aligned}
 13) \quad (I) & 2x + y - 3z = 0 \\
 (II) & x - 4y + z = 0 \\
 (III) & 4x + 16y + 4z = 0
 \end{aligned}$$

$$\begin{aligned}
 A: & 8(9x - 11z) = 0(8) \\
 B: & -9(8x + 8z) = 2(-9) \\
 & 72x - 88z = 0 \\
 & \underline{-72x - 72z = 0} \\
 & \frac{-160z}{-160} = 0 \\
 & z = 0
 \end{aligned}$$

$$\begin{aligned}
 (I) & 4(2x + y - 3z) = (0)4 \\
 (II) & x - 4y + z = 0 \\
 & \underline{-8x + 4y - 12z = 0} \\
 A: & 9x - 11z = 0
 \end{aligned}$$

$$\begin{aligned}
 A: & 9x - 11(0) = 0 \\
 & \frac{9x}{9} = \frac{0}{9} \\
 & x = 0
 \end{aligned}$$

$$\begin{aligned}
 (II) & 4(x - 4y + z) = (0)4 \\
 (III) & 4x + 16y + 4z = 0 \\
 & \underline{4x - 16y + 4z = 0} \\
 B: & 8x + 8z = 2
 \end{aligned}$$

$$\begin{aligned}
 (I) & 2(0) + y - 3(0) = 0 \\
 & y = 0
 \end{aligned}$$

(0, 0, 0)

$$\begin{aligned}
 15) \quad (I) & 3x + 2y + 2z = 3 \\
 (II) & x + 2y - z = 5 \\
 (III) & 2x - 4y + z = 0
 \end{aligned}$$

$$\begin{aligned}
 A: & 3(3x - 2y) = (5)5 \\
 B: & 5x + 6y = 13 \\
 & \underline{9x - 6y = 15} \\
 & \frac{14x}{14} = \frac{28}{14} \\
 & x = 2
 \end{aligned}$$

$(2, \frac{1}{2}, -2)$

$$\begin{aligned}
 (II) & x + 2y - z = 5 \\
 (III) & \underline{2x - 4y + z = 0} \\
 A: & 3x - 2y = 5
 \end{aligned}$$

$$\begin{aligned}
 A: & 3(2) - 2y = 5 \\
 & 6 - 2y = 5 \\
 & \underline{-6 \quad -6} \\
 & -\frac{2y}{-2} = -\frac{1}{-2} \\
 & y = \frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 (I) & 3x + 2y + 2z = 3 \\
 (II) & 2(x + 2y - z) = (5)2 \\
 & 3x + 2y + 2z = 3 \\
 & \underline{2x + 4y - 2z = 10} \\
 B: & 5x + 6x = 13
 \end{aligned}$$

$$\begin{aligned}
 (I) & 3(2) + 2\left(\frac{1}{2}\right) + 2z = 3 \\
 & 6 + 1 + 2z = 3 \\
 & 7 + 2z = 3 \\
 & \underline{-7 \quad -7} \\
 & \frac{2z}{2} = -\frac{4}{2} \\
 & z = -2
 \end{aligned}$$

$$\begin{aligned}
 17) \quad (I) & x - 2y + 3z = 4 \\
 (II) & 2x - y + z = -1 \\
 (III) & 4x + y + z = 1
 \end{aligned}$$

$$\begin{aligned}
 A: & 3(6x + 2y) = (0)3 \\
 B: & -2(9x + 5z) = 6(-2) \\
 & 18x + 6z = 0 \\
 & \underline{-18x - 10z = -12} \\
 & -\frac{4z}{-4} = -\frac{12}{-4} \\
 & z = 3
 \end{aligned}$$

(-1, 2, 3)

$$\begin{aligned}
 (II) & 2x - y + z = -1 \\
 (III) & \underline{4x + y + z = 1} \\
 A: & 6x + 2z = 0
 \end{aligned}$$

$$\begin{aligned}
 A: & 6x + 2(3) = 0 \\
 & 6x + 6 = 0 \\
 & \underline{-6 \quad -6} \\
 & \frac{6x}{6} = \frac{-6}{6} \\
 & x = -1
 \end{aligned}$$

$$\begin{aligned}
 (I) & x - 2y + 3z = 4 \\
 (III) & 2(4x + y + z) = (1)2 \\
 & x - 2y + 3z = 4 \\
 & \underline{8x + 2y + 2z = 2} \\
 B: & 9x + 5z = 6
 \end{aligned}$$

$$\begin{aligned}
 (I) & (-1) - 2y + 3(3) = 4 \\
 & 8 - 2y = 4 \\
 & \underline{-8 \quad -8} \\
 & \frac{-2y}{-2} = \frac{-4}{-2} \\
 & y = 2
 \end{aligned}$$

$$\begin{array}{l}
19) \text{ (I) } x - y + 2z = 0 \\
\text{ (II) } x - 2y + 3z = -1 \\
\text{ (III) } 2x - 2y + z = -3
\end{array}$$

$$\begin{array}{l}
\text{ (I) } (-1)(x - y + 2z) = 0(-1) \\
\text{ (II) } x - 2y + 3z = -1 \\
-x + y - 2z = 0 \\
\hline
\text{A: } -y + z = -1 \\
-y + (1) = -1 \\
\hline
-1 \quad -1 \\
-\frac{y}{-1} = -\frac{2}{-1} \\
y = 2
\end{array}$$

$$\begin{array}{l}
\text{ (I) } (-2)(x - y + 2z) = 0(-2) \\
\text{ (III) } 2x - 2y + z = -3 \\
-2x + 2y - 4z = 0 \\
\hline
-\frac{3z}{-3} = -\frac{3}{-3} \\
z = 1
\end{array}$$

$$\begin{array}{l}
\text{ (I) } x - (2) + 2(1) = 0 \\
x - 2 + 2 = 0 \\
x = 0
\end{array}$$

$$(0, 2, 1)$$

$$\begin{array}{l}
21) \text{ (I) } 4x - 3y + 2z = 40 \\
\text{ (II) } 5x + 9y - 7z = 47 \\
\text{ (III) } 9x + 8y - 3z = 97
\end{array}$$

$$\begin{array}{l}
\text{ (I) } 3(4x - 3y + 2z) = (40)3 \\
\text{ (II) } 5x + 9y - 7z = 47 \\
12x - 9y + 6z = 120 \\
\hline
\text{A: } 17x - z = 167
\end{array}$$

$$\begin{array}{l}
\text{ (I) } 8(4x - 3y + 2z) = (40)8 \\
\text{ (III) } 3(9x + 8y - 3z) = (97)3 \\
32x - 24y + 16z = 320 \\
27x + 24y - 9z = 291 \\
\hline
\text{B: } 59x + 7z = 611
\end{array}$$

$$\begin{array}{l}
\text{A: } 7(17x - z) = (167)7 \\
\text{B: } 59x + 7z = 611 \\
119x - 7z = 1169 \\
\hline
\frac{178x}{178} = \frac{1780}{178} \\
x = 10
\end{array}$$

$$\begin{array}{l}
\text{A: } 17(10) - z = 167 \\
170 - z = 167 \\
-170 \quad -170 \\
\hline
-\frac{z}{-1} = -\frac{3}{-1} \\
z = 3
\end{array}$$

$$\begin{array}{l}
\text{ (I) } 4(10) - 3y + 2(3) = 40 \\
46 - 3y = 40 \\
-46 \quad -46 \\
\hline
-\frac{3y}{-3} = -\frac{6}{-3} \\
y = 2
\end{array}$$

$$(10, 2, 3)$$

$$\begin{array}{l}
23) \text{ (I) } 3x + 3y - 2z = 13 \\
\text{ (II) } 6x + 2y - 5z = 13 \\
\text{ (III) } 5x - 2y - 5z = -1
\end{array}$$

$$\begin{array}{l}
\text{ (II) } 6x + 2y - 5z = 13 \\
\text{ (III) } 5x - 2y - 5z = -1 \\
\hline
\text{A: } 11x - 10z = 12
\end{array}$$

$$\begin{array}{l}
\text{ (I) } 2(3x + 3y - 2z) = (13)2 \\
\text{ (III) } 3(5x - 2y - 5z) = (-1)3 \\
6x + 6y - 4z = 26 \\
15x - 6y - 15z = -3 \\
\hline
\text{B: } 21x - 19z = 23
\end{array}$$

$$\begin{array}{l}
\text{A: } 19(11x - 10z) = (12)19 \\
\text{B: } (-10)(21x - 19z) = 23(-10) \\
209x - 190z = 228 \\
-210 + 190z = -230 \\
\hline
-\frac{x}{-1} = -\frac{2}{-1} \\
x = 2
\end{array}$$

$$\begin{array}{l}
\text{A: } 11(2) - 10z = 12 \\
22 - 10z = 12 \\
-22 \quad -22 \\
\hline
-\frac{10z}{-10} = -\frac{10}{-10} \\
z = 1
\end{array}$$

$$\begin{array}{l}
\text{ (I) } 3(2) + 3y - 2(1) = 13 \\
4 + 3y = 13 \\
-4 \quad -4 \\
\hline
\frac{3y}{3} = \frac{9}{3} \\
y = 3
\end{array}$$

$$(2, 3, 1)$$

$$\begin{array}{lll}
25) (I) 3x - 4y + 2z = 1 & (I) 3x - 4y + 2z = 1 & (II) 2x + 3y - 3z = -1 \\
(II) 2x + 3y - 3z = -1 & (III)(-3)(x + 10y - 8z) = 7(-3) & (III)(-2)(x + 10y - 8z) = 7(-2) \\
(III) x + 10y - 8z = 7 & 3x - 4y + 2z = 1 & 2x + 3y - 3z = -1 \\
& \underline{-3x - 30y + 24z = -21} & \underline{-2x - 20y + 16z = -14} \\
& A: -34y + 26z = -20 & B: -17y + 13z = -15
\end{array}$$

$$\begin{array}{l}
A: -34y + 26z = -20 \\
B: -2(-17y + 13z) = -15(-2) \\
-34y + 26z = -20 \\
\underline{34y - 26z = 30} \\
0 = 10
\end{array}$$

*false*  
*No solution  $\theta$*

$$\begin{array}{lll}
27) (I)m + 6n + 3p = 8 & (II)(-5)(3m + 4n) = (-3)(-5) & (II) 3m + 4(18) = -3 \\
(II) 3m + 4n = -3 & (III) 3(5m + 7n) = (1)3 & 3m + 72 = -3 \\
(III) 5m + 7n = 1 & -15m - 20n = 15 & \underline{-72 \quad -72} \\
& \underline{15m + 21n = 3} & \frac{3m}{3} = \frac{-75}{3} \\
& n = 18 & m = -25
\end{array}$$

$$\begin{array}{l}
(I)(-25) + 6(18) + 3p = 8 \\
-25 + 108 + 3p = 8 \\
83 + 3p = 8 \\
\underline{-83 \quad -83} \\
\frac{3p}{3} = \frac{-75}{3} \\
p = -25
\end{array}$$

$(-25, 18, -25)$

$$\begin{array}{l}
29) (I) -2w + 2x + 2y - 2z = -10 \\
(II) w + x + y + z = -5 \\
(III) 3w + 2x + 2y + 4z = -11 \\
(IV) w + 3x - 2y + 2z = -6
\end{array}$$

$$\begin{array}{l}
(I) -2w + 2x + 2y - 2z = -10 \\
(II)(-2)(w + x + y + z) = (-5)(-2) \\
-2w + 2x + 2y - 2z = -10 \\
\underline{-2w - 2x - 2y - 2z = 10} \\
A: -4w - 4z = 0
\end{array}$$

$$\begin{array}{l}
(I) (-1)(-2w + 2x + 2y - 2z) = (-10)(-1) \\
(III) 3w + 2x + 2y + 4z = -11 \\
\underline{2w - 2x - 2y + 2z = 10} \\
B: 5w + 6z = -1
\end{array}$$

$$\begin{array}{l}
A: 3(-4w - 4z) = 0(3) \\
B: 2(5w + 6z) = (-1)2 \\
-12w - 12z = 0 \\
\underline{10w + 12z = -2} \\
-\frac{2w}{-2} = \frac{-2}{-2} \\
w = 1
\end{array}$$

$$\begin{array}{l}
A: -4(1) - 4z = 0 \\
-4 - 4z = 0 \\
\underline{+4 \quad +4} \\
-\frac{4z}{-4} = \frac{4}{-4} \\
z = -1
\end{array}$$

$$\begin{aligned}
 (III) \quad & 3(1) + 2x + 2y + 4(-1) = -11 \\
 & 3 + 2x + 2y - 4 = -11 \\
 & 2x + 2y - 1 = -11 \\
 & \quad \quad \quad \underline{\quad +1 \quad +1 \quad} \\
 C: & 2x + 2y = -10
 \end{aligned}$$

$$\begin{aligned}
 (IV) \quad & (1) + 3x - 2y + 2(-1) = -6 \\
 & 1 + 3x - 2y - 2 = -6 \\
 & 3x - 2y - 1 = -6 \\
 & \quad \quad \quad \underline{\quad +1 \quad +1 \quad} \\
 D: & 3x - 2y = -5
 \end{aligned}$$

$$\begin{aligned}
 C: & 2x + 2y = -10 \\
 D: & 3x - 2y = -5 \\
 & \frac{5x}{5} = -\frac{15}{5} \\
 & x = -3
 \end{aligned}$$

$$\begin{aligned}
 C: & 2(-3) + 2y = -10 \\
 & -6 + 2y = -10 \\
 & \quad \quad \quad \underline{\quad +6 \quad +6 \quad} \\
 & \frac{2y}{2} = -\frac{4}{2} \\
 & y = -2
 \end{aligned}$$

$$(1, -3, -2, -1)$$

$$31) (I) \quad w + x + y + z = 2$$

$$(II) \quad w + 2x + 2y + 4z = 1$$

$$(III) \quad -w + x - y - z = -2$$

$$(IV) \quad -w + 3x + y - z = -2$$

$$(I) \quad w + x + y + z = 2$$

$$(III) \quad -w + x - y - z = -6$$

$$\begin{aligned}
 & \underline{\quad \quad \quad \frac{2x}{2} = -\frac{4}{2} \quad} \\
 & x = -2
 \end{aligned}$$

$$(III)(-1)(-w + x - y - z) = (-6)(-1)$$

$$(IV) \quad -w + 3x + y - z = -2$$

$$\underline{\quad \quad \quad w - x + y + z = 6 \quad}$$

$$2x + 2y = 4$$

$$2(-2) + 2y = 4$$

$$-4 + 2y = 4$$

$$+4 \quad \quad +4$$

$$\frac{2y}{2} = \frac{8}{2}$$

$$y = 4$$

$$(II) \quad w + 2x + 2y + 4z = 1$$

$$(IV) \quad -2 + 3x + y - z = -2$$

$$5x + 3y + 3z = -1$$

$$5(-2) + 3(4) + 3z = -1$$

$$-10 + 12 + 3z = -1$$

$$2 + 3z = -1$$

$$\underline{\quad -2 \quad \quad \quad -2 \quad}$$

$$\frac{3z}{3} = \frac{-3}{3}$$

$$z = -1$$

$$(I) \quad w + (-2) + (4) + (-1) = 2$$

$$w + 1 = 2$$

$$\underline{\quad -1 \quad -1 \quad}$$

$$w = 1$$

$$(1, -2, 4, -1)$$