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.



Exploratory Challenge 1

Divide segment $AB$ into three segments of equal lengths.



Exercise 1

Divide segment $AB$ into five segments of equal lengths.



Exploratory Challenge 2

Divide segment $AB$ into four segments of equal length.



Exercise 2

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

Lesson Summary

**Side splitter method**: If $\overbar{AB}$ 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 $\overbar{A\_{n}B}$ that is a side of $△ABA\_{n}$. Through each point $A\_{1}$,$ A\_{2}$,$ \cdots $,$ A\_{n-1}$, construct line segments $\overbar{A\_{i}B\_{i}}$ parallel to $\overbar{A\_{n}B}$ that connect two sides of $△AA\_{n}B$.

**Dilation method**: Construct a ray $XY$ parallel to $\overbar{AB}$ . On the parallel ray, use a compass to mark off $n$ equally spaced points $X\_{1}$, $X\_{2}$,$\cdots $,$ X\_{n}$ so that $XX\_{n}\ne AB$. Lines $\overleftrightarrow{AX}$ and $\overleftrightarrow{BX\_{n}}$ intersect at a point $O$. Construct the rays $\vec{OX\_{i}}$ that meet $\overbar{AB}$ 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.



1. Use the dilation method to create an equally spaced $3×3$ grid in the following square.



1. Use the side splitter method to create an equally spaced $3×3$ grid in the following square.

