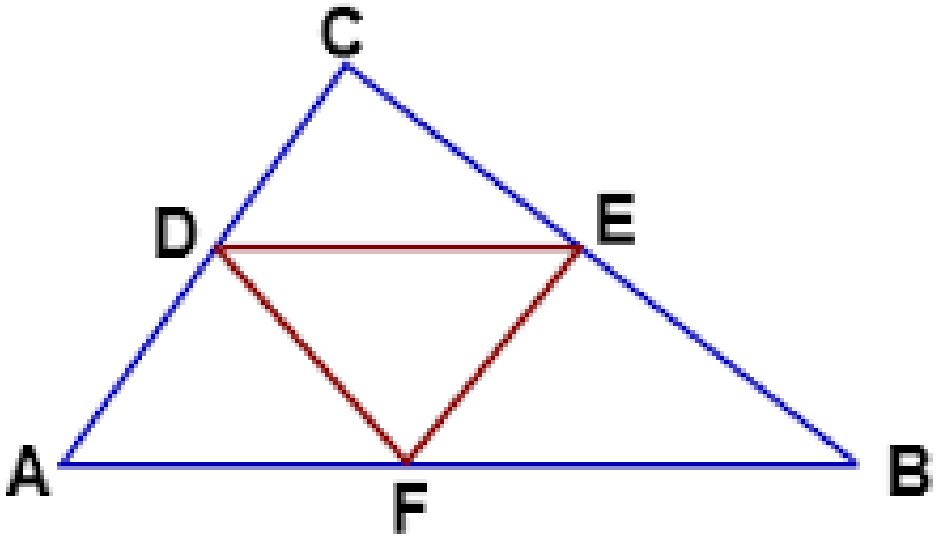
Chapter 5 Relationships within Triangles

5.1
MIDSEGMENT THEOREM

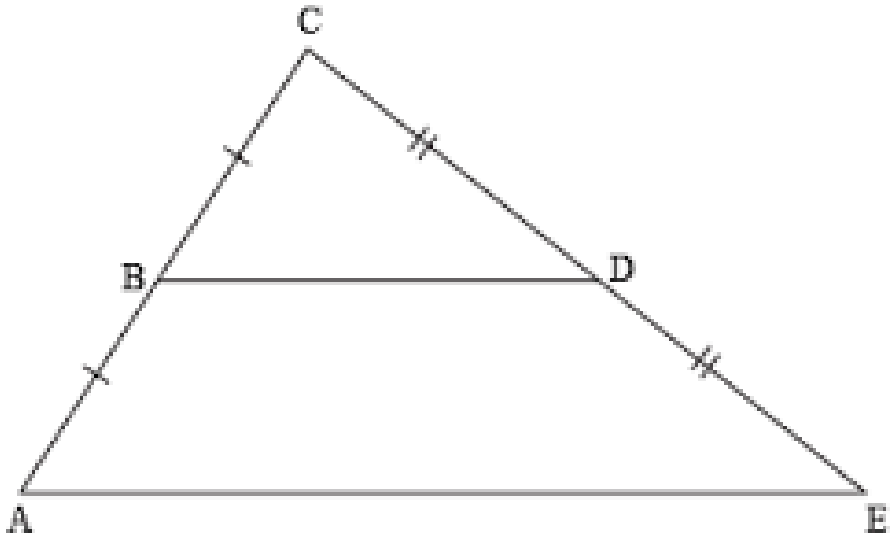
Midsegment of a Triangle

- A _____ that _____ the _____ of _____ of the triangle.
- All triangles have _____ midsegments.

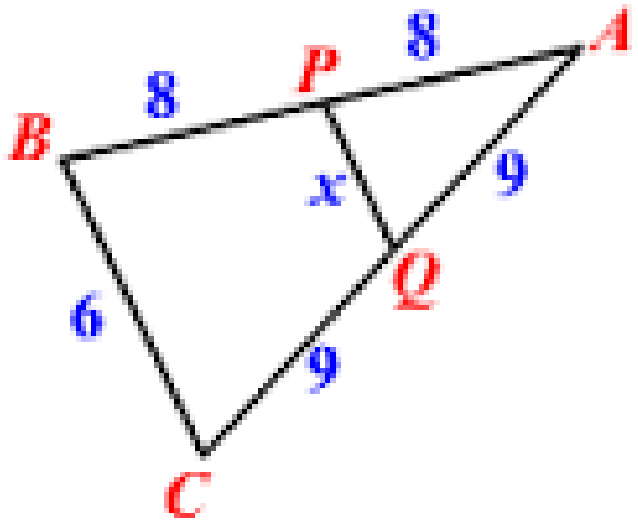


Midsegment Theorem

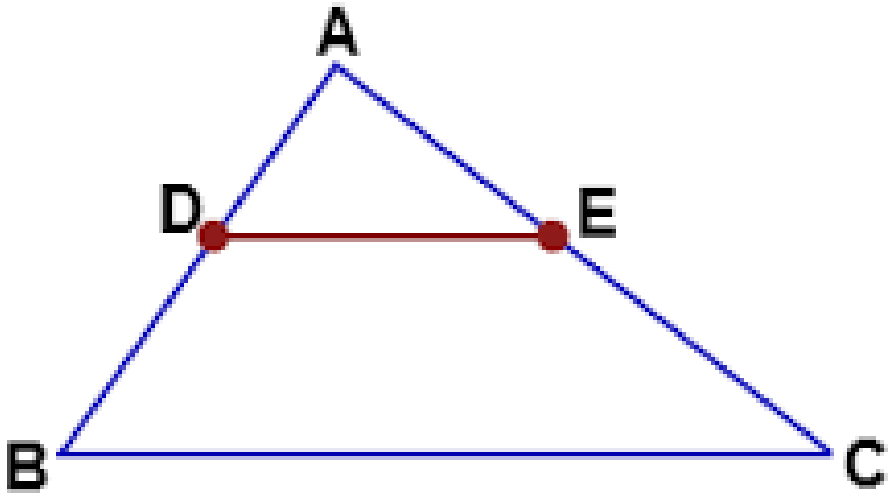
- The midsegment of _____ of a triangle is _____ to the _____ of the triangle.
- It is also _____ as the _____ _____.



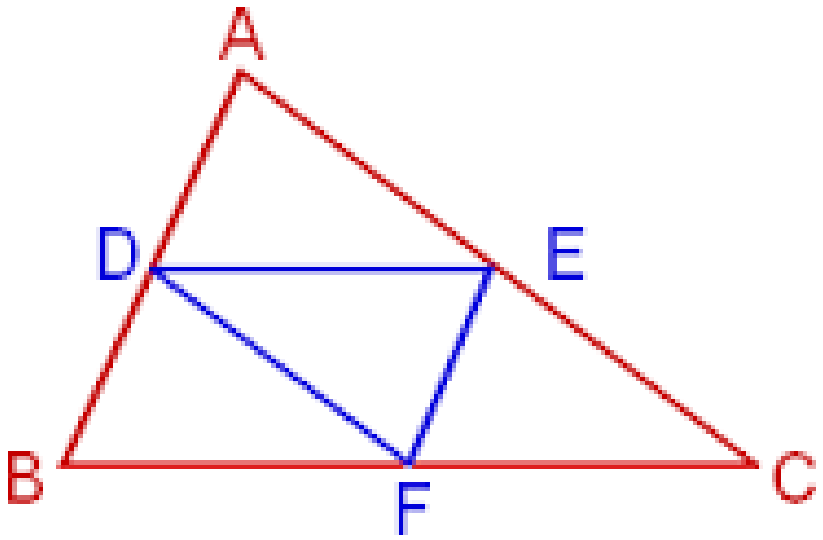
EX: Find x.



EX: DE is the midsegment of Triangle ABC. Find x.

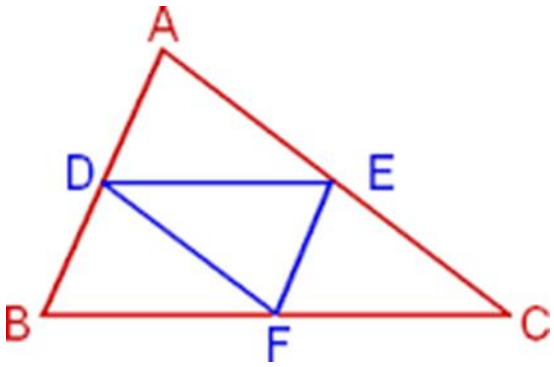


EX: Complete each statement using the following information.



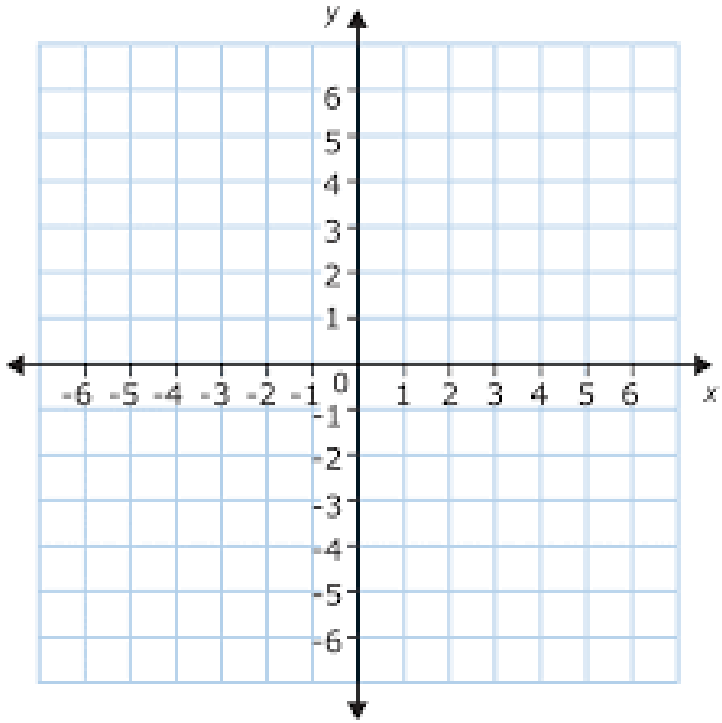
EX: Use the diagram, where D, E, and F are midpoints.

- If DE = 3x + 8 and BC = 2x + 24, what is AB?

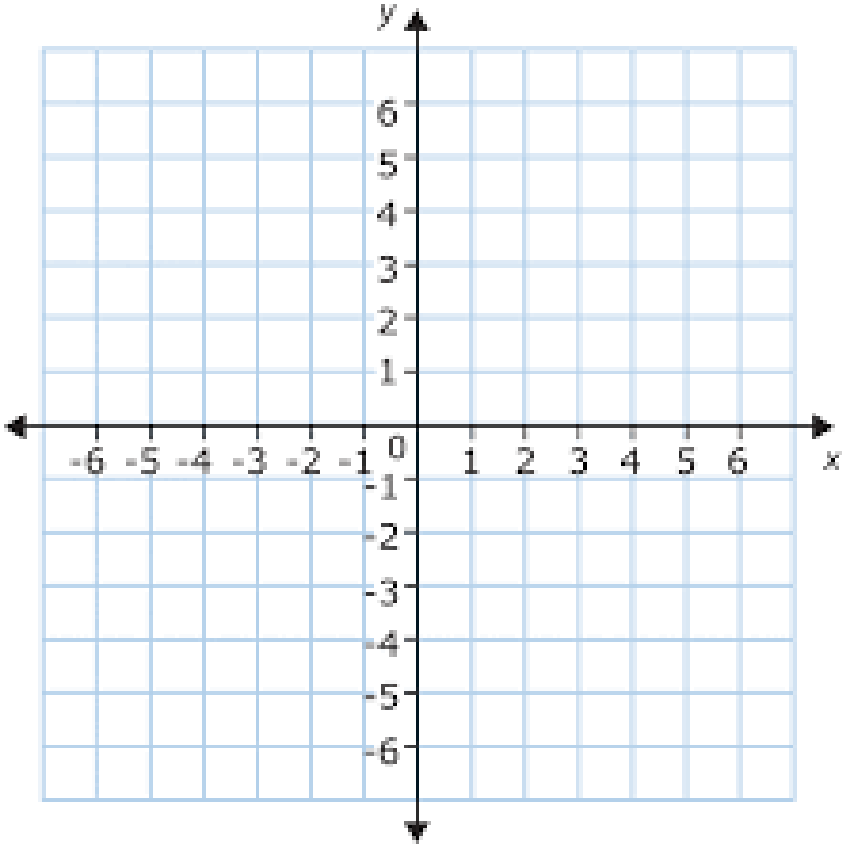


EX: Place the figure in a coordinate plane in a convenient way. Assign coordinates to each vertex.

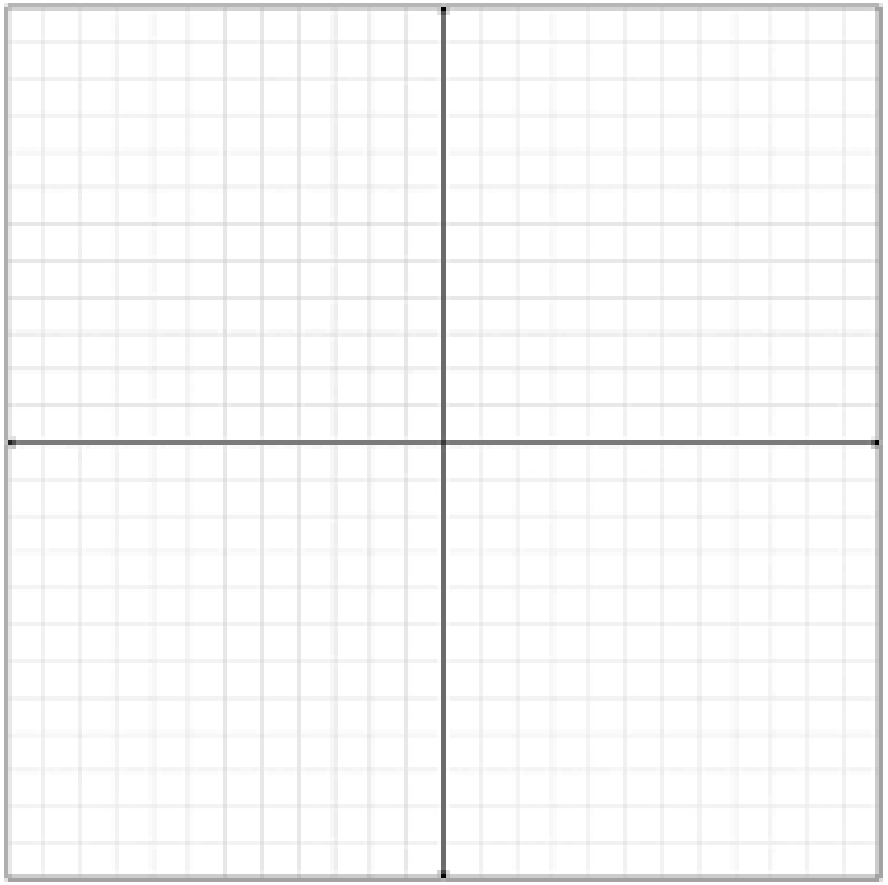
- Right triangle: leg lengths are 4 units and 5 units



- Isosceles triangle: leg length 6



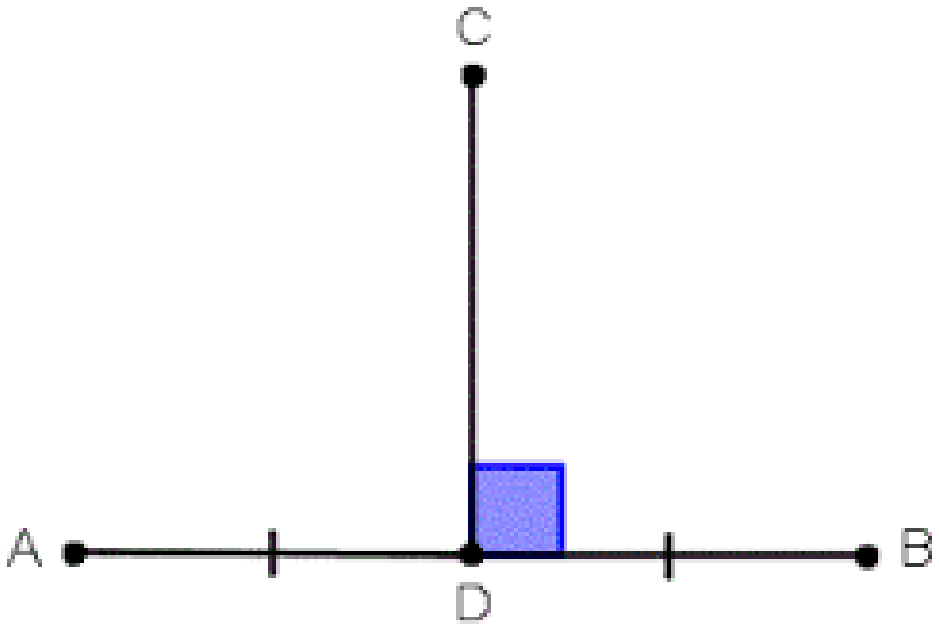
- Rectangle: length is *r* and width is *s*



5.2
PERPENDICULAR BISECTORS

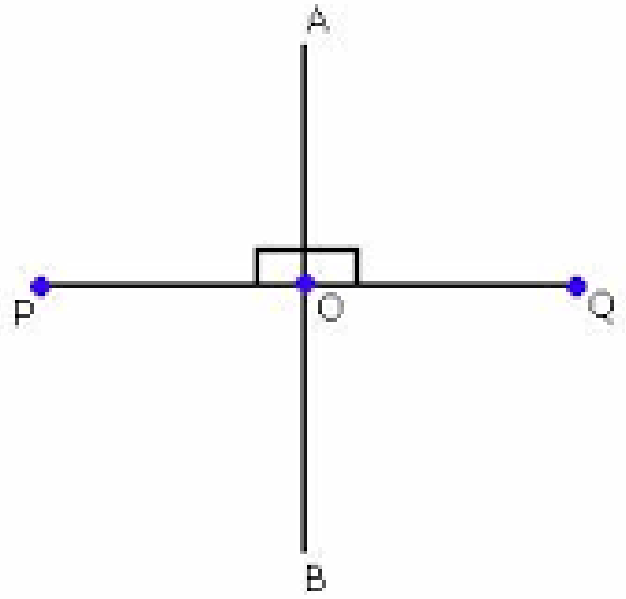
Perpendicular Bisector

- A segment, ray, or line that is _____ to a segment and _____ at its _____.



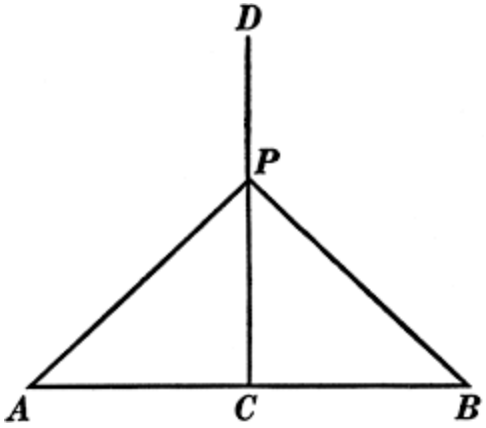
Perpendicular Bisector Theorem

- Any _____ on the _____ of a segment is _____ from the _____ of the segment.

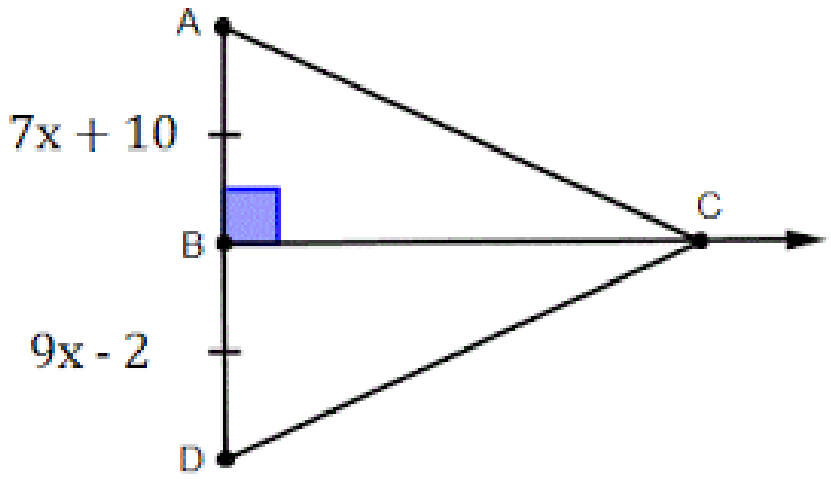


Converse of the Perpendicular Bisector Theorem

- If a _____ is _____ from the _____ of a segment, then the _____ is on the _____ _____ of the segment.

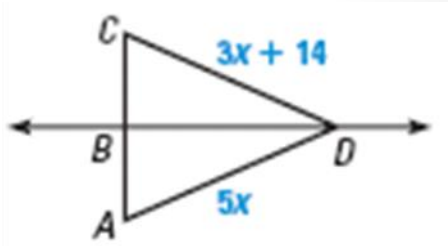


EX: Find x.



EX:

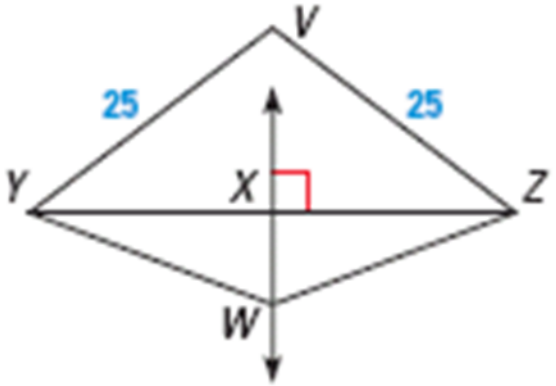
$\overleftrightarrow{BD}$ is the perpendicular bisector of $\overline{AC}$. Find AD.



EX:

In the diagram, $\overleftrightarrow{WX}$ is the perpendicular bisector of $\overline{YZ}$.

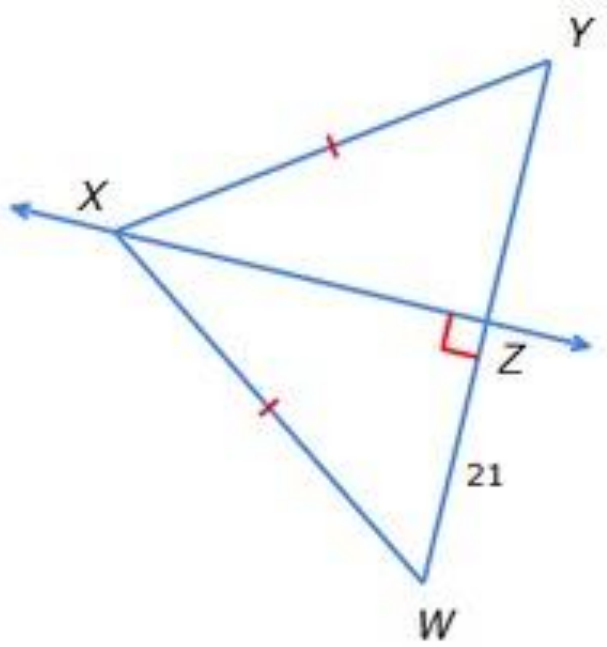
What segment lengths in the diagram are equal?



Is V on WX?

EX:

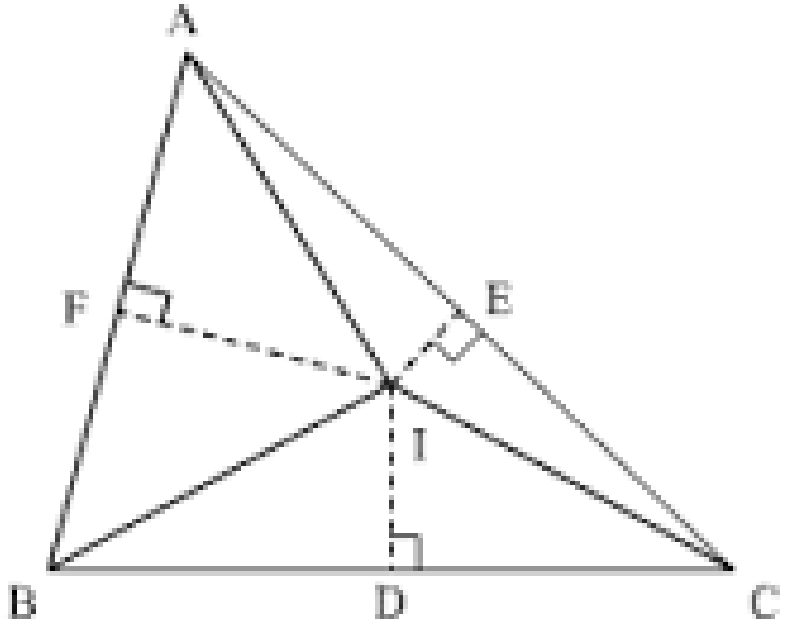
What is *WY*?



WY = ☐

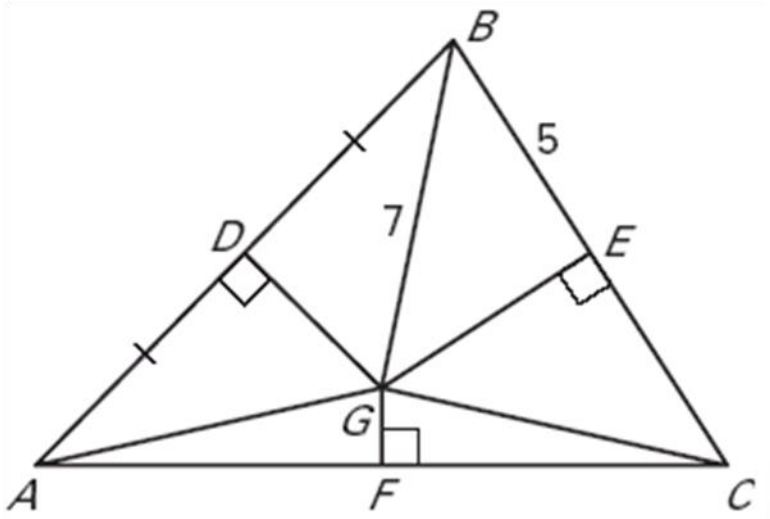
Perpendicular Bisectors of a Triangle

- The perpendicular bisectors of a triangle _____ at _____ that is _____ from the _____ of the triangle.



EX:

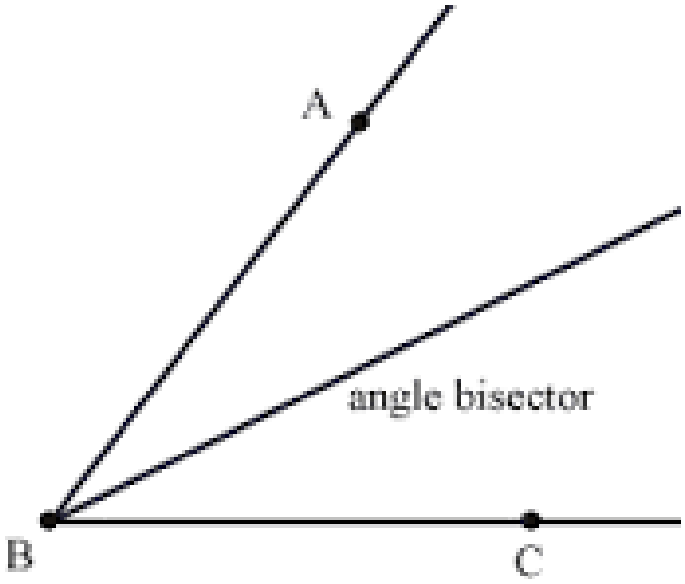
3. **In this diagram, the perpendicular bisectors of $\triangle ABC$ meet at point G. Find EC and GC.**



5.3
ANGLE BISECTORS

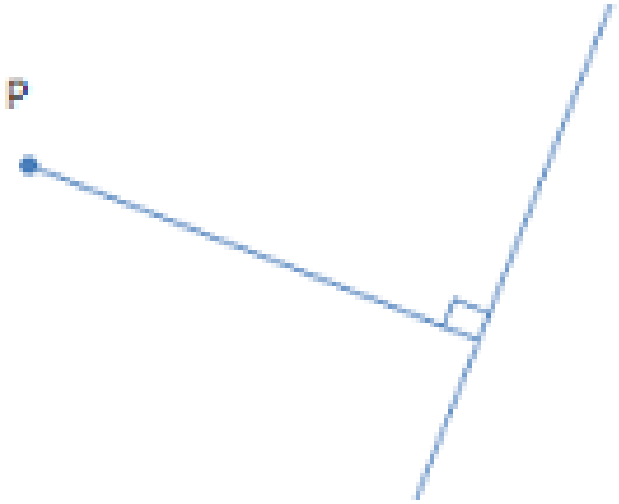
Angle Bisector

- Divides an angle _____



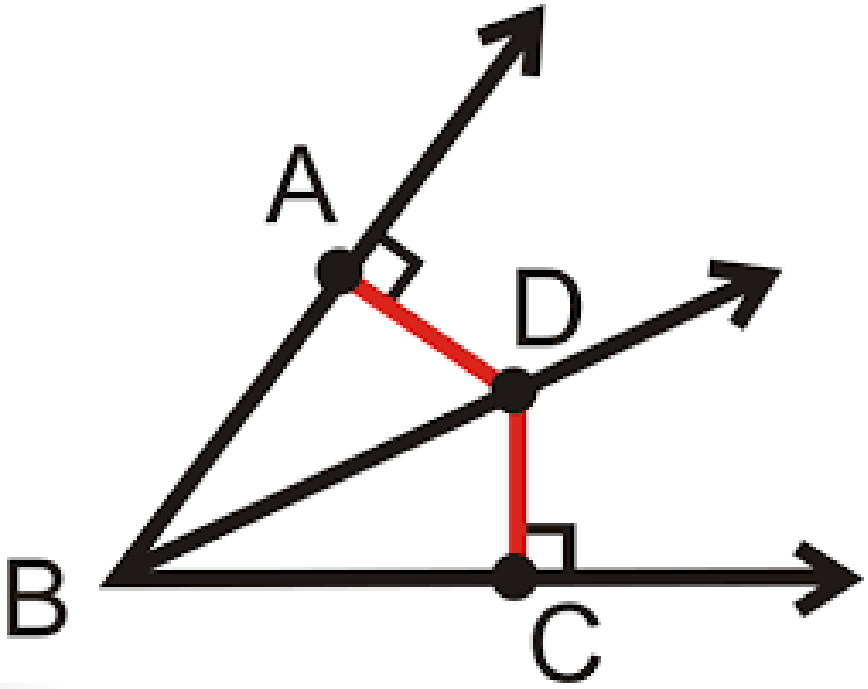
Distance from a Point to a Line

- The _____ from the point to the line.



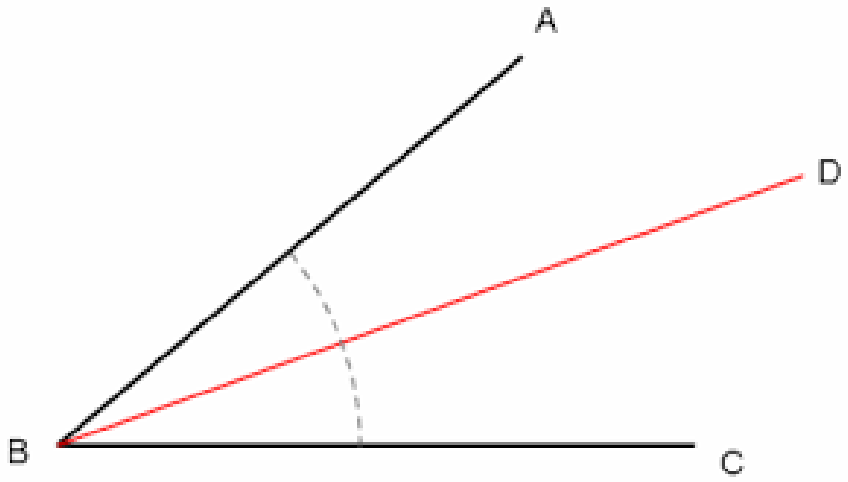
Angle Bisector Theorem

- If a _____ is on the _____ of an angle, then it is the _____ from the _____ of the angle.



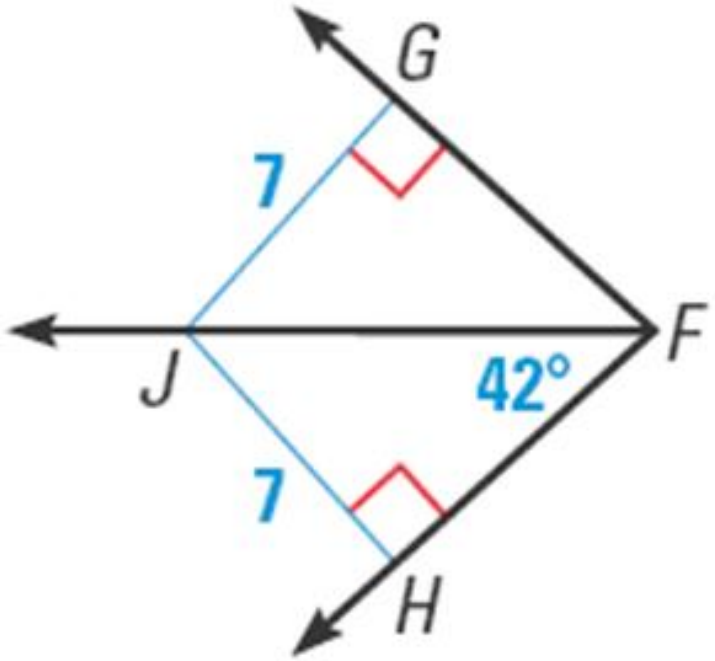
Converse of the Angle Bisector Theorem

- If a _____ is the _____ from the sides of an angle, then it is on the _____ _____ of the angle.



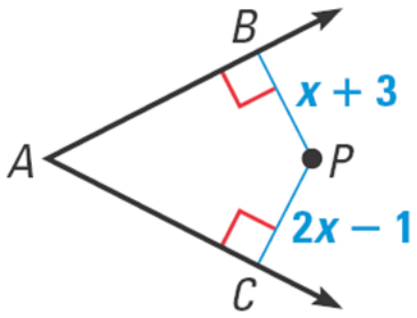
EX:

Find the measure of $\angle GFJ$.

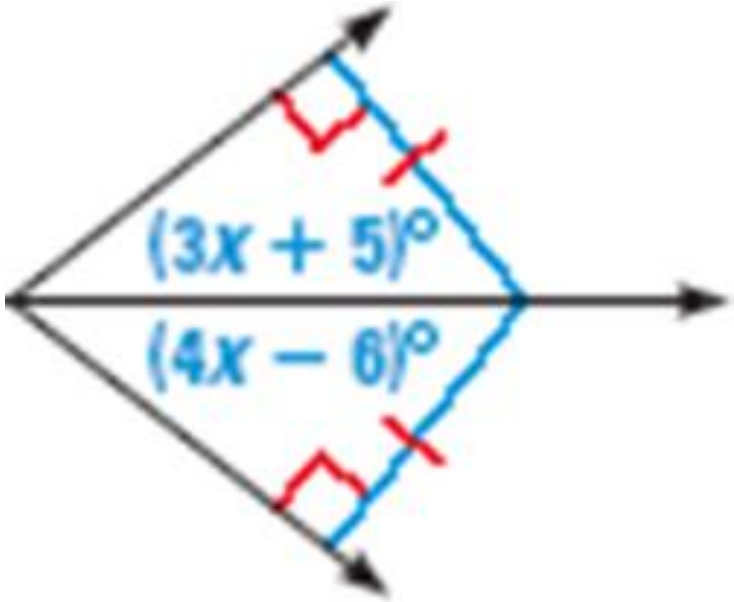


EX:

For what value of x does P lie on the bisector of $\angle A$?

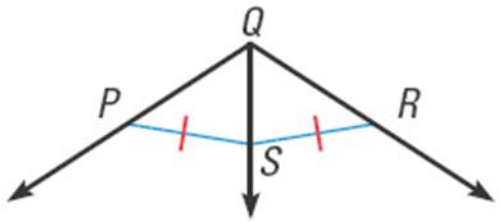


EX: Find x.



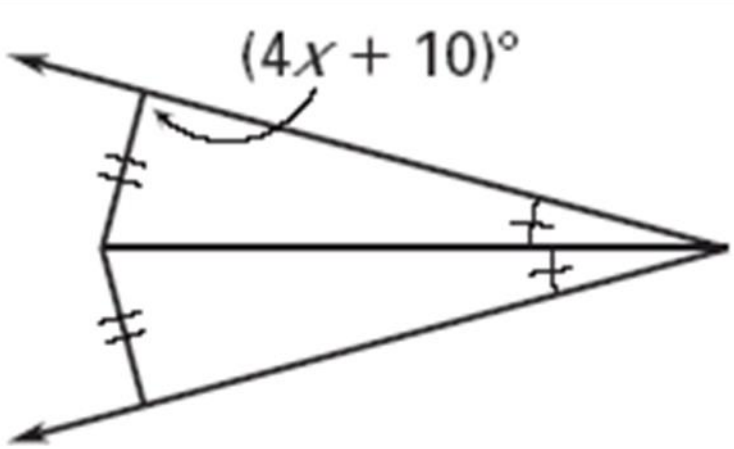
EX:

4. **Do you have enough information to conclude that $\overrightarrow{QS}$ bisects $\angle PQR$? *Explain.***



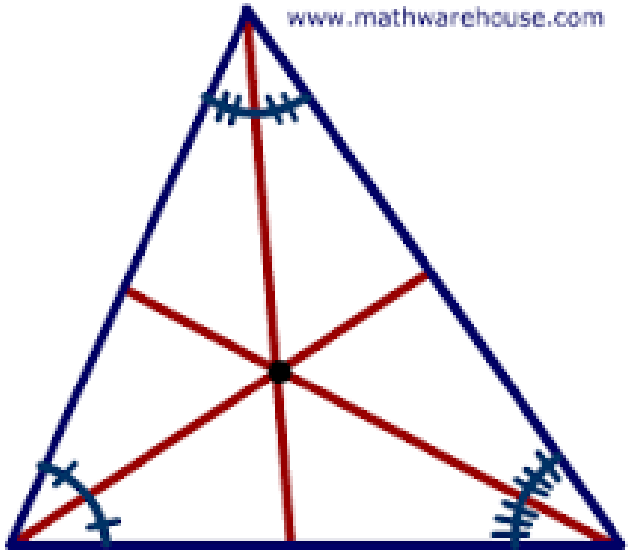
EX: Find x.

2.

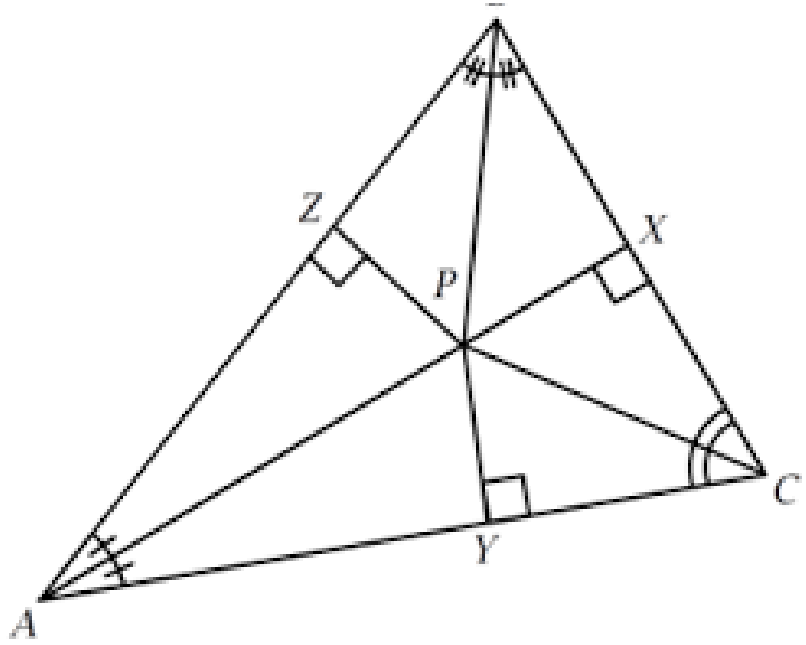


Angle Bisectors of a Triangle

- The angle bisectors of a triangle _____ at _____ that is the _____ from the _____ of the triangle.
  - This _____ is called the _____.

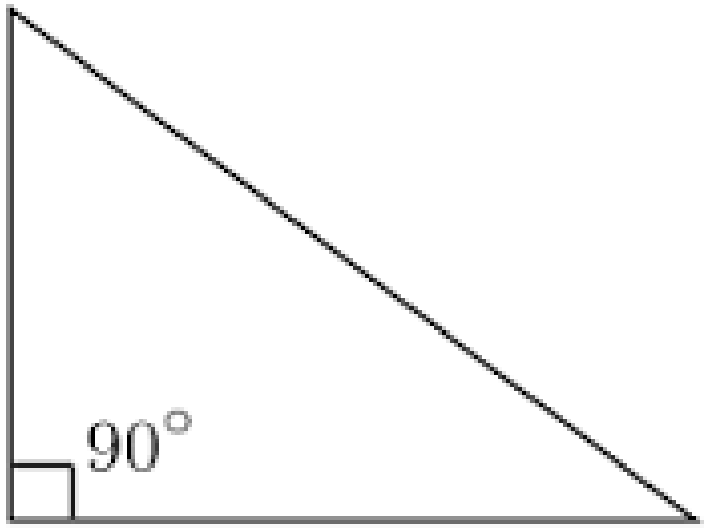


EX: Find x and y.

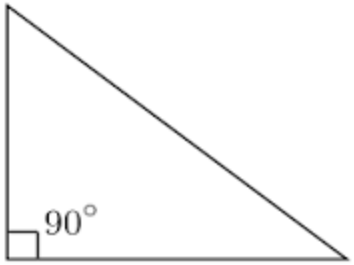


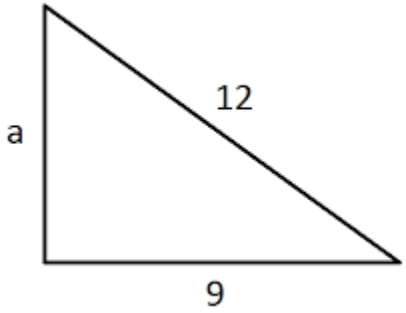
Pythagorean Theorem

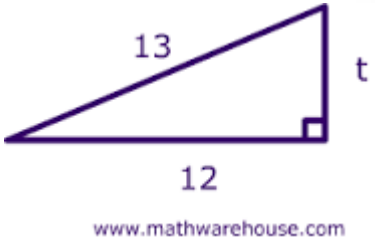
- For a _____ with legs _____ and hypotenuse _____, the Pythagorean Theorem says_____.



EX: Find the missing sides in each triangle.

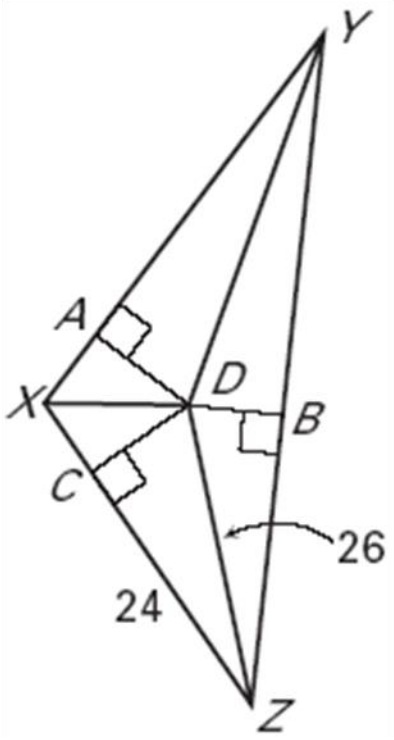






EX:

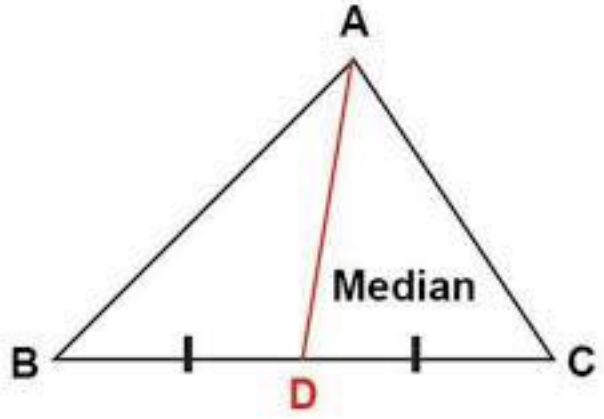
3. Point D is the incenter of $\triangle XYZ$. Find DB.

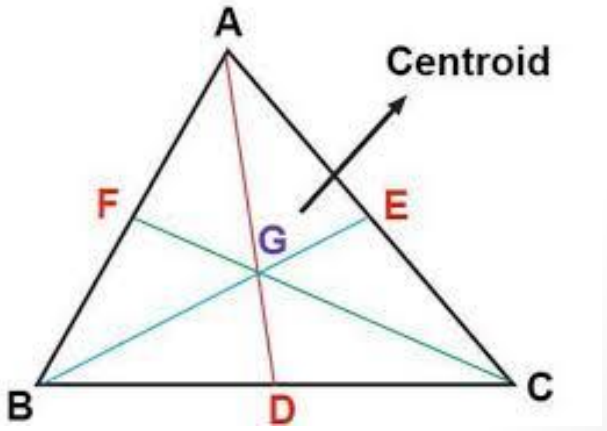


5.4 USE MEDIANS AND ALTITUDES

Median of a Triangle

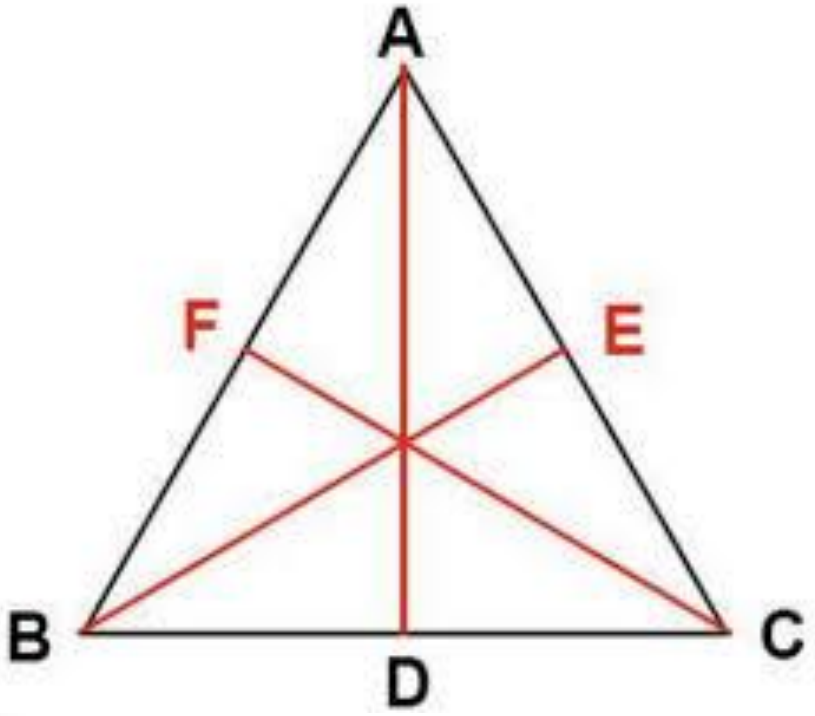
- The segment from the _____ to the _____ of the _____.
- The _____ where the _____ of a triangle meet is called the _____.





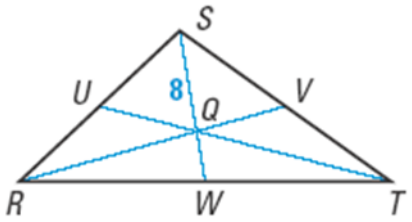
Medians of a Triangle Theorem

- The medians of a triangle _____ that is _____ of the distance from _____ to the _____ of the opposite side.



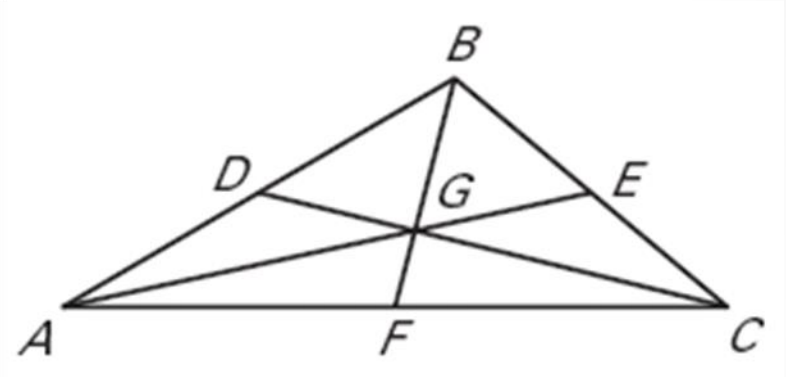
EX:

In $\triangle RST$, Q is the centroid and $SQ = 8$. Find QW and SW.



EX:

In Exercises $1–3$, **use the diagram.**
G **is the centroid of** $\triangle ABC$.



If $BG = 9$, **find** BF.

If $BD = 12$, **find** AD.

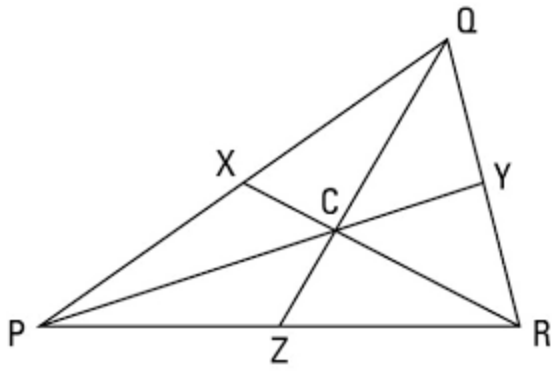
If $CD = 27$, **find** GC.

EX:

There are three paths through a triangular park. Each path goes from the midpoint of one edge to the opposite corner. The paths meet at point *P*.

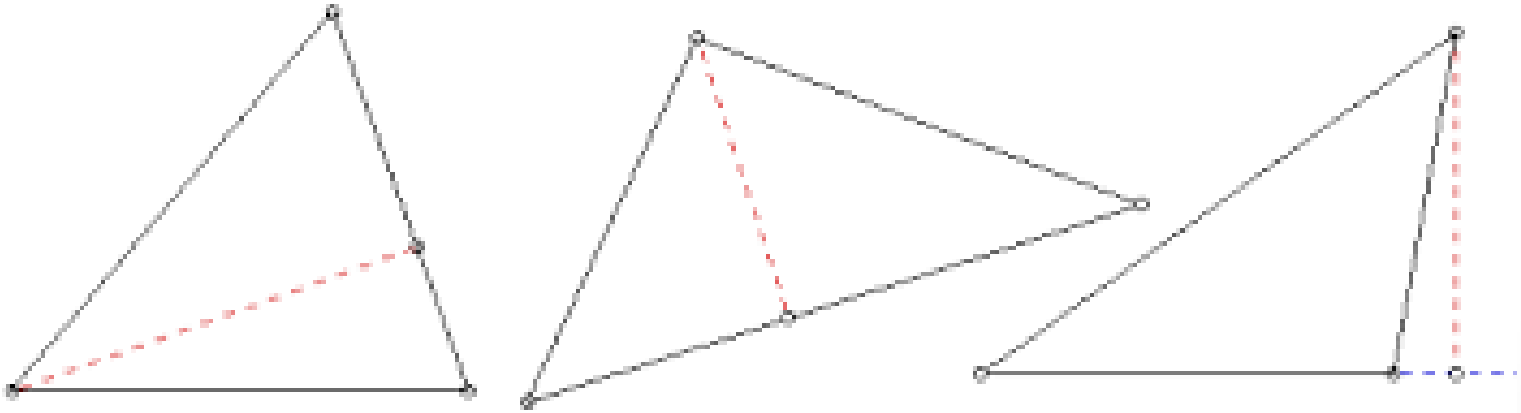
If $PT = 800$ feet, **find** PA **and** TA.

EX: Point C is the centroid. Use the information to find x.



Altitude of a Triangle

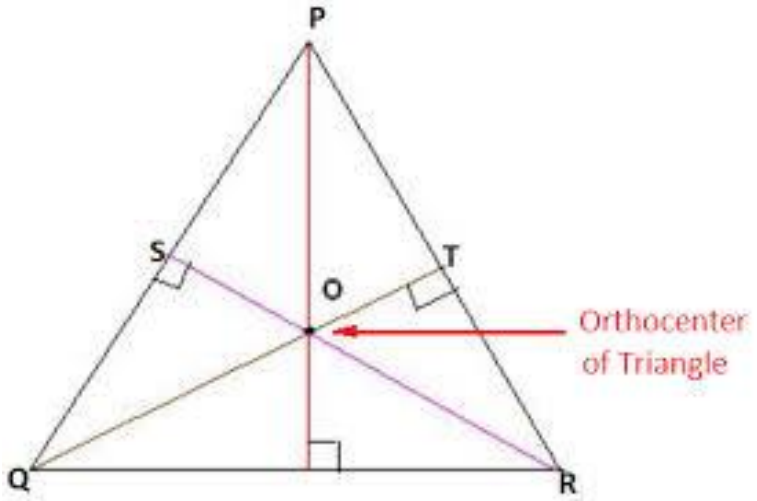
- The _____ from a _____ to the _____ or the _____.

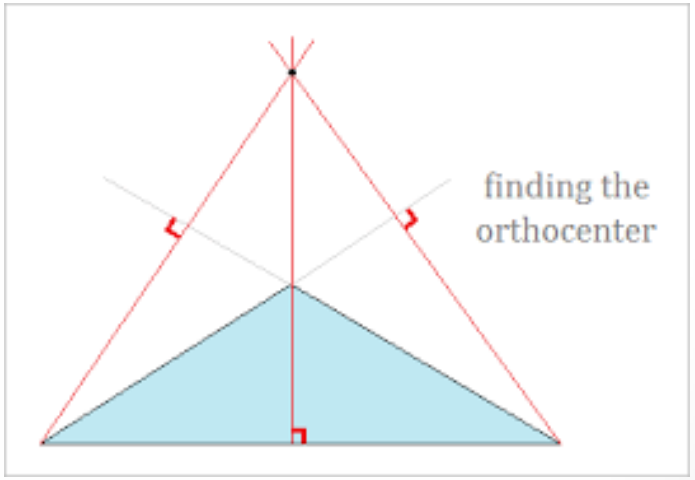


Some examples of altitudes of triangles.

Orthocenter

- The _____ where the _____ or the _____of a triangle _____.

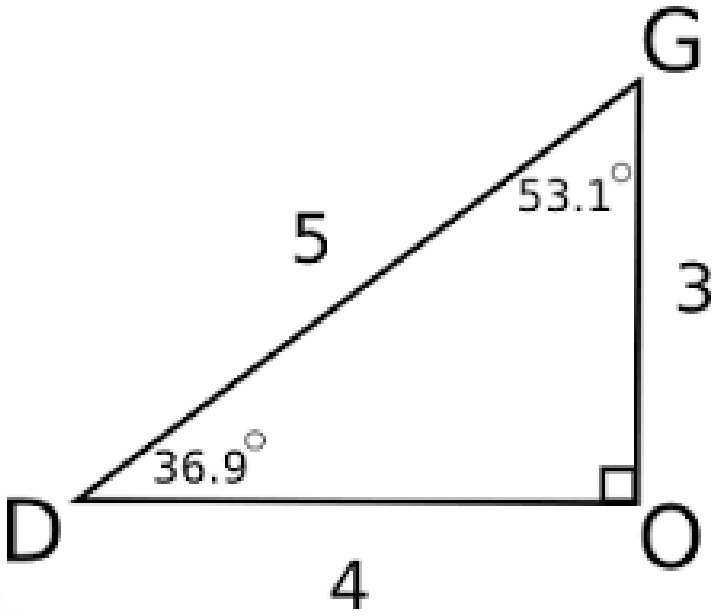




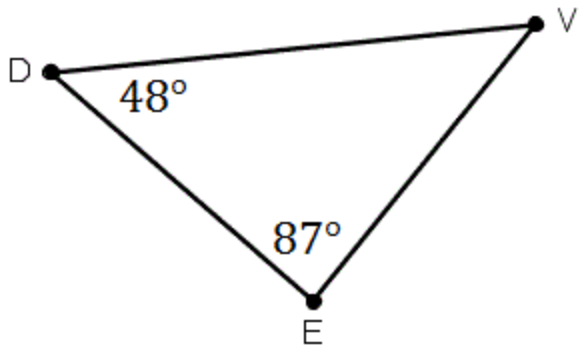
5.5
USE INEQUALITIES IN A TRIANGLE

Comparing Triangle Sides and Angles

- In a triangle:
- _____ have _____ opposite of them.
- _____ have _____ opposite them.

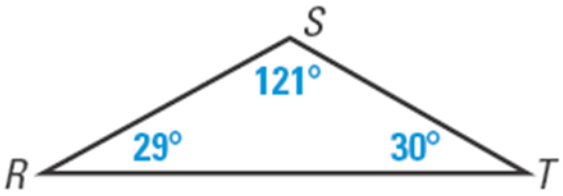


EX: List the sides and angles in order from smallest to largest.



EX:

1. **List the sides of $\triangle RST$ in order from shortest to longest.**



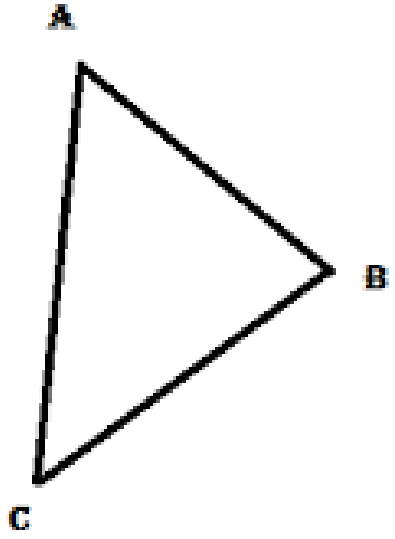
EX: Standardized Test Practice

STAGE PROP You are constructing a stage prop that shows a large triangular mountain. The bottom edge of the mountain is about 27 feet long, the left slope is about 24 feet long, and the right slope is about 20 feet long. You are told that one of the angles is about 46° and one is about 59°. What is the angle measure of the peak of the mountain?

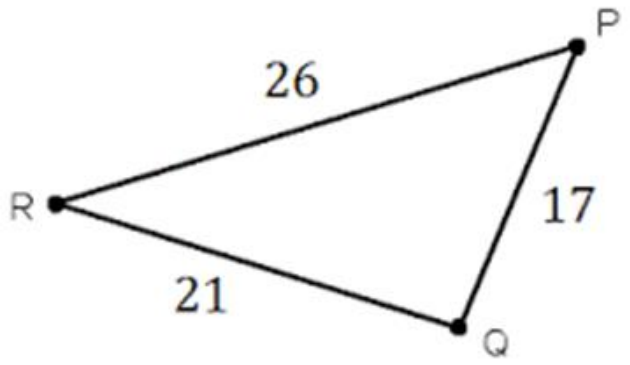
(A) 46° (B) 59° (C) 75° (D) 85°

Triangle Inequality Theorem

- The _____ of the _____ of any _____ of a triangle is _____ the _____ of the _____.



EX: Show that the Triangle Inequality Theorem holds true for this triangle.



EX: Is it possible to construct a triangle with the given side lengths? Explain.

- 5.5, 6, 11

- 6, 11, 21

EX: Describe the possible lengths of the third side of the triangle given the other two sides.

- 12 inches, 8 inches

- 11 feet, 15 feet