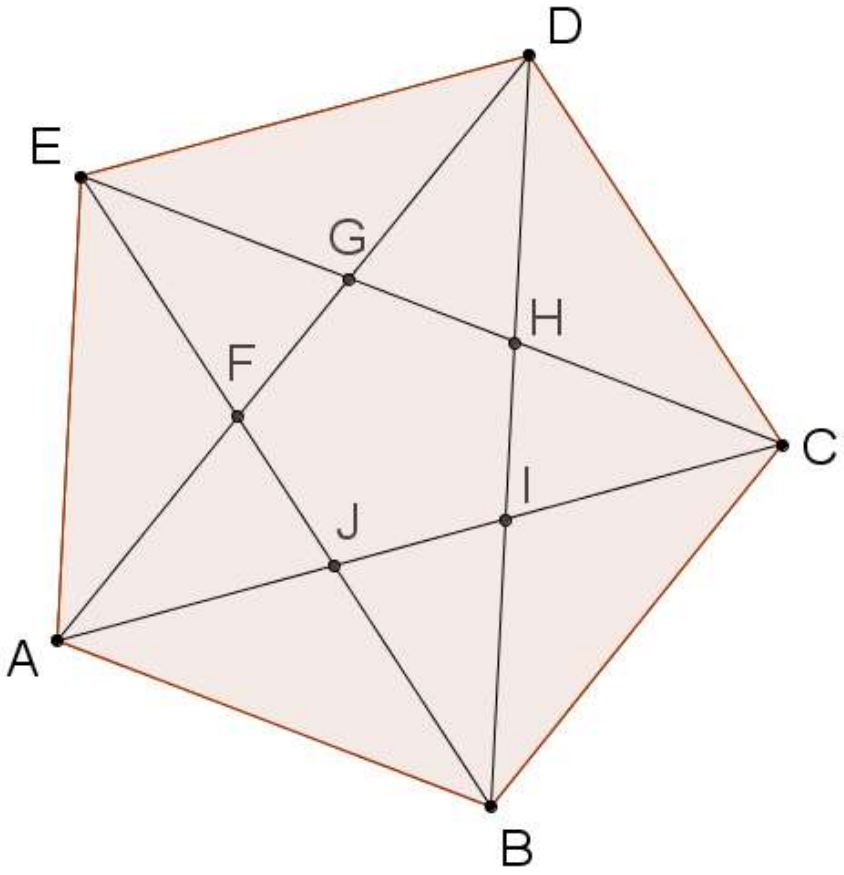
7.4a Classwork: Special Angle Relationships

This diagram is a regular pentagon with all its diagonals drawn and all points labeled.



1. How many *non-overlapping* angles are in the diagram?

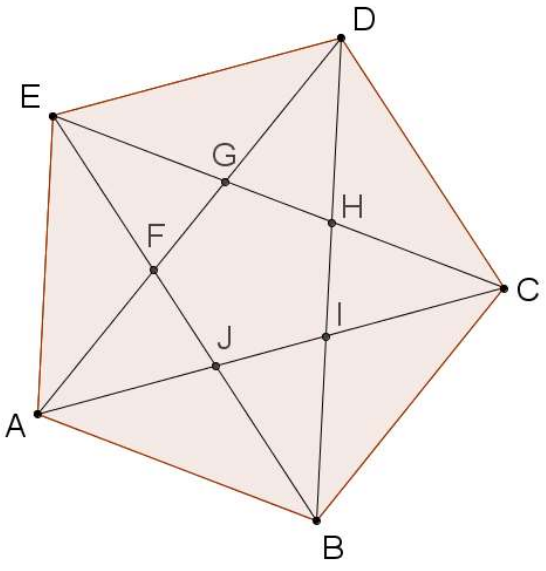
2. There are groups of angles that all have the same measure. For example, $\angle DEG$ and ∠AEF have the same measure. How many *different measures* of angles are there in the diagram? Use a protractor.

Vertical Angles: Two lines that intersect form vertical angles. Vertical angles are pairs of angles that are always opposite one another (rather than adjacent to each other). For example, $\angle EFG$ and $\angle AFJ$ are vertical angles.

Adjacent Angles: Two angles are adjacent if they have a common ray (side) and vertex. For example, $\angle EFG$ and $\angle EFA$ are adjacent angles.

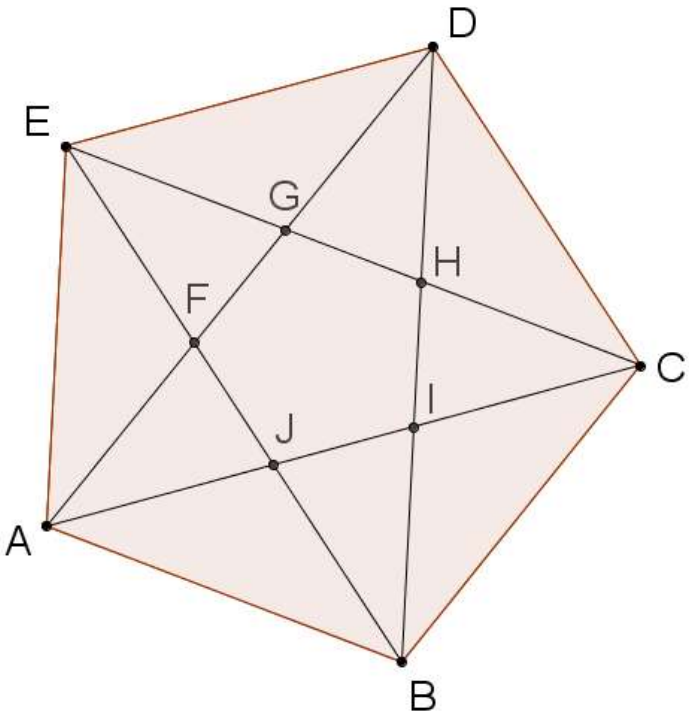
3. Name at least five vertical angle pairs. Use a different colored highlighter to mark each pair in the diagram above.

4. Name at least five adjacent angle pairs. Use a different colored highlighter to mark each pair in the diagram at right.



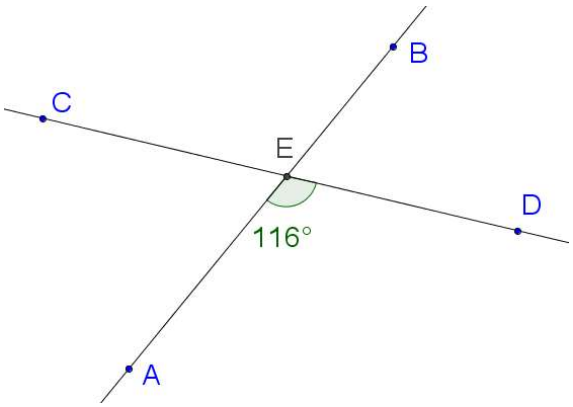
5. What seems to be the relationship between measures of two vertical angles? Draw another pair of vertical angles below by constructing two intersecting lines and measure the two angles in the vertical pair. Does this example support your conjecture?

$\angle DGE$ and $\angle EGF$ are called *supplementary* angles because their measures add to 180°. When supplementary angles are adjacent, you can see that they form a straight line with the two outside rays. Supplementary angles don't always have to be next to each other.

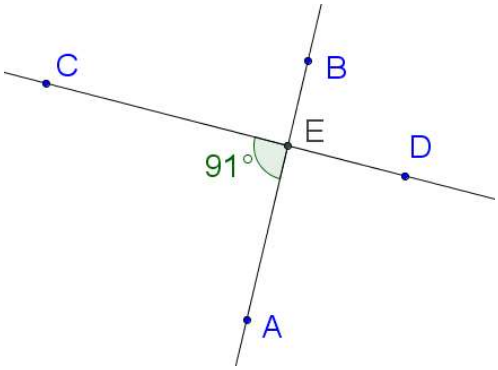


6. Find and name at least 5 pairs of supplementary angles in the diagram. Use a different color to mark each pair in the diagram.

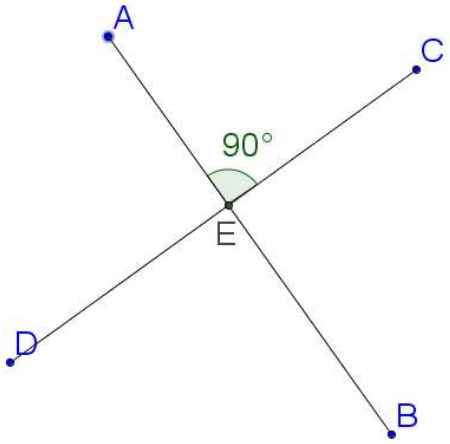
7. For each pair of intersecting lines below, find the three missing measures of angles formed. Justify your answer in the table.



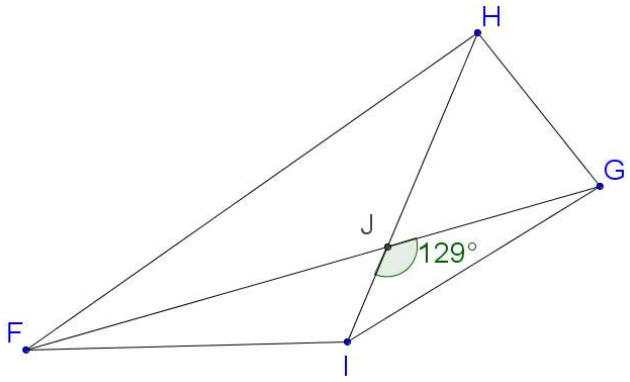
Angle	Measure of angle	Justification
$\angle CEB$		
$\angle DEB$		
$\angle AEC$		



Angle	Measure of angle	Justification
$\angle CEB$		
$\angle DEB$		
$\angle AED$		

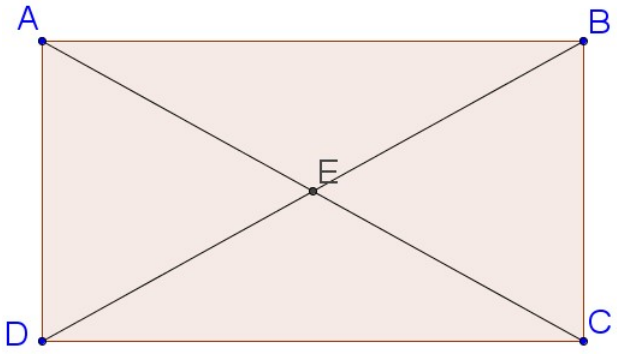


Angle	Measure of angle	Justification
$\angle CEB$		
$\angle DEB$		
$\angle AED$		



Angle	Measure of angle	Justification
$\angle FJI$		
$\angle HJG$		
$\angle FJH$		

8. For this rectangle with diagonals drawn in, there is one place where you can see supplementary and vertical angles. Use a protractor to measure one of the angles, and then calculate the measures of the other three angles that have vertex at E using facts about vertical and supplementary pairs.

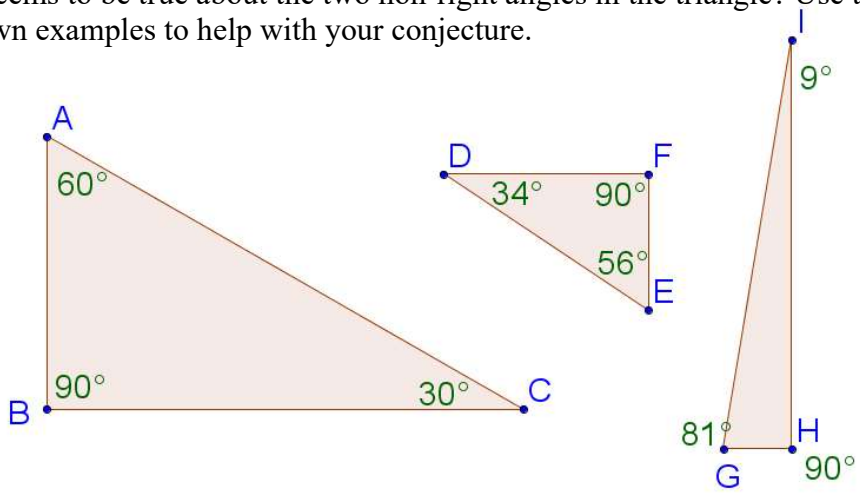


$\angle EAB$ and $\angle DAE$ are *complementary* because their measures add to 90°. When complementary angles are adjacent, you can see the right angle that is formed by the outside rays. However, complementary angles don't need to be adjacent; as long as their measures add to 90 degrees, two angles form a complementary pair.

9. Find and name at least five more pairs of complementary angles in the figure above. Use a different highlighter to mark each pair on the diagram.

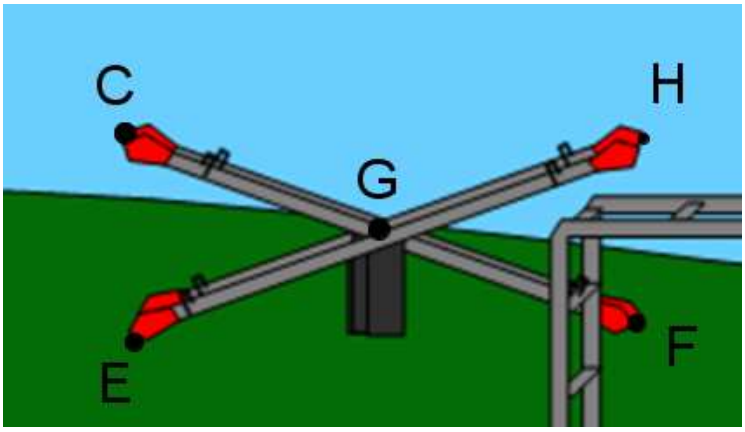
10. Review: What is the sum of all the angles in a triangle?

11. Consider a right triangle. What seems to be true about the two non-right angles in the triangle? Use the examples below, or draw your own examples to help with your conjecture.



For #12-13, use properties of complementary, supplementary, and vertical angles to find missing measures.

12. Two pair of seesaws sit unused at a playground, as shown. $\angle EGF$ has a measure of 140 °.



a. Which angle is vertical to $\angle EGF$?

b. What is the measure of $\angle CGH$?

c. Name an angle that is supplementary to $\angle EGF$.

d. What is the measure of $\angle CGE$?

e. What is the measure of $\angle HGF$?

13. In the diagram below, $\angle ADB$ is a right angle. The figure is formed by 3 intersecting lines.

Fill in the measures and justifications in the table:

Angle	**Measure**	**Justification**
$\angle CDA$	90°	Supplementary to $\angle ADB$, which is 90.
$\angle ADG$		
$\angle GDB$		
$\angle BDF$		
$\angle EDC$