$$\begin{cases} x_1 + x_2 + x_3 = 6 \\ x_1 + 2x_2 - x_3 = 2 \\ 2x_1 + x_2 + 2x_3 = 10 \end{cases}$$

Rewrite the system in matrix form and solve it by Gaussian Elimination (Gauss-Jordan elimination)

$$\left(\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 1 & 2 & -1 & 2 \\ 2 & 1 & 2 & 10 \end{array}\right)$$

$R_2 - 1\,R_1 \to R_2$ (multiply 1 row by 1 and subtract it from 2 row); $R_3 - 2\,R_1 \to R_3$ (multiply 1 row by 2 and subtract it from 3 row)

$$\left(\begin{array}{ccc|c} 1 & 1 & 1 & 6 \\ 0 & 1 & -2 & -4 \\ 0 & -1 & 0 & -2 \end{array}\right)$$

$R_1 - 1\,R_2 \to R_1$ (multiply 2 row by 1 and subtract it from 1 row); $R_3 + 1\,R_2 \to R_3$ (multiply 2 row by 1 and add it to 3 row)

$$\left(\begin{array}{ccc|c} 1 & 0 & 3 & 10 \\ 0 & 1 & -2 & -4 \\ 0 & 0 & -2 & -6 \end{array}\right)$$

$R_3 / -2 \to R_3$ (divide the 3 row by -2)

$$\left(\begin{array}{ccc|c} 1 & 0 & 3 & 10 \\ 0 & 1 & -2 & -4 \\ 0 & 0 & 1 & 3 \end{array}\right)$$

$R_1 - 3\,R_3 \to R_1$ (multiply 3 row by 3 and subtract it from 1 row); $R_2 + 2\,R_3 \to R_2$ (multiply 3 row by 2 and add it to 2 row)

$$\left(\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 2 \\ 0 & 0 & 1 & 3 \end{array}\right)$$

$$\begin{cases} x_1 = 1 \\ x_2 = 2 \\ x_3 = 3 \end{cases}$$