

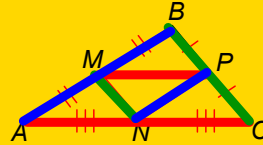
# 5.1 MIDSEGMENT THEOREM AND COORDINATE PROOF



- Before** You used coordinates to show properties of figures.
- Now** You will use properties of midsegments and write coordinate proofs.
- Why?** So you can use indirect measure to find a height, as in Ex. 35.

**Midsegment of a Triangle** - A segment that connects the midpoints of two sides of the triangle. Every triangle has 3 midsegments.

The midsegments of  $\triangle ABC$  at the right are  $\overline{MP}$ ,  $\overline{MN}$ ,  $\overline{NP}$

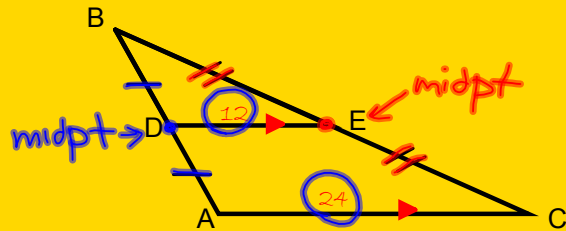
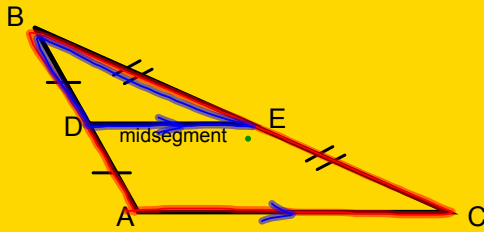


**THEOREM** *For Your Notebook*

**THEOREM 5.1** Midsegment Theorem

The segment connecting the midpoints of two sides of a triangle is parallel to the third side and is half as long as that side.

What is the relationship between  $\triangle ABC$  and  $\triangle DBE$ ? They are Similar Triangles



**Use the Midsegment Theorem to find lengths**

**CONSTRUCTION** Triangles are used for strength in roof trusses. In the diagram,  $UV$  and  $VW$  are midsegments of  $\triangle RST$ . Find  $UV$  and  $RS$ .

$UV = \frac{1}{2} RT$  or  $2UV = RT$   
 $UV = \frac{1}{2} \cdot 90$   
 $UV = 45 \text{ in}$

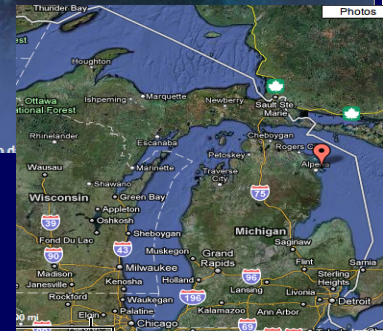
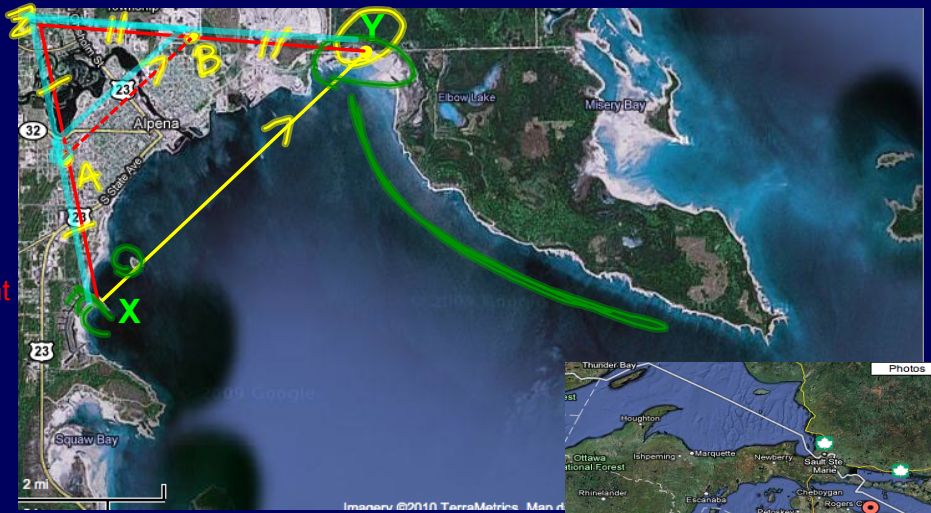
$2UV = 90$   
 $UV = 45 \text{ in}$

$VW = \frac{1}{2} RS$   
 $57 = \frac{1}{2} RS$   
 $114 \text{ in} = RS$

$2VW = RS$   
 $2 \cdot 57 = RS$   
 $114 \text{ in} = RS$

Marco is on the University of Michigan swim team. During the summer he went to Alpena, MI to train at Thunder Bay. He needs to find out the distance from his grandpa's house to the north side of town across the bay.

How can he use the Midsegment Theorem to find this distance?



$$AB = 1.5 \text{ miles}$$

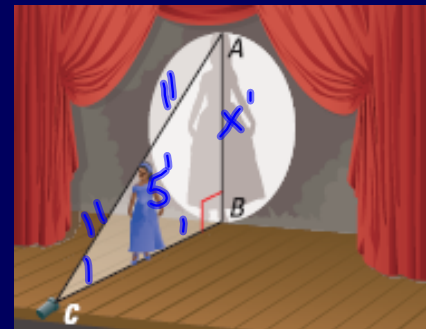
$$\therefore XY = 2 \cdot AB$$

$$XY = 2 \cdot 1.5 \text{ mi}$$

$$XY = 3 \text{ mi}$$

35. **FLOODLIGHTS** A floodlight on the edge of the stage shines upward onto the backdrop as shown. Morgan is 5 feet tall. She stands halfway between the light and the backdrop, and the top of her head is at the midpoint of  $\overline{AC}$ . The edge of the light just reaches the top of her head.

How tall is her shadow?



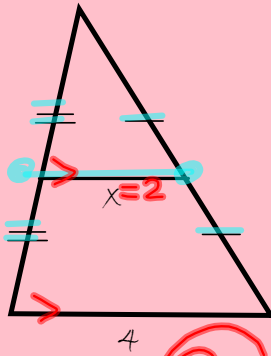
$$2 \cdot 5' = x'$$

$$10' = x$$

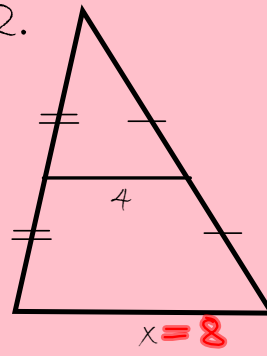
Questionnaire

Solve for x.

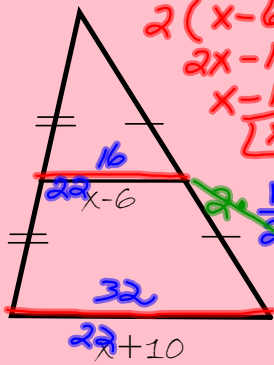
1.



2.



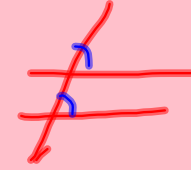
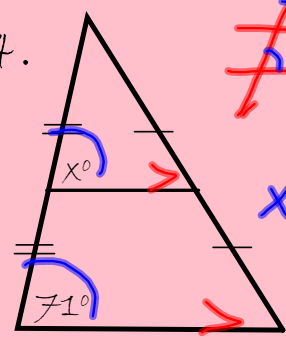
3.



$$\begin{aligned}
 2(x-6) &= x+10 \\
 2x-12 &= x+10 \\
 x-12 &= 10 \\
 \boxed{x=22}
 \end{aligned}$$

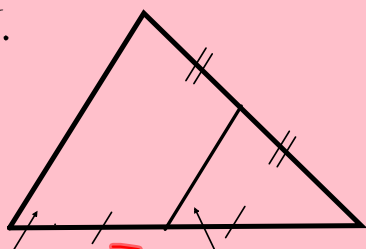
$$\begin{aligned}
 \frac{1}{2}(x+10) &= x-6 \\
 x+10 &= 2x-12 \\
 10 &= x-12 \\
 +12 & \quad +12 \\
 \boxed{22} &= x
 \end{aligned}$$

4.



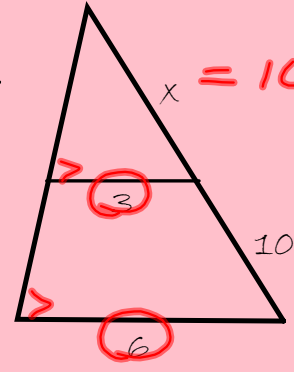
$$x = 71^\circ$$

5.

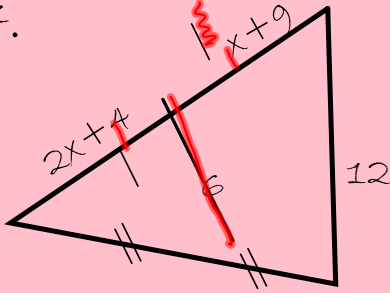


$$\begin{aligned}
 x+35 &= 2x-21 \\
 35 &= x-21 \\
 \boxed{56} &= x
 \end{aligned}$$

6.



7.



$$\begin{aligned}
 2x+4 &= x+9 \\
 x+4 &= 9 \\
 \boxed{x=5}
 \end{aligned}$$