

# Module 5: Analyzing Geometric Functions

## TOPIC 1: CONSTRUCTIONS

This topic is built around three major constructions: inscribing a square, a regular hexagon, and an equilateral triangle in a square. Constructions develop students' understanding of the structure of geometric figures as a composition of parts, and working with them develops their intuition about the nature and structure of these shapes and builds reasoning skills as they consider how to construct shapes with given characteristics. Because they need reasons to justify their constructions, they are building their deductive reasoning skills, and this reasoning will serve them well when they write formal proofs in later topics.

## Where have we been?

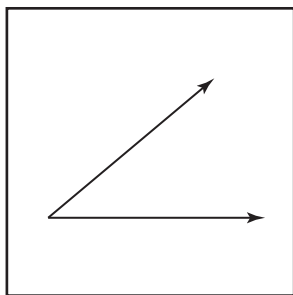
As students progressed through upper elementary and into middle school, they began refining their understanding of shapes, classifying them by side lengths and angle measures. Precision in drawing shapes became more important to reflect their new understandings. This topic builds from these basic understandings of geometric relationships.

## Where are we going?

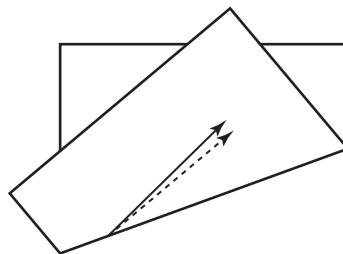
Learning to make geometric constructions is an important first step in learning the formal reasoning needed to prove that geometric relationships are true in all cases.

## Angle Bisector

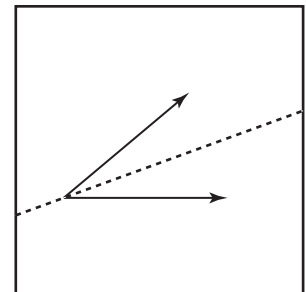
If a ray is drawn through the vertex of an angle and divides the angle into two angles of equal measure, or two congruent angles, this ray is called an angle bisector. You can use patty paper to construct an angle bisector.



Draw an angle on patty paper.



Fold so that the two rays of the angle lie on top of each other.



Open the paper. The crease is the angle bisector.

## I Heart Descartes . . . or Nart

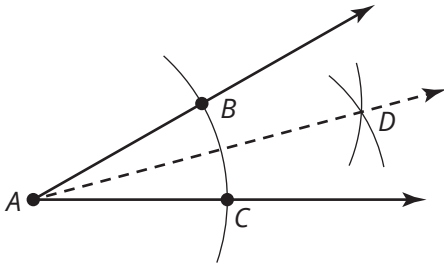
Are you better at geometry or algebra? Many students have a preference for one subject or the other. However, geometry and algebra are very closely related.

While there are some branches of geometry that do not use much algebra, analytic geometry applies methods of algebra to geometric questions. Analytic geometry is also known as the study of geometry using a coordinate system. So anytime you are performing geometric calculations and it involves a coordinate system, you are studying analytic geometry. Be sure to thank Descartes and his discovery of the coordinate plane for this!

### Talking Points

Although students aren't typically expected to actually make constructions on standardized tests, they may see questions asking them about the structure of constructions. Here is a sample question:

**Given  $\angle A$ . What is the first step in constructing the angle bisector of  $\angle A$ ?**



The first step in constructing the angle bisector is to draw an arc from point  $A$  that intersects the sides of the angle at points  $B$  and  $C$ .

### Key Terms

#### central angle

A central angle is an angle whose vertex is at the center of the circle.

#### segment bisector

A segment bisector is a line, line segment, or ray that divides a line segment into two line segments of equal length.

#### perpendicular bisector

A perpendicular bisector is a line, line segment, or ray that bisects a line segment and is also perpendicular to the line segment.

#### inscribed polygon

An inscribed polygon is a polygon inside another polygon in which all the vertices of the interior polygon touch the sides of the outer polygon.