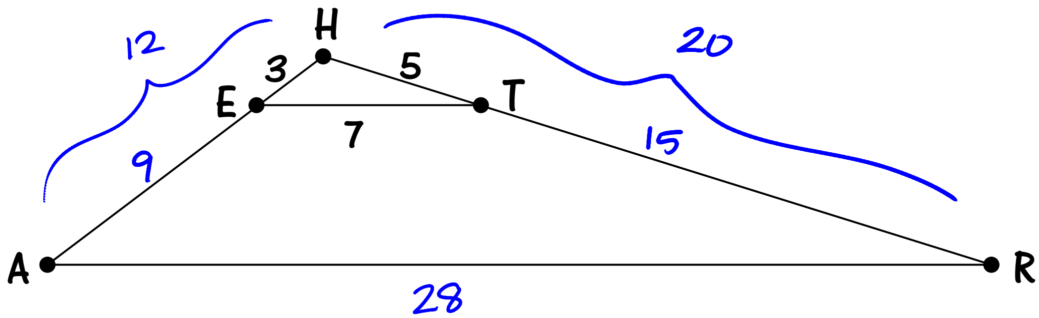
7.4 Applying Properties of Similar Triangles



1) ΔHAR is a dilation of ΔHET by a factor of 4.

a) Find the side lengths of ΔHAR.

HA = $3 \times 4 = 12$ HR = $5 \times 4 = 20$ AR = $7 \times 4 = 28$

↑ scale factor (enlargement)

b) Find the remaining side lengths.

EA = $12 - 3 = 9$ TR = $20 - 5 = 15$

2) Determine if ΔHET ~ ΔHAR. If your answer is yes, include the property and similarity ratio. If your answer is no, explain why not. Show work to justify your answer.

Yes, ΔHET ~ ΔHAR by SSS~ b/c the corresponding sides are proportional.

$\left(\frac{HE}{HA} = \frac{ET}{AR} = \frac{HT}{HR} = \frac{1}{4}\right)$ The ~ ratio is 1/4.

3) If the triangles are similar, what other information do you know that is not marked in your diagram. (Hint: In similar triangles, you know that angles are congruent and sides are proportional. What have we not talked about yet?)

Since the Δ's are ~, the corresponding ∠'s are ≅:

① ∠H ≅ ∠H ② ∠HET ≅ ∠A ③ ∠HTE ≅ ∠R

4) Based off of the information above, determine which proportions are true and which ones are false.

a) $\frac{HE}{HA} = \frac{HT}{HR}$ $\frac{3}{12} = \frac{5}{20}$ TRUE

~Δ's $\frac{1}{4} = \frac{1}{4}$ ✓

b) $\frac{ET}{AR} = \frac{HT}{HR}$ $\frac{7}{28} = \frac{5}{20}$ TRUE

~Δ's $\frac{1}{4} = \frac{1}{4}$ ✓

c) $\frac{ET}{AR} = \frac{HT}{TR}$ $\frac{7}{28} \neq \frac{5}{15}$ FALSE

$\frac{B}{B} \neq \frac{R}{R}$ $\frac{1}{4} \neq \frac{1}{3}$ ✗

d) $\frac{HE}{HT} = \frac{EA}{TR}$ $\frac{3}{5} = \frac{9}{15}$ TRUE

Δ Proportionality $\frac{L}{R} = \frac{L}{R}$ ✓ $\frac{3}{5} = \frac{3}{5}$ ✓

e) $\frac{HE}{EA} = \frac{HT}{TR}$ $\frac{3}{9} = \frac{5}{15}$ TRUE

Δ Proportionality $\frac{L}{L} = \frac{R}{R}$ $\frac{1}{3} = \frac{1}{3}$ ✓

f) $\frac{HE}{EA} = \frac{ET}{AR}$ $\frac{3}{9} = \frac{7}{28}$ FALSE

$\frac{L}{L} \neq \frac{B}{B}$ $\frac{1}{3} \neq \frac{1}{4}$

Used Δ proportionality Thm incorrectly... cannot use w/ base of Δ's

There are two different rules we can use to solve for missing sides:

transversals

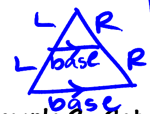
Similar Triangles: Always works!

★ Sides are proportional ★

$$\frac{\text{Side in small }\triangle}{\text{Side in large }\triangle} = \frac{\text{Side in small }\triangle}{\text{Side in large }\triangle}$$

Triangle Proportionality Theorem:

★ The parallel lines divide the SIDES of the $\triangle$ proportionally (not the BASES)



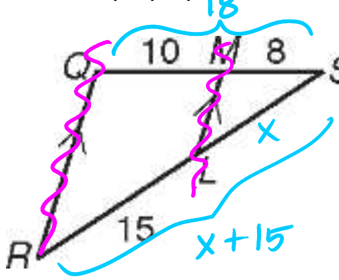
$\boxed{\frac{L}{R} = \frac{L}{R}}$ ✓

$\frac{L}{Base} \neq \frac{L}{Base}$

$\frac{R}{Base} \neq \frac{R}{Base}$

Don't do this ☺

Example 1: Set up a proportion and solve for LS.



Opt 2: $\triangle$ Prop.

$\frac{8}{x} = \frac{10}{15}$

$10x = 120$

$x = 12$

$\boxed{LS = 12}$

Opt 1: $\sim \triangle$'s

$\frac{8}{18} = \frac{x}{x+15}$

$18x = 8x + 120$

$10x = 120$

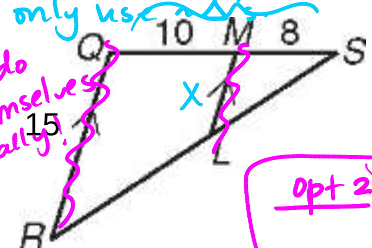
$x = 12$

$\boxed{LS = 12}$

Example 2: Set up a proportion and solve for ML.

★ can only use $\sim\triangle$'s

// lines do not $\div$ themselves proportionally!



Opt 1: $\sim\triangle$'s

$\frac{8}{18} = \frac{x}{15}$

$18x = 120$

$x = 6\frac{2}{3}$ so $ML = 6\frac{2}{3}$

~~Opt 2: $\frac{8}{x} = \frac{10}{15}$~~

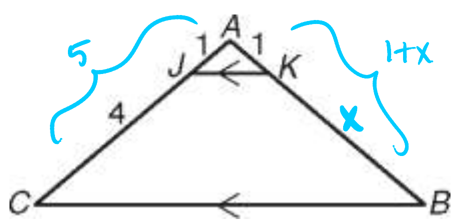
~~$10x = 120$~~

~~$x = 12$~~

~~so $ML = 12$??~~

Cannot do since looking for a base

Example 3: Set up a proportion and solve for BK.



Opt 1: $\frac{1}{5} = \frac{1}{1+x}$

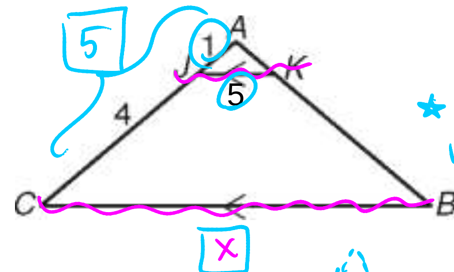
$1+x = 5$

$x = 4$ so $BK = 4$

Opt 2: $\frac{1}{4} = \frac{1}{x}$

$x = 4$ so $BK = 4$

Example 4: Set up a proportion and solve for CB.



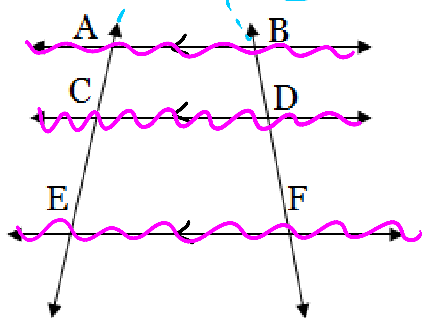
★ can only use $\sim\triangle$'s

$\frac{1}{5} = \frac{5}{x}$

$x = 25$

$\boxed{CB = 25}$

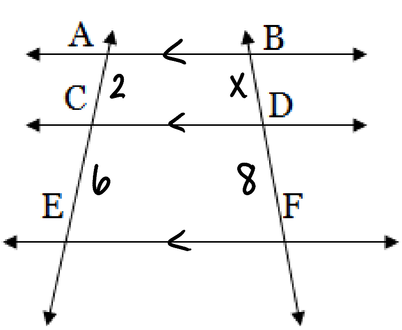
Example 5: How is this diagram different from the ones above?



There are no $\triangle$'s ☹, but the // lines divide the transversals proportionally!

$\frac{AC}{BD} = \frac{CE}{DF}$ or $\frac{AC}{AE} = \frac{BD}{BF}$ etc!

Example 6: Solve for BD.



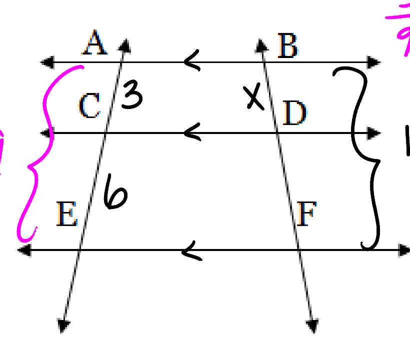
$\frac{2}{x} = \frac{6}{8}$

$6x = 16$

$x = 16/6$

$x = 8/3$ $BD = 8/3$

Example 7: Solve for BD.



$\frac{3}{9} = \frac{x}{15}$

$9x = 45$

$x = 5$

$BD = 5$