

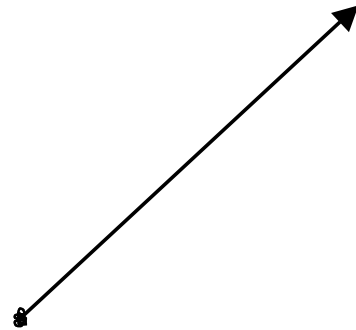
## Exterior and Remote Interior Angles of a Triangle

Name: \_\_\_\_\_ Date: \_\_\_\_\_.

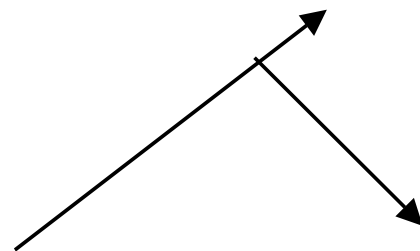
Directions: Today, by using a computer program called Geometer's Sketchpad, we will learn two important facts about the exterior angles of a triangle. Follow the step-by-step instructions and fill in the blanks as needed. I will have examples throughout the worksheet as to what your drawings should look similar to. Feel free to raise your hand and ask for help if you need it. Remember to work at your own pace, not your neighbor's pace! Do not copy answers from your neighbors!

STEP 1: Find the Geometer's Sketchpad icon on your computer and double click on it. You should see a blank screen with the heading Untitled # 1 and icons along the side.

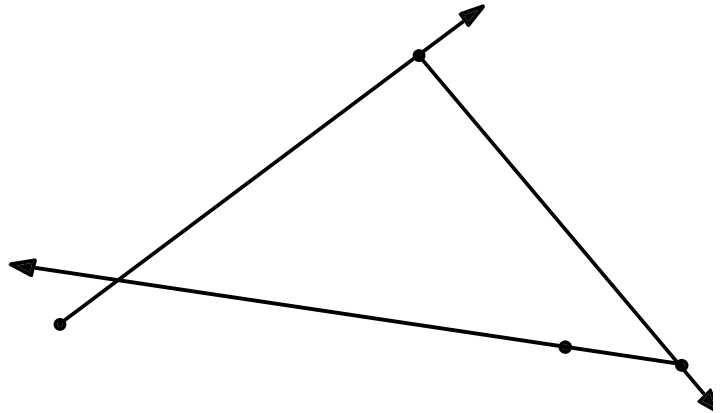
STEP 2: Go to the fourth icon down (along the side); it is the line segment icon. If you click on it, three icons appear to the right: a line segment icon, a ray icon, and a line icon. We want to construct a ray so move your cursor over the ray icon and click on it. The fourth icon down should have changed from a line segment to a ray and be highlighted to tell you this is the icon that you picked. Click anywhere in the sketching region and drag until you see a dotted ray where you want your ray to be. Stop dragging. You should now have constructed your first ray similar to the one on the right.



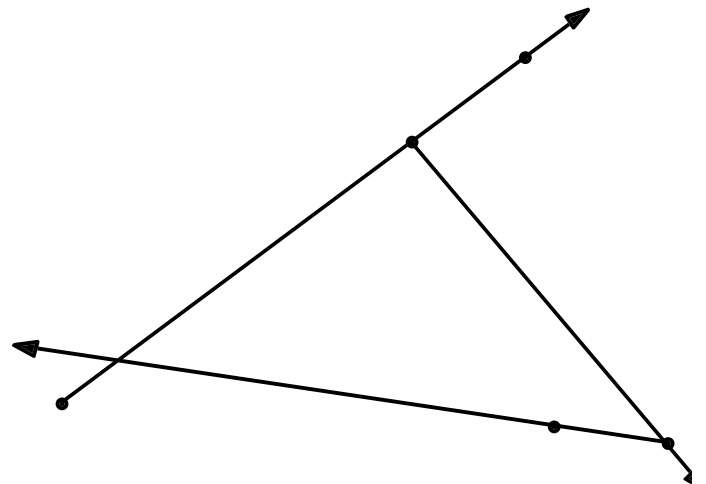
STEP 3: Make sure your ray icon is still highlighted. Move your cursor on top of your first ray, click and drag the ray in the direction that you want to go. You should have a point of intersection and two rays. Your two rays should look similar to the one on the right.



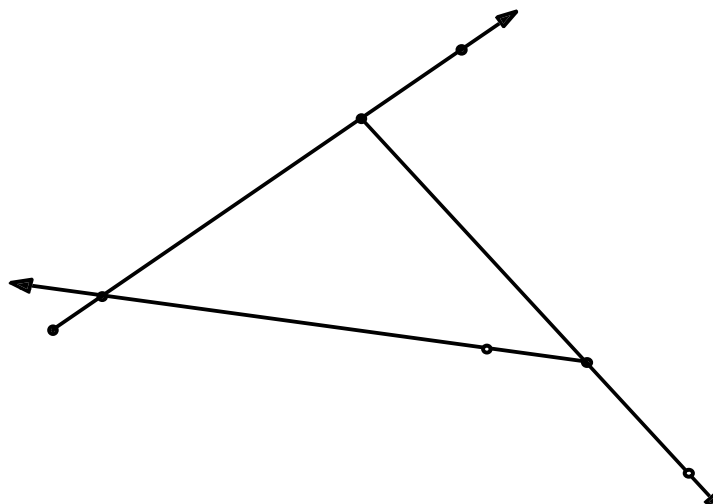
STEP 4: Again, make sure your ray icon is still highlighted and construct another ray that intersects with your other two rays. To do this, move your cursor on top of your second ray and drag towards your first ray until you see that they will intersect. Stop dragging. You should have a triangle now.



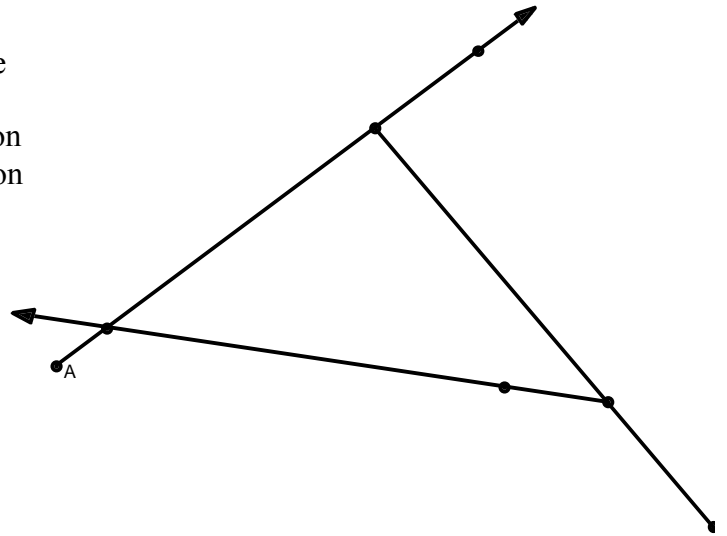
STEP 5: Go to the second icon from the top; this is your icon to create points. Click on this icon. You should have three points already at the vertices of your triangle. If you don't, you will have to construct the points over the intersection points of the rays. To create the points over the points of intersection, move the cursor over the intersection. You should notice at the bottom of the screen a message of ray a and ray b to know that you are at the intersection. Click at that point. We need to construct three more points further on the ray than the vertices. On the first ray that you constructed, click anywhere past the point where the second ray begins.



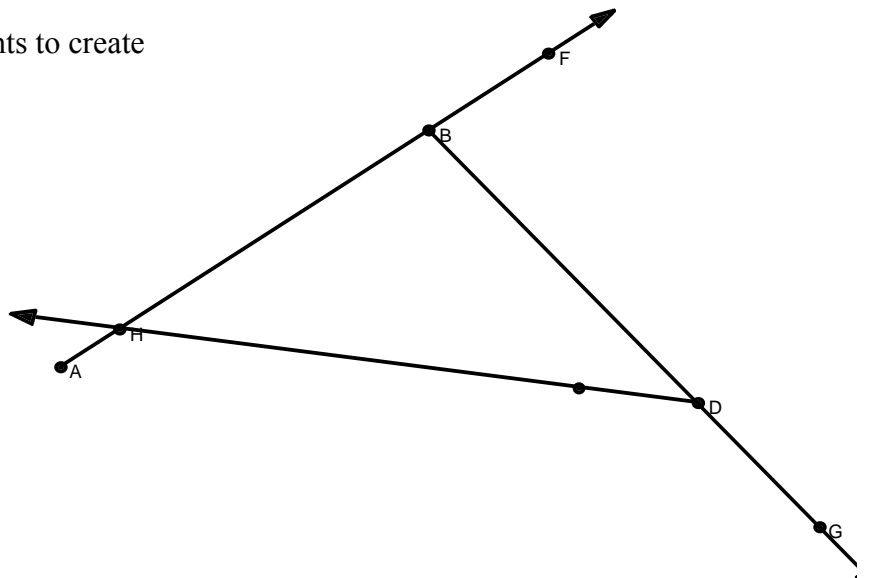
STEP 6 Make sure your point icon is still highlighted. Create the other two points past the vertices of the triangle. (You may already have these drawn in from creating your ray.)



STEP 7: Click on the hand icon, which is the fifth icon from the top. Move your hand over one of the points. The hand should turn black. Click on the point and a label should appear. (By clicking on the 'A' you can move it to a preferable position.)



Continue to click on the remaining points to create labels for them.

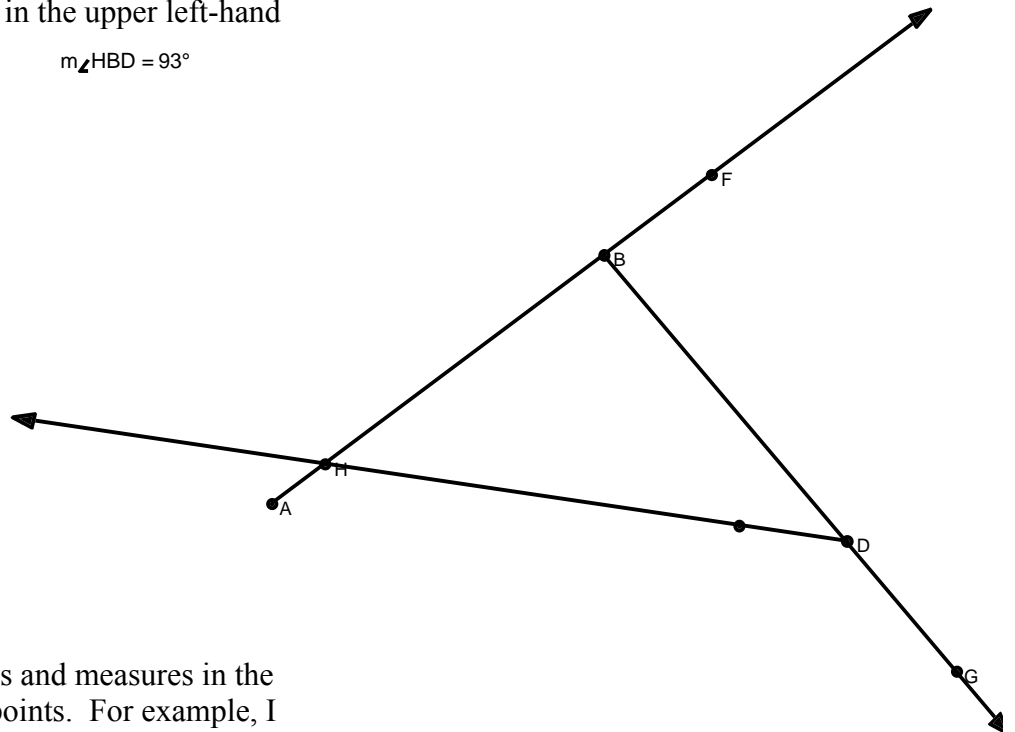


Definitions: Exterior angle- For the purposes of this worksheet, exterior angles are those angles that lie outside the triangle. In my triangle example, the exterior angles that I have named are  $\angle AHD$ ,  $\angle FBD$ , and  $\angle HDG$ .

Remote Interior Angles- The two angles that are in the interior of a triangle, opposite a given exterior angle. For example, for the exterior angle  $\angle AHD$ , the remote interior angles are  $\angle HBD$  and  $\angle BDH$ .

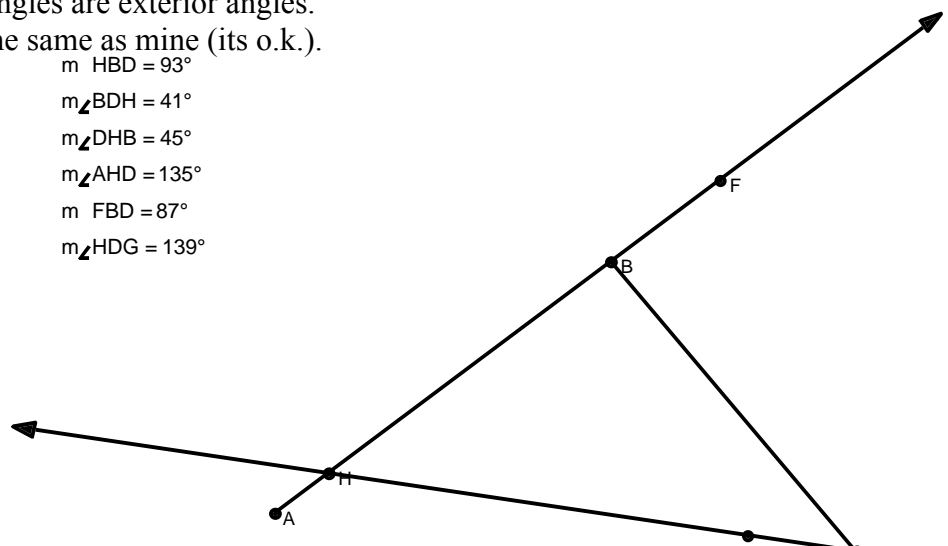
STEP 8: Click on the first icon at the side of the page. It is the arrow icon. Three icons should appear to the right. We want to select the first one. This icon allows us to select items on our picture. Select one of the vertices of the triangle. That point should now be highlighted. To select another point, we must hold the shift key and click on the next vertex. Repeat the process for the third vertex. Go to the Measure icon at the top of the page. Scroll down to angle and click on it. The measure of the angle should have appeared in the upper left-hand corner.

$$m\angle HBD = 93^\circ$$



Notice that *Sketchpad* names and measures in the order that you click on the points. For example, I clicked on point H, then B, then D. Sketchpad measured  $\angle HBD$ . I want to measure the following angles:  $\angle HBD$ ,  $\angle BDH$ ,  $\angle DHB$ ,  $\angle AHD$ ,  $\angle FBD$ , and  $\angle HDG$ . The first three angles are interior angles and the last three angles are exterior angles. Your angles may not be the same as mine (its o.k.).

- $m\angle HBD = 93^\circ$
- $m\angle BDH = 41^\circ$
- $m\angle DHB = 45^\circ$
- $m\angle AHD = 135^\circ$
- $m\angle FBD = 87^\circ$
- $m\angle HDG = 139^\circ$



Record your angle measurements below:

INTERIOR ANGLES

EXTERIOR ANGLES

∠ \_\_\_\_\_  
.

∠ \_\_\_\_\_

∠ \_\_\_\_\_  
.

∠ \_\_\_\_\_

∠ \_\_\_\_\_  
.

∠ \_\_\_\_\_

Write your exterior angles with their corresponding remote interior angles below:

EXTERIOR ANGLES

REMOTE INTERIOR ANGLES

∠ \_\_\_\_\_  
.

∠ \_\_\_\_\_

∠ \_\_\_\_\_  
.

∠ \_\_\_\_\_

∠ \_\_\_\_\_

∠ \_\_\_\_\_

Write down any relationship that you see with the exterior angles and the remote interior angles:

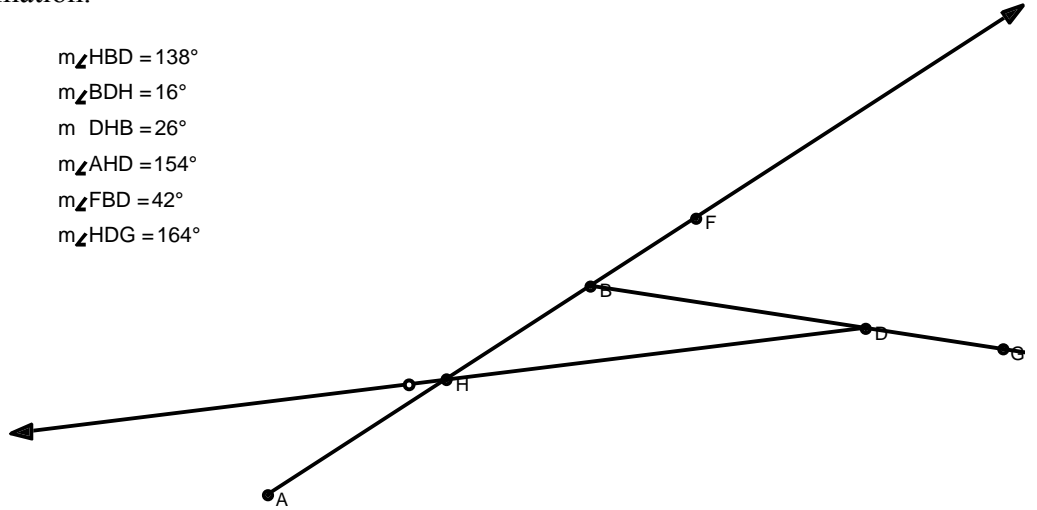
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Move your cursor over any of the vertices to change the angle measurements. To do this, click on one of the vertices and move your mouse. The vertex should move while the other vertices stay still. You should notice the angle measurements change. Record all your new information.

$m\angle HBD = 138^\circ$   
 $m\angle BDH = 16^\circ$   
 $m\angle DHB = 26^\circ$   
 $m\angle AHD = 154^\circ$   
 $m\angle FBD = 42^\circ$   
 $m\angle HDG = 164^\circ$



What are the measurements of the exterior angles corresponding interior angles? Record your answer.

EXTERIOR ANGLES

REMOTE INTERIOR ANGLES

$\angle$  \_\_\_\_\_

$\angle$  \_\_\_\_\_

.

$\angle$  \_\_\_\_\_

$\angle$  \_\_\_\_\_

.

$\angle$  \_\_\_\_\_

$\angle$  \_\_\_\_\_

Did your hypothesis about the relationship between the exterior angle and the remote interior angles change? Why or why not?

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Is there anything significant about the sum of the exterior angles? Explain your answer.

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