Determinants of 2 x 2 and 3 x 3 Matrices

Determinant of a 2 x 2 Matrix

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} \rightarrow a \cdot d - c \cdot b$$

Example 1

Determinant of a 2 x 2 Matrix

$$\begin{vmatrix} 3 & 5 \\ 4 & 6 \end{vmatrix} \rightarrow 3 \cdot 6 - 4 \cdot 5$$

$$= -2$$

Example 2

Determinant of a 2 x 2 Matrix

$$\begin{vmatrix} -4 & 3 \\ 5 & 2 \end{vmatrix} \rightarrow -4 \cdot 2 - 5 \cdot 3$$

$$= -23$$

Example 3

Determinant of a 2 x 2 Matrix

$$\begin{vmatrix} 8 & 4 \\ 6 & 5 \end{vmatrix} \rightarrow 8 \cdot 5 - 6 \cdot 4$$

$$= 16$$

Example 4

Determinant of a 3 x 3 Matrix

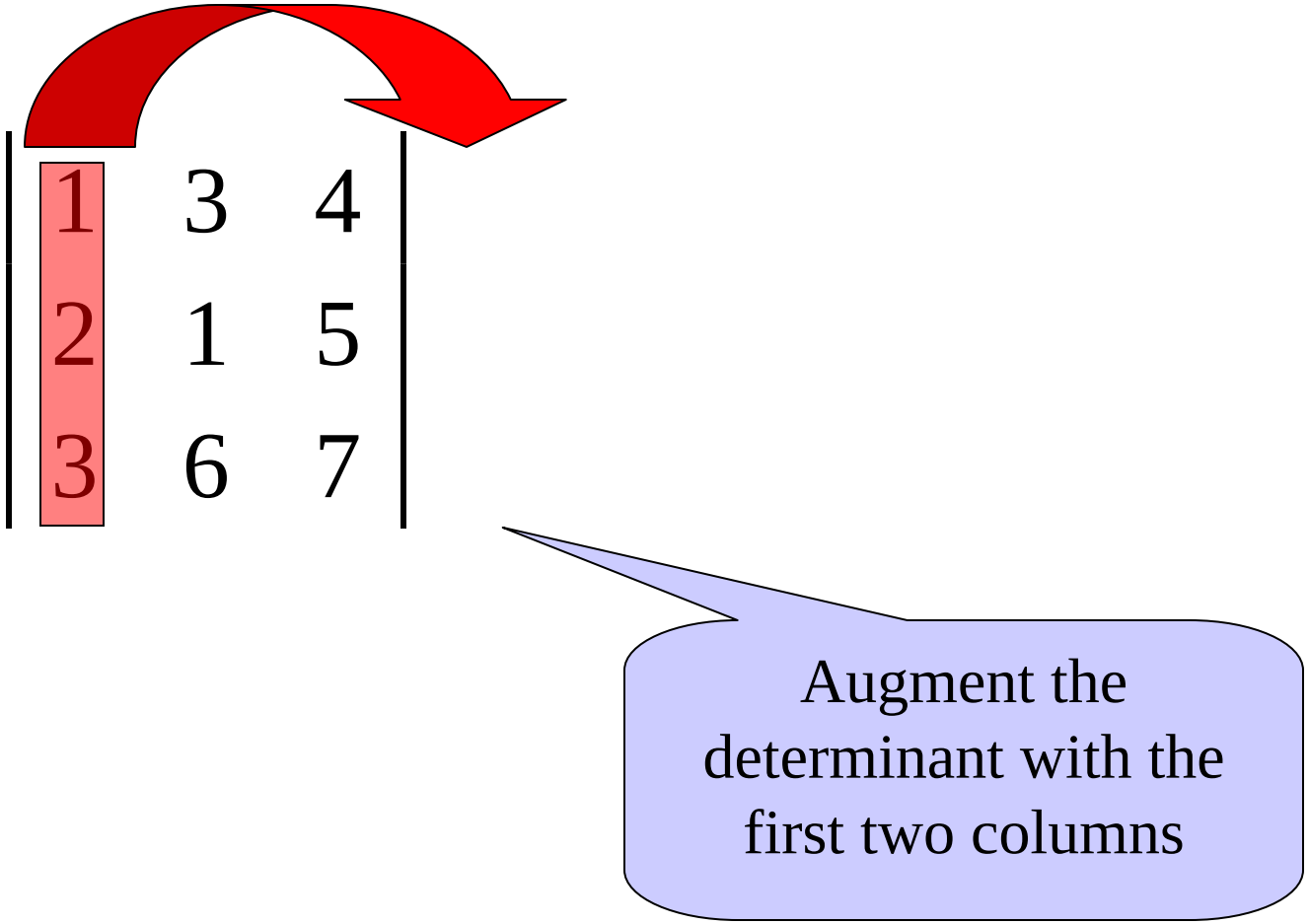
$$\begin{vmatrix} 1 & 3 & 4 \\ 2 & 1 & 5 \\ 3 & 6 & 7 \end{vmatrix}$$

Determinant of a 3 x 3 Matrix

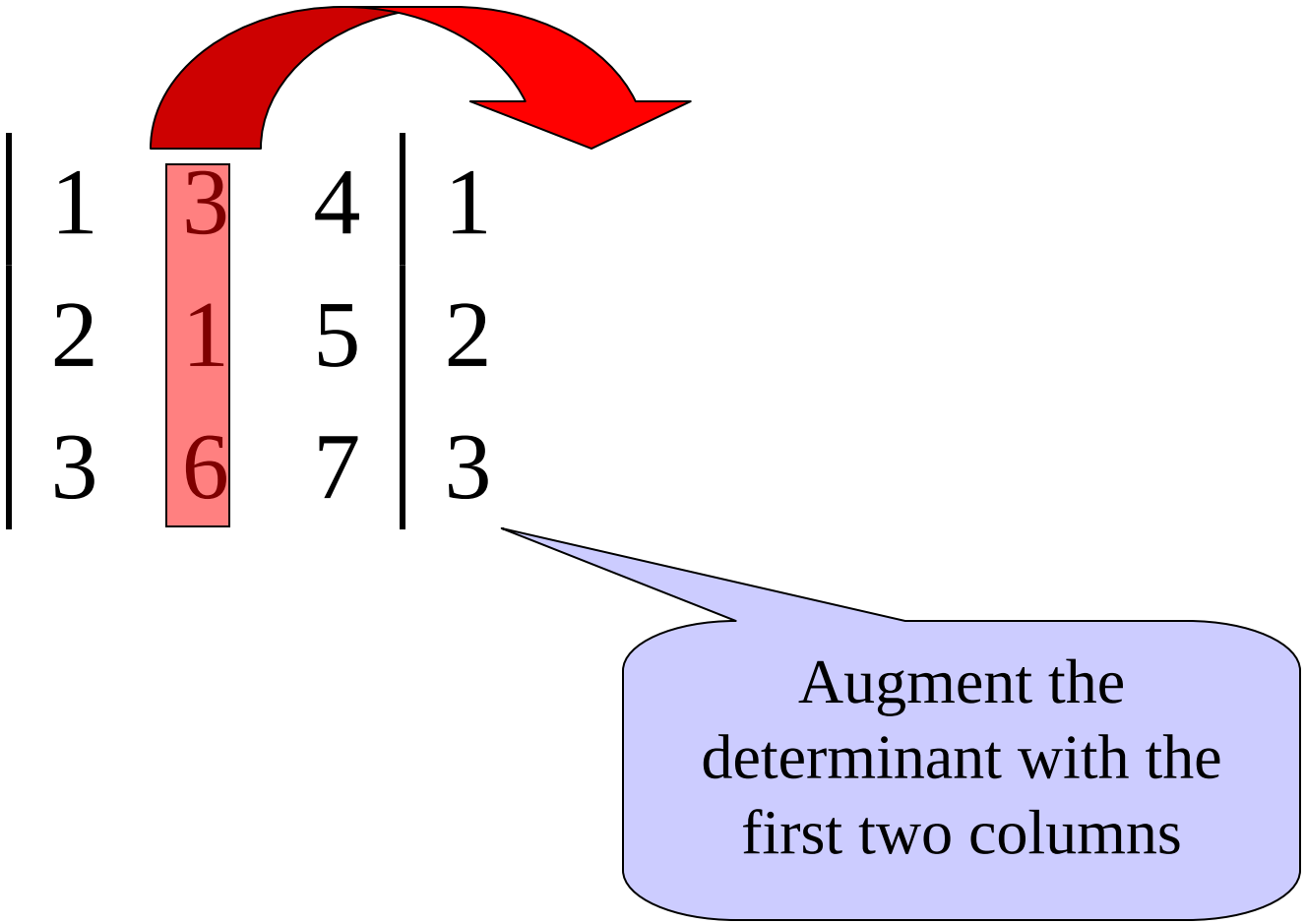
$$\begin{vmatrix} 1 & 3 & 4 \\ 2 & 1 & 5 \\ 3 & 6 & 7 \end{vmatrix}$$

Augment the determinant with the first two columns

Determinant of a 3 x 3 Matrix



Determinant of a 3 x 3 Matrix

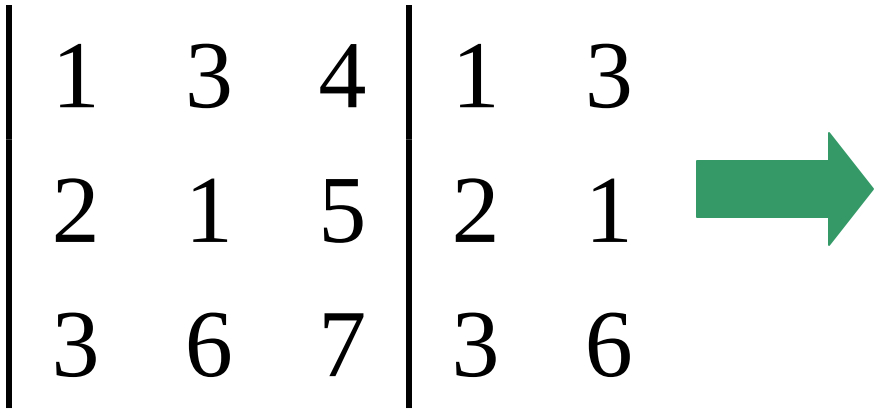


Determinant of a 3 x 3 Matrix

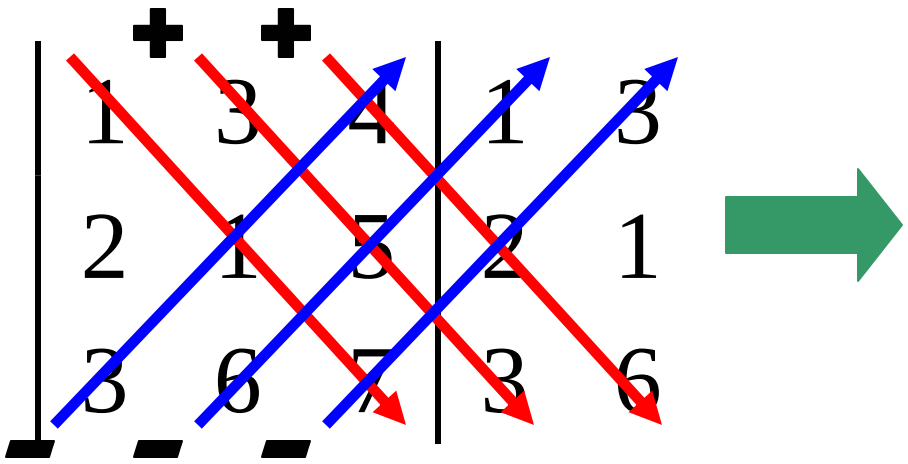
$$\left|\begin{array}{ccc|cc} 1 & 3 & 4 & 1 & 3 \\ 2 & 1 & 5 & 2 & 1 \\ 3 & 6 & 7 & 3 & 6 \end{array}\right|$$

Augment the determinant with the first two columns

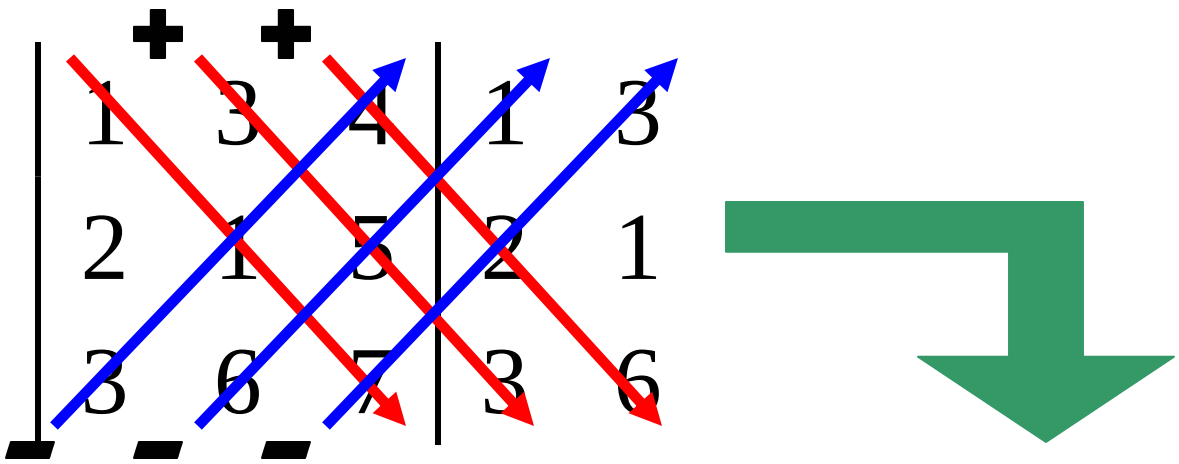
Determinant of a 3 x 3 Matrix



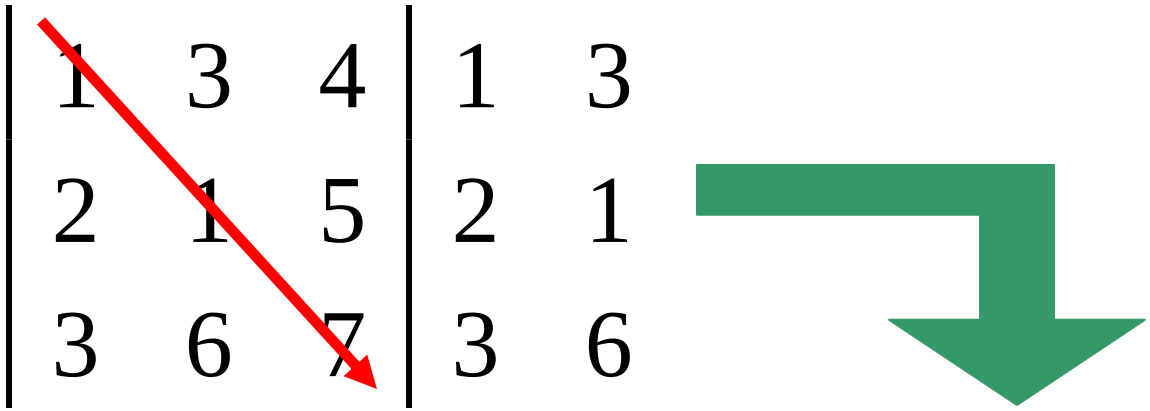
Determinant of a 3 x 3 Matrix



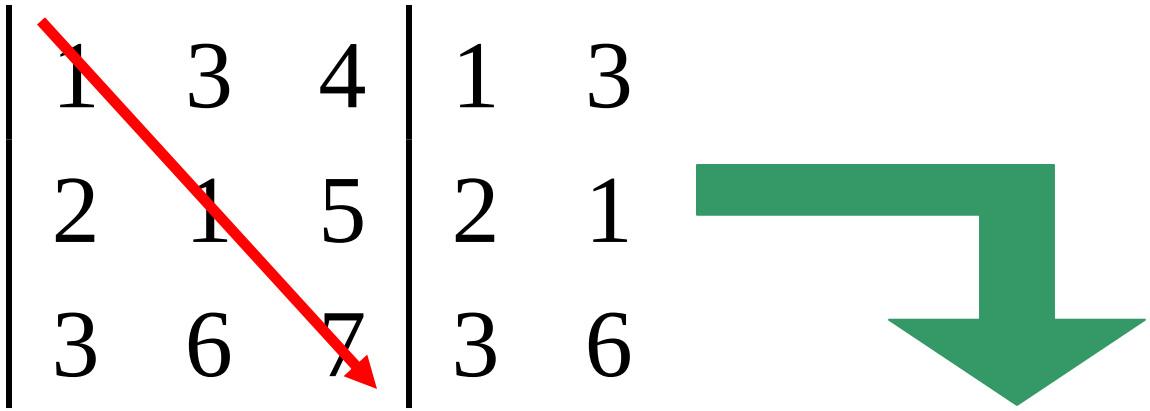
Determinant of a 3 x 3 Matrix



Determinant of a 3 x 3 Matrix

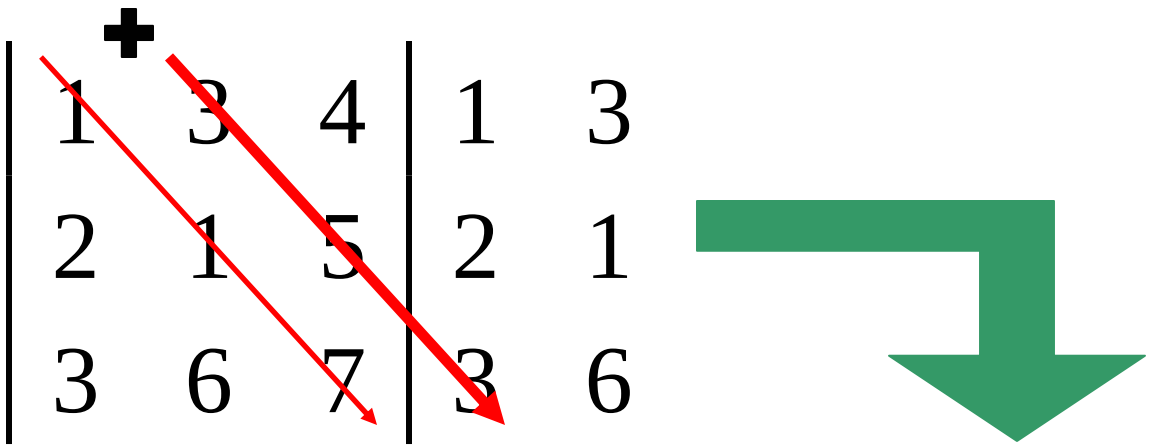


Determinant of a 3 x 3 Matrix



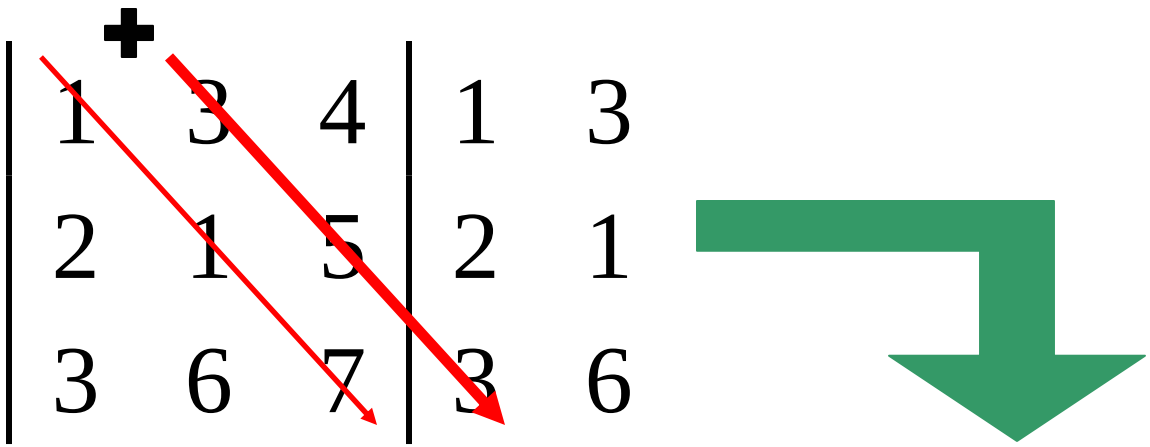
1•1•7

Determinant of a 3 x 3 Matrix



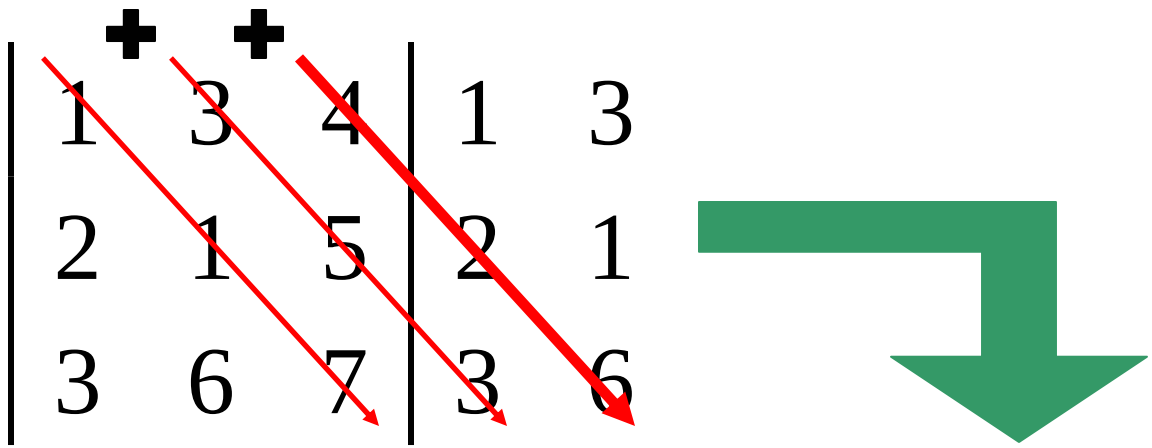
1•1•7 +

Determinant of a 3 x 3 Matrix



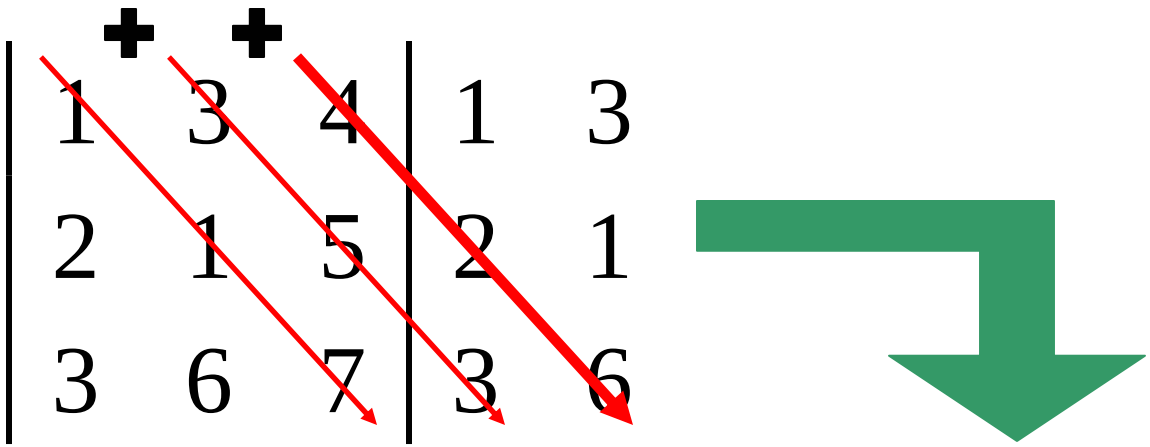
1•1•7 + **3•5•3**

Determinant of a 3 x 3 Matrix



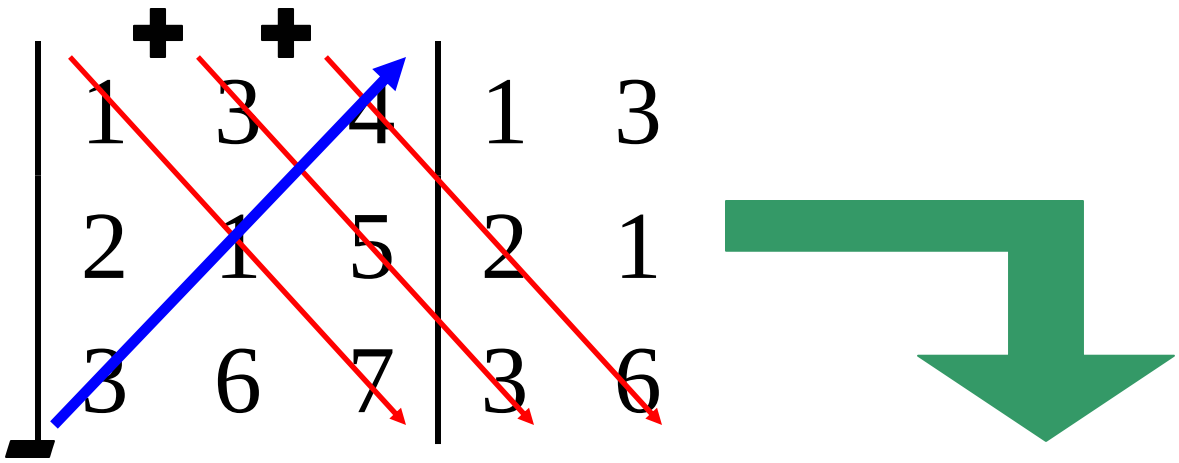
1•1•7 + 3•5•3 +

Determinant of a 3 x 3 Matrix



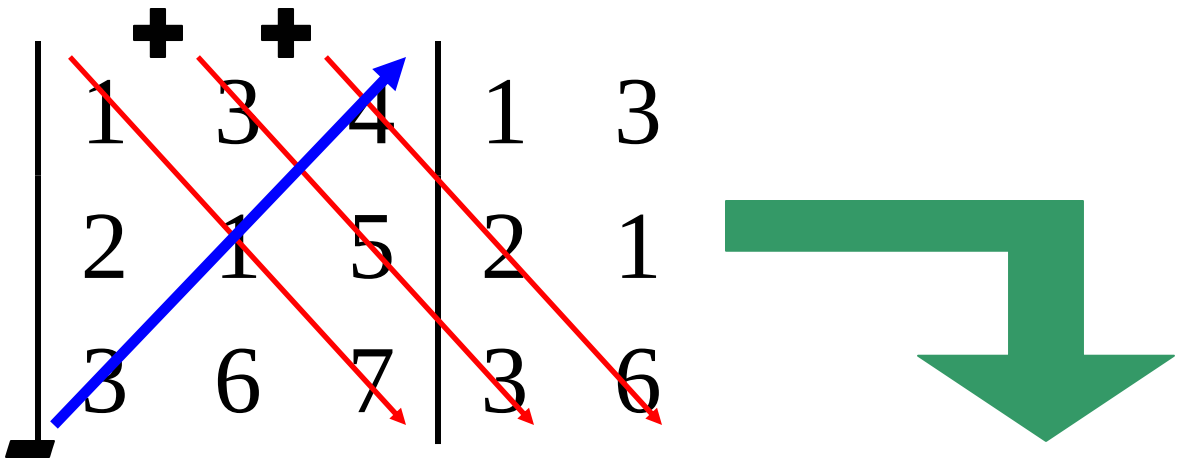
1•1•7 + 3•5•3 + **4•2•6**

Determinant of a 3 x 3 Matrix



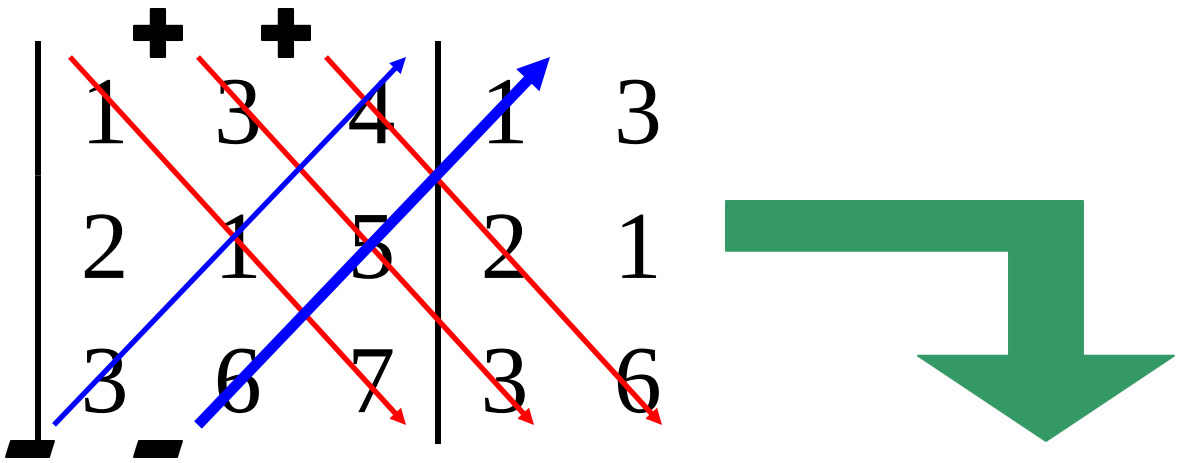
1•1•7 + 3•5•3 + 4•2•6 -

Determinant of a 3 x 3 Matrix



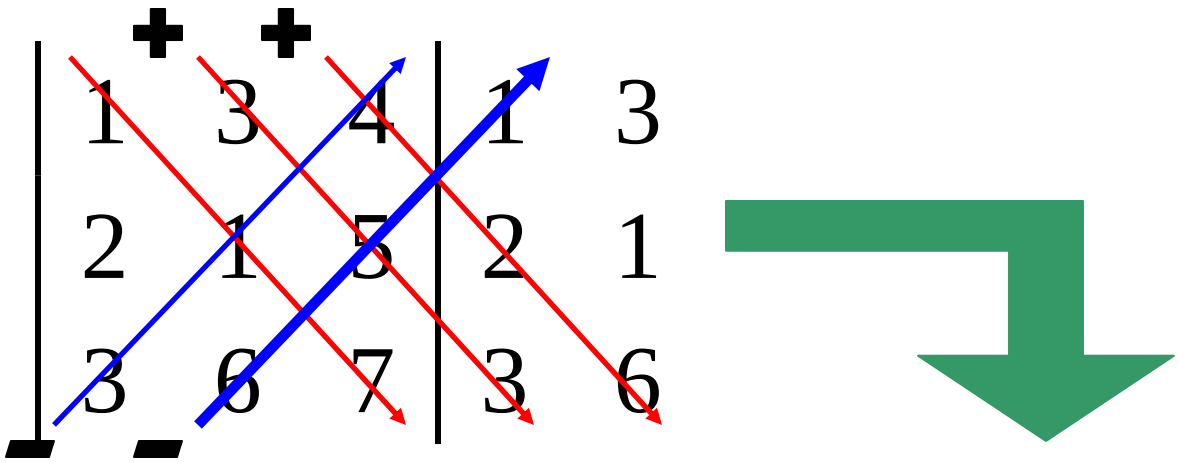
1•1•7 + 3•5•3 + 4•2•6 - **3•1•4**

Determinant of a 3 x 3 Matrix



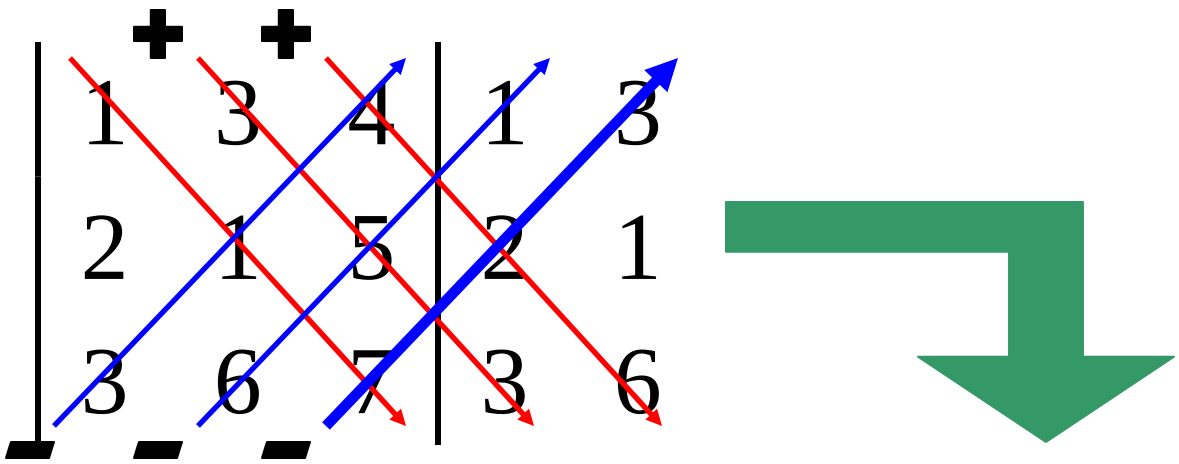
1•1•7 + 3•5•3 + 4•2•6 - 3•1•4 -

Determinant of a 3 x 3 Matrix



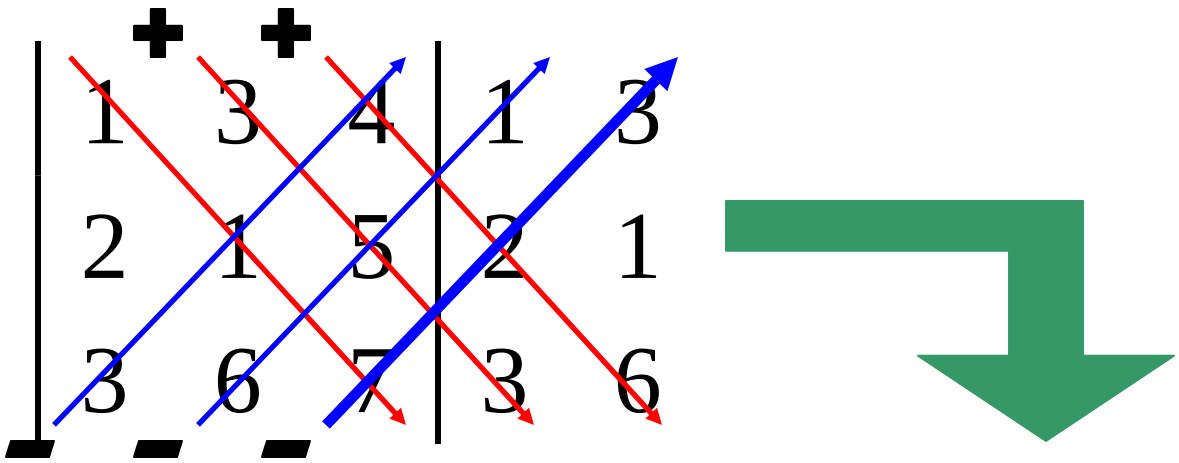
1•1•7 + 3•5•3 + 4•2•6 - 3•1•4 - **6•5•1**

Determinant of a 3 x 3 Matrix



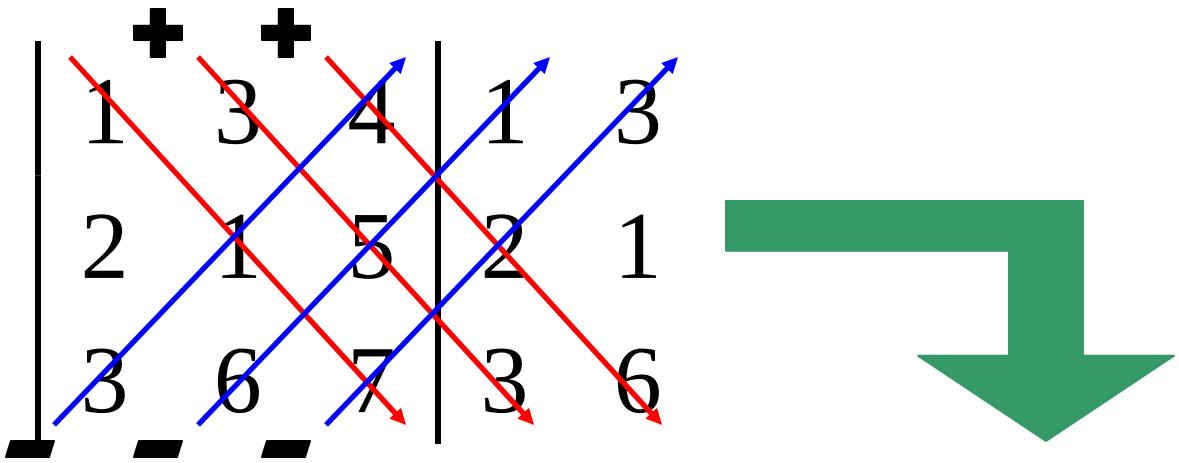
1•1•7 + 3•5•3 + 4•2•6 - 3•1•4 - 6•5•1 -

Determinant of a 3 x 3 Matrix



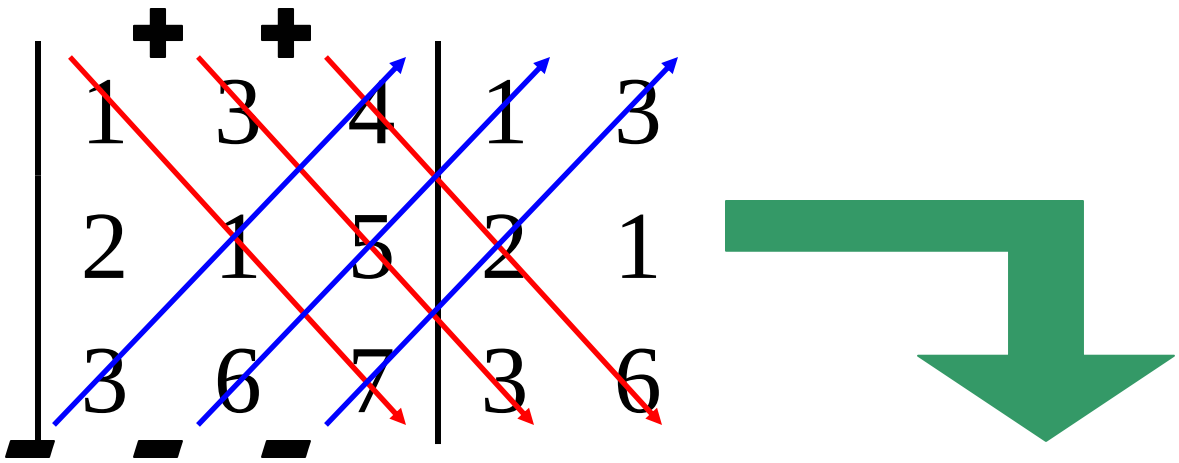
1•1•7 + 3•5•3 + 4•2•6 - 3•1•4 - 6•5•1 - **7•2•3**

Determinant of a 3 x 3 Matrix



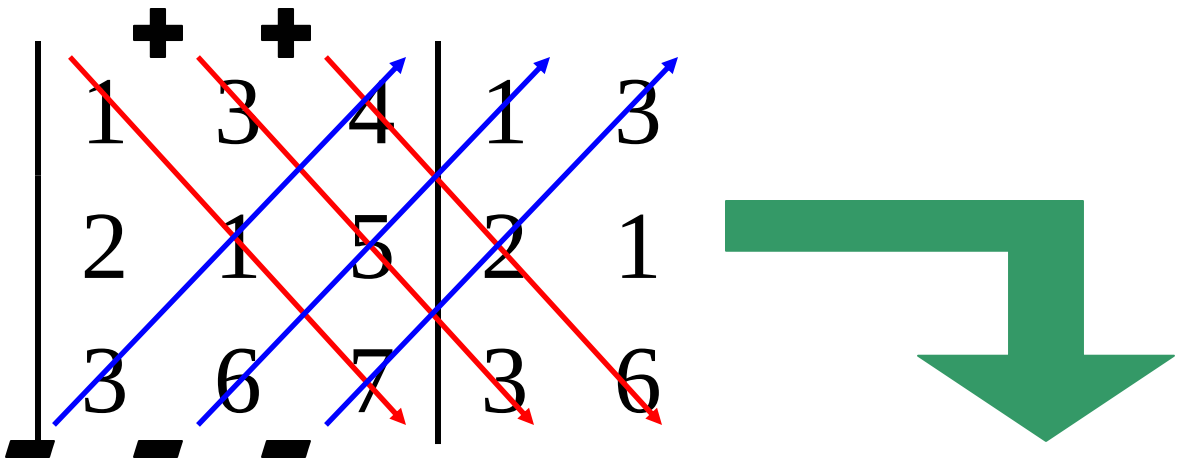
1•1•7 + 3•5•3 + 4•2•6 - 3•1•4 - 6•5•1 - 7•2•3

Determinant of a 3 x 3 Matrix



1•1•7 + 3•5•3 + 4•2•6 - 3•1•4 - 6•5•1 - 7•2•3

Determinant of a 3 x 3 Matrix

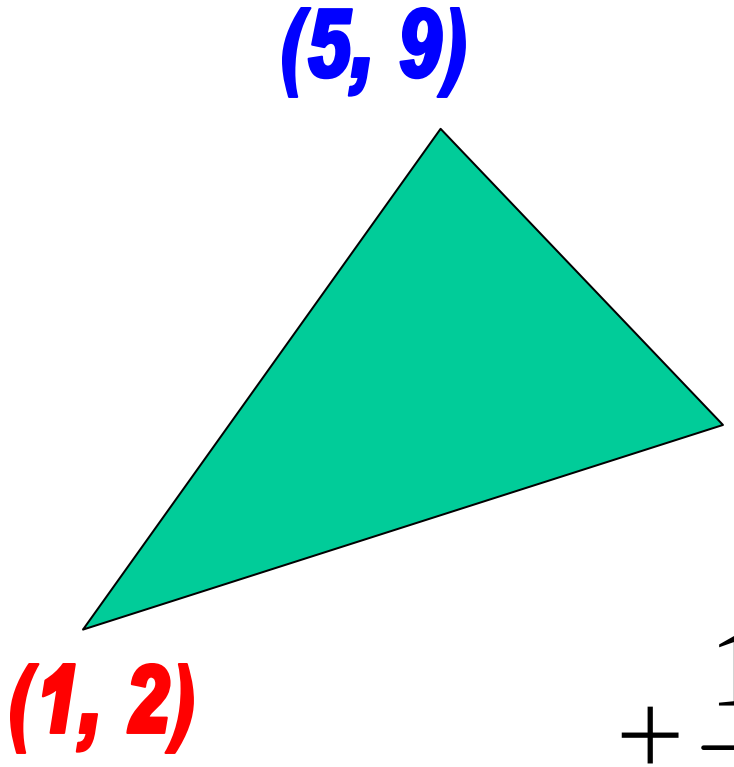


$$1\cdot1\cdot7 + 3\cdot5\cdot3 + 4\cdot2\cdot6 - 3\cdot1\cdot4 - 6\cdot5\cdot1 - 7\cdot2\cdot3$$

$$7 + 45 + 48 - 12 - 30 - 42$$

$$= 16$$

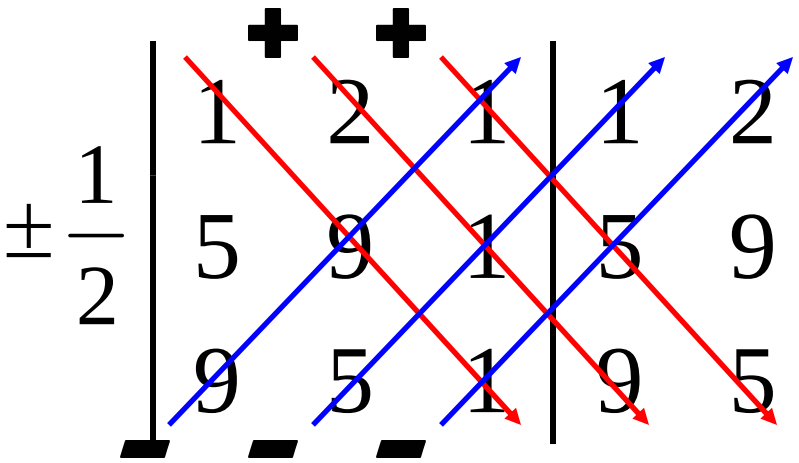
Find the area of the Triangle



Use a Determinant

$$\pm\frac{1}{2}\begin{vmatrix} & \\ & \end{vmatrix}$$

Determinant of a 3 x 3 Matrix

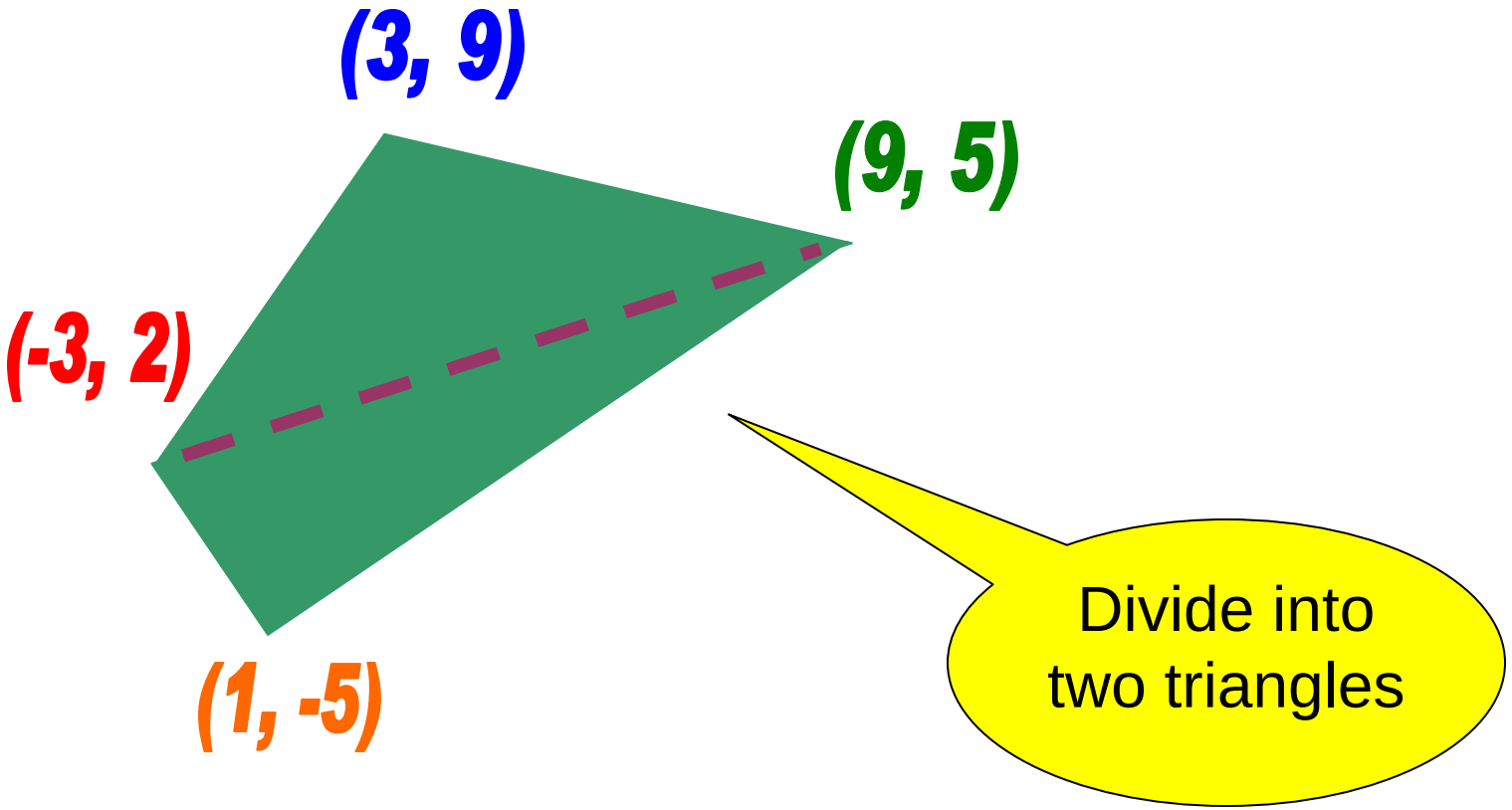


$\pm\frac{1}{2}$ ( )

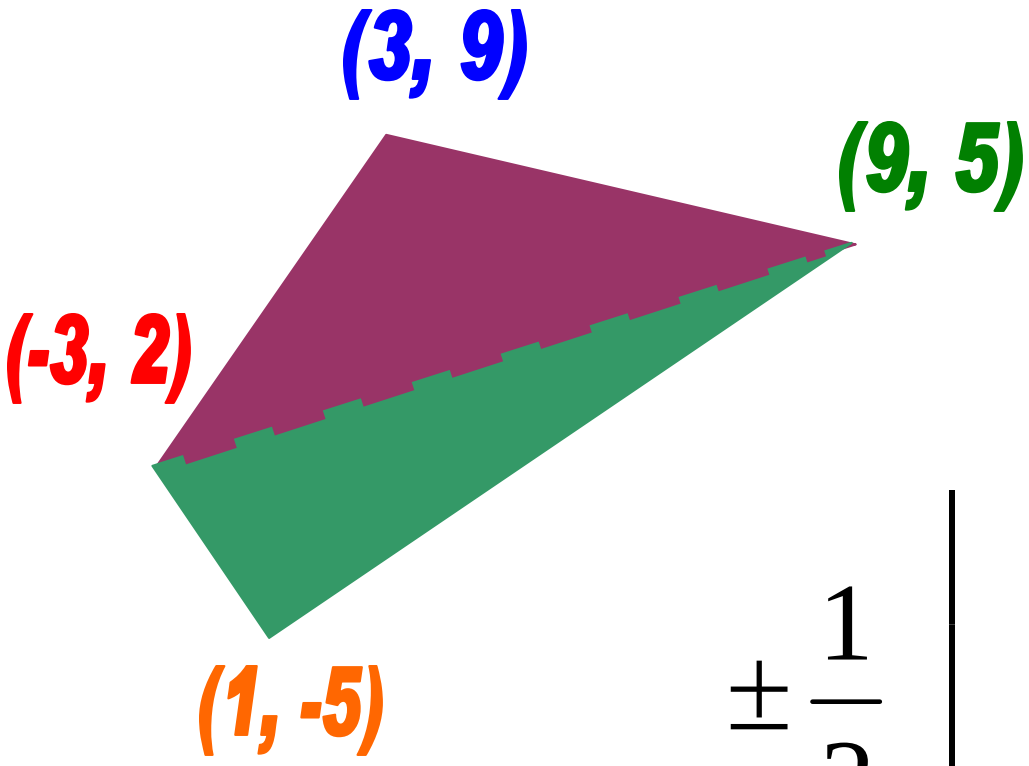
$\pm\frac{1}{2}$ (9 + 18 + 25 - 81 - 5 - 10)

$\pm\frac{1}{2}(-44) =$ **22**

Find the area of the Quadrilateral



Find the area of the Quadrilateral

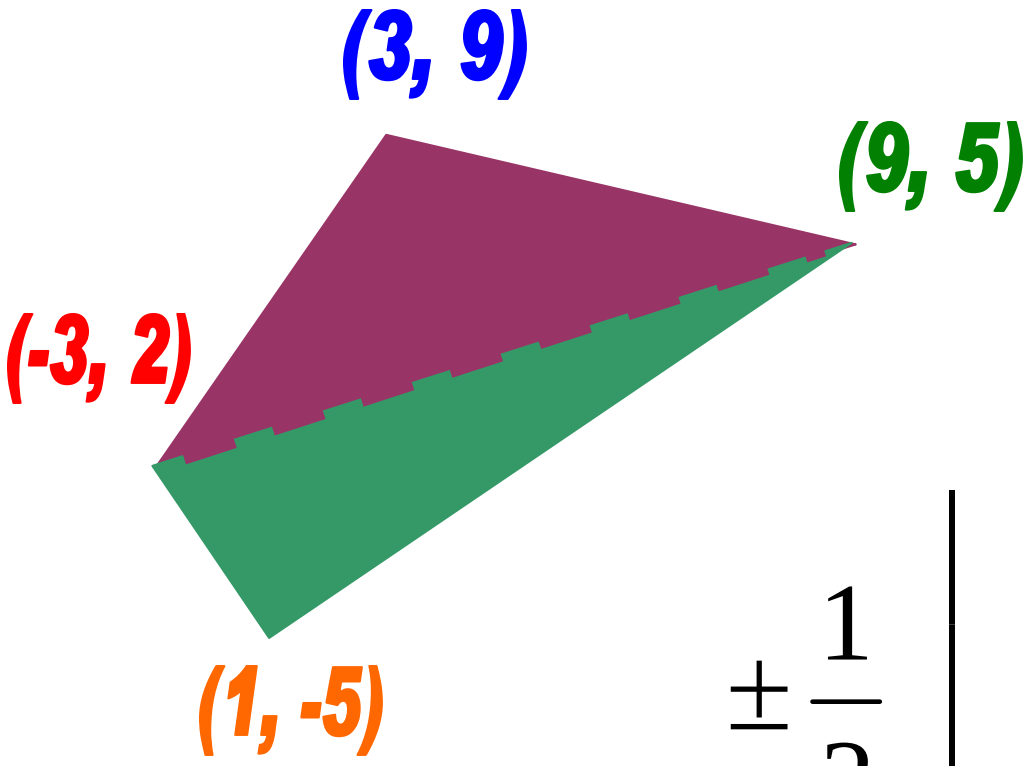


The top triangle

$$\pm\frac{1}{2}\begin{vmatrix} & \\ & \end{vmatrix} = \pm\tfrac{1}{2}(-66)$$

33

Find the area of the Quadrilateral

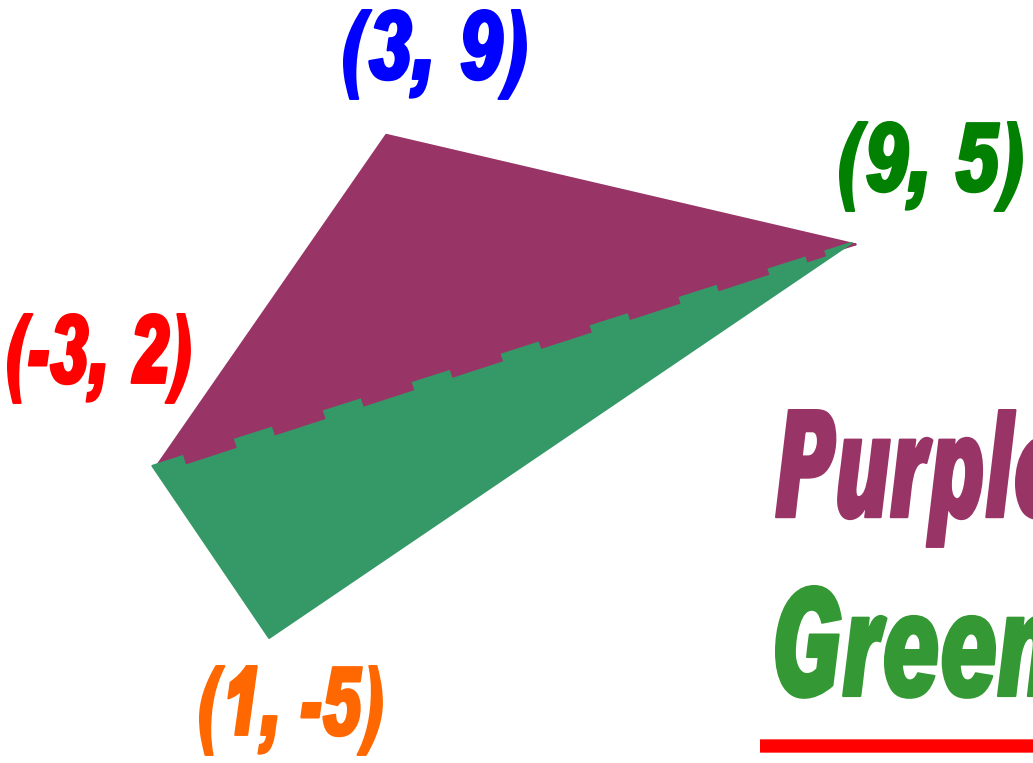


The bottom triangle

$$\pm\frac{1}{2}\begin{vmatrix} & \\ & \end{vmatrix} = \pm\tfrac{1}{2}(-96)$$

48

Find the area of the Quadrilateral



Purple Area = 33

Green Area = 48

Total Area = 81