

Let A be the quantities of onions, carrots and garlic cloves needed to make vegetable , minestrone and French onion soup respectively.

```
(% i8) A: matrix(
      [2,2,8],
      [3,1,0],
      [2,3,4]
    );
```

$$(A) \begin{pmatrix} 2 & 2 & 8 \\ 3 & 1 & 0 \\ 2 & 3 & 4 \end{pmatrix}$$

Let x=vegetable, y=minestone and z=French onion.

```
(% i18) B: matrix(
      x
      y
      z
    );
```

$$(B) \begin{pmatrix} x \\ y \\ z \end{pmatrix}$$

Let C be the quatities of the ingredients in the store cupboard.

```
(% i39) C: matrix(
      [40],
      [10],
      [25]
    );
```

$$(C) \begin{pmatrix} 40 \\ 10 \\ 25 \end{pmatrix}$$

By using these matrices to represent the 3 simultaneous equation, $2x+2y+8z=40$
 $3x+1y+0z=10$ $2x+3y+4z=25$ The inverse of A is

```
(% i43) A_inv:invert(A);
```

$$(A_inv) \begin{pmatrix} \frac{1}{10} & \frac{2}{5} & -\left(\frac{1}{5}\right) \\ -\left(\frac{3}{10}\right) & -\left(\frac{1}{5}\right) & \frac{3}{5} \\ \frac{7}{40} & -\left(\frac{1}{20}\right) & -\left(\frac{1}{10}\right) \end{pmatrix}$$

By multiply both sides of the equations by the inverse of A

(% i42) A_inv.C;

(% o42) $\begin{pmatrix} 3 \\ 1 \\ 4 \end{pmatrix}$

So we can mke 3 portions of vegetable soup, 1 minestone soup and 4 French onion soup.