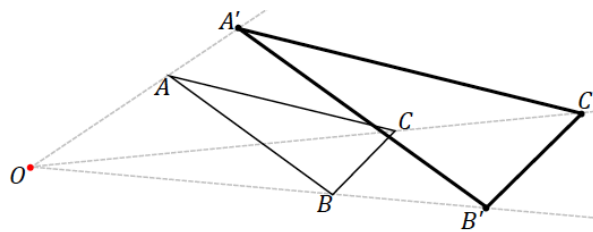# Lesson 3: Making Scale Drawings Using the Parallel Method

Classwork

Opening Exercise

Dani dilated $\triangle ABC$ from center O, resulting in $\triangle A'B'C'$. She says that she completed the drawing using parallel lines. How could she have done this? Explain.
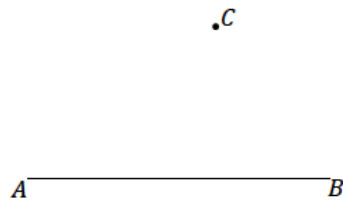
Example 1

a. Use a ruler and setsquare to draw a line through C parallel to $\overline{AB}$. What ensures that the line drawn is parallel to $\overline{AB}$?

b. Use a ruler and setsquare to draw a parallelogram $ABCD$ around $\overline{AB}$ and point C.

. C

A ——————————— B

Example 2

Use the figure below with center O and a scale factor of $r = 2$ and the following steps to create a scale drawing using the parallel method.

Step 1. Draw a ray beginning at O through each vertex of the figure.

Step 2. Select one vertex of the scale drawing to locate; we have selected A'. Locate A' on $\overrightarrow{OA}$ so that $OA' = 2OA$.

Step 3. Align the setsquare and ruler as in the image below; one leg of the setsquare should line up with side AB, and the perpendicular leg should be flush against the ruler.

Step 4. Slide the setsquare along the ruler until the edge of the setsquare passes through A'. Then, along the perpendicular leg of the setsquare, draw the segment through A' that is parallel to $\overline{AB}$ until it intersects with $\overrightarrow{OB}$, and label this point B'.

Step 5. Continue to create parallel segments to determine each successive vertex point. In this particular case, the setsquare has been aligned with $\overline{AC}$. This is done because, in trying to create a parallel segment from $\overline{BC}$, the parallel segment was not reaching B'. This could be remedied with a larger setsquare and longer ruler, but it is easily avoided by working on the segment parallel to $\overline{AC}$ instead.

Step 6. Use your ruler to join the final two unconnected vertices.
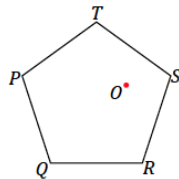
C

O

A B
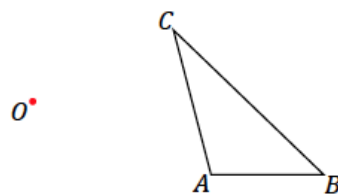
Exercises

1. With a ruler and setsquare, use the parallel method to create a scale drawing of $WXYZ$ by the parallel method. W' has already been located for you. Determine the scale factor of the scale drawing. Verify that the resulting figure is in fact a scale drawing by showing that corresponding side lengths are in constant proportion and that corresponding angles are equal in measurement.
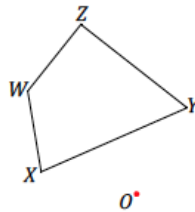
2. With a ruler and setsquare, use the parallel method to create a scale drawing of $DEFG$ about center O with scale factor $r = \frac{1}{2}$. Verify that the resulting figure is in fact a scale drawing by showing that corresponding side lengths are in constant proportion and that the corresponding angles are equal in measurement.
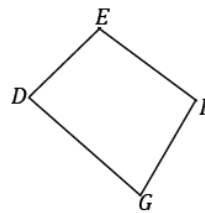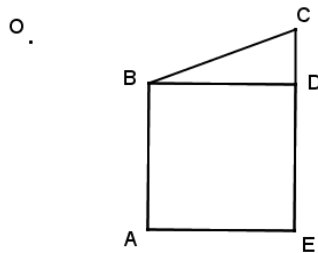
3. With a ruler and setsquare, use the parallel method to create a scale drawing of pentagon $PQRST$ about center O with scale factor $\frac{5}{2}$. Verify that the resulting figure is in fact a scale drawing by showing that corresponding side lengths are in constant proportion and that corresponding angles are equal in measurement.

Problem Set

1. With a ruler and setsquare, use the parallel method to create a scale drawing of the figure about center O. One vertex of the scale drawing has been provided for you.

    O.

   B ... C
    D
    A
    E

    .A'

    Determine the scale factor. Verify that the resulting figure is in fact a scale drawing by showing that corresponding side lengths are in constant proportion and that the corresponding angles are equal in measurement.

2. With a ruler and setsquare, use the parallel method to create a scale drawing of the figure about center O and scale factor $r = \frac{1}{3}$. Verify that the resulting figure is in fact a scale drawing by showing that corresponding side lengths are in constant proportion and the corresponding angles are equal in measurement.

    A
    B
    E
    C
    D
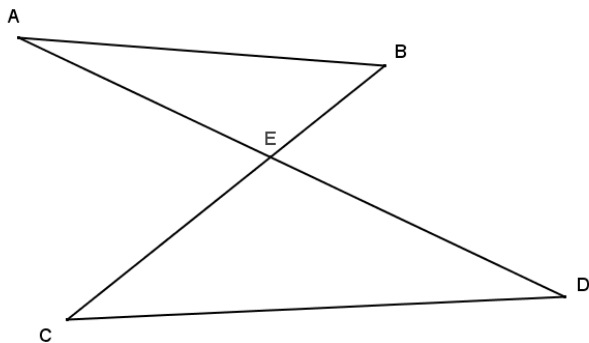
    .O

3. With a ruler and setsquare, use the parallel method to create the following scale drawings about center O: (1) first use a scale a factor of 2 to create $\triangle A'B'C'$, (2) then, with respect to $\triangle A'B'C'$, use a scale factor of $\frac{2}{3}$ to create scale drawing $\triangle A''B''C''$. Calculate the scale factor for $\triangle A''B''C''$ as a scale drawing of $\triangle ABC$. Use angle and side length measurements and the appropriate proportions to verify your answer.
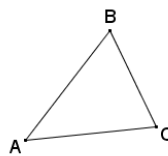

4. Follow the direction in each part below to create three scale drawings of $\triangle ABC$ using the parallel method.

   a. With the center at vertex A, make a scale drawing of $\triangle ABC$ with a scale factor of $\frac{3}{2}$.

   b. With the center at vertex B, make a scale drawing of $\triangle ABC$ with a scale factor of $\frac{3}{2}$.

   c. With the center at vertex C, make a scale drawing of $\triangle ABC$ with a scale factor of $\frac{3}{2}$.
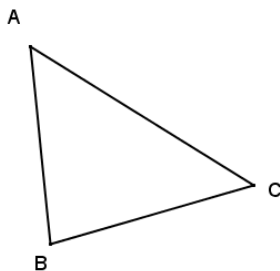
   d. What conclusions can be drawn about all three scale drawings from parts (a)–(c)?

5. Use the parallel method to make a scale drawing of the line segments in the following figure using the given W', the image of vertex W, from center O. Determine the scale factor.
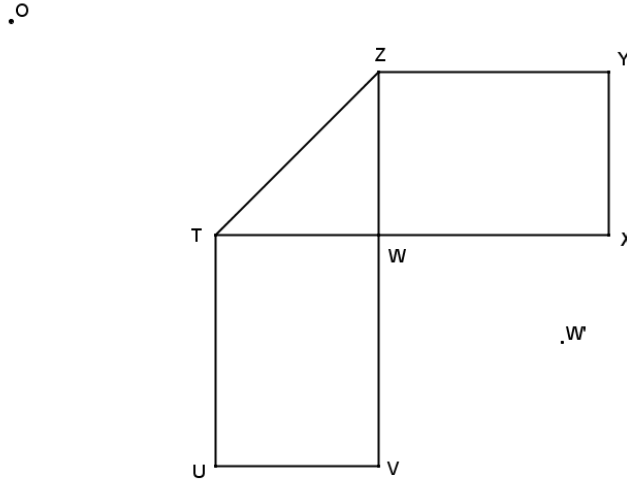
Use your diagram from Problem 1 to answer this question.

6. If we switch perspective and consider the original drawing $ABCDE$ to be a scale drawing of the constructed image $A'B'C'D'E'$, what would the scale factor be?