

MUHAMMED ADEBAYO KASSIM PICKING METHODS (MAK METHODS)

PICK DIRECT METHODS

TWO EQUATION TWO UNKNOWNNS

$$X + 3Y = 5$$

$$X - Y = -1$$

$$X + 3Y - 5 = 0$$

$$X - Y + 11 = 0$$

Pick the first two column coefficient, ie first and second. Pick the next two column coefficients ie second and third and Pick the next two column coefficients ie third and first.

$$\Delta = \begin{vmatrix} 1 & 3 \\ 1 & -1 \end{vmatrix} = -1 - 3 = -4$$

$$\Delta_1 = \begin{vmatrix} 3 & -5 \\ -1 & 11 \end{vmatrix} = 33 - 5 = 28$$

$$\Delta_2 = \begin{vmatrix} -5 & 1 \\ 11 & 1 \end{vmatrix} = -5 - 11 = -16$$

$$X = \frac{\Delta_1}{\Delta} = \frac{28}{-4} = -7$$

$$Y = \frac{\Delta_2}{\Delta} = \frac{-16}{-4} = 4$$

THREE EQUATIONS THREE UNKNOWNNS

$$X - Y + Z = 12$$

$$2X - 3Y - 2Z = 7$$

$$X + Y + Z = 6$$

$$X - Y + Z - 12 = 0$$

$$2X - 3Y - 2Z - 7 = 0$$

$$X + Y + Z - 6 = 0$$

Pick the first three column coefficients ie first, second and third. Leave the first column coefficient and pick the next three column coefficients ie second, third and first. Leave the second column coefficient and pick the next three column coefficient ie third, fourth and first. Leave the third column coefficient and pick the next three column coefficient ie fourth, first and second.

$$\Delta = \begin{vmatrix} 1 & -1 & 1 \\ 2 & -3 & -2 \\ 1 & 1 & 1 \end{vmatrix}$$

$$= 1 \begin{vmatrix} -3 & -2 \\ 1 & 1 \end{vmatrix} - (-1) \begin{vmatrix} 2 & -2 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} 2 & -3 \\ 1 & 1 \end{vmatrix}$$

$$\begin{aligned}
&= 1(-3 + 2) + 1(2 + 2) + 1(2 + 3) \\
&= 1(-1) + 1(4) + 1(5) \\
&= -1 + 4 + 5 \\
&= 8
\end{aligned}$$

$$\begin{aligned}
\Delta_1 &= \begin{vmatrix} -1 & 1 & -12 \\ -3 & -2 & -7 \\ 1 & 1 & -6 \end{vmatrix} \\
&= -1 \begin{vmatrix} -2 & -7 \\ 1 & -6 \end{vmatrix} - 1 \begin{vmatrix} -3 & -7 \\ 1 & -6 \end{vmatrix} - 12 \begin{vmatrix} -3 & -2 \\ 1 & 1 \end{vmatrix} \\
&= -1(12 + 7) - 1(18 + 7) - 12(-3 + 2) \\
&= -1(19) - 1(25) - 12(-1) \\
&= -19 - 25 + 12 \\
&= -32
\end{aligned}$$

$$\begin{aligned}
\Delta_2 &= \begin{vmatrix} 1 & -12 & 1 \\ -2 & -7 & 2 \\ 1 & -6 & 1 \end{vmatrix} \\
&= 1 \begin{vmatrix} -7 & 2 \\ -6 & 1 \end{vmatrix} - (-12) \begin{vmatrix} -2 & 2 \\ 1 & 1 \end{vmatrix} + 1 \begin{vmatrix} -2 & -7 \\ 1 & -6 \end{vmatrix} \\
&= 1(-7 + 12) + 12(-2 - 2) + 1(12 + 7) \\
&= 1(5) + 12(-4) + 1(19) \\
&= 5 - 48 + 19 \\
&= -24
\end{aligned}$$

$$\begin{aligned}
\Delta_3 &= \begin{vmatrix} -12 & 1 & -1 \\ -7 & 2 & -3 \\ -6 & 1 & 1 \end{vmatrix} \\
&= -12 \begin{vmatrix} 2 & -3 \\ 1 & 1 \end{vmatrix} - 1 \begin{vmatrix} -7 & -3 \\ -6 & 1 \end{vmatrix} - 1 \begin{vmatrix} -7 & 2 \\ -6 & 1 \end{vmatrix} \\
&= -12(2 + 3) - 1(-7 - 18) - 1(-7 + 12) \\
&= -12(5) - 1(-25) - 1(-5) \\
&= -60 + 25 - 5 \\
&= -40
\end{aligned}$$

$$X = \frac{-\Delta_1}{\Delta} = \frac{-(-32)}{8} = \frac{32}{8} = 4$$

$$Y = \frac{+\Delta_2}{\Delta} = \frac{-24}{8} = -3$$

$$Z = \frac{-\Delta_3}{\Delta} = \frac{-(-40)}{8} = 5$$

FOUR EQUATION FOUR UNKNOWNNS

$$2a + 3b - 2c + 2d = 2$$

$$4a + 2b - 3c - d = 6$$

$$a - b + c - 2d = 7$$

$$3a + 2b + 4c - 2d = 5$$

$$2a + 3b - 2c + 2d - 2 = 0$$

$$4a + 2b - 3c - d - 6 = 0$$

$$a - b + c - 2d - 7 = 0$$

$$3a + 2b + c - d - 5 = 0$$

Pick the first four column coefficients ie first, second, third, fourth. Leave the first column coefficient and pick the next four column coefficients ie second, third, fourth and fifth. Leave the second column coefficient and pick the next four column coefficients ie third, fourth, fifth and first. Leave the third column coefficient and pick the next four column coefficients ie fourth, fifth, first and second. Leave the fourth column coefficient and pick the next four column coefficients ie fifth, first, second and third.

$$\begin{aligned}\Delta &= \begin{vmatrix} 2 & 3 & -2 & 2 \\ 4 & 2 & -3 & -1 \\ 1 & -1 & 4 & -2 \\ 3 & 2 & 1 & -1 \end{vmatrix} \\ &= 2 \begin{vmatrix} 2 & -3 & -1 \\ -1 & 4 & -2 \\ 2 & 1 & -1 \end{vmatrix} - 3 \begin{vmatrix} 4 & -3 & -1 \\ 1 & 4 & -2 \\ 3 & 1 & -1 \end{vmatrix} - 2 \begin{vmatrix} 4 & 2 & -1 \\ 1 & -1 & -2 \\ 3 & 2 & -1 \end{vmatrix} + 2 \begin{vmatrix} 4 & 2 & -3 \\ 1 & -1 & 4 \\ 3 & 2 & 1 \end{vmatrix} \\ &= 2(20) - 3(18) - 2(5) - 2(-29) \\ &= 40 - 54 - 10 + 58 \\ &= 34\end{aligned}$$

$$\begin{aligned}\Delta_1 &= \begin{vmatrix} 3 & -2 & 2 & -2 \\ 2 & -3 & -1 & -6 \\ -1 & 4 & -2 & -7 \\ 2 & 1 & -1 & -5 \end{vmatrix} \\ &= 3 \begin{vmatrix} -3 & -1 & -6 \\ 4 & -2 & -7 \\ 1 & -1 & -5 \end{vmatrix} - 2 \begin{vmatrix} 2 & -1 & -6 \\ -1 & -2 & -7 \\ 2 & 1 & -5 \end{vmatrix} + 2 \begin{vmatrix} 2 & -3 & -6 \\ -1 & 4 & -7 \\ 2 & 1 & -5 \end{vmatrix} + 2 \begin{vmatrix} 2 & -3 & -1 \\ -1 & 4 & -2 \\ 2 & 1 & -1 \end{vmatrix} \\ &= 3(-10) + 2(-5) + 2(85) + 2(20) \\ &= -30 - 10 + 170 + 40 \\ &= 170\end{aligned}$$

$$\begin{aligned}\Delta_2 &= \begin{vmatrix} -2 & 2 & -2 & 2 \\ -3 & -1 & -6 & 4 \\ 4 & -2 & -7 & 1 \\ 1 & -1 & -5 & 3 \end{vmatrix}\end{aligned}$$

$$\begin{aligned}
&= -2 \begin{vmatrix} -1 & -6 & 4 \\ -2 & -7 & 1 \\ -1 & -5 & 3 \end{vmatrix} - 2 \begin{vmatrix} -3 & -6 & 4 \\ 4 & -7 & 1 \\ 1 & -5 & 3 \end{vmatrix} - 2 \begin{vmatrix} -3 & -1 & 4 \\ 4 & -2 & 1 \\ 1 & -1 & 3 \end{vmatrix} - 2 \begin{vmatrix} -3 & -1 & -6 \\ 4 & -2 & -7 \\ 1 & -1 & -5 \end{vmatrix} \\
&= -2(-2) - 2(62) - 2(18) - 2(-10) \\
&= 4 - 124 - 36 + 20 \\
&= -136
\end{aligned}$$

$$\begin{aligned}
\Delta_3 &= \begin{vmatrix} 2 & -2 & 2 & 3 \\ -1 & -6 & 4 & 2 \\ -2 & -7 & 1 & -1 \\ -1 & -5 & 3 & 2 \end{vmatrix} \\
&= 2 \begin{vmatrix} -6 & 4 & 2 \\ -7 & 1 & -1 \\ -5 & 3 & 2 \end{vmatrix} + 2 \begin{vmatrix} -1 & 4 & 2 \\ -2 & 1 & -1 \\ -1 & 3 & 2 \end{vmatrix} + 2 \begin{vmatrix} -1 & -6 & 2 \\ -2 & -7 & -1 \\ -1 & -5 & 2 \end{vmatrix} - 3 \begin{vmatrix} -1 & -6 & 4 \\ -2 & -7 & 1 \\ -1 & -5 & 3 \end{vmatrix} \\
&= 2(14) + 2(5) + 2(-5) - 3(-2) \\
&= 28 + 10 - 10 + 6 \\
&= 34
\end{aligned}$$

$$\begin{aligned}
\Delta_4 &= \begin{vmatrix} -2 & 2 & 3 & -2 \\ -6 & 4 & 2 & -3 \\ -7 & 1 & -1 & 4 \\ -5 & 3 & 2 & 1 \end{vmatrix} \\
&= -2 \begin{vmatrix} 4 & 2 & -3 \\ 1 & -1 & 4 \\ 3 & 2 & 1 \end{vmatrix} - 2 \begin{vmatrix} -6 & 2 & -3 \\ -7 & -1 & 4 \\ -5 & 2 & 1 \end{vmatrix} + 3 \begin{vmatrix} -6 & 4 & -3 \\ -7 & 1 & 4 \\ -5 & 3 & 1 \end{vmatrix} + 2 \begin{vmatrix} -6 & 4 & 2 \\ -7 & 1 & -1 \\ -5 & 3 & 2 \end{vmatrix} \\
&= -2(-29) - 2(85) + 3(62) + 2(14) \\
&= 58 - 170 + 186 + 28 \\
&= 102
\end{aligned}$$

$$A = \frac{\Delta_1}{\Delta} = \frac{170}{34} = 5$$

$$B = \frac{\Delta_2}{\Delta} = \frac{-136}{34} = -4$$

$$C = \frac{\Delta_3}{\Delta} = \frac{34}{34} = 1$$

$$D = \frac{\Delta_4}{\Delta} = \frac{102}{34} = 3$$

Generally for two, four, six unknowns etc (even values) has a positive sign at the front of their solutions while three, five, seven unknowns have a negative – positive order sign in front of their solutions.

$$\text{Two unknowns, } X_1 = \frac{\Delta_1}{\Delta} \quad X_2 = \frac{\Delta_2}{\Delta}$$

$$\text{Four unknowns, } X_1 = -\frac{\Delta_1}{\Delta} \quad X_2 = \frac{\Delta_2}{\Delta} \quad X_3 = -\frac{\Delta_3}{\Delta}$$

$$\text{Five unknowns, } X_1 = \frac{-\Delta_1}{\Delta} \quad X_2 = \frac{\Delta_2}{\Delta} \quad X_3 = -\frac{\Delta_3}{\Delta} \quad X_4 = \frac{\Delta_4}{\Delta} \quad X_5 = \frac{-\Delta_5}{\Delta}$$

References

Kassim Adebayo, 2019, Matrices Picking Methods- Faster than you ever thought possible

https://www.amazon.com/gp/aw/d/B087637F7L/ref=mw_dp_img?is=1