## Identity & Inverse Matrices

$I_{2\times 2} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

multiplicative identity of a matrix

$A \cdot I = A$

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## Inverse Relationships

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what is the inverse of 3?

$\frac{1}{3}$, but why? $3 \cdot \frac{1}{3} = \frac{3}{3} = 1$

For matrices:

$A \cdot A^{-1} = I$

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## Finding the inverse of a matrix

Can the matrix have an inverse?

- ☆ must be square
- ☆ $\det \neq 0$

$$A=\begin{bmatrix} a & b \\ c & d \end{bmatrix}, \quad A^{-1}=\frac{1}{\det A}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

Flip - the main diag.
Flop - the other signs
Matrix -

**Ex:**

$A=\begin{bmatrix} 2 & 4 \\ 5 & 6 \end{bmatrix}$ find the inverse.

2x2

☆ Is A square? yes

☆ $\det A \neq 0$? yes

$$\begin{vmatrix} 2 & 4 \\ 5 & 6 \end{vmatrix} = 12-20=-8$$

$$A^{-1}=\frac{1}{-8}\begin{bmatrix} 6 & -4 \\ -5 & 2 \end{bmatrix}=\begin{bmatrix} -6/8 & 4/8 \\ 5/8 & -2/8 \end{bmatrix}$$

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#6 $\begin{bmatrix} 4 & 5 \\ -4 & -3 \end{bmatrix}$

☆ Square?

☆ $\det \neq 0$?

$$\begin{vmatrix} 4 & 5 \\ -4 & -3 \end{vmatrix} = (-12)-(-20)=8$$

$$A^{-1}=\frac{1}{8}\begin{bmatrix} -3 & -5 \\ +4 & 4 \end{bmatrix}=\begin{bmatrix} -3/8 & -5/8 \\ 4/ & \end{bmatrix}$$

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$$\begin{bmatrix} 2 & 4 \\ 5 & 6 \end{bmatrix}\begin{bmatrix} -3/4 & 1/2 \\ 5/8 & -1/4 \end{bmatrix}=\begin{bmatrix} -12/8 & 1-1 \\ -15/4 & 5/2-6/4 \end{bmatrix}$$

2x2 ✓ 2x2

$$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$ ✓

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## 2×2 Det.

### 3 D's of Determinants

Determinant

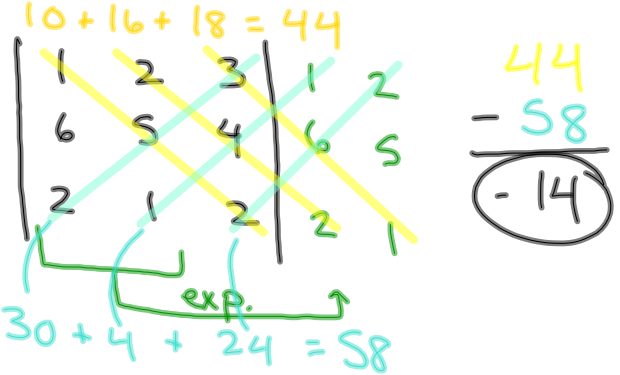
Diagonals

Difference

ex: $\begin{vmatrix} 5 & -3 \\ 6 & -4 \end{vmatrix}$ $(-20) - (-18) = -2$

## ex. 3×3

use expansion by diagonals

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