

Geometry
Unit 1 Line Master 6a

Investigating Geometric Relationships

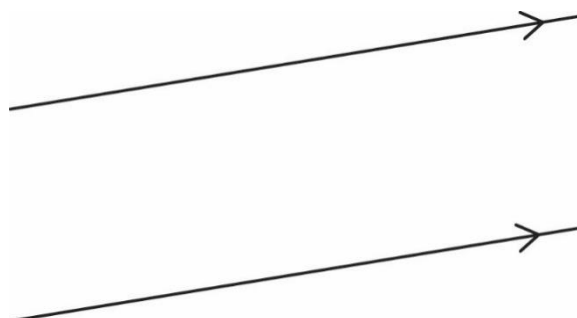
Angles with Parallel and Intersecting Lines

The given lines are parallel. Draw a line (*transversal*) that crosses the parallel lines.

Which angles do you think are congruent?

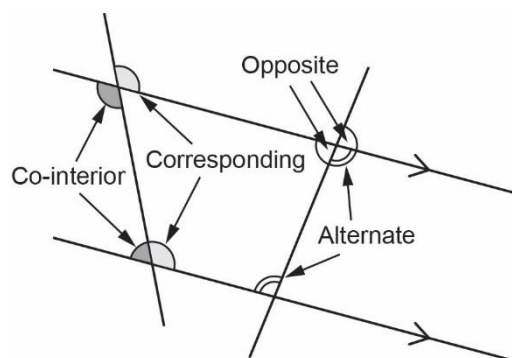
Measure these angles to confirm.

What angle relationships did you discover?



When a transversal crosses parallel lines, there are several pairs of angles that have named relationships.

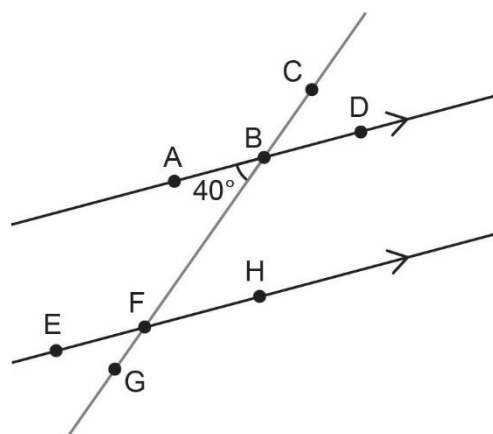
Which pairs of angles are congruent? Which pairs of angles are supplementary?



Determine the unknown angles. Justify how you know (e.g., corresponding angles).

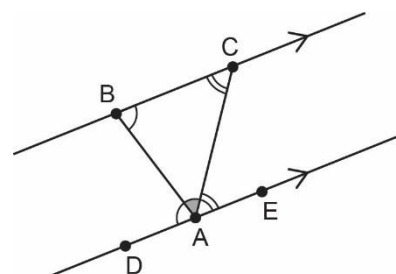
Relate each reason to the given $\angle ABF$.

| Angle | Measure | Reason |
|-------|------------|--------|
| ABF | 40° | given |
| EFG | | |
| CBD | | |
| BFH | | |
| FBD | | |
| EFB | | |



Investigating Geometric Relationships (cont'd)

How can you use parallel lines to prove that the sum of the interior angles in a triangle is 180° ?

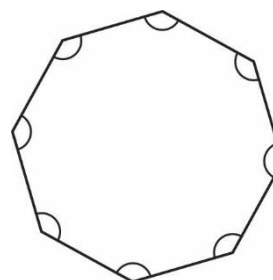


Sum of Interior Angles in a Polygon

To determine the sum of the interior angles in a polygon, you can divide the polygon into triangles. The sum will be the number of triangles $\times 180^\circ$.

Draw a polygon and divide it into triangles. How does the number of triangles relate to the number of sides of the polygon?

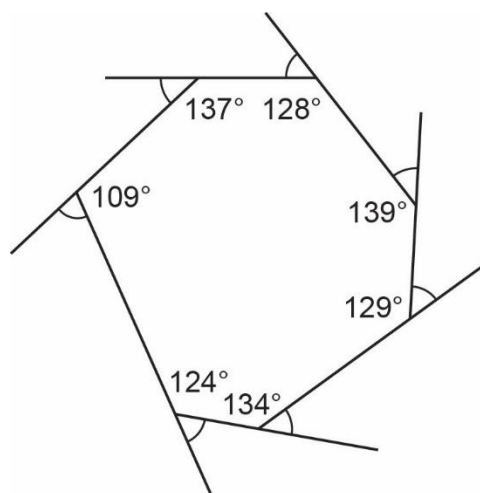
What is the measure of each angle in a regular octagon?



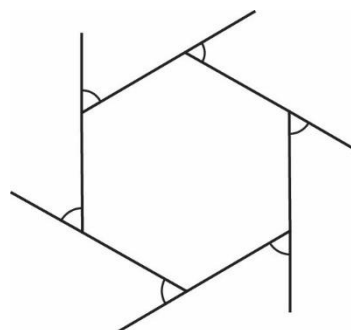
Investigating Geometric Relationships (cont'd)

Sum of Exterior Angles of a Polygon

The interior angles of a heptagon are shown.
What is the sum of its exterior angles?



What is the measure of each exterior angle of a regular hexagon?

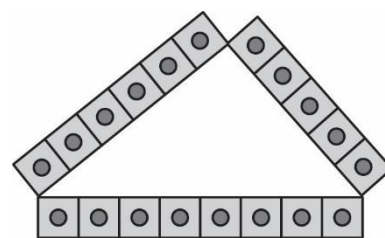


Side Lengths of a Triangle

Given any three side lengths, is it always possible to make a triangle?

Use Relational rods of various lengths or linking cubes to try to make a variety of triangles.

What do you notice? When is a triangle possible?



A triangle has side lengths 5 and 8.

a) What is the shortest possible integer length of the third side?

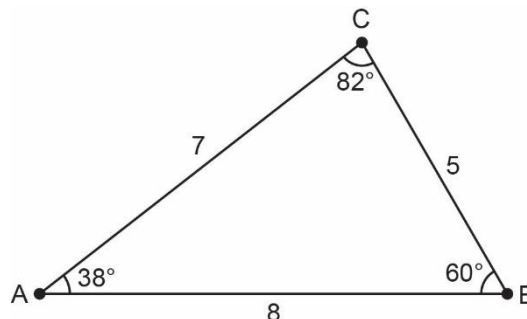
b) What is the longest possible integer length of the third side?

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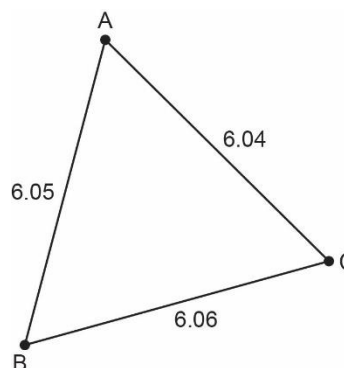
Investigating Geometric Relationships (cont'd)

Angles and Side Lengths in a Triangle

How do the relative side lengths of the triangle relate to the relative size of the angles?



What is the largest angle of the triangle?
How do you know?

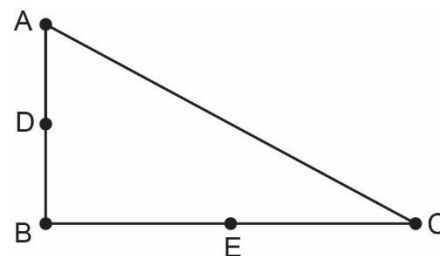


Perpendicular Bisector in a Right Triangle

Points D and E are midpoints on the legs of this right triangle.

Construct the perpendicular bisectors through points D and E.

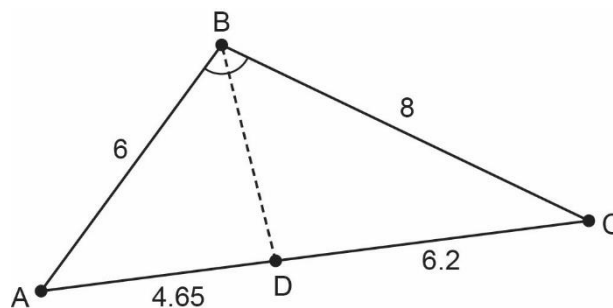
What do you notice about the hypotenuse?



Angle Bisector in a Triangle

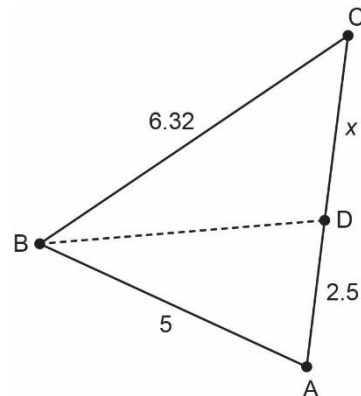
\overline{BD} bisects $\angle ABC$. Calculate the ratios $\frac{AB}{CB}$ and $\frac{AD}{CD}$.

What do you notice?



Investigating Geometric Relationships (cont'd)

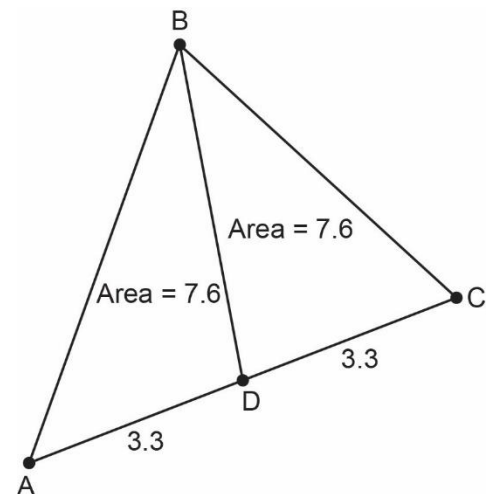
\overline{BD} bisects $\angle ABC$. What is the length of \overline{CD} ?



Median of a Triangle

\overline{BD} is a *median*, meaning it bisects \overline{AC} .

What does a median do to the area of a triangle?



Which triangle has the greater area, $\triangle ABD$ or $\triangle CBD$? How do you know?

