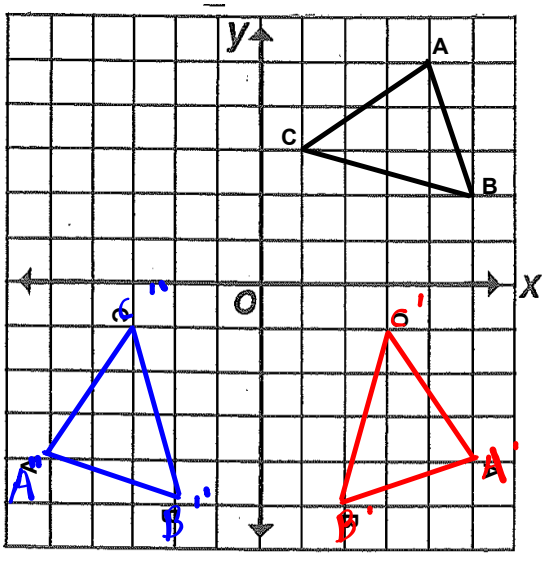
Warm Up

Rotate triangle ABC 90° clockwise, then reflect over the y-axis. What are the coordinates of your final image?



A(4,5)

B(5,2)

C(1,3)

A''(-5,-4) B''(-2,-5) C''(-3,-1)

Questions about rotations?

Kuta Software - Infinite Pre-Algebra

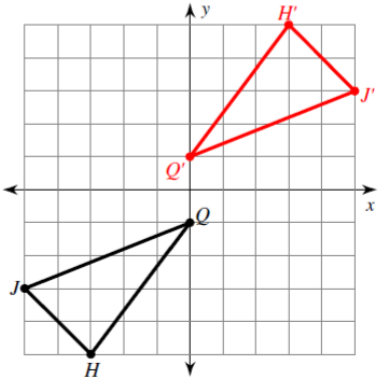
Name_____

Rotations of Shapes

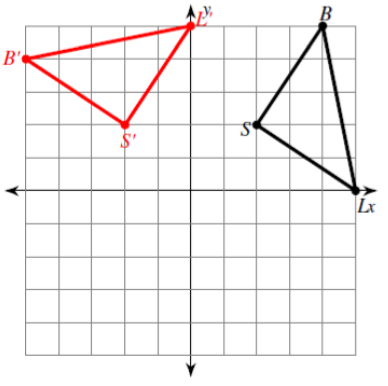
Period____

Graph the image of the figure using the transformation given.

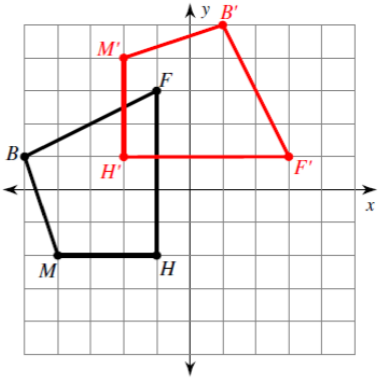
1) rotation 180° about the origin



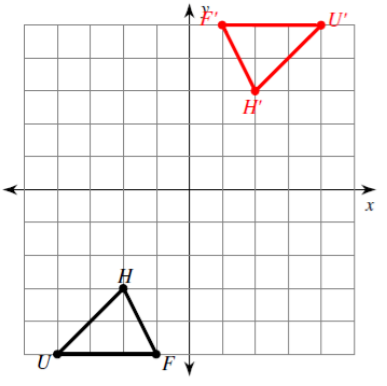
2) rotation 90° counterclockwise about the origin



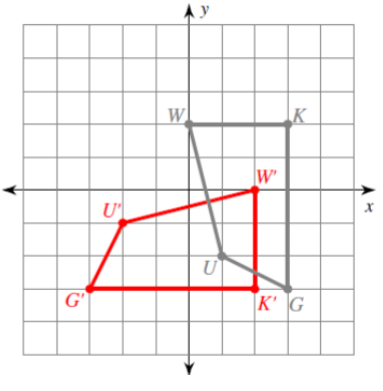
3) rotation 90° clockwise about the origin



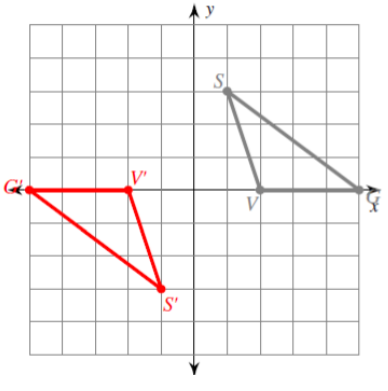
4) rotation 180° about the origin



5) rotation 90° clockwise about the origin
$U(1, -2)$, $W(0, 2)$, $K(3, 2)$, $G(3, -3)$



6) rotation 180° about the origin
$V(2, 0)$, $S(1, 3)$, $G(5, 0)$



Find the coordinates of the vertices of each figure after the given transformation.

7) rotation 180° about the origin
$Z(-1, -5)$, $K(-1, 0)$, $C(1, 1)$, $N(3, -2)$

$Z'(1, 5)$, $K'(1, 0)$, $C'(-1, -1)$, $N'(-3, 2)$

8) rotation 180° about the origin
$L(1, 3)$, $Z(5, 5)$, $F(4, 2)$

$L'(-1, -3)$, $Z'(-5, -5)$, $F'(-4, -2)$

9) rotation 90° clockwise about the origin
$S(1, -4)$, $W(1, 0)$, $J(3, -4)$

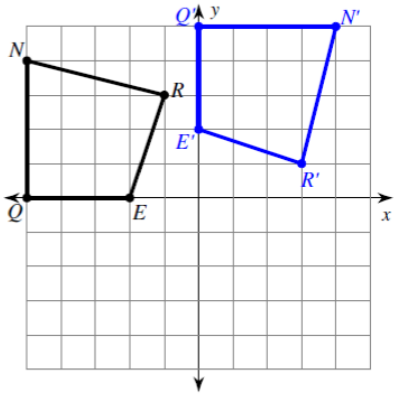
$S'(-4, -1)$, $W'(0, -1)$, $J'(-4, -3)$

10) rotation 180° about the origin
$V(-5, -3)$, $A(-3, 1)$, $G(0, -3)$

$V'(5, 3)$, $A'(3, -1)$, $G'(0, 3)$

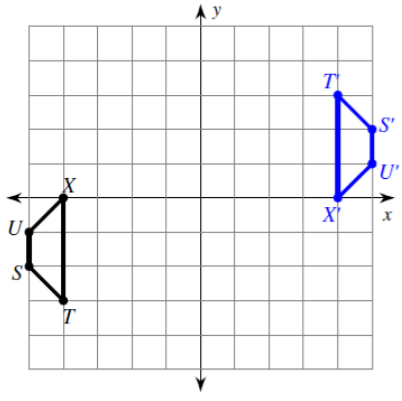
Write a rule to describe each transformation.

11)



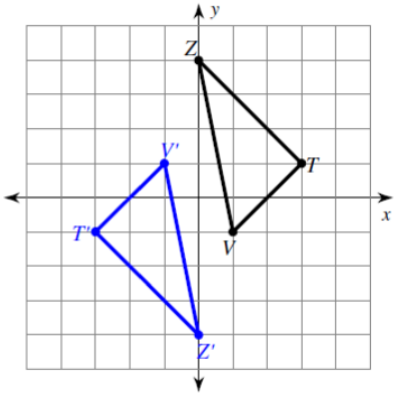
rotation 90° clockwise about the origin

12)



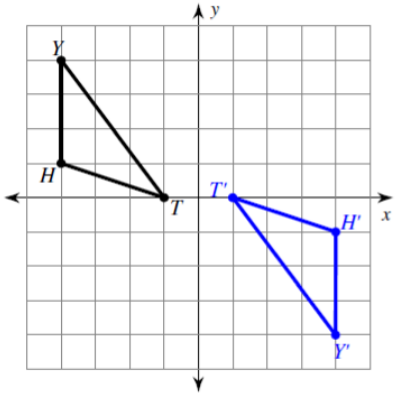
rotation 180° about the origin

13)



rotation 180° about the origin

14)

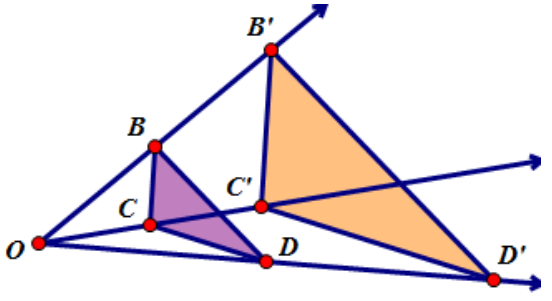


rotation 180° about the origin

DILATION

Stretching and Shrinking

A **DILATION** is a transformation that produces an image that is the same shape as the original, but a different size.



Rules for Dilations:

- Dilations are centered around the origin (0, 0) unless otherwise stated.
- The image and the preimage are similar.
- Dilations involve a scale factor.

Scale Factors:

- Scale factor is: $\frac{\text{image length}}{\text{pre-image length}}$ which is a ratio.
- If the scale factor is greater than 1, the figure becomes larger.
- If the scale factor is between 0 and 1, the figure becomes smaller.

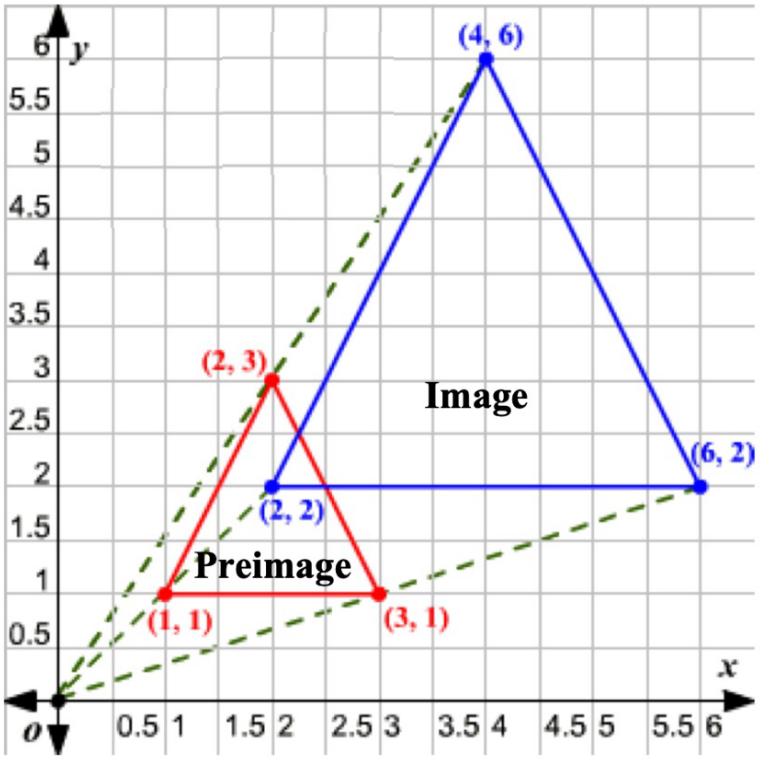
A dilation is

SIMILAR / CONGRUENT

to the original figure.

This is our only transformation that is not congruent.

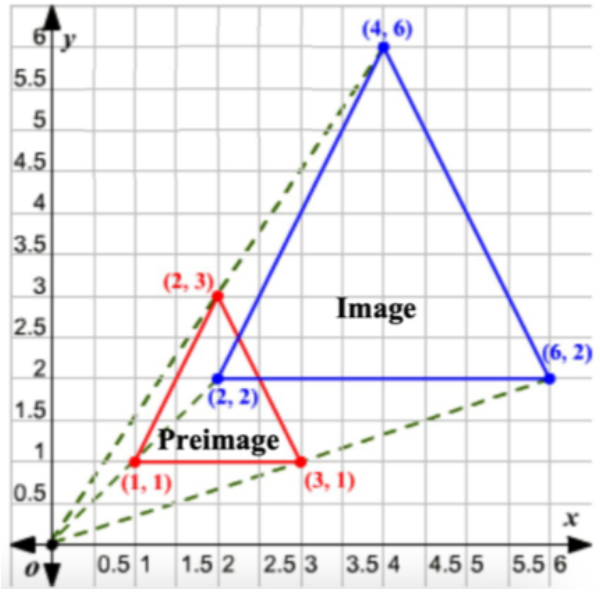
Example 1: How can we calculate the scale factor?



Let's compare the lengths of the base of each triangle:

$$\frac{\text{image length}}{\text{pre-image length}} = \frac{4}{2} = 2$$

this is our scale factor



Let's look at what is happening to each point that is dilated:

A (1, 1) → A' (2, 2)

B (2, 3) → B' (4, 6)

C (3, 1) → C' (6, 2)

What is this rule?

$(x, y) \rightarrow (2x, 2y)$

The rule for dilations is:

(x, y) → (fx, fy) where f represents the scale factor.

If the scale factor is 3, how would you write the rule?

(x, y) → (3x , 3y)

Example 2:

Triangle ABC has vertices A (0, 2), B (4, 4), and C (-1, 4). What are the vertices of its image with a scale factor of 4?

$(x, y) \rightarrow (4x, 4y)$

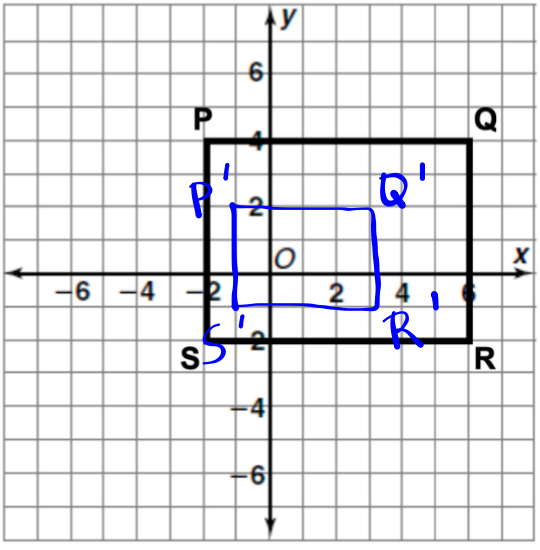
$A'(0, 8)$ $B'(16, 16)$ $C'(-4, 16)$

Example 3:

Quadrilateral PQRS has vertices P (-2, 4), Q (4, 6) (6, 4), R (6, -2), and S (- 2, - 2). It is dilated by a scale factor of 1/2.

a. What are the coordinates of the image (after dilation)? Graph them.

P' (-1, 2) Q' (3, 2) R' (3, -1) S' (-1, -1)



b. Demonstrate these quadrilaterals are similar by comparing the ratios of the lengths.

$\frac{P'Q'}{PQ} = \frac{4}{8} = \frac{1}{2}$ $\frac{Q'R'}{QR} = \frac{3}{6} = \frac{1}{2}$ $\frac{R'S'}{RS} = \frac{4}{8} = \frac{1}{2}$ $\frac{S'P'}{SP} = \frac{3}{6} = \frac{1}{2}$

c. What do you notice about the angle measurements of the two figures?

They are all the same.

Example 4:

If the scale factor is $\frac{5}{2}$, how would you write the general rule? Is this an enlargement or a reduction?

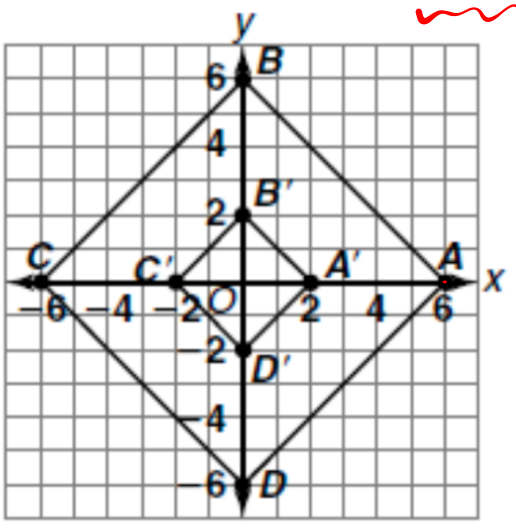
$(x, y) \rightarrow \left(\frac{5}{2}x, \frac{5}{2}y\right)$

Enlargement.

We know because $\frac{5}{2} > 1$

Example 5:

Quadrilateral A'B'C'D' is a dilation of quadrilateral ABCD. Find the scale factor. Classify the dilation as an enlargement or a reduction.



$B(0,6) \rightarrow B'(0,2)$

$\frac{2}{6} = \frac{1}{3}$

$A(6,0) \rightarrow A'(2,0)$

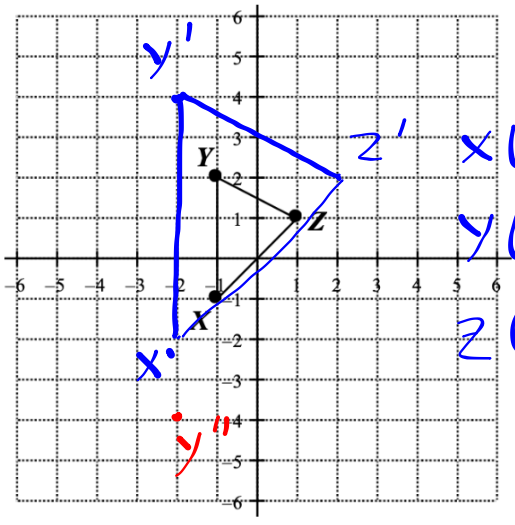
$\frac{2}{6} : \frac{1}{3}$

2/6 = 1/3

This is a reduction!

Example 6:

Δ XYZ is graphed below. Draw and label Δ X'Y'Z' after a dilation with scale factor of two.



y'
z'
x'
y''

x (-1,-1) → x' (-2,-2)
y (-1,2) → y' (-2,4)
z (1,1) → z' (2,2)

What will be the coordinates of point Y" after a reflection of Δ X'Y'Z' over the x-axis?

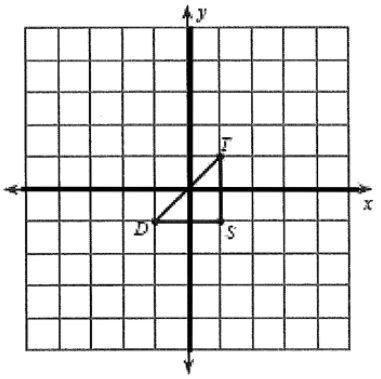
y" (-2,-4)

Name _____ Period _____ Date _____

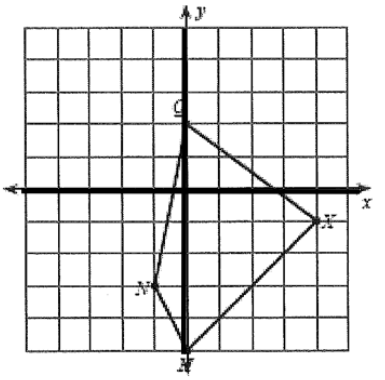
Dilations Practice

Graph the image of the figure using the transformation given. Assume all dilations are from the origin unless otherwise noted.

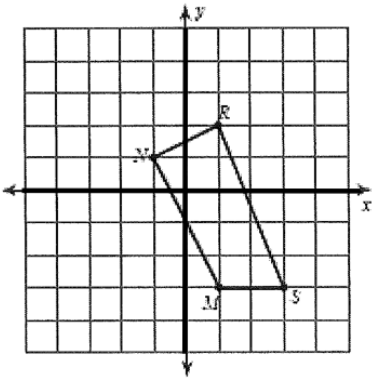
1. Dilation of 2.5



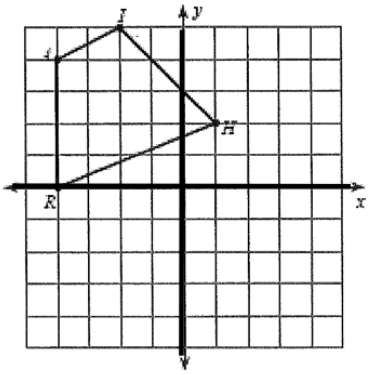
2. Dilation of 0.5



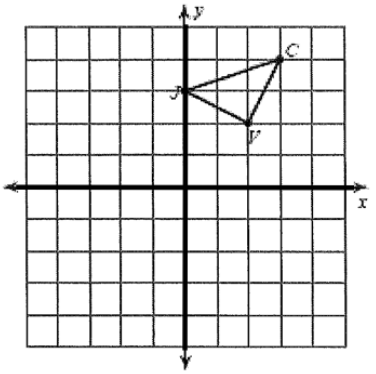
3. Dilation of 1.5



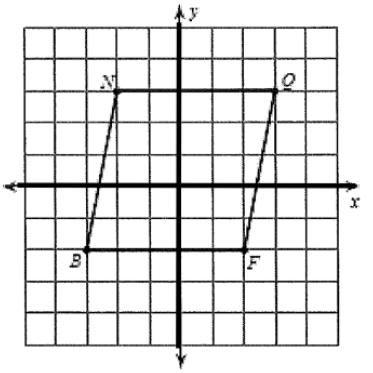
4. Dilation of 0.5



5. Dilation of ¼

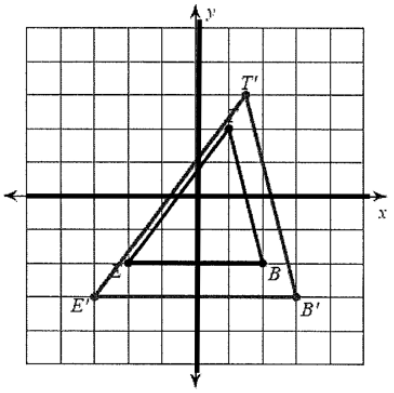


6. Dilation of 1.5

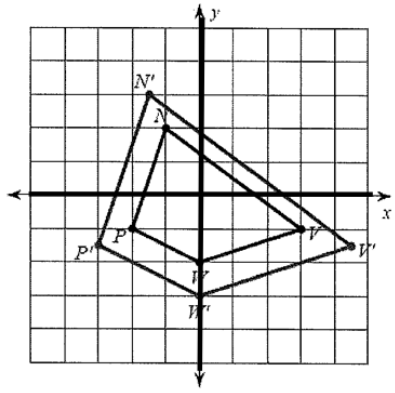


Write a rule to describe each transformation.

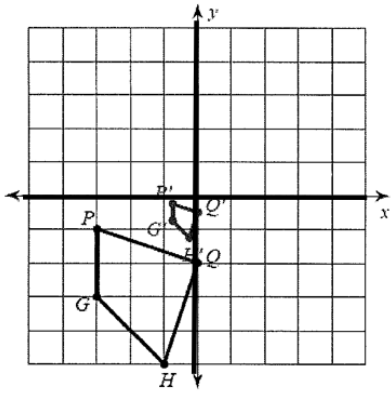
7.



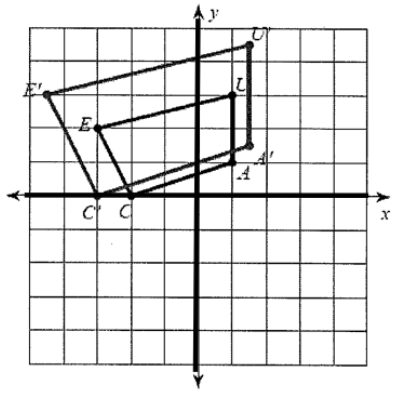
8.



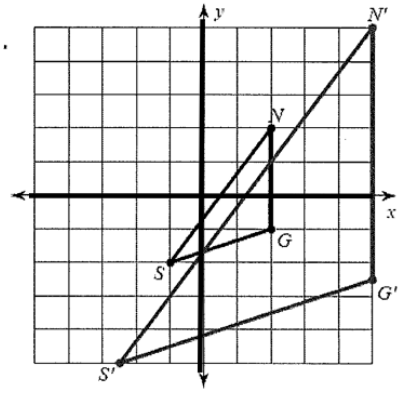
9.



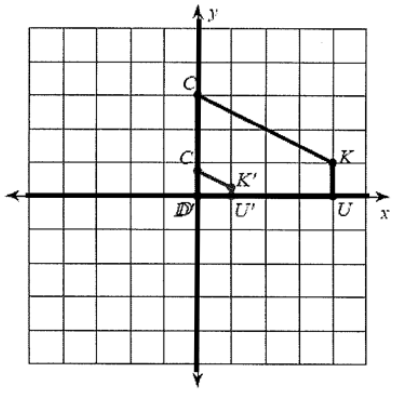
10.



11.



12.



Write a rule to describe each transformation.

13. U(–2, –1), K(0, 2), F(2, –2) to U'(–3, –1.5), K'(0, 3), F'(3, –3)

14. V(–1, –2), K(–1, 3), Y(1, 0) to V'(–1.5, –3), K'(–1.5, 4.5), Y'(1.5, 0)

15. K(–1, –2), U(–2, 2), V(2, 2), Q(2, –1) to K'(–2, –4), U'(–4, 4), V'(4, 4), Q'(4, –2)

16. N(–4, 1), T(–5, 3), J(–4, 3), C(–1, 0) to N'(–1, 0.25), T'(–1.25, 0.75), J'(–1, 0.75), C'(–0.25, 0)

17. K(–1, 0), N(–2, 2), H(3, 3), T(3, –2) to K'(–1.5, 0), N'(–3, 3), H'(4.5, 4.5), T'(4.5, –3)

Write the coordinates of the vertices after the given transformation.

18. Dilation of 4
N(0, 1), O(1, 1), P(0, 8)

19. Dilation of 1.5
V(−2, −2), I(1, 2), F(2, 0)

20. Dilation of ½
U(3, 2), C(4, 4), E(5, 2)

21. Dilation of 2
H(−1, −2), A(−2, 2), W(2, 2)

22. Dilation of ¼
W(−4, −5), X(−5, −1), T(−3, 0)

23. Dilation of 5
Q(−3, −3), M(0, −1), H(1, −3)

24. Dilation of 3
Q(−3, −3), M(0, −1), H(1, −3)

25. Dilation of 5/2
C(−1, −2), V(−2, 2), N(2, 0)

Homework

Finish Classwork