Lesson 10: Dividing the King's Foot into 12 Equal Pieces

Classwork
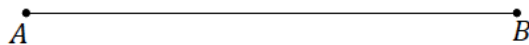
Opening Exercise

Use a compass to mark off equally spaced points C, D, E, and F so that AB, BC, CD, DE, and EF are equal in length. Describe the steps you took.
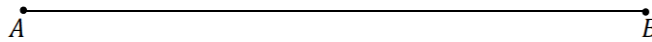
A B

Exploratory Challenge 1

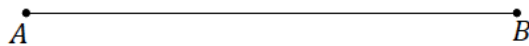Divide segment AB into three segments of equal lengths.

A ——————————————— B

Exercise 1

Divide segment AB into five segments of equal lengths.

$\overset{\bullet}{A} \rule{8cm}{0.4pt} \overset{\bullet}{B}$

Exploratory Challenge 2

Divide segment AB into four segments of equal length.

$\overset{\bullet}{A} \rule{6cm}{0.4pt} \overset{\bullet}{B}$

Exercise 2

On a piece of poster paper, draw a segment AB with a measurement of 1 foot. Use the dilation method to divide $\overline{AB}$ into twelve equal-length segments, or into 12 inches.

Lesson Summary

SIDE SPLITTER METHOD: If $\overline{AB}$ is a line segment, construct a ray AA_1 and mark off n equally spaced points using a compass of fixed radius to get points $A = A_0, A_1, A_2, \cdots, A_n$. Construct $\overline{A_nB}$ that is a side of $\triangle ABA_n$. Through each point $A_1, A_2, \cdots, A_{n-1}$, construct line segments $\overline{A_iB_i}$ parallel to $\overline{A_nB}$ that connect two sides of $\triangle AA_nB$.

DILATION METHOD: Construct a ray XY parallel to $\overline{AB}$. On the parallel ray, use a compass to mark off n equally spaced points $X_1, X_2, \cdots, X_n$ so that $XX_n \neq AB$. Lines $\overleftrightarrow{AX}$ and $\overleftrightarrow{BX_n}$ intersect at a point O. Construct the rays $\overrightarrow{OX_i}$ that meet $\overline{AB}$ in points A_i.

Problem Set

1. Pretend you are the king or queen and that the length of your foot is the official measurement for one foot. Draw a line segment on a piece of paper that is the length of your foot. (You may have to remove your shoe.) Use the method above to find the length of 1 inch in your kingdom.

2. Using a ruler, draw a segment that is 10 cm. This length is referred to as a decimeter. Use the side splitter method to divide your segment into ten equal-sized pieces. What should be the length of each of those pieces based on your construction? Check the length of the pieces using a ruler. Are the lengths of the pieces accurate?

3. Repeat Problem 2 using the dilation method. What should be the length of each of those pieces based on your construction? Check the length of the pieces using a ruler. Are the lengths of the pieces accurate?

4. A portion of a ruler that measured whole centimeters is shown below. Determine the location of $5\frac{2}{3}$ cm on the portion of the ruler shown.

5. Merrick has a ruler that measures in inches only. He is measuring the length of a line segment that is between 8 and 9 in. Divide the one-inch section of Merrick's ruler below into eighths to help him measure the length of the segment.

8   9
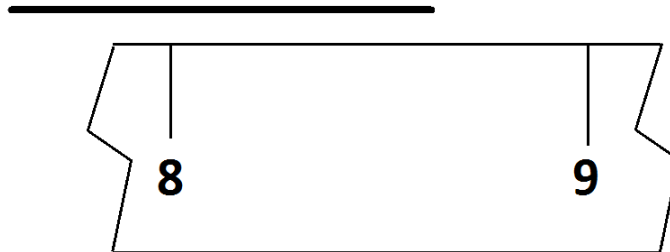
6. Use the dilation method to create an equally spaced 3 × 3 grid in the following square.
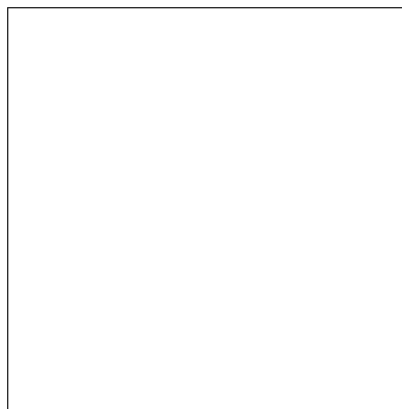
7. Use the side splitter method to create an equally spaced 3×3 grid in the following square.