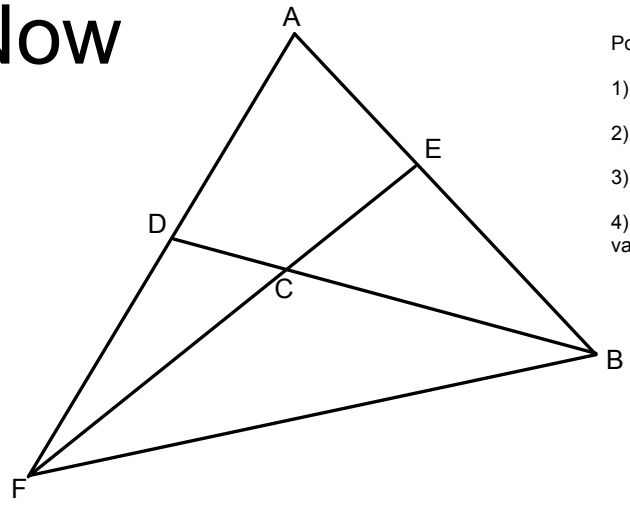
Day 46

Do Now



Points D and E are midpoints

1) What are segments BD and FE called?

2) If DC = 8, what is the length of CB?

3) If FE = 30, what is the length of FC?

4) If FC = 10x - 16 and FE = 10x + 20, what is the value of x?

Day 46

Objective To identify properties of medians and altitudes of a triangle

Day 46

Activity 1

Construct a perpendicular line that passes through vertex A and side BC.

Construct a perpendicular line that passes through vertex B and side AC.

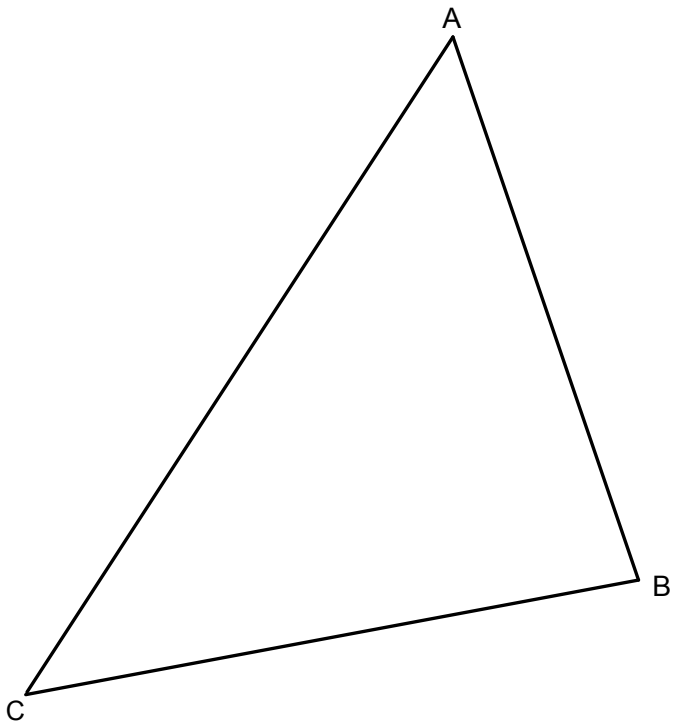
Where the two perpendicular lines intersect, label that point O.

Now construct a segment that passes through vertex C, point O, and side AB.

Where is point O located?
Are there any other properties that you can find?

Day 46

Activity 1



Day 46

Activity 2

Construct a perpendicular line that passes
through vertex A and side BC. (hint extend segment BC)

Construct a perpendicular line that passes
through vertex B and side AC. (hint extend segment AC)

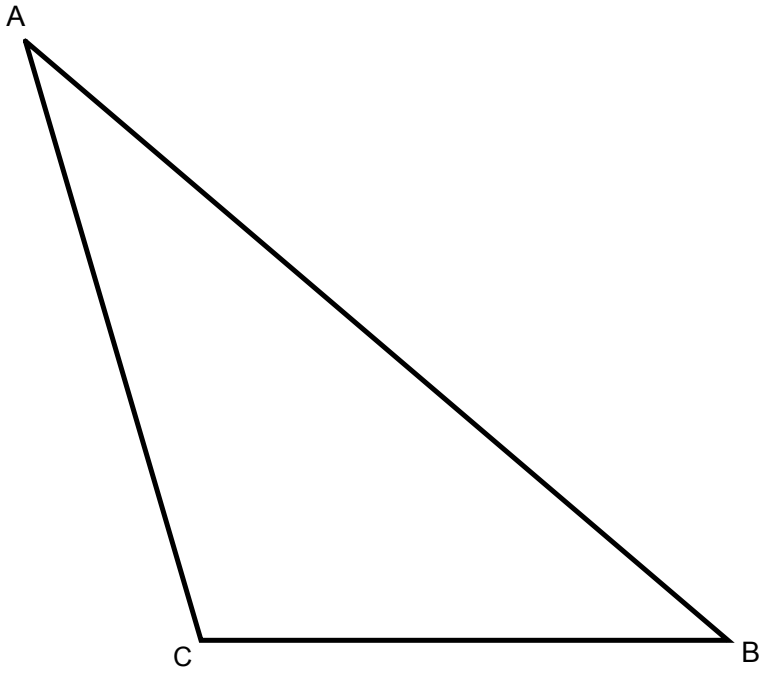
Where the two perpendicular lines intersect,
label that point O.

Now construct a segment that passes through
vertex C, point O, and side AB.

Where is point O located?
Are there any other properties that you can find?

Day 46

Activity 2



Day 46

Activity 3

Construct a perpendicular line that passes through vertex C and side AB.

Construct a perpendicular line that passes through vertex B and side AC.

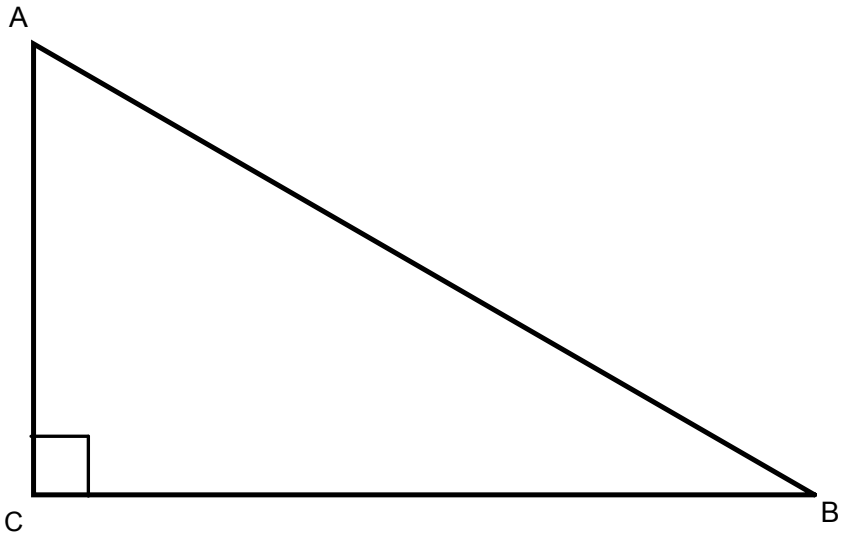
Where the two perpendicular lines intersect, label that point O.

Now construct a segment that passes through vertex A, point O, and side CB.

Where is point O located?
Are there any other properties that you can find?

Day 46

Activity 3

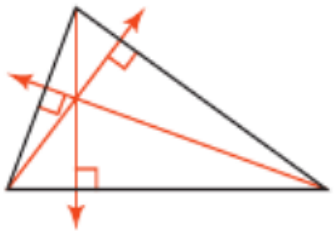


An **altitude of a triangle** is the perpendicular segment from a vertex of the triangle to the line containing the opposite side. An altitude of a triangle can be inside or outside the triangle, or it can be a side of the triangle.

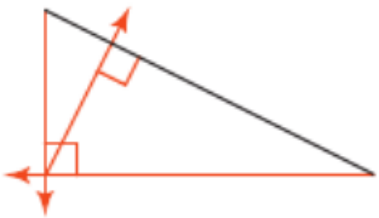
The point of concurrency of the altitudes is called the orthocenter.

The lines that contain the altitudes of a triangle are concurrent at the **orthocenter of the triangle.** The orthocenter of a triangle can be inside, on, or outside the triangle.

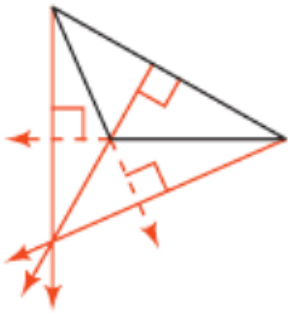
Acute triangle



Right triangle



Obtuse triangle

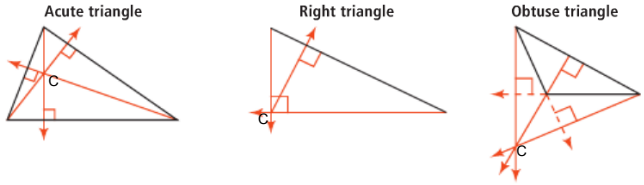


Day 46

Definition

1) point of concurrency of the altitudes of a triangle

What does it look like?



Point C is the orthocenter

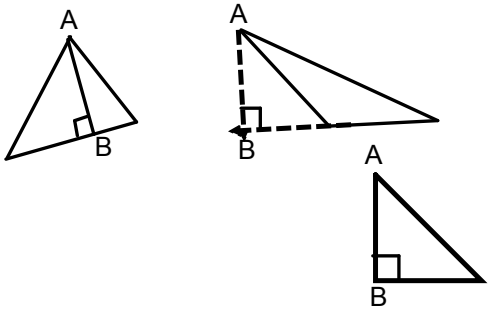
Orthocenter

How is it created?

Altitudes (height of a triangle)

Altitude - segment that is perpendicular going through a vertex and the opposite side

Altitudes can be inside, outside or a side of a triangle



Where is it located?

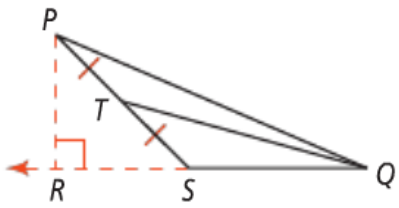
Acute - inside
Obtuse - outside
Right - on the vertex of the right angle
(see diagrams above)

Day 46

Identifying Medians and Altitudes

A For $\triangle PQS$, is $\overline{PR}$ a *median*, an *altitude*, or *neither*? Explain.

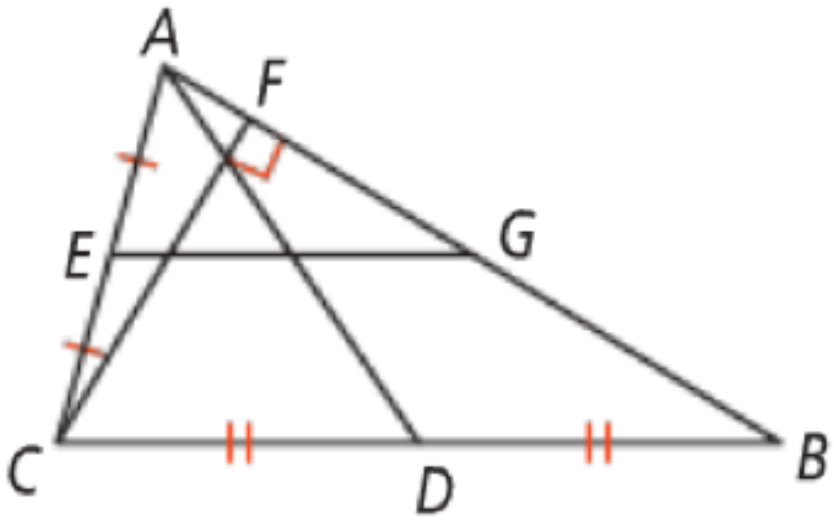
B For $\triangle PQS$, is $\overline{QT}$ a *median*, an *altitude*, or *neither*? Explain.



Day 46

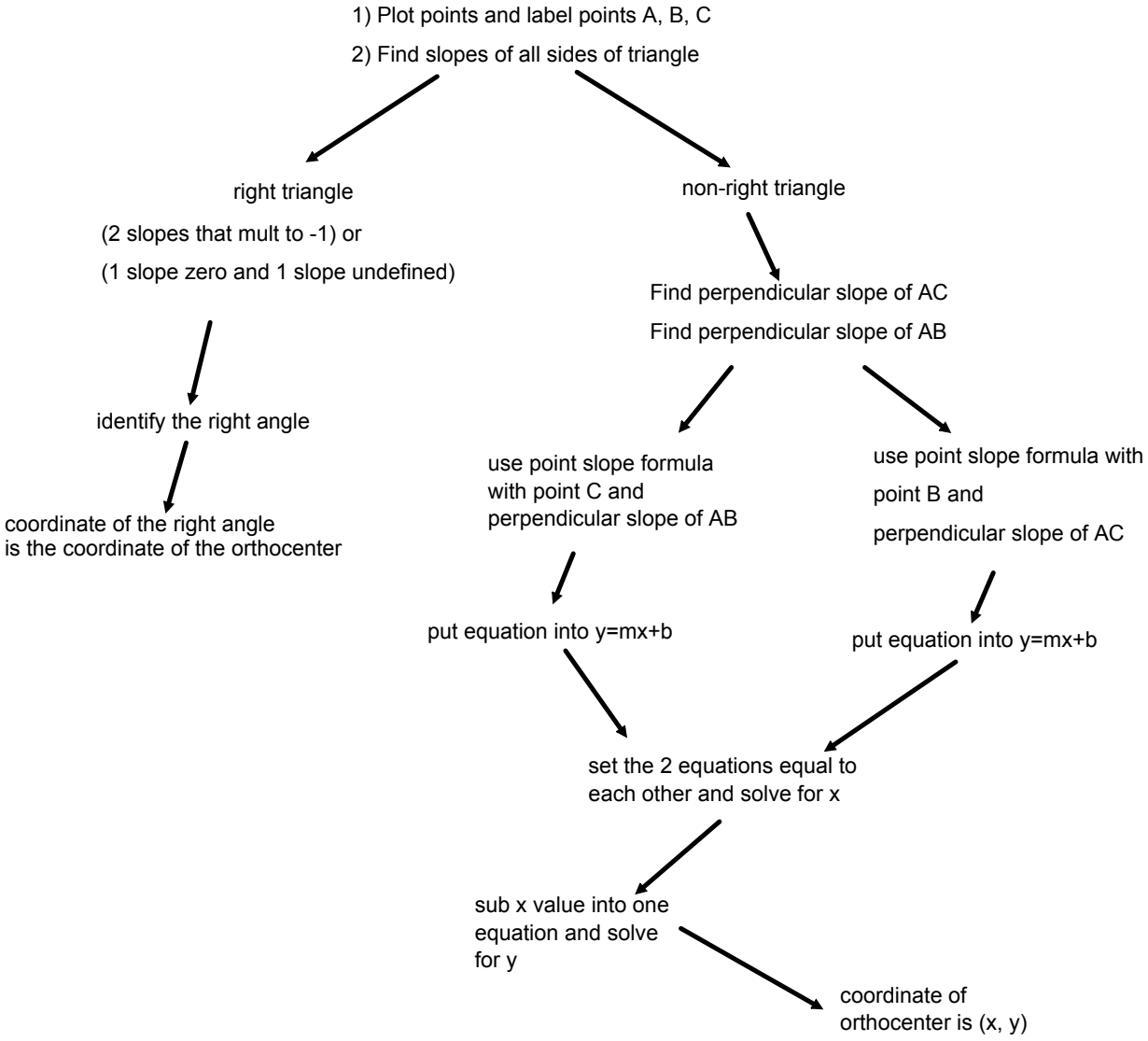
For $\triangle ABC$, is each segment a *median*, an *altitude*, or *neither*? Explain.

a. $\overline{AD}$ **b.** $\overline{EG}$ **c.** $\overline{CF}$



Day 46

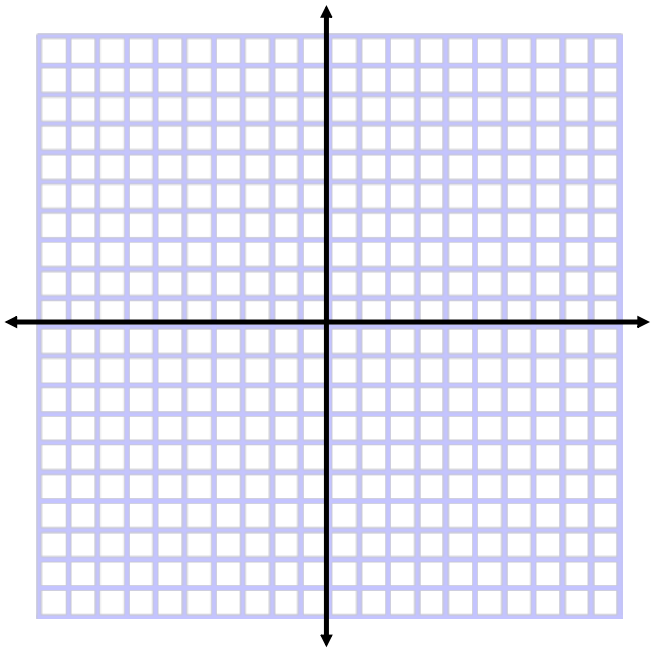
Finding coordinates of the Orthocenter



Day 46

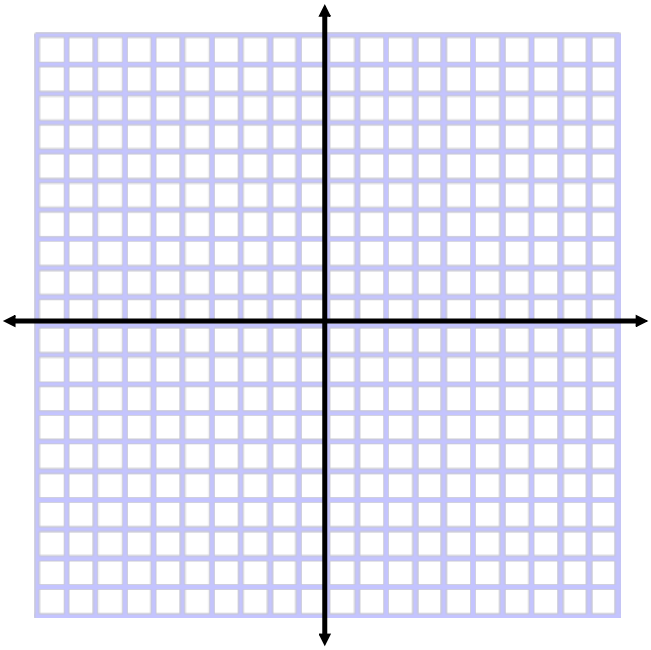
Finding the Orthocenter

$\triangle ABC$ has vertices $A(1, 3)$, $B(2, 7)$, and $C(6, 3)$. What are the coordinates of the orthocenter of $\triangle ABC$?



Day 46

$\triangle DEF$ has vertices $D(1, 2)$, $E(1, 6)$, and $F(4, 2)$. What are the coordinates of the orthocenter of $\triangle DEF$?

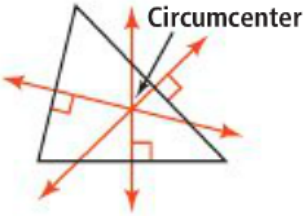


Day 46

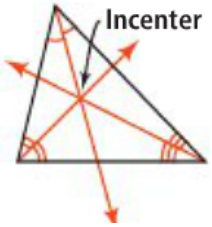
take note

Concept Summary Special Segments and Lines in Triangles

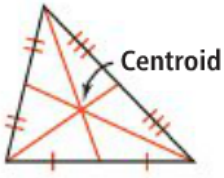
Perpendicular Bisectors



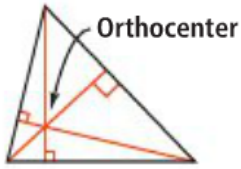
Angle Bisectors



Medians

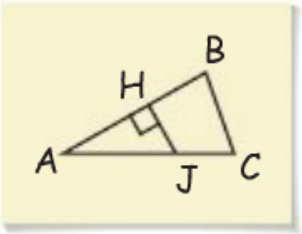


Altitudes



Do you UNDERSTAND?

5. **Error Analysis** Your classmate says she drew $\overline{HJ}$ as an altitude of $\triangle ABC$. What error did she make?



6. **Reasoning** Does it matter which two altitudes you use to locate the orthocenter of a triangle? Explain.

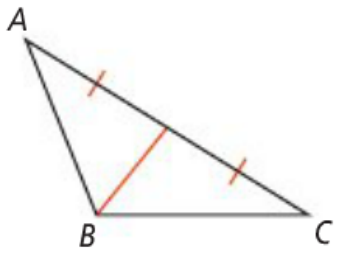
7. **Reasoning** The orthocenter of $\triangle ABC$ lies at vertex A. What can you conclude about $\overline{BA}$ and $\overline{AC}$? Explain.

Day 46

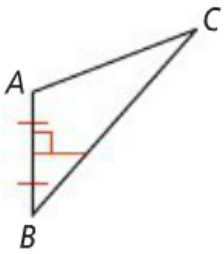
homework

For $\triangle ABC$, is the red segment a *median*, an *altitude*, or *neither*? Explain.

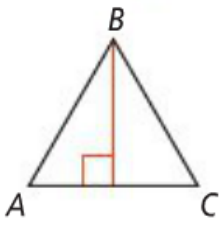
11.



12.

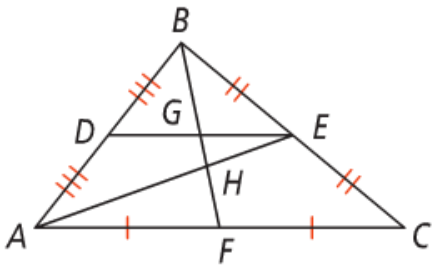


13.

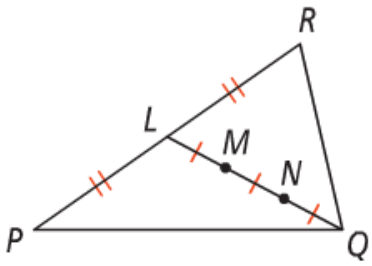


Name the centroid.

17.

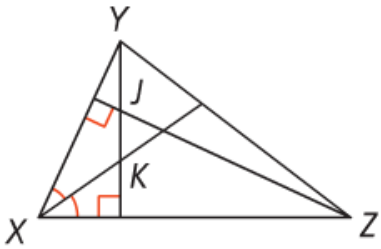


18.

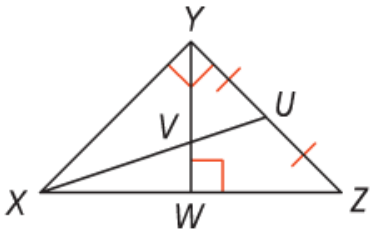


Name the orthocenter of $\triangle XYZ$.

19.



20.



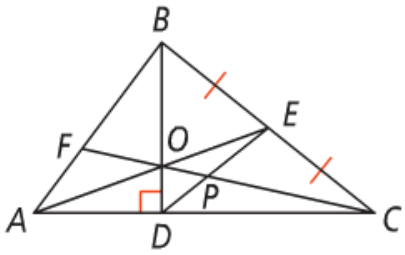
In Exercises 24–27, name each segment.

24. a median in $\triangle ABC$

25. an altitude in $\triangle ABC$

26. a median in $\triangle BDC$

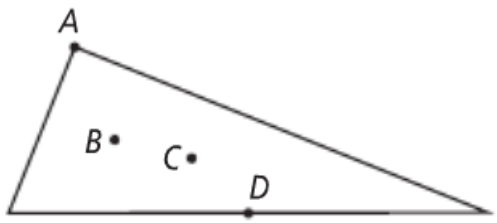
27. an altitude in $\triangle AOC$



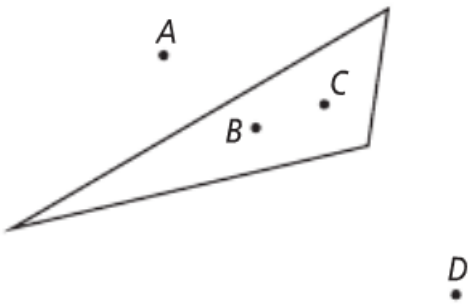
Day 46

***A*, *B*, *C*, and *D* are points of concurrency for the triangle. Determine whether each point is a *circumcenter*, *incenter*, *centroid*, or *orthocenter*. Explain.**

37.

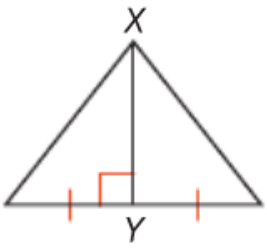


38.

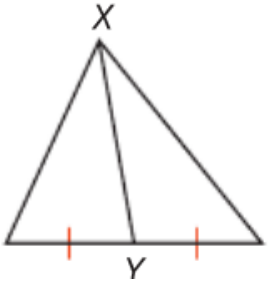


Is $\overline{XY}$ a *perpendicular bisector*, an *angle bisector*, or *neither*? Explain.

43.



44.



Day 46

11. Median; it connects a vertex of $\triangle ABC$ and the midpt. of the opposite side.

12. Neither; it does not have a vertex of $\triangle ABC$ as an endpoint.

13. Altitude; it extends from a vertex of $\triangle ABC$ and is $\perp$ to the opposite side.

17. H

18. M

19. J

20. Y

24. $\overline{AE}$

25. $\overline{BD}$

26. $\overline{DE}$

27. $\overline{OD}$

43. Both; the markings show directly that $\overline{XY}$ is a $\perp$ bisector. The two $\triangle$s formed are congruent by SAS, so the two $\angle$s at top are $\cong$. Therefore, $\overline{XY}$ is also an $\angle$ bisector.

44. Neither; $\overline{XY}$ connects vertex X and the midpt., Y, of the opposite side, so $\overline{XY}$ is a median.

37) a - orthocenter; b - incenter; c - centroid; d - circumcenter

38) a - circumcenter; b - centroid; c - incenter; d - orthocenter