3.6 Matrices and Transformations

Dilation Translation

Dilation
↳ Change in size
No change in shape
central change
(all from zero (corner))

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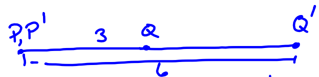
we look for a
scale factor



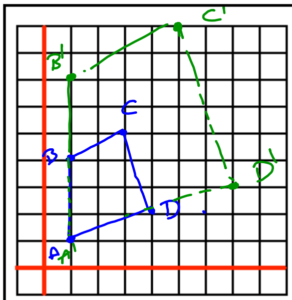
$$\text{scale factor} = \frac{\text{New}}{\text{original}} = \frac{2}{1}$$

$$2\begin{array}{cc} x & y \\ \multicolumn{2}{c}{\begin{bmatrix} 6 & 3 \\ -2 & 5 \end{bmatrix}} \end{array} = \begin{bmatrix} 12 & 6 \\ -4 & 10 \end{bmatrix}$$

$(x, y) \rightarrow s(x, y)$

$$S\begin{bmatrix} x_1 & y_1 \\ x_2 & y_2 \\ \vdots & \\ x_n & y_n \end{bmatrix}$$

$$\frac{1}{3}\begin{bmatrix} 9 & 3 \\ 24 & 21 \\ 15 & 6 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 8 & 7 \\ 5 & 2 \end{bmatrix}$$



scale factor of 2
with center at A

Translations (Slides)

Same shape
same orientation
different spot

move ↑ ↓ → ←

how does x, y change

X change L, R
Y change U, D

$(x, y) \rightarrow (x+2, y-1)$
describe → right 2 down 1

$$\begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} 2 \\ -1 \end{bmatrix} = \begin{bmatrix} x+2 \\ y-1 \end{bmatrix}$$

maxtrix notation

$$\begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} -5 \\ 3 \end{bmatrix}$$ Left 5, up 3

All transformations will have at least one change

write in matrix notation

shift up 2

$$\begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} 0 \\ 2 \end{bmatrix}$$

shift right 2 down $\frac{1}{2}$

$$\begin{bmatrix} x \\ y \end{bmatrix} + \begin{bmatrix} 2 \\ -\frac{1}{2} \end{bmatrix}$$

$$2\begin{bmatrix} x \\ y \end{bmatrix}$$

matrix notation for a scale factor of $\frac{2}{3}$

$$\frac{2}{3}\begin{bmatrix} x \\ y \end{bmatrix}$$

$s > 1$ gets bigger
$s < 1$ gets smaller