

Geometry CC - Unit 3  
 LESSON 2: The Incenter of a Triangle  
 M1 L5

**Homework: HW Handout 3.2**

1. Sketch 2 <u>angle bisectors</u> .	2. Sketch 2 <u>altitudes</u> .	3. Sketch 2 <u>medians</u> .
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In isosceles  $\triangle DEF$ ,  $\angle DEF$  is the vertex, and  $m\angle EFD = 50^\circ$ . If angle bisector  $\overline{EG}$  is drawn, find  $m\angle EGF$ .

$180 - 100 = 80^\circ$   
 $80 \div 2 = 40^\circ$   
 $50 + 40 = 90^\circ$   
 $180 - 90 = 90^\circ$   
 $m\angle EGF = 90^\circ$

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5. Construct angle bisector  $\overline{AD}$ .  
 (Hint: bisect  $\angle A$ )

6. Construct median  $\overline{AD}$ .  
 (Hint: bisect  $\overline{CB}$ )

7. Construct altitude  $\overline{AD}$ .  
 (Hint: Construct perpendicular bisector from point A)

8. If  $Q$  is the vertex angle of isosceles  $\triangle PQR$ , and  $\overline{RA}$  is a median, find  $m\overline{QR}$ .

$8\text{in}$   
 $4\text{in}$   
 $8\text{in}$   
 $m\overline{QR} = 8\text{in}$

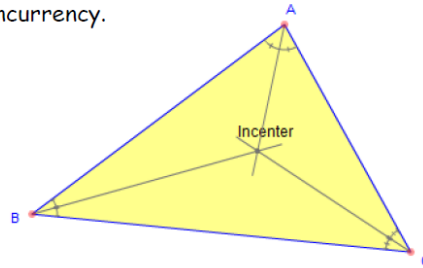
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Vocabulary:

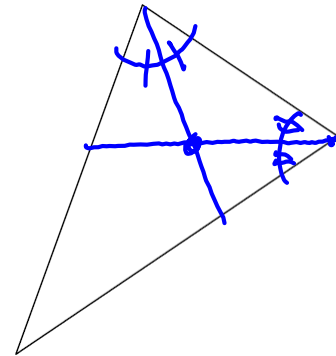
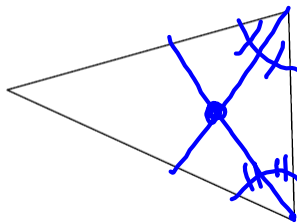
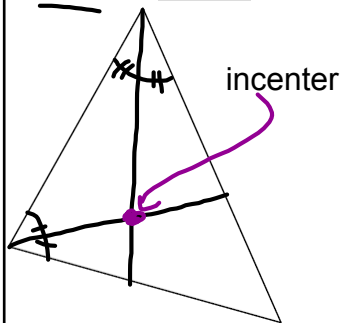
- Concurrency - The point where three or more lines intersect. (Usually refers to various centers of a triangle).
- Incenter - The point where the three angle bisectors of a triangle meet. One of a triangle's points of concurrency.

PROPERTIES OF THE INCENTER:

- The center of the triangle's inner circle
- Equidistant from all 3 sides of the triangle



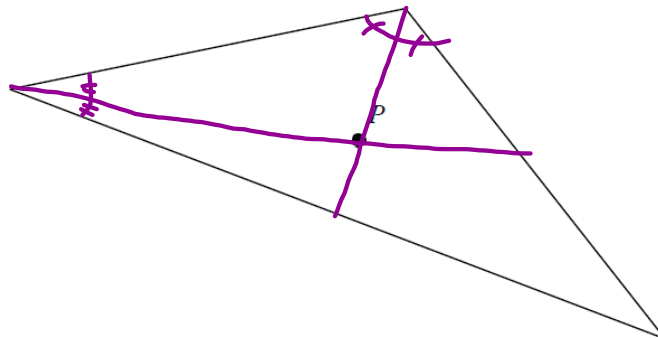
Sketch the incenter of each triangle:



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Question: *What can you add to your diagram to show the incenter?*

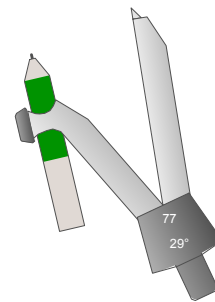
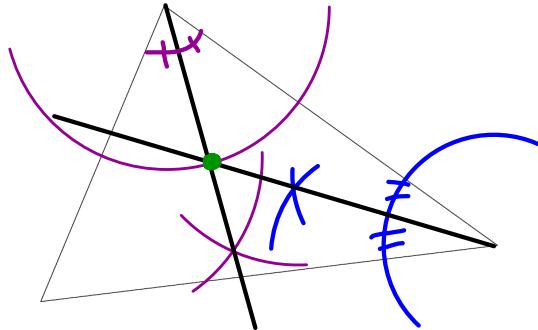
Add the correct markings to indicate that point *P* is the triangle's incenter.



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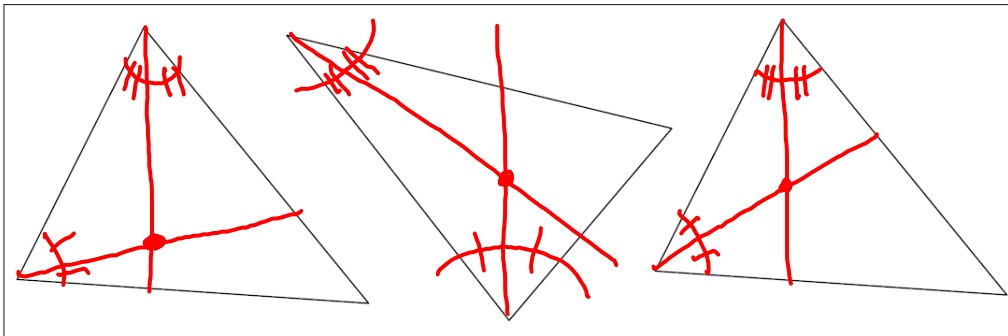
Let's CONSTRUCT the incenter!

- \* Construct the 3 angle bisectors of the triangle below.  
(The point of intersection of all 3 angle bisectors will be the incenter!)

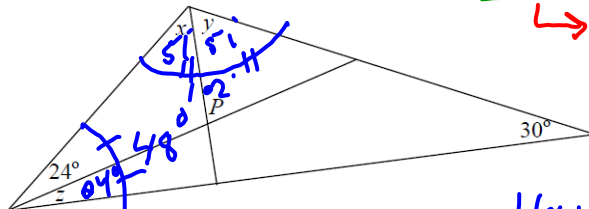


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For each triangle, sketch the incenter.



Example 1: In the triangle below, point  $P$  is the incenter. Find the measures of angles  $x$ ,  $y$ ,  $z$ .



↳ 3 bisectors

$$z = 24^\circ$$

$$x = 51^\circ$$

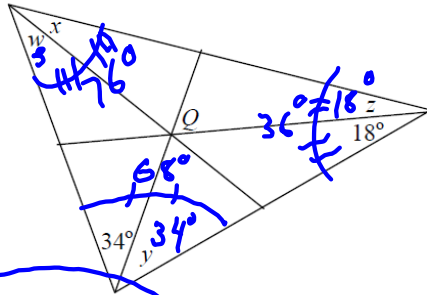
$$y = 51^\circ$$

$$48 + 30 = 78$$

$$180 - 78 = 102 / 2 = 51^\circ$$

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Example 2: In the triangle below, point  $Q$  is the incenter. Find the measures of angles  $w$ ,  $x$ ,  $y$ ,  $z$ .



$$y = 34^\circ$$

$$z = 18^\circ$$

$$w = 38^\circ$$

$$x = 38^\circ$$

$$68 + 36 = 104$$

$$180 - 104 = 76^\circ$$

$$76 / 2 = 38^\circ$$

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