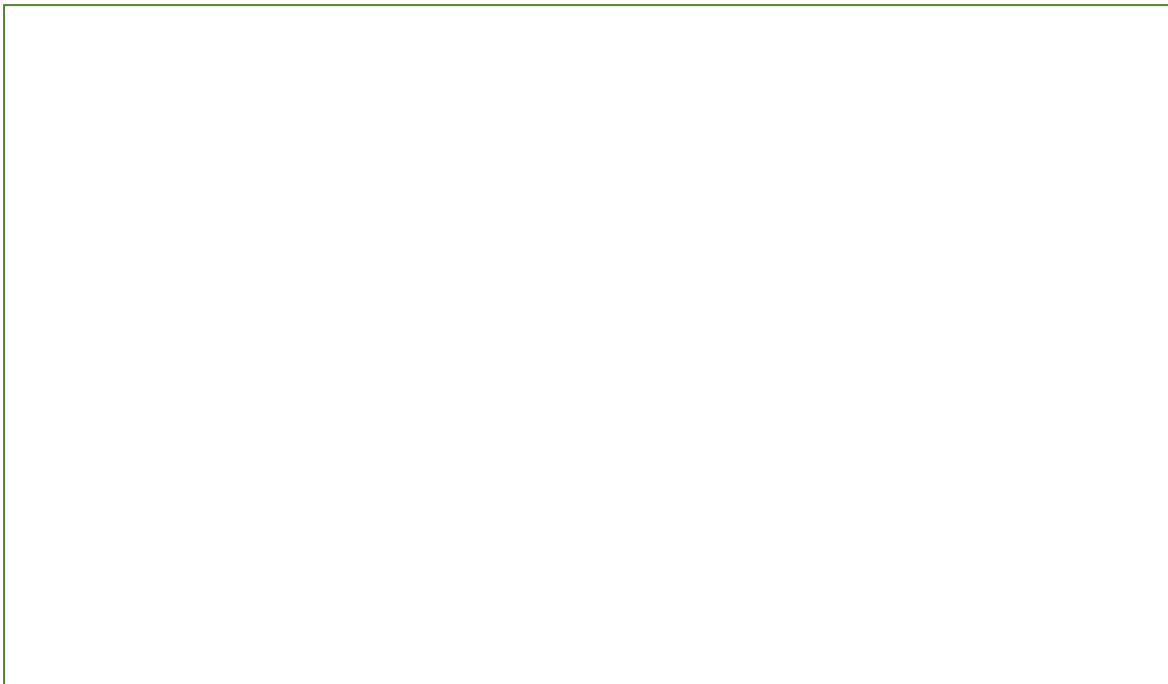# Enlargements

Enlargements and Invariance

Using the Determinant

Example

$A(1,1), B(1,2), C(2,2)$ are points on a triangle. The transformation with matrix $\mathbf{M} = \begin{pmatrix} 4 & 0 \\ 0 & 3 \end{pmatrix}$ is applied to the triangle to produce a new triangle with vertices A', B' and C'.

(a) Determine the coordinates of A', B', C'.

(b) What is the area of triangle ABC?

(c) What is the area of triangle $A'B'C'$?

(d) Determine $\det(M)$. What do you notice?

Area of Object	Transformation Matrix	Area of Image
4	$\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$	
3	$\begin{pmatrix} 2 & 0 \\ 9 & 4 \end{pmatrix}$	
9	$\begin{pmatrix} 5 & 3 \\ -2 & -1 \end{pmatrix}$	
1	$\begin{pmatrix} -5 & 2 \\ -4 & -2 \end{pmatrix}$	

Test Your Understanding

$$A = \begin{pmatrix} 2 & -2 \\ -1 & 3 \end{pmatrix}$$

(a) Find det A.

(1)

The triangle R is transformed to the triangle S by the matrix A.
Given that the area of triangle S is 72 square units,

(c) find the area of triangle R.

(2)