## 7.2 Use Similar Triangles to Solve Problems

### A Ratio and Proportions

- ✓ A ratio is a comparison of two quantities by using division. Example: $\frac{a}{b}$
- ✓ A proportion is an equation that says that two ratios are equivalent. Example: $\frac{a}{b}=\frac{c}{d}$
- ✓ Cross-multiplication is a common method to solve a proportion.

Example 1. Solve each proportion for $x$.

a) $\frac{x}{2}=\frac{3}{4}$

b) $\frac{x-1}{3}=\frac{2x-5}{2}$

c) $\frac{x-2}{3}=\frac{4}{x-3}$

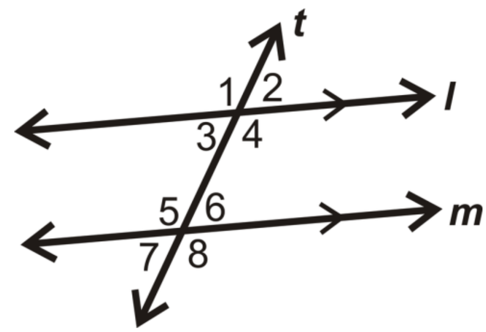
### B Two Parallel Lines and a Transversal

$\angle 1=\angle 4$ (opposite angles)

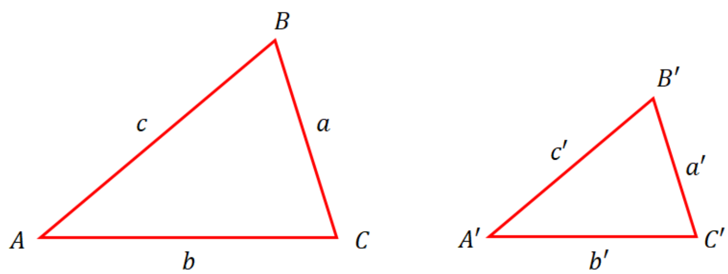
$\angle 1=\angle 5$ (corresponding angles)

$\angle 3=\angle 6$ (interior alternate angles)

$\angle 1=\angle 8$ (exterior alternate angles)




### C Similar Triangles




If the triangles $\Delta ABC$ and $\Delta A'B'C'$ are similar ($\Delta ABC \sim \Delta A'B'C'$) then:

- ✓ the corresponding sides are proportional:

$$k=\frac{AB}{A'B'}=\frac{BC}{B'C'}=\frac{AC}{A'C'} \quad \text{or} \quad k=\frac{c}{c'}=\frac{a}{a'}=\frac{b}{b'} \quad \text{(similarity proportions)}$$

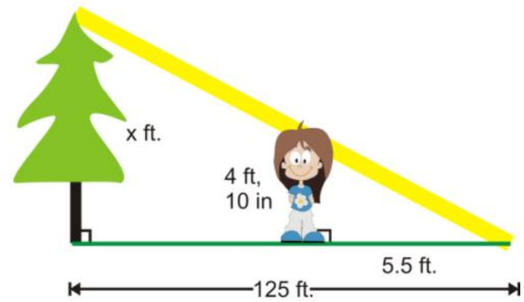
where $k$ is called the *scale factor* and

- ✓ the ratio of the areas is given by:

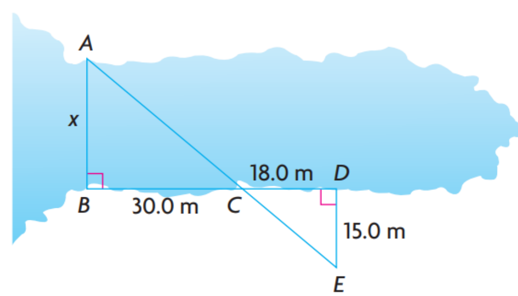
$$k^2=\frac{Area_{\Delta ABC}}{Area_{\Delta A'B'C'}}$$

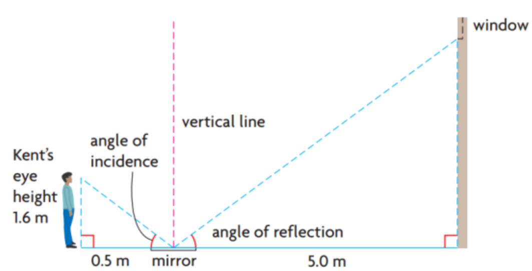
Example 1. A tree outside Ellie's building casts a 125 feet shadow. At the same time of day, Ellie casts a 5.5 feet shadow. If Ellie is 4 feet 10 inches tall, how tall is the tree?




Example 2. How wide is this bay?



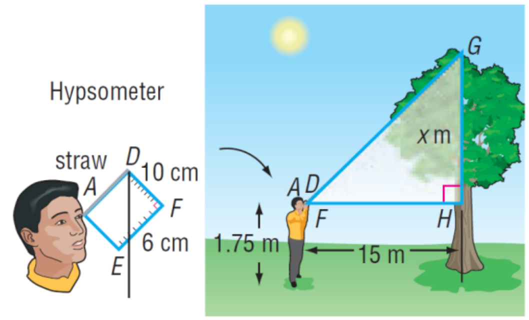

Example 3. Kent uses a mirror to determine the height of Julie's window. He knows that the angle of incidence equals the angle of reflection when light is reflected off a mirror. How high is the window?



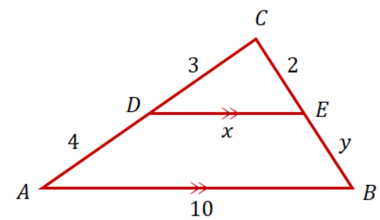


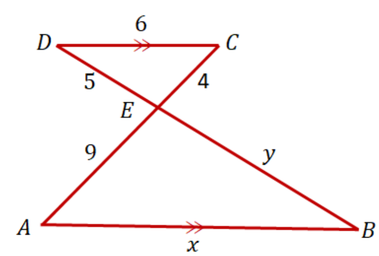
Example 4. A hypsometer can be used to estimate the height of a tree. Ken looks through the straw to the top of the tree and obtains the readings given in the diagram. Find the height of the tree.




Example 5. Find the unknown variables $x$ and $y$.



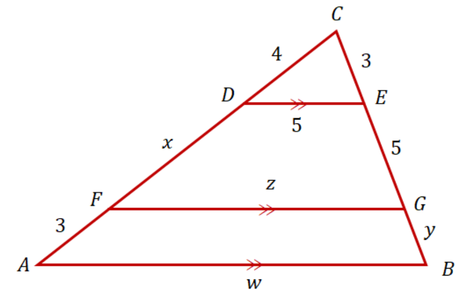

Example 6. Find the unknown variables $x$ and $y$.



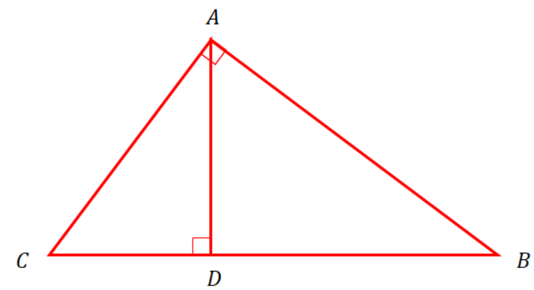


Example 7. Find the unknown variables $x$, $y$, $z$, and $w$.




Example 8. For the diagram provided, prove that:




a) $AD^2 = (DB)(DC)$ (Altitude Theorem)

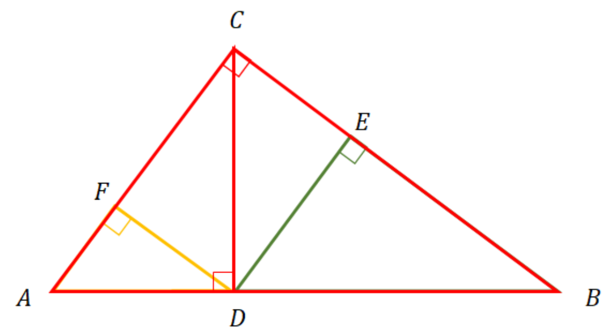
b) $AC^2 = (CB)(CD)$

c) $AB^2 = (BC)(BD)$

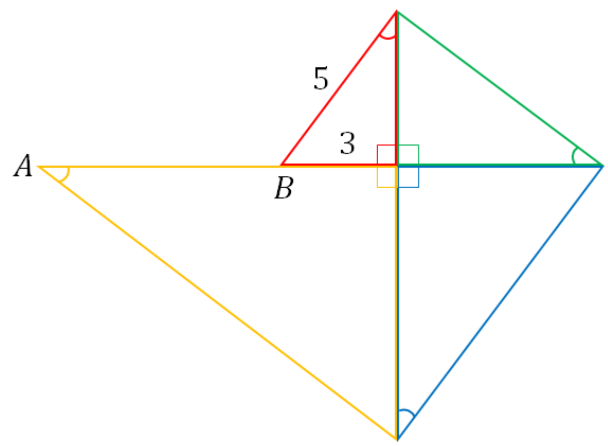
d) $BC^2 = AC^2 + AB^2$ (Pythagorean Theorem)

Notes: Textbook Pages 342-346
Homework: Textbook Pages 346-351 # 5, 6ab, 7ab, 8a, 9, 10, 14, 19, (28, 29, 30 optional)

Challenge 1. Given $AB = 10$ and $AC = 6$, find $EF$.




Challenge 2. Find $AB$.




Challenge 3. Find $FH$.