Lesson 5.3 - Perpendicular Bisectors and Circumcenter

AGENDA
- Homework Check & Review
- Warm Up - Get a compass & ruler (+Universal Angle Maker)
- Notes 5.3 Perpendicular Bisectors and Circumcenter

HOMEWORK:
- pg 311-12: #12-15,22-27, 30,32
- Proof B
- Construction Project - Circumcenter
- Keep up with your Lesson Summaries
- Finish CR#4 due Wednesday 12/14/16
- Interim cut off is Monday

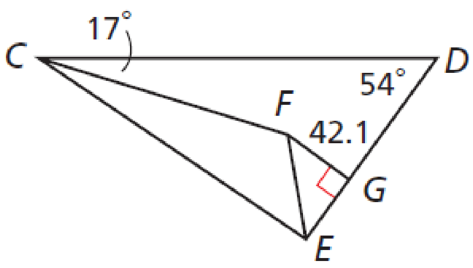
QUIZ NEXT CLASS

HW 5.2 - answers

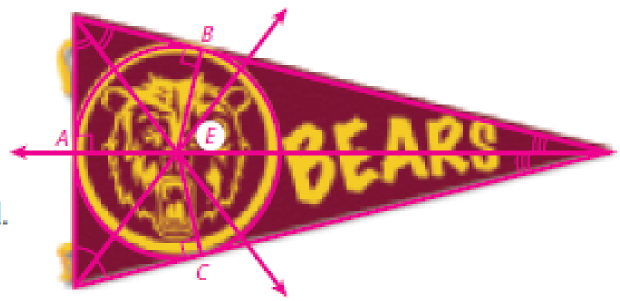
$\overline{CF}$ and $\overline{EF}$ are angle bisectors of $\triangle CDE$. Find each measure.

9. the distance from F to $\overline{CD}$ **42.1**

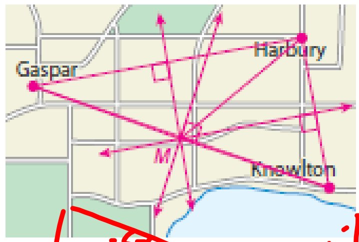
10. $m\angle FED$ **46°**



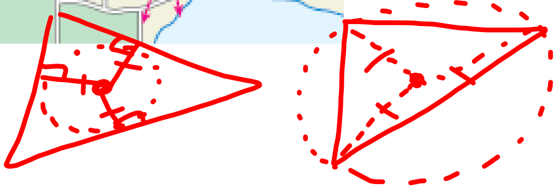
4 11. **Design** The designer of the Newtown High School pennant wants the circle around the bear emblem to be as large as possible. Draw a sketch to show where the center of the circle should be located. Justify your sketch.



~~20. **Business** A company repairs photocopiers in Harbury, Gaspar, and Knowlton. Draw a sketch to show where the company should locate its office so that it is the same distance from each city. Justify your sketch.~~



Why couldn't you do this?

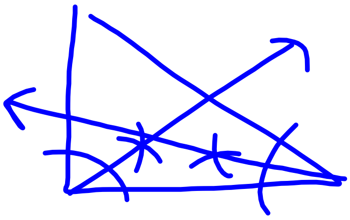


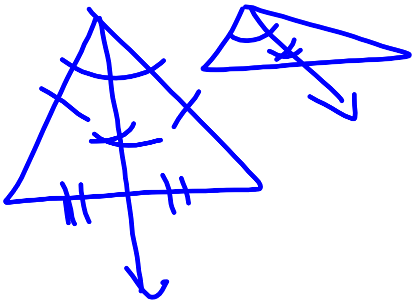
Tell whether each statement is sometimes, always, or never true. Support your answer with a sketch.

28. The angle bisectors of a triangle intersect at a point outside the triangle. N

29. An angle bisector of a triangle bisects the opposite side. S

31. The incenter of a right triangle is on the triangle. N

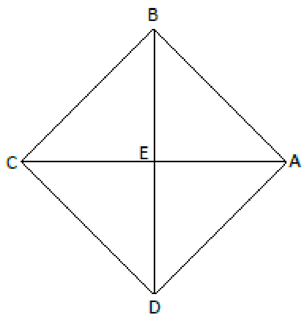




Proof A (Day 2)

Given: $\overline{BED}$; $\overline{AED}$; ΔABC is isosceles with base $\overline{AC}$
$\overline{BE}$ bisects $\measuredangle ABC$

Prove: $\Delta CBE \cong \Delta ABE$

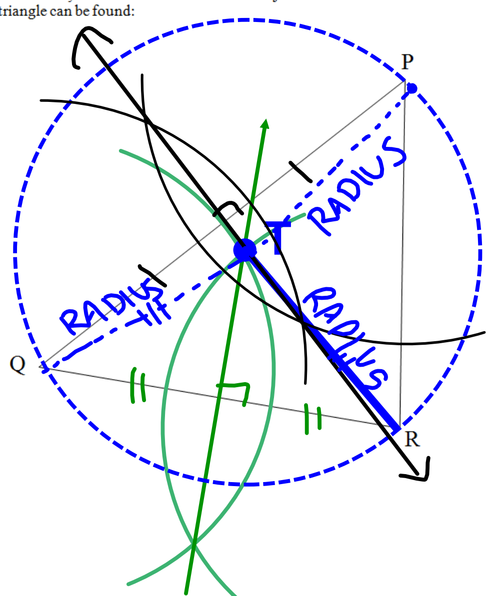


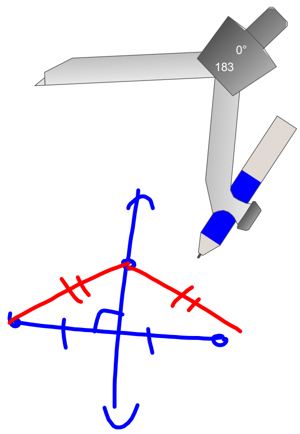
Geometry Unit 5 Day 3 Exploration: Concurrency of Perpendicular Bisectors

Point of Concurrency	Lines that meet to form the point
Incenter	Angle Bisectors (lesson 5-2)
Circumcenter TODAY	Perpendicular Bisectors
Orthocenter	Altitudes
Centroid	Medians

Construction:

1. Construct the perpendicular bisector of $\overline{PQ}$. Use your UAM to check your accuracy.
2. Construct the perpendicular bisector of $\overline{QR}$. Use your UAM to check your accuracy. click
3. Did you find a point of concurrency? If so, label it T. Otherwise, check your constructions.
4. Draw in the segment $\overline{TR}$. click
5. Using T as the center, construct a circle with a radius of length TR. click
6. Where can you find other radii? Make a conjecture about where the radii of a circumscribed circle of a triangle can be found:





Triangle Type (by angle): ACUTE

Location of Circumcenter: INSIDE

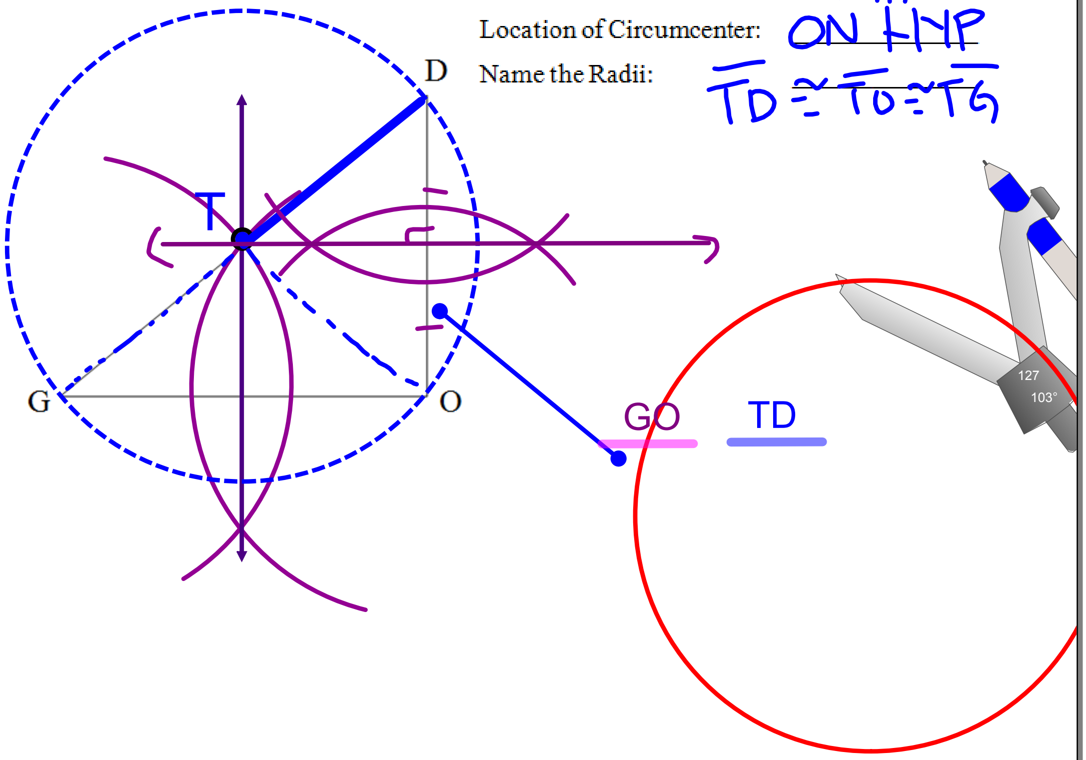
Name the Radii: $\overline{TP} \cong \overline{TR} \cong \overline{TQ}$

Further Investigation:
Construct the circumcenter T using at least two perpendicular bisectors per triangle. Where does the circumcenter fall for each type of triangle?

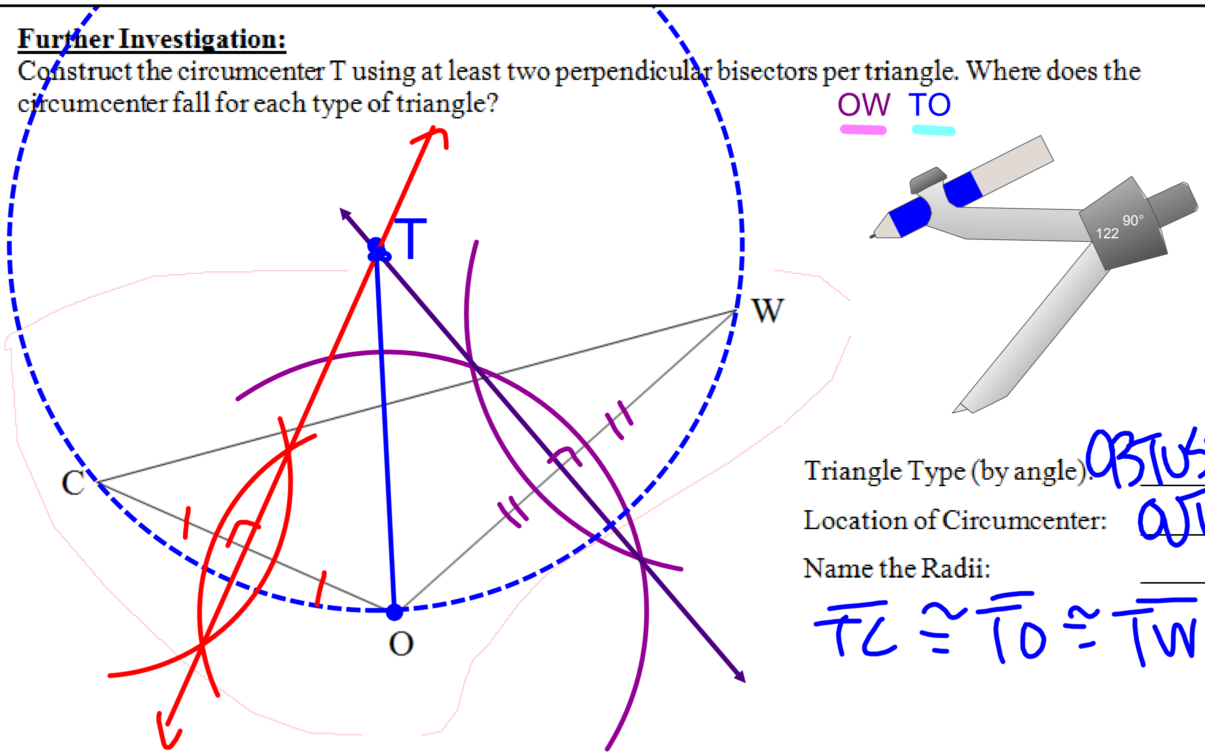
Triangle Type (by angle): RIGHT

Location of Circumcenter: ON HYP

Name the Radii: $\overline{TD} \cong \overline{TO} \cong \overline{TG}$



Further Investigation:
Construct the circumcenter T using at least two perpendicular bisectors per triangle. Where does the circumcenter fall for each type of triangle?



Triangle Type (by angle): OBTUSE

Location of Circumcenter: OUT

Name the Radii:

$\overline{TC} \cong \overline{TO} \cong \overline{TW}$

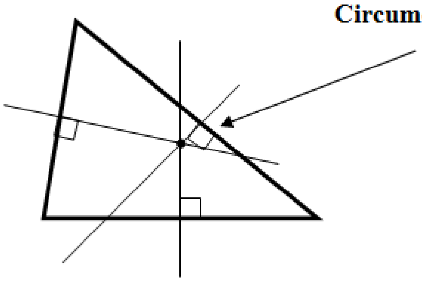
Name: ______________________ **Section:** ______________ **Date:** __________

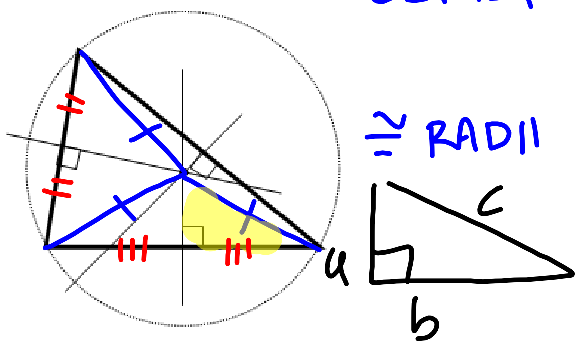
Geometry Unit 5 Day 3 Notes: Perpendicular Bisectors & Circumcenters

Circumcenter

Defn: The point of concurrency of the perpendicular bisectors of a triangle is called the CIRCUM-CENTER of the triangle.

Circumcenter





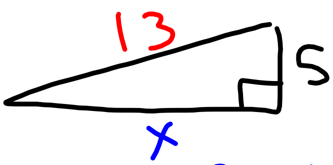
NOTE: The circumcenter of a triangle is the center of the circle that would be circumscribed about the triangle.

Theorem 5-2-1

The circumcenter of a triangle is equidistant from the VERTICES **of the triangle**

Example 1:

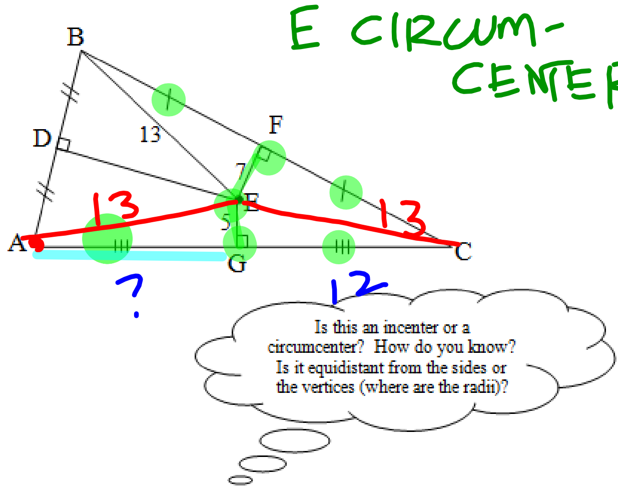
Given the triangle at right, find AG.



$x^2 + 5^2 = 13^2$

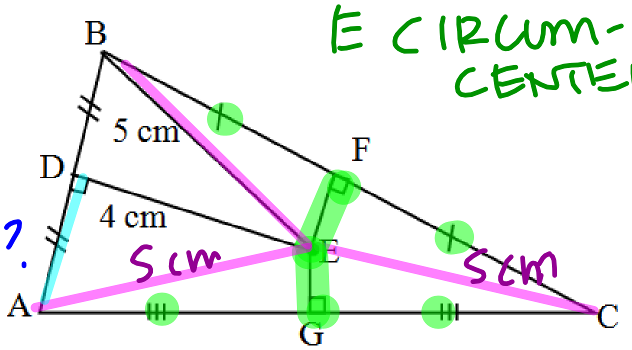
$x = 12$

≅ CIRCUM-CENTER



Example 2:

Given the triangle with BE =5 and DE = 4, a)What is the measure of CE?

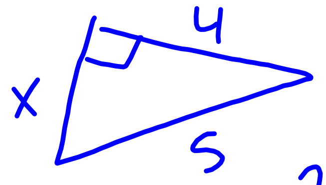


E CIRCUM-CENTER

≅ RADII TO VERTICES

CE = 5 cm

b) What is the measure of AD?



$x^2 + 4^2 = 5^2$

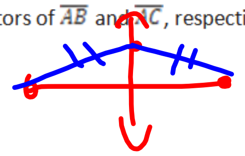
$x = 3$

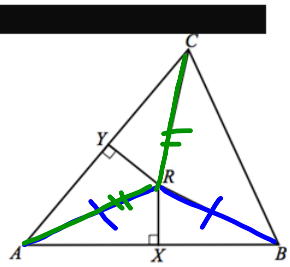
Proof of the Equidistance

Use your knowledge of triangle congruence criteria and CPCTC to write a proof for the following:

In the figure $\overline{RX}$ and $\overline{RY}$ are the perpendicular bisectors of $\overline{AB}$ and $\overline{AC}$, respectively.

Prove: RA=RB=RC



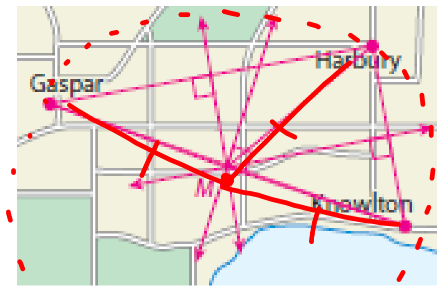


- Since $\overline{RX}$ is the perpendicular bisector of $\overline{AB}$, then RA=RB because any point on the perpendicular bisector of a segment is EQUIDISTANT to the ENDPOINTS of the segment (perpendicular bisector theorem).
- Since $\overline{RY}$ is the perpendicular bisector of $\overline{AC}$, then RA=RC because any point on the perpendicular bisector of a segment is EQUIDISTANT to the ENDPOINTS of the segment (perpendicular bisector theorem).
- Since RA=RB and RA=RC, then RA=RB=RC by SUBSTITUTION

Therefore we have proven that the circumcenter is equidistant to the VERTICES of the triangle. Note that we could also have gone through SAS≅ and CPCTC twice!

Let's revisit the homework question you couldn't do previously...

20. **Business** A company repairs photocopiers in Harbury, Gaspar, and Knowlton. Draw a sketch to show where the company should locate its office so that it is the same distance from each city. Justify your sketch.

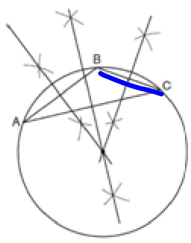


CIRCUMCENTER

CONCURRENCY OF ⊥ BISECTORS OF △ SIDES → EQUIDISTANT TO VERTICES (CITIES)

Regents Questions

1. The diagram at right shows the construction of the center of the circle circumscribed about ΔABC. This construction represents how to find the intersection of
   [A] the angle bisectors of ΔABC
   [B] the medians to the sides of ΔABC
   [C] the altitudes to the sides of ΔABC
   [D] the perpendicular bisectors of the sides of ΔABC



2. Describe the location of the point of concurrency of the perpendicular bisectors of a triangle.
   [A] on the longest side of the triangle
   [B] in the same place as the point of concurrency of the altitudes of the triangle
   [C] always in the interior of the triangle
   [D] in the exterior, on, or in the interior of the triangle
   [E] none of the above

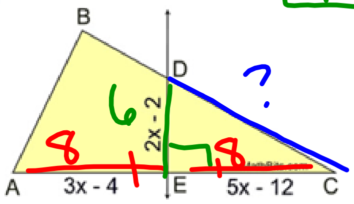
3. $\overleftrightarrow{DE} \perp$ bisector of $\overline{AC}$

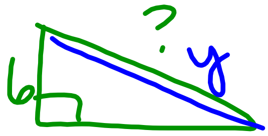
$AE = 3x - 4$

$EC = 5x - 12$

$DE = 3x - 2$

Find DC.





$3x - 4 = 5x - 12$

$x = 4$

$6^2 + 8^2 = y^2$

$100 = y^2$

$\pm 10 = y$

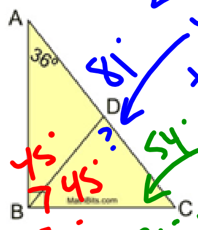
$DC = 10$

4. right ΔABC

$\overline{BD}$ bisects $< ABC$

$m < A = 36°$

Find $m < BDC$.



Δ sum

$45 + 54 + ? = 180$

Δ sum

$36 + 90 + m\angle C = 180$

Do #2 on the back of your construction project rubric - construct the perpendicular bisector