Geometry Notes TG - 5: Dilations

Dilations

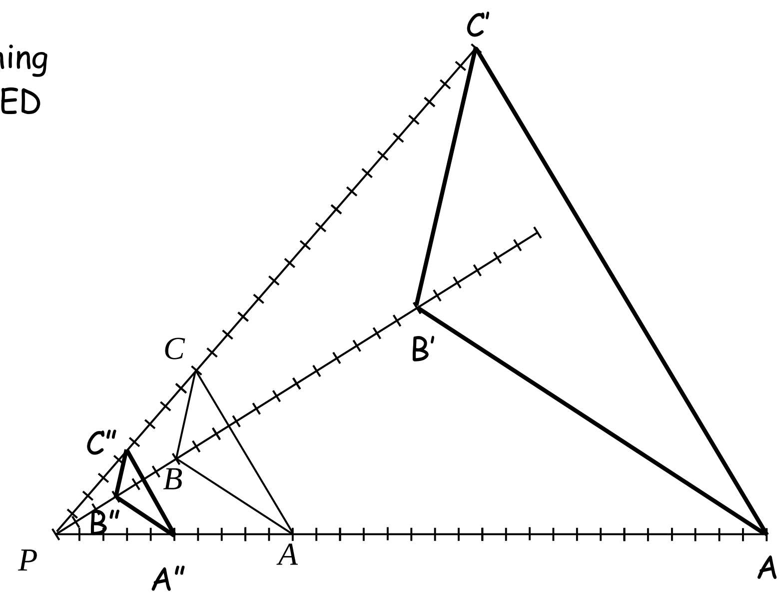
A *dilation* is an enlargement or reduction of a figure.

If point *P* be the *center of dilation*, then

Enlargement: All points move AWAY from point P by the same factor.
Remember: A factor is something that is MULTIPLIED

Reduction: All points move TOWARD point P by the same factor.

The factor (or ratio) by which everything is enlarged or reduced is the *constant of dilation*, *k*.



Ex: In the figure at right,

a. Find $\Delta A'B'C'$, the dilation of ΔABC by a factor of 3 from the point *P*.
(See graph)

$\Delta A'B'C'$ is similar to ΔABC. All distances (lengths) in $\Delta A'B'C'$ are 3 times the corresponding distances in ΔABC.

Ex: If $AC = 8$, then $A'C' = (3)(8) = 24$

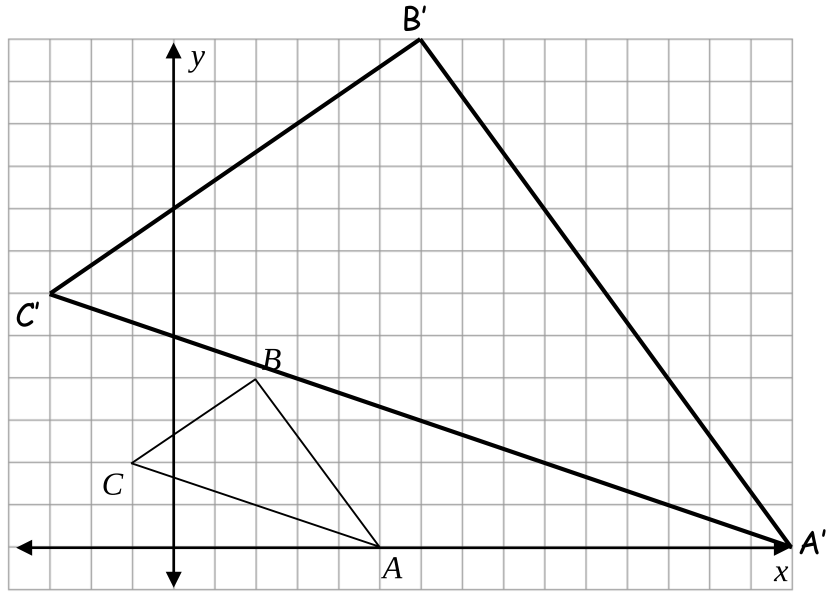
a. Find $\Delta A''B''C''$, the dilation of ΔABC by a factor of 1/2 from the point *P*.
(See graph)

Again, $\Delta A'B'C'$ is similar to ΔABC. All distances (lengths) in $\Delta A'B'C'$ are 1/2 the corresponding distances in ΔABC.

Ex: If $AC = 8$, then $A'C' = (1/2)(8) = 4$

Dilations with Coordinates

Ex: ΔABC has vertices at $A(5, 0)$, $B(2, 4)$ and $C(-1, 2)$. Dilate ΔABC by a factor of 3 from the origin.



$A(5, 0) \to A'(15, 0)$

$B(2, 4) \to B'(6, 12)$

$C(-1, 2) \to C'(-3, 6)$

In this dilation,
$P(x, y) \to P'(3x, 3y)$

Notation: $D_3(x, y) = (3x, 3y)$

In general, $D_k(x, y) = (kx, ky)$ For dilations, think MULTIPLY.

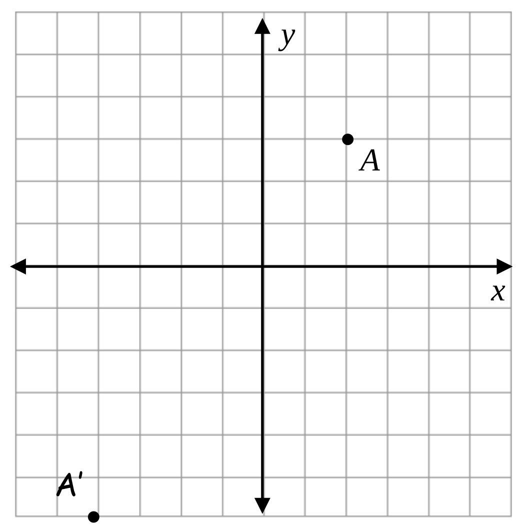
Ex: 1) $D_4(-3, 5) = (-12, 15)$

2) $D_{3/4}(8, -12) = (6, -9)$

3) Find the value of k if $D_k(6, -9) = (10, -15)$

$6k = 10 \to k = 10/6$ or $5/3$
Note that using the y-coordinates gives the same result.

4) $D_{-2}(2, 3) = (-4, -6)$



A dilation by a negative constant is a combination of

1. A "normal" dilation and

2. A reflection in the origin.