

Dilations

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What is a Dilation?

- *Dilation* is a transformation that produces an image **SIMILAR** to the original by proportionally shrinking or stretching the **SIZE** of the pre-image.



- *Same shape, Different size – SIMILAR images.*

Let's take a look...

And, of course,
increasing the
circle

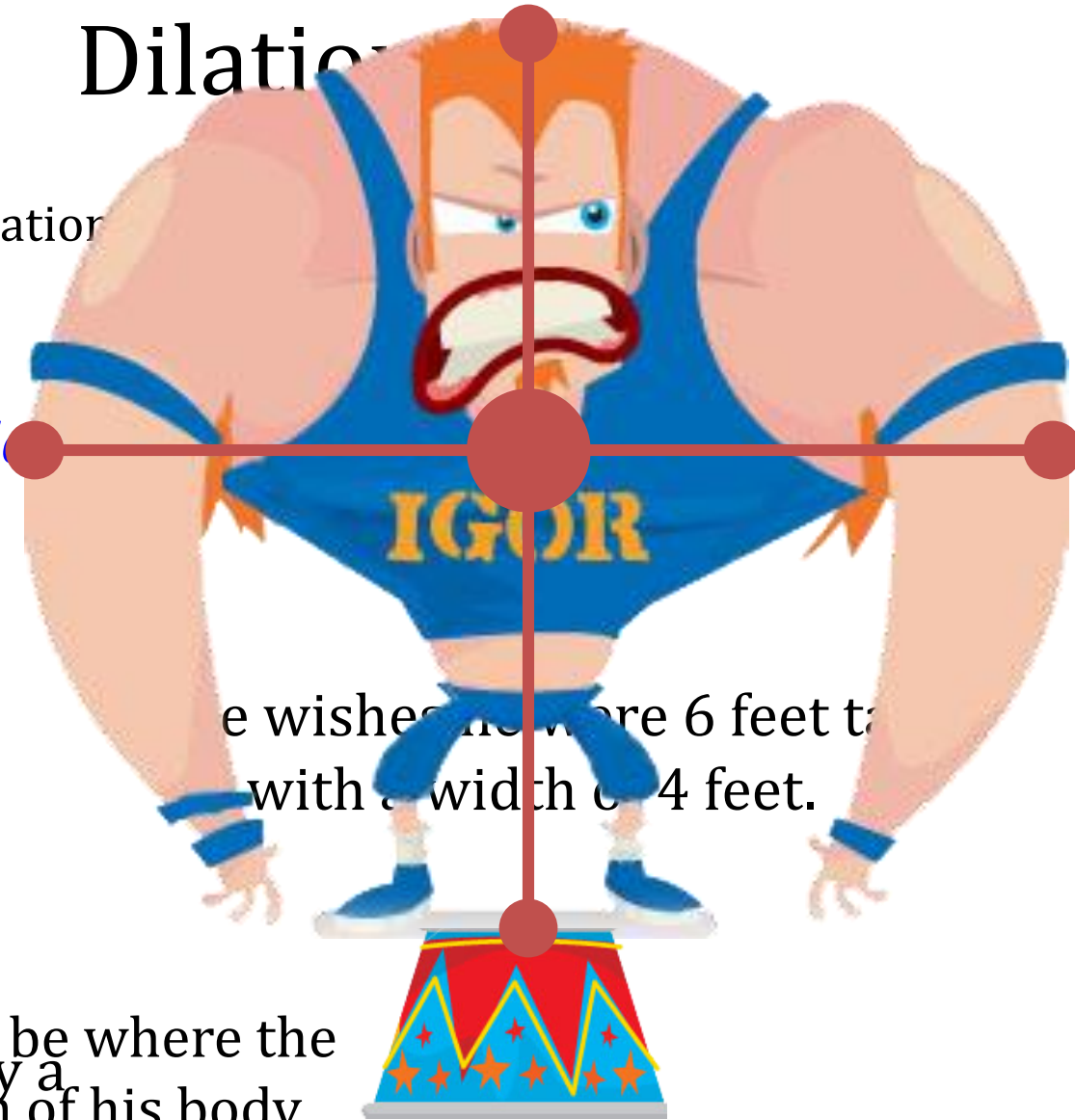
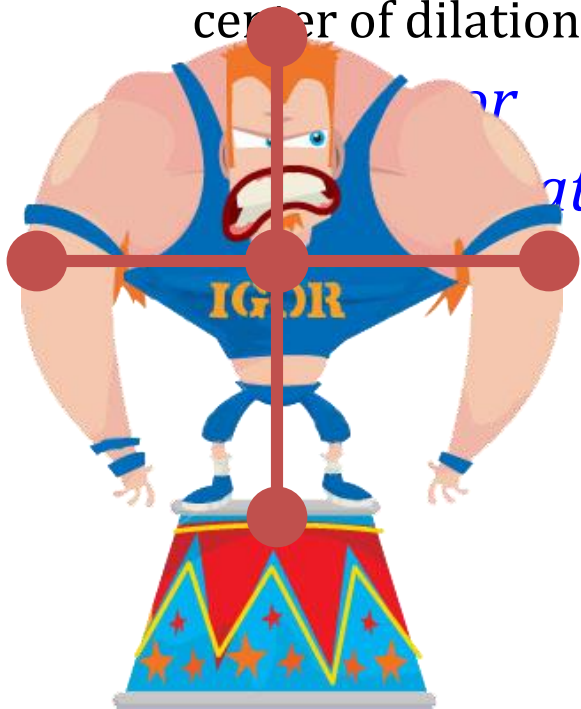
**So, we always have a circle with a
certain diameter. We are just
changing the size or scale.**

Decreasing the
size of the
circle
decreases the
diameter.

We have a circle
with a certain
diameter.

Scale Factor and Center of Dilation

When we describe dilation we need to specify the center of dilation.



He wishes he were 6 feet tall and 4 feet wide.

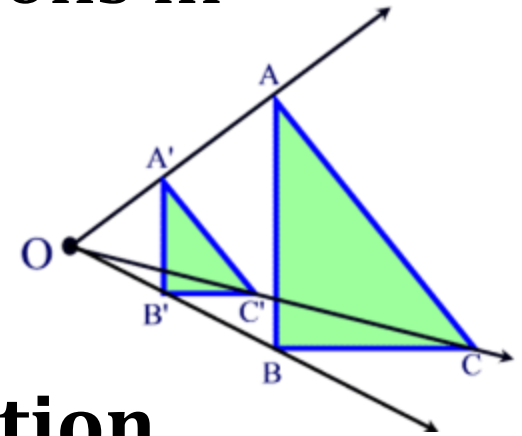
His center of dilation would be where the lines representing the original length and greatest width of his body intersect.

Scale Factor

A dilation of scale factor k is the ratio of the lengths of corresponding dimensions in similar images.

Notation: $D_{k, o}(x, y) = (kx, ky)$

$k = \frac{A'B'}{AB}$ **O is center of dilation**



If O is a fixed point and A' is the image of point A , then O , A and A' are collinear

and $k = \frac{OA'}{OA}$

Scale Factor

- If the scale factor is *larger than 1*, the figure is *enlarged*.
- If the scale factor is *between 1 and 0*, the figure is *reduced* in size.

$$\mathbf{k > 1}$$

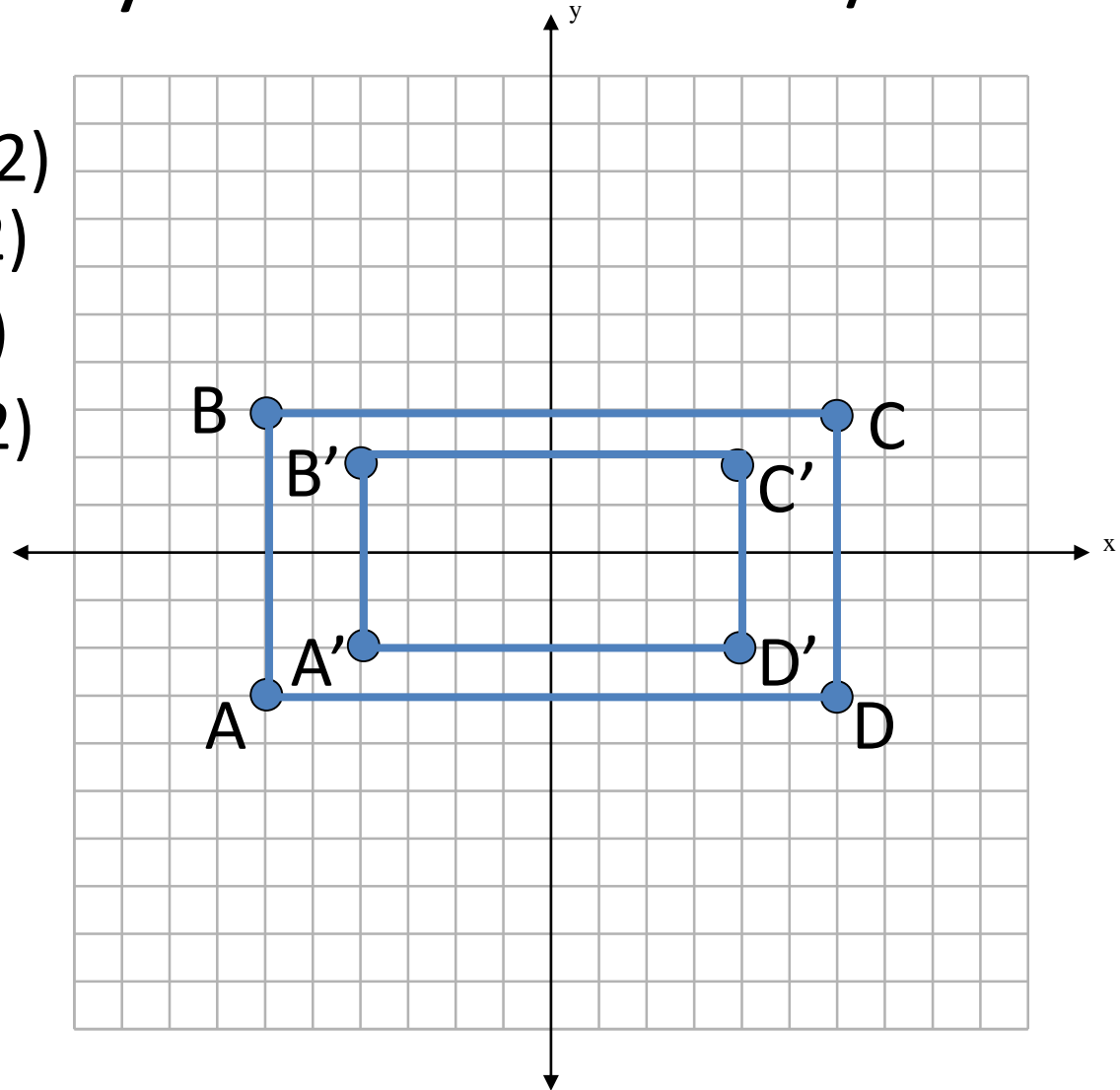
$$\mathbf{0 < k < 1}$$

Center of Dilation

- The center of dilation is a fixed point in the plane about which all points are expanded or contracted.

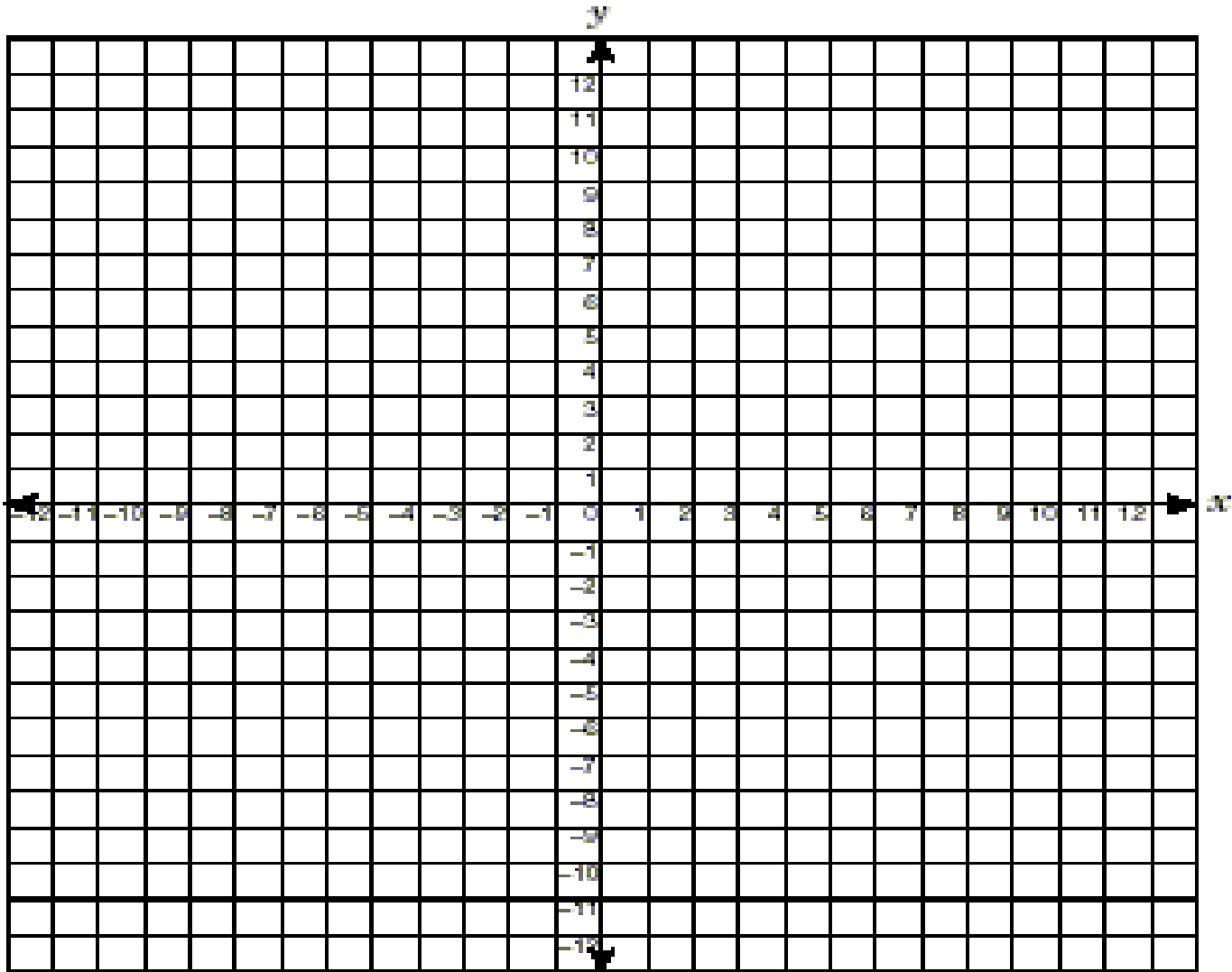
Given the vertices of the rectangle, find a dilation by a scale factor of $\frac{2}{3}$.

- $A (-6,-3)$ $A' (-4,-2)$
- $B (-6,3)$ $B' (-4,2)$
- $C (6,3)$ $C' (4,2)$
- $D (6,-3)$ $D' (4,-2)$

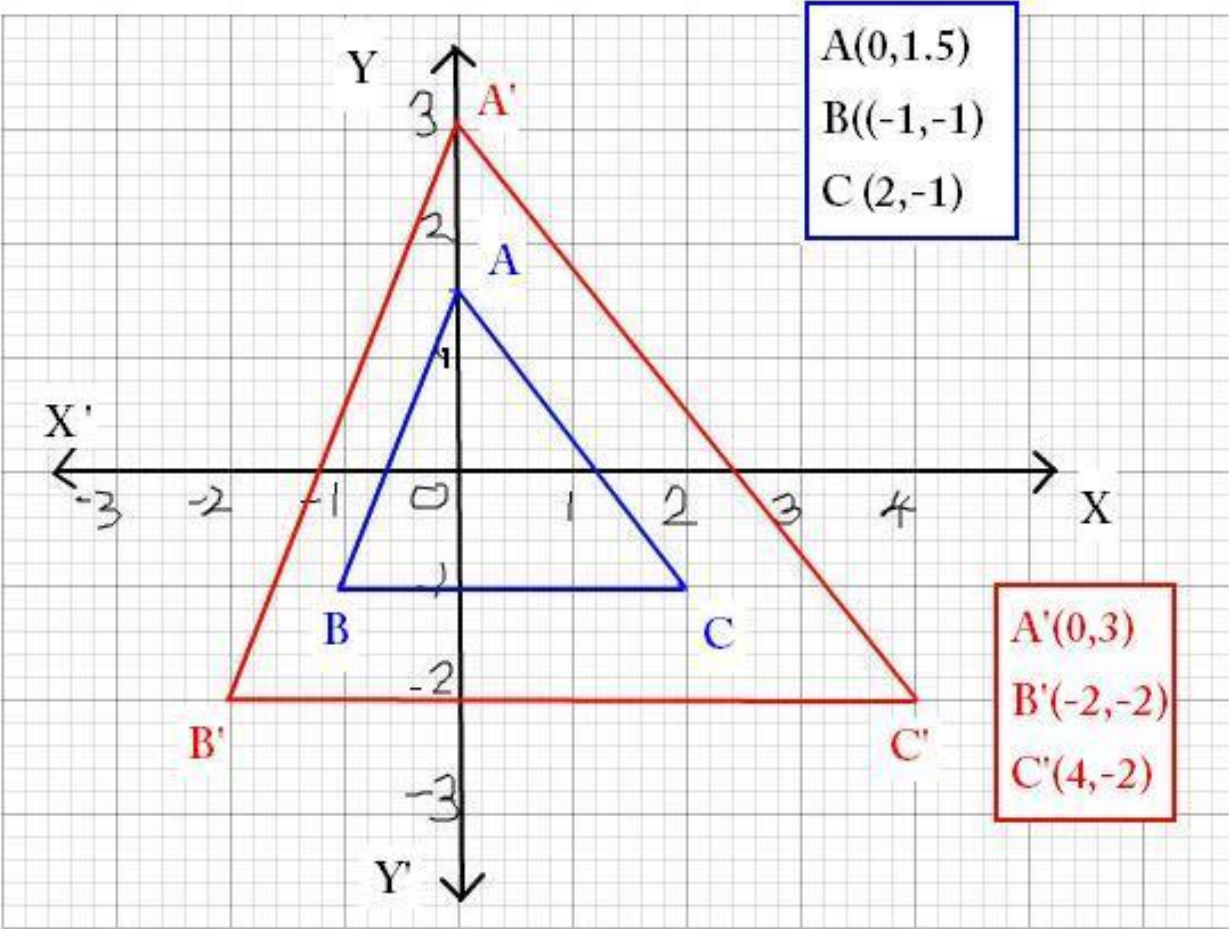


pre-image points are $(-3,-3)$, $(1,-2)$, and $(0,4)$

→ dilate the pre-image by a scale factor of 2 from the origin



Given the pre-image and image, determine the scale factor.



Dilate an image from an arbitrary point.

Dilate $k=3$ from point $(10,-10)$

$A(7,-8)$ therefore
 $\therefore A'(1, -4)$

x distance from P to A: -3
 x distance from P to A': -9
 x value of A': $10 + (-9) = 1$

y distance from P to A: 2
 y distance from P to A': 6
 y value of A': $-10 + 6 = -4$

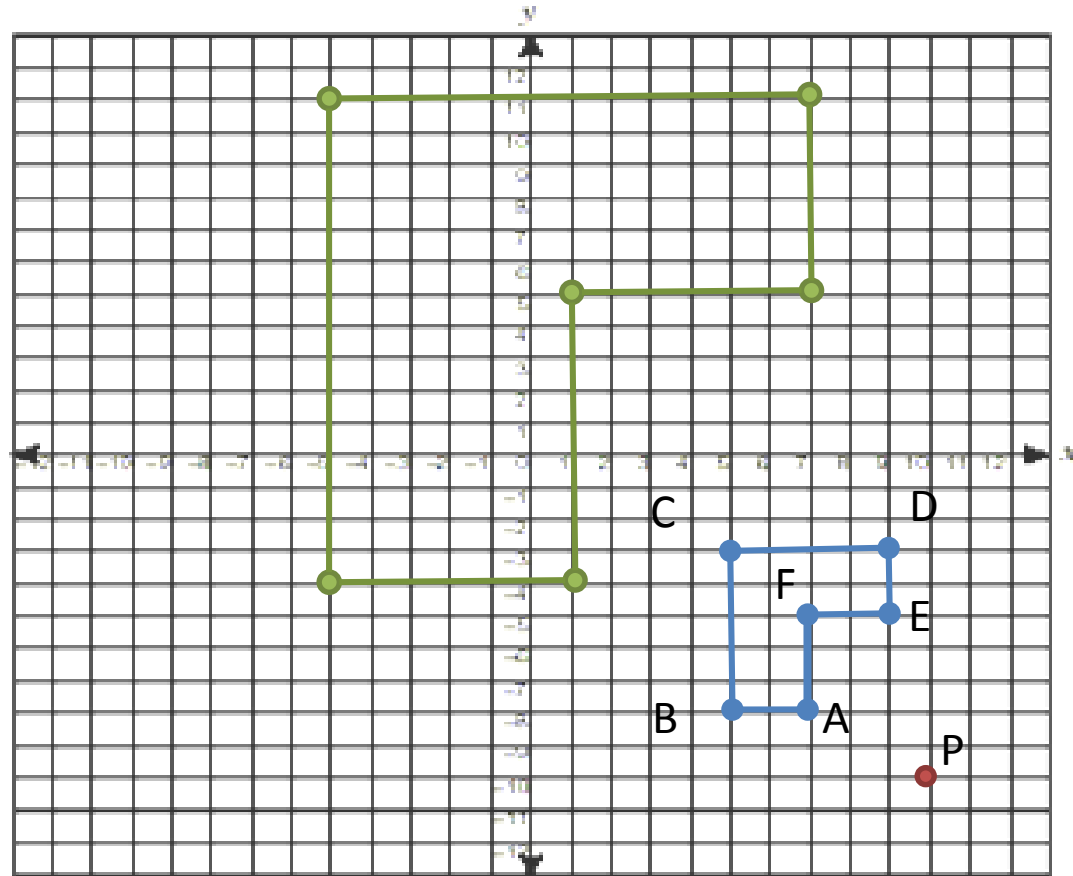
$B(5,-8)$ $\therefore B'(-5, -4)$

$C(5,-3)$ $\therefore C'(-5, 11)$

$D(9,-3)$ $\therefore D'(7, 11)$

$E(9,-5)$ $\therefore E'(7, 5)$

$F(7,-5)$ $\therefore F'(1, 5)$



How can you tell this is correct?

<http://www.regentsprep.org/Regents/math/geometry/GT3/PracDil.htm>

<http://www.regentsprep.org/Regents/math/geometry/GT3/PracCoD.htm>