Notes → Dilations

Today we will be working with a new type of transformation. List the three previous transformations we have studied. For each transformation, explain what it does in "everyday language".

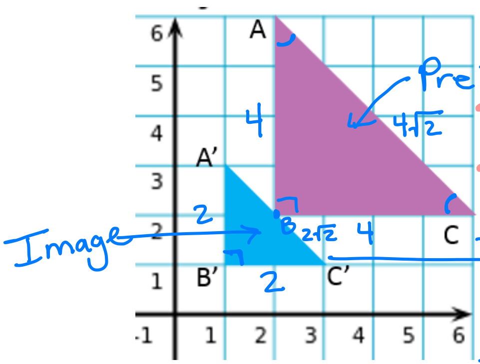
- Reflection (Flip)
- Rotation (Turn)
- Translation (Shift, slide)

These three transformations are known as *rigid transformations*. What similarity do you think these transformations have that makes them all *rigid transformations?*

Preimage $\cong$ Image

Now we are going to study dilations. Dilations change the ***size*** of the shape. They either expand the shape by a **scale factor** or they shrink the shape by a **scale factor**. What does scale factor mean?

- In math, the word dilate means to stretch or shrink a figure.
- If a scale factor is less than 1, then the figure gets shrunk.
- If a scale factor is greater than 1, then the figure gets stretch.

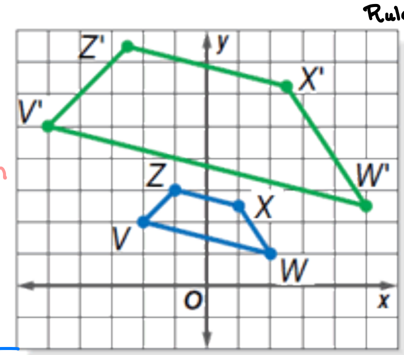


Preimage
- Perimeter $\boxed{P = 8 + 4\sqrt{2}}$
- Area $= \frac{1}{2}bh$ $b \perp h$ $A = \frac{1}{2}(4)(4) = \boxed{8}$

Image $\boxed{P = 4 + 2\sqrt{2}}$ $A = \frac{1}{2}(2)(2) = \boxed{2}$

- Perimeter is cut in half.
- Area is cut in fourth.

Reduction
$\boxed{\text{Scale Factor of } \tfrac{1}{2}}$
from the origin

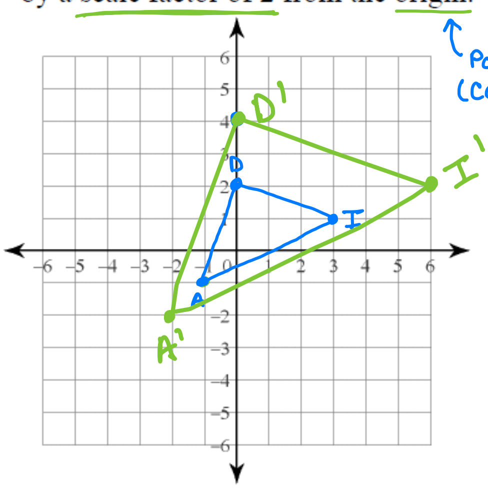


Rule: $f(x,y) \longrightarrow f'(2.5x, 2.5y)$
$Z(-1,3) \longrightarrow Z'(-2.5, 7.5)$
$X(1,2.5) \longrightarrow X'(2.5, 6.25)$
$W(2,1) \longrightarrow W'(5, 2.5)$
$V(-2,2) \longrightarrow V'(-5, 5)$

Enlargement
$\boxed{\text{Scale Factor of 2.5}}$
from the origin

Dilate Δ ADI, A(-1,-1), D(0,2), I(3,1) by a scale factor of 2 from the origin.

Point of Dilation (P.O.D.)
(Center) of Dilation (C.O.D.)



A' (-2 , -2)
D' (0 , 4)
I' (6 , 2)

Perimeter doubled.
Area quadrupled

How do you do a dilation from the origin?

multiple the coordinates by the scale factor.

What are the important pieces of information given for a dilation?

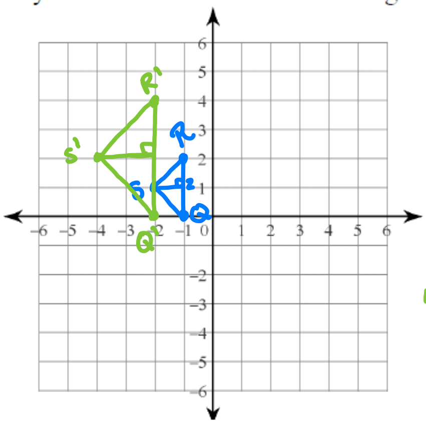
1) scale factor
2) Point of Dilation.

Do the next 4 dilation problems. Check your answers with a neighbor.

Area

1) Dilate Δ QRS if Q(-1,0), R(-1,2), S(-2,1) by a scale factor of 2 from the origin.

Perimeter doubles. Area quadruples.

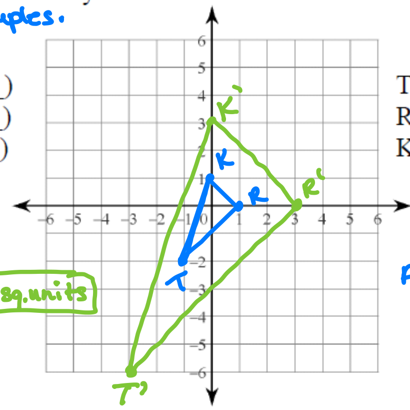


Q' (-2 , 0)
R' (-4 , 2)
S' (-2 , 4)

Area Preimage
$A = 1 \text{ unit}^2$

Area Image
$A = \frac{1}{2}(4)(2) = \boxed{4 \text{ sq. units}}$

2) Dilate Δ TRK if T(-1,-2), R(1,0), K(0,1) by a scale factor of 3 from the origin.

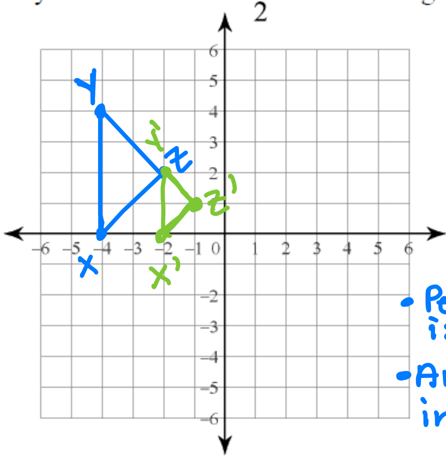


T'(-3 , -6)
R'(3 , 0)
K'(0 , 3)

Perimeter triples.

Area becomes 9 times greater.

3) Dilate Δ XYZ if X(-4,0), Y(-4,4), Z(-2, 2) by a scale factor of $\frac{1}{2}$ from the origin.

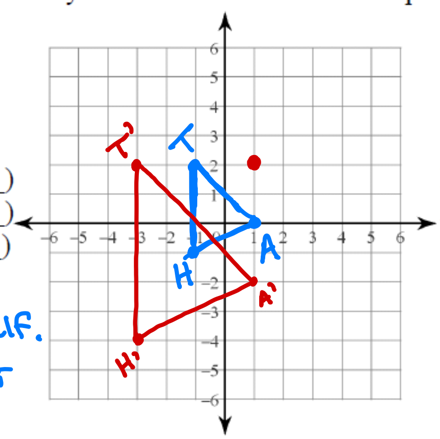


X' (-2 , 0)
Y' (-2 , 2)
Z' (-1 , 1)

- Perimeter is cut in half.
- Area is cut in fourths.

(1,2) (1,2) (1,2)

4) Dilate Δ HAT if H(-1,-1), A(1,0), T(-1,2) by a scale factor of 2 from the point (1,2)

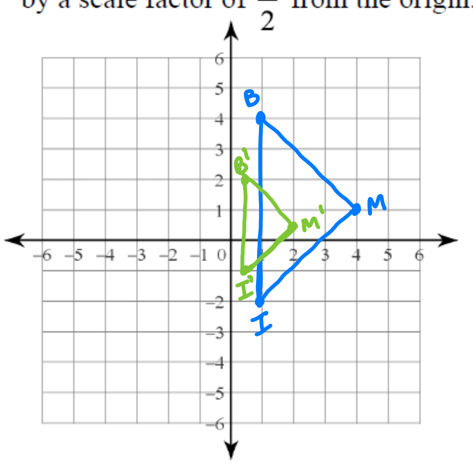


H'(-3 , -4)
A'(1 , -2)
T'(-3 , 2)

5) a) Discuss what your strategy was for problem 3 with your group. How was this different from problems 1) and 2).

b) If you did not freak out and give up when you saw problem 4), examine what you did do for problem 4). What strategy did you use to dilate the shape from a point different from the origin? Discuss this with your group and write down a way to dilate from a point other than the origin.

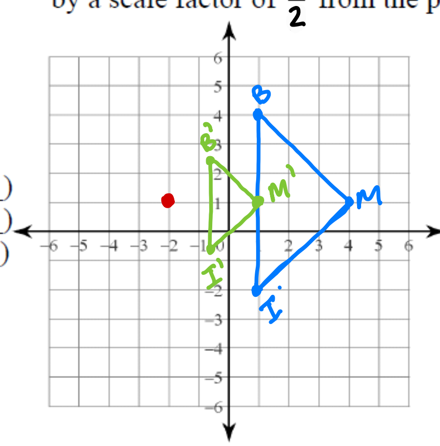
6) Dilate Δ IBM if I(1,-2), B(1,4), M(4,1) by a scale factor of $\frac{1}{2}$ from the origin.



I' ($\frac{1}{2}$, -1)
B' ($\frac{1}{2}$, 2)
M' (2 , $\frac{1}{2}$)

(-2,1) (-2,1) (-2,1)

7) Dilate Δ IBM if I(1,-2), B(1,4), M(4,1) by a scale factor of $\frac{1}{2}$ from the point (-2,1)



I'($-\frac{1}{2}$, $-\frac{1}{2}$)
B'($-\frac{1}{2}$, 2.5)
M'(1 , 1)