

Secondary 2
lesson 8.2

Segments in Triangles

Mid-Segments, Perpendicular Bisectors,
Angle Bisectors, Medians, and Altitudes

Objectives:

Understand what a Mid-Segment is and it's properties

- 1) a Mid-segments is Parallel to it's partner side
- 2) a Mid-Segment is $\frac{1}{2}$ as long as it's partner side

Understand what a Perpendicular Bisector is and it's properties

- 3) Equidistant from segment ends
- 4) Creates Circumcenter

Understand what an Angle Bisector is and it's properties

- 5) Equidistance from sides
- 6) Creates Incenter

Understand what a Median is and it's properties

- 7) Medians split each other into proportions of $\frac{1}{3}$ and $\frac{2}{3}$
- 8) Medians are concurrent at the Centroid

Understand what an Altitude is and it's properties

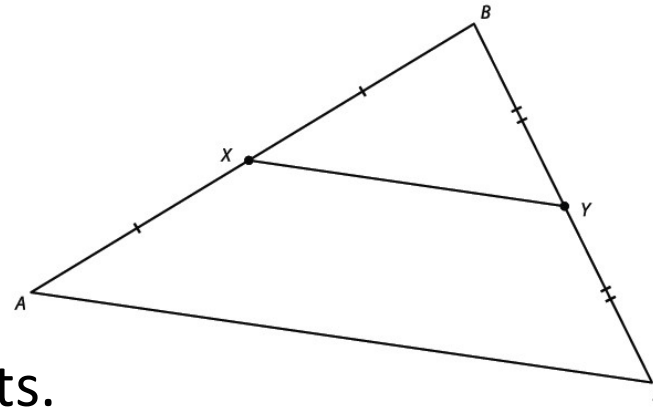
- 9) Altitudes are concurrent at the Orthocenter

Mid-segments (one quick new triangle property)

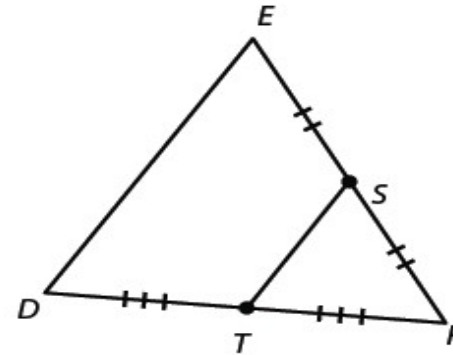
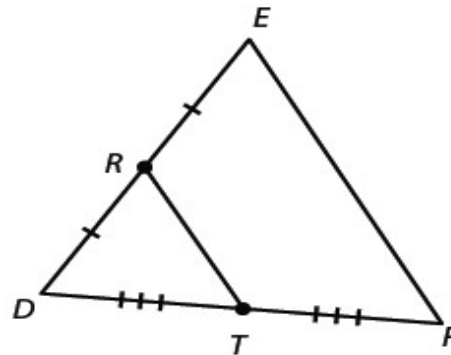
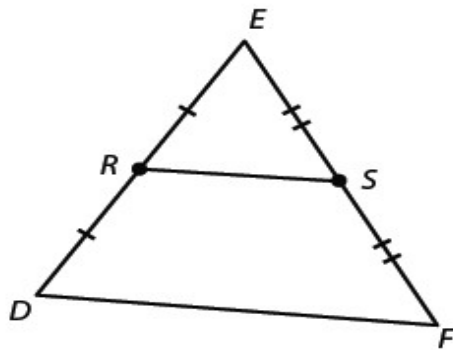
Midsegments are line segments created by connecting the midpoints of two sides of a triangle.

X is the midpoint of AB

Y is the midpoint of BC



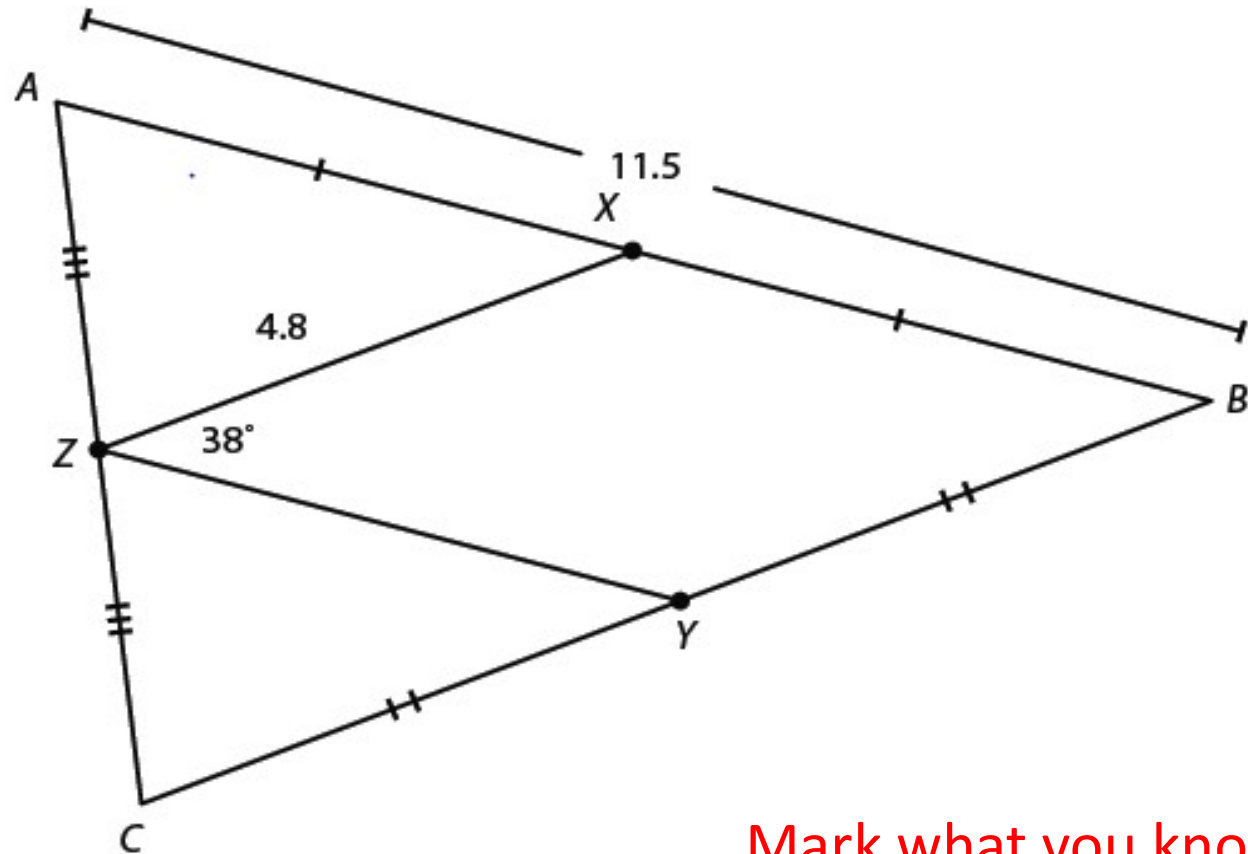
Every triangle has three midsegments.



A mid-segment is parallel to the third side and $\frac{1}{2}$ as long

Example 1

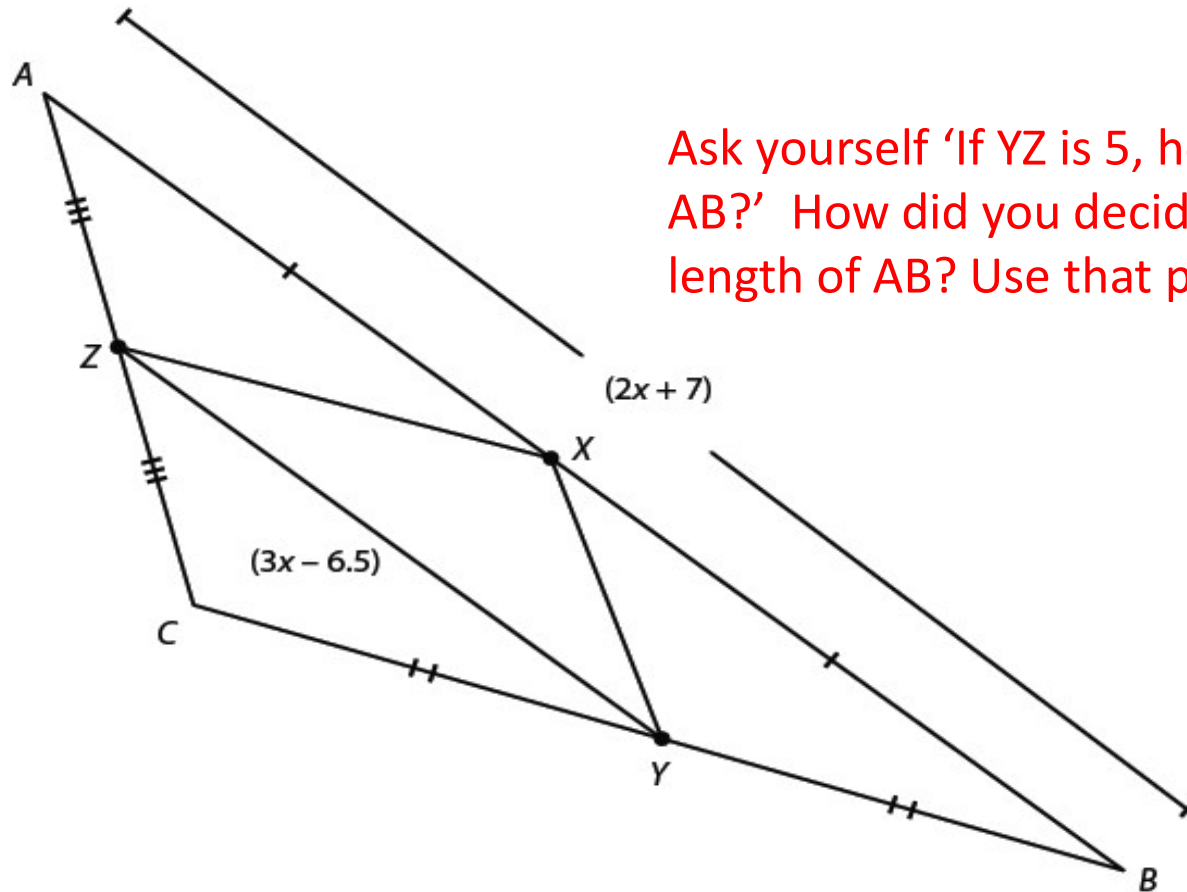
Find the lengths of BC and YZ and the measure of $\angle AXZ$.



Mark what you know!
(angles and segments)

Example 2

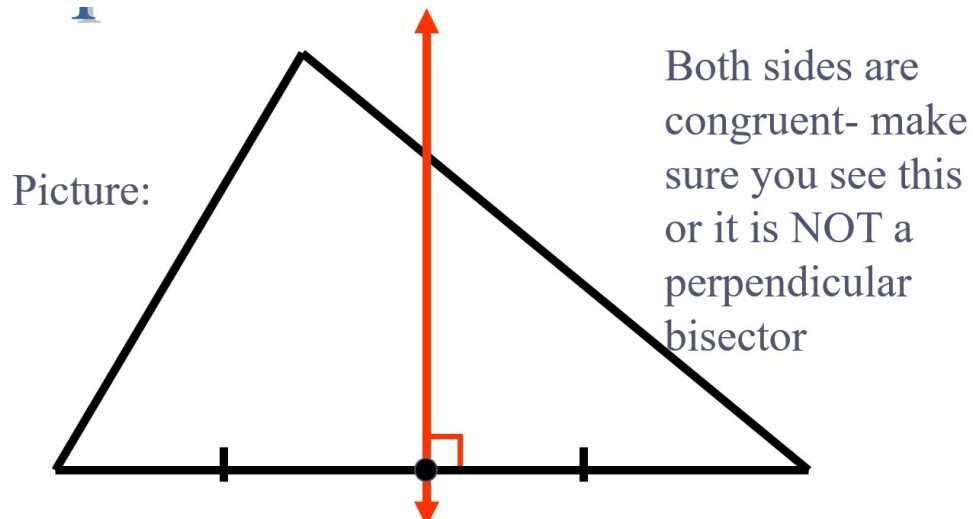
If $AB = 2x + 7$ and $YZ = 3x - 6.5$, what is the length of AB ?



Ask yourself 'If YZ is 5, how long is AB ?' How did you decide the length of AB ? Use that pattern.

Segment number 2:

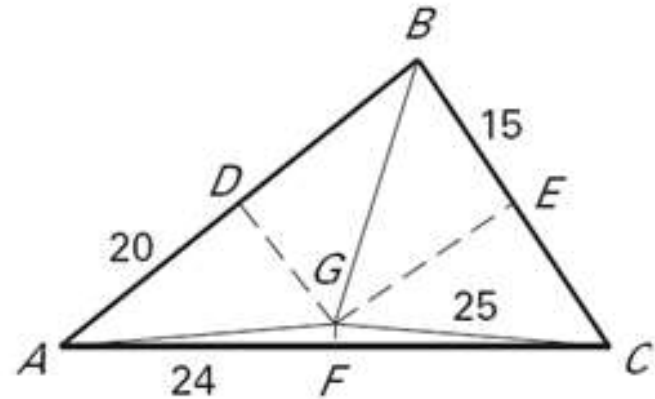
Perpendicular Bisector is a line that passes through the midpoint of the side of a triangle at a 90 degree angle. (It goes from the middle of a side and is perpendicular to that side.)



The 3 Perpendicular Bisectors of a triangle meet at the Circumcenter.
The Circumcenter is equidistance from the angles of a triangle.

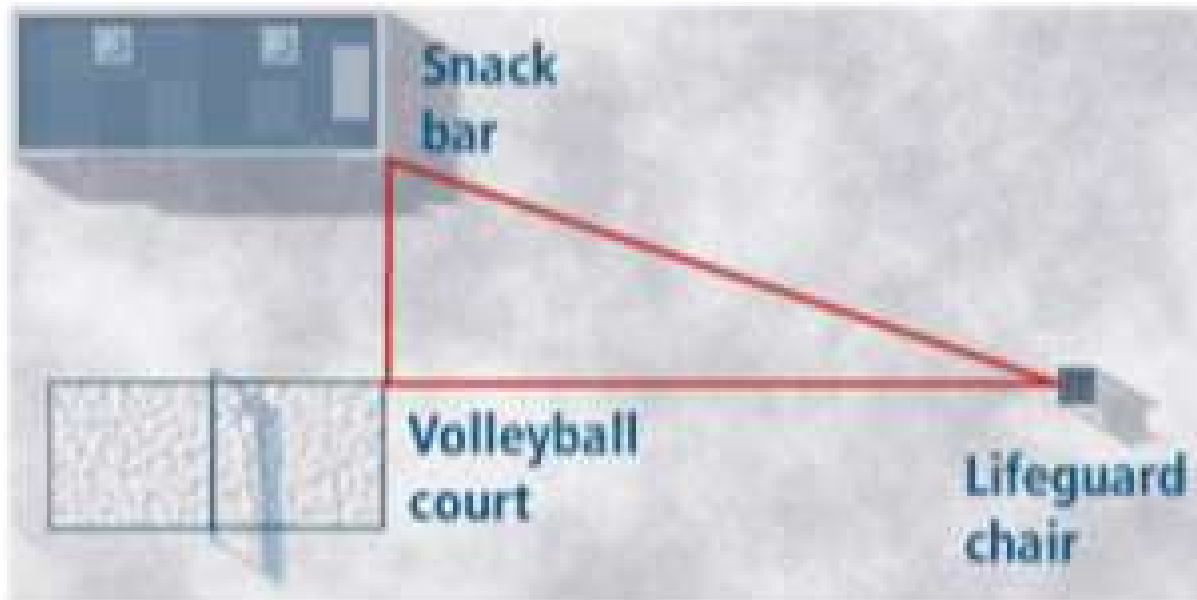
In the diagram, the perpendicular bisectors of $\triangle ABC$ meet at point G --the circumcenter, and are shown dashed. Find the indicated measure.

12) $AG =$ _____ 13) $BD =$ _____



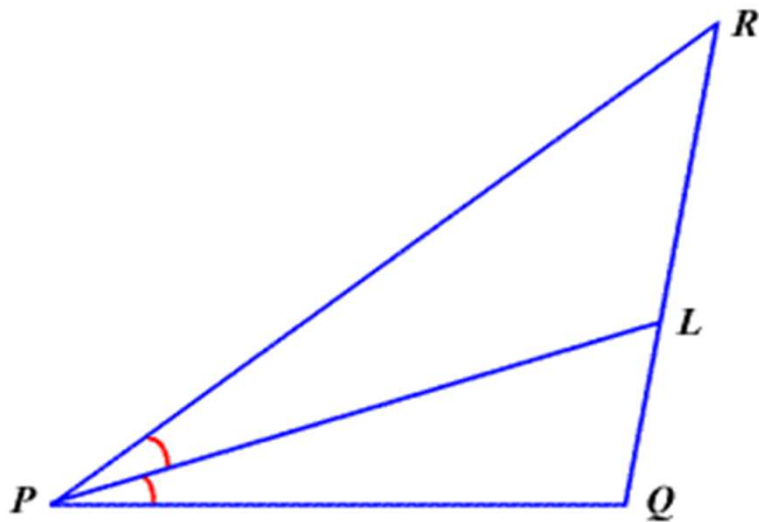
14). IF $BG = (2x - 15)$, find x .

City Planning Show where town officials should place a recycling barrel so that it is equidistant from the lifeguard chair, the snack bar, and the volleyball court. Explain.



Segment number 3:

Angle Bisector is a line or line segment that divides the angle into two equal parts. (It goes from the angle, to some point on the opposite side.)

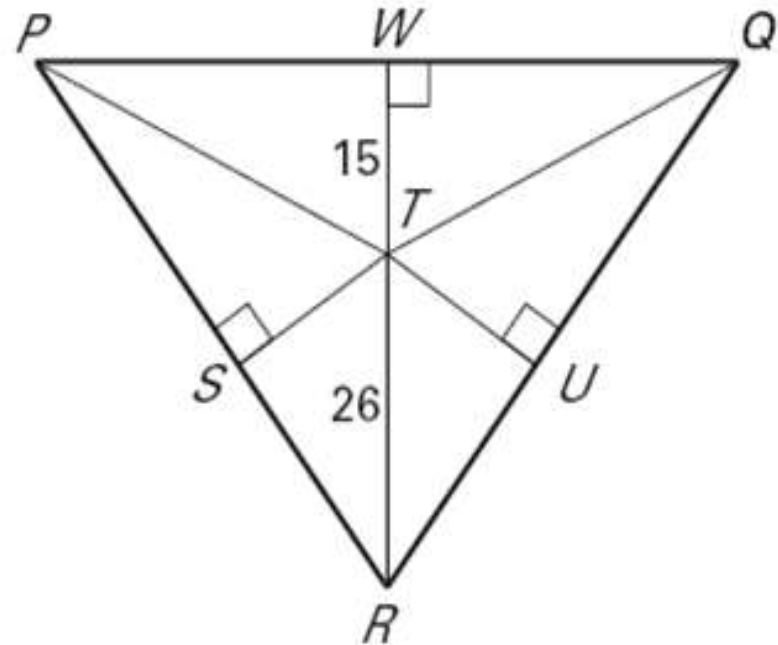


The 3 Angle Bisectors of a triangle meet at the Incenter.
The Incenter of a triangle is equidistance from the sides of a triangle.

Point T is the incenter of $\triangle PQR$.

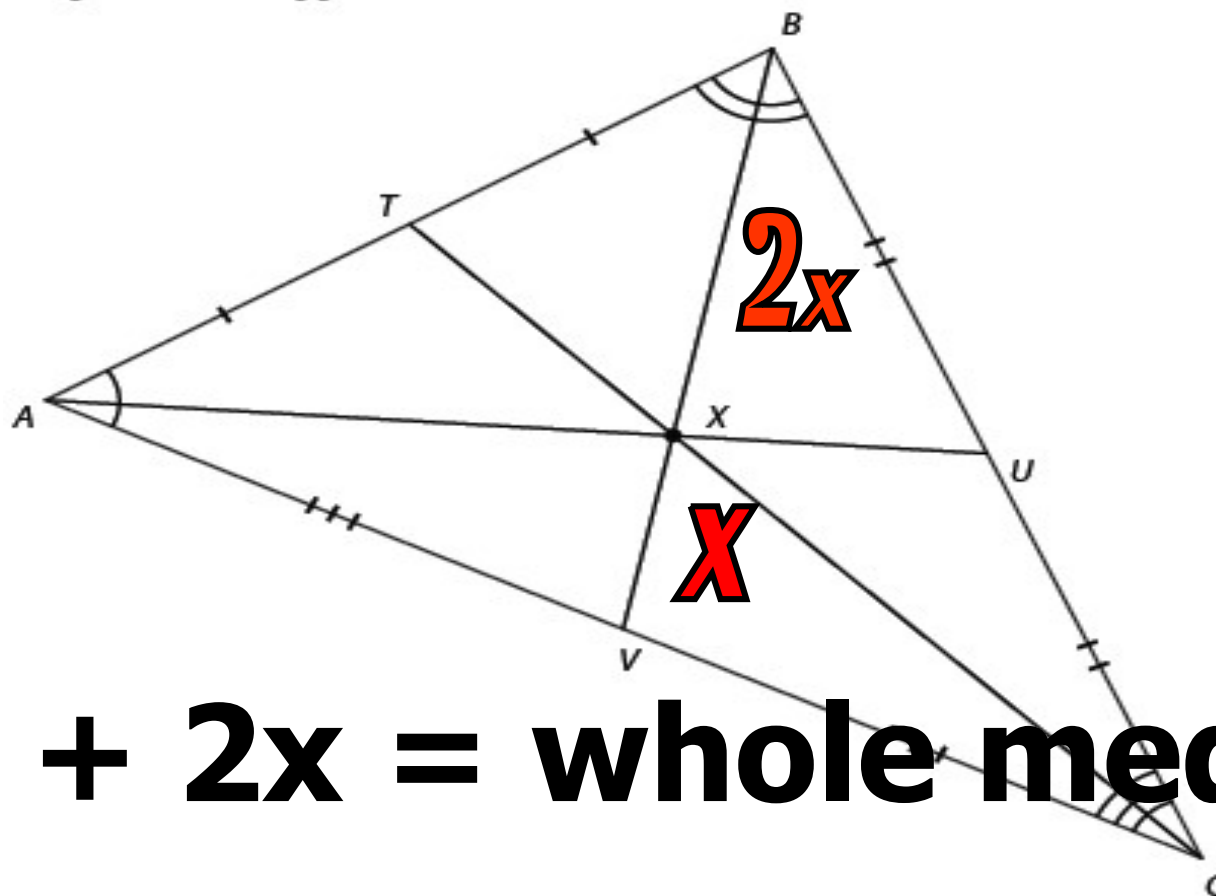
15) $ST =$ _____

16) If $m\angle PRT = 24^\circ$, then $m\angle QRT =$ _____



Median is a line or line segment that goes from one angle to the midpoint of the opposite side.

The centroid of a triangle is $\frac{2}{3}$ the distance from each vertex to the midpoint of the opposite side.



$x + 2x = \text{whole median}$

The centroid of this triangle is at point X.

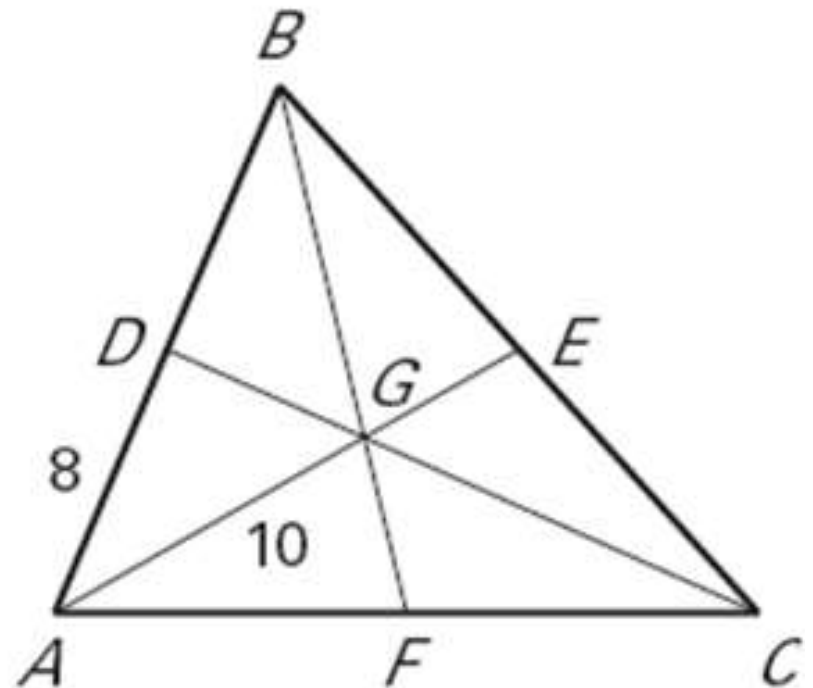
$$AX = \frac{2}{3} AU ; BX = \frac{2}{3} BV ; CX = \frac{2}{3} CT$$

The 3 Medians of a triangle meet at the Centroid. The Centroid of a triangle is $\frac{2}{3}$ of the distance from each vertex to the midpoint of the opposite side.

Point G is the centroid of $\triangle ABC$, $AD = 8$, $AG = 10$, $BE = 10$, $AC = 16$ and $CD = 18$. Find the length of each segment.

17). $DB =$ _____

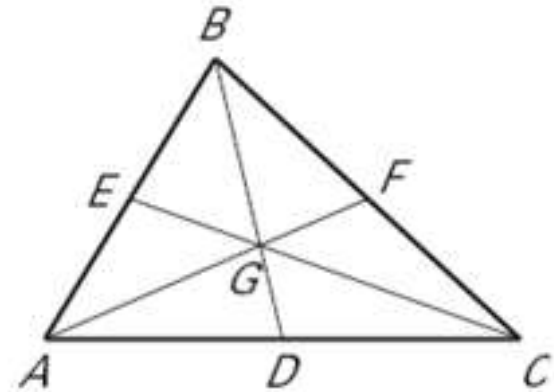
18). $EA =$ _____



More practice

Point G is the centroid of $\triangle ABC$. Use the given information to find the value of the variable.

19) $FG = 2x + 8$ and $GA = 6x - 4$

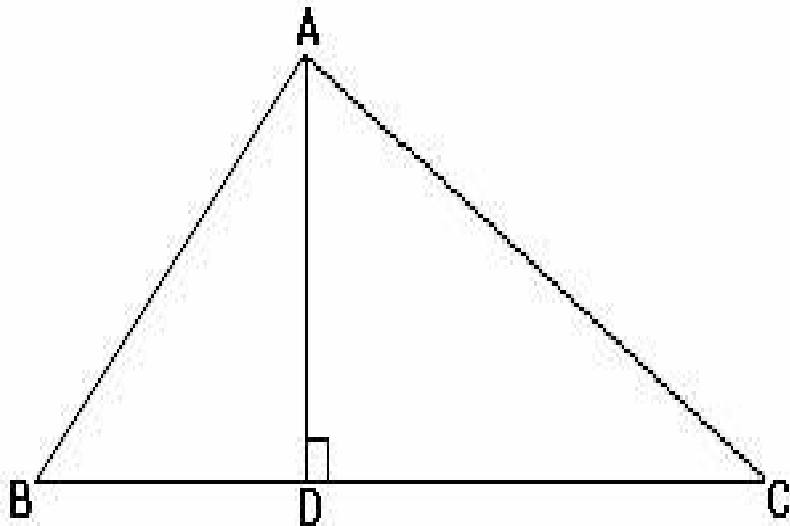


Segment number 5:

Altitude is a line or line segment that intersects the side of a triangle at a 90 degree angle.

(It goes from an angle and is perpendicular to the opposite side.)

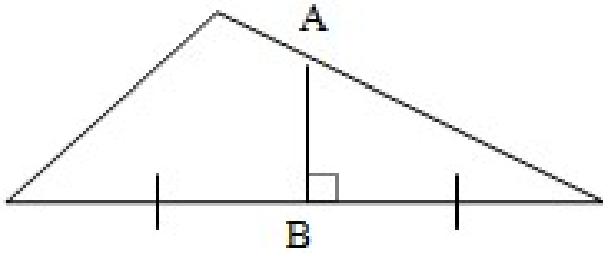
It's Point of Concurrency is called an Orthocenter.



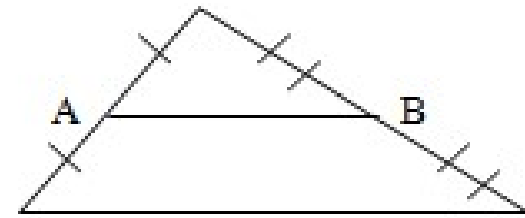
Important idea: Altitude goes from angle and is perpendicular to opposite side (does not have to go to the midpoint!)

What is segment AB?

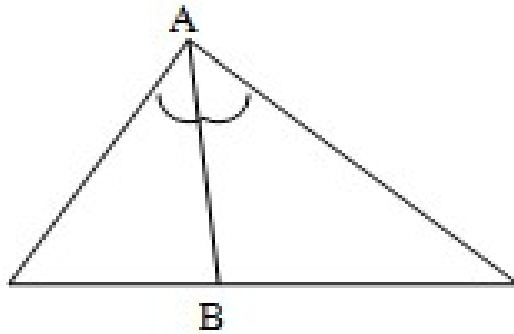
1)



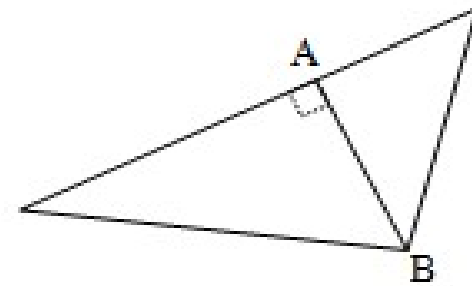
2)



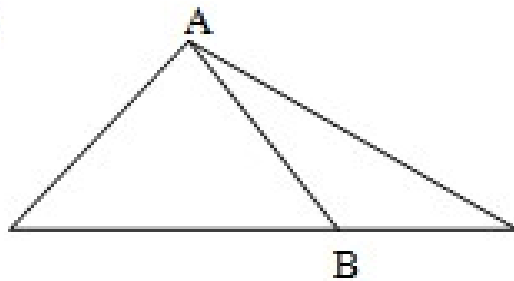
3)



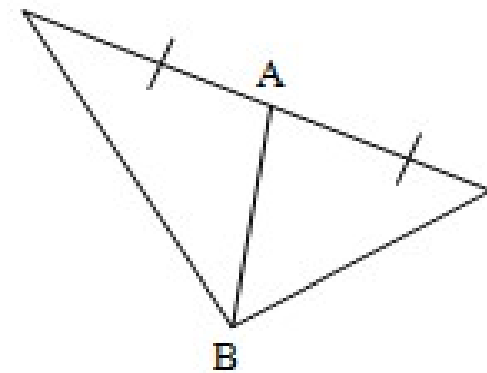
4)



5)



6)



Time to solve an equation!
Find the zero's $x^2 + 5x + 4 = 0$

Assignment:

Worksheet 8.2 and XL8.2