

$$\begin{array}{ll}
 \text{in} & \text{out} \\
 A: 150 + x_1 = x_2 & x_1 - x_2 = -150 \\
 B: x_2 = 240 + x_3 & x_2 - x_3 = 240 \\
 C: 100 + x_3 = x_4 & x_3 - x_4 = -100 \\
 D: x_4 = 80 + x_5 & x_4 - x_5 = 80 \\
 E: 160 + x_5 = x_6 & x_5 - x_6 = -160 \\
 F: x_6 = 90 + x_1 & x_6 - x_1 = 90
 \end{array}$$

$$\left[\begin{array}{cccccc|c}
 1 & -1 & 0 & 0 & 0 & 0 & -150 \\
 0 & 1 & -1 & 0 & 0 & 0 & 240 \\
 0 & 0 & 1 & -1 & 0 & 0 & -100 \\
 0 & 0 & 0 & 1 & -1 & 0 & 80 \\
 0 & 0 & 0 & 0 & 1 & -1 & -160 \\
 -1 & 0 & 0 & 0 & 0 & 1 & 90
 \end{array} \right]$$

MATLAB

$$\left[\begin{array}{cccccc|c}
 \textcircled{1} & 0 & 0 & 0 & 0 & -1 & -90 \\
 0 & \textcircled{1} & 0 & 0 & 0 & -1 & 60 \\
 0 & 0 & \textcircled{1} & 0 & 0 & -1 & -180 \\
 0 & 0 & 0 & \textcircled{1} & 0 & -1 & -80 \\
 0 & 0 & 0 & 0 & \textcircled{1} & -1 & -160 \\
 0 & 0 & 0 & 0 & 0 & 0 & 0
 \end{array} \right]$$

p p p p p f

```

A=[1 -1 0 0 0 0 -150 ;
    0 1 -1 0 0 0 240 ;
    0 0 1 -1 0 0 -100 ;
    0 0 0 1 -1 0 80 ;
    0 0 0 0 1 -1 -160 ;
    -1 0 0 0 0 1 90];
rref(A)

```

ans = 6x7

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1 0 0 0 0 0 -1 -90
0 1 0 0 0 0 -1 60
0 0 1 0 0 0 -1 -180
0 0 0 1 0 0 -1 -80
0 0 0 0 1 -1 -160
0 0 0 0 0 0 0 0

```

$$\left. \begin{aligned} x_1 - x_6 &= -90 \\ x_2 - x_6 &= 60 \\ x_3 - x_6 &= -180 \\ x_4 - x_6 &= -80 \\ x_5 - x_6 &= -160 \\ x_6 &\text{ free} \end{aligned} \right\} \Leftrightarrow$$

$$\boxed{\begin{aligned} x_1 &= x_6 - 90 \\ x_2 &= x_6 + 60 \\ x_3 &= x_6 - 180 \\ x_4 &= x_6 - 80 \\ x_5 &= x_6 - 160 \\ x_6 &\text{ free} \end{aligned}}$$

complete solution

$$\begin{aligned} AB \text{ min } x_1 &= 180 - 90 = 90 \text{ vph} \\ BC \text{ min } x_2 &= 180 + 60 = 240 \text{ vph} \\ CD \text{ min } x_3 &= 180 - 180 = 0 \text{ vph} \\ DE \text{ min } x_4 &= 180 - 80 = 100 \text{ vph} \\ EF \text{ min } x_5 &= 180 - 160 = 20 \text{ vph} \\ FA \text{ min } x_6 &= 180 \text{ vph} \end{aligned}$$

