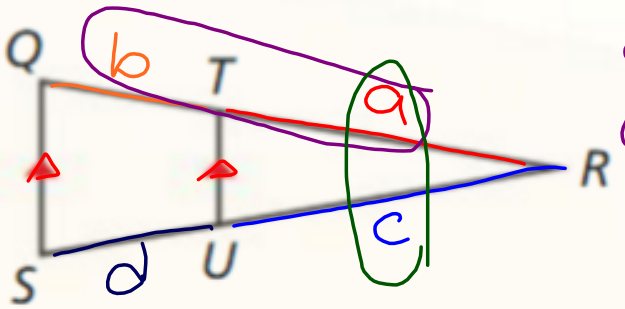
Header: Your name
Mrs. Theo
3/9/2022
Notes

8.4

Similarity Theorems

Side Splitter Theorem

If a line parallel to one side of a triangle intersects the other two sides, then it divides the two sides proportionally.



If $\overline{TU} \parallel \overline{QS}$, then $\frac{RT}{TQ} = \frac{RU}{US}$

or

$\frac{a}{c} = \frac{b}{d}$

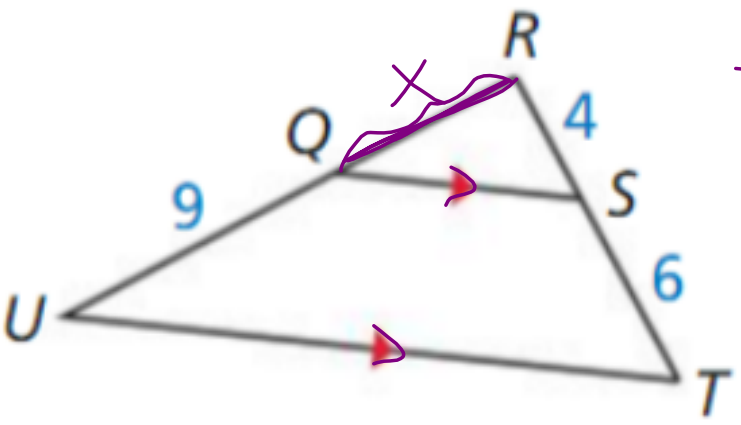
still

$ad = cb$

Example #3

Finding the Length of a Segment

In the diagram, $\overline{QS} \parallel \overline{UT}$, $RS = 4$, $ST = 6$, and $QU = 9$. What is the length of $\overline{RQ}$?



$\frac{x}{9} = \frac{4}{6}$

$6x = 9 \cdot 4$

$6x = 36$

$x = 6$

$\overline{RQ} = 6$

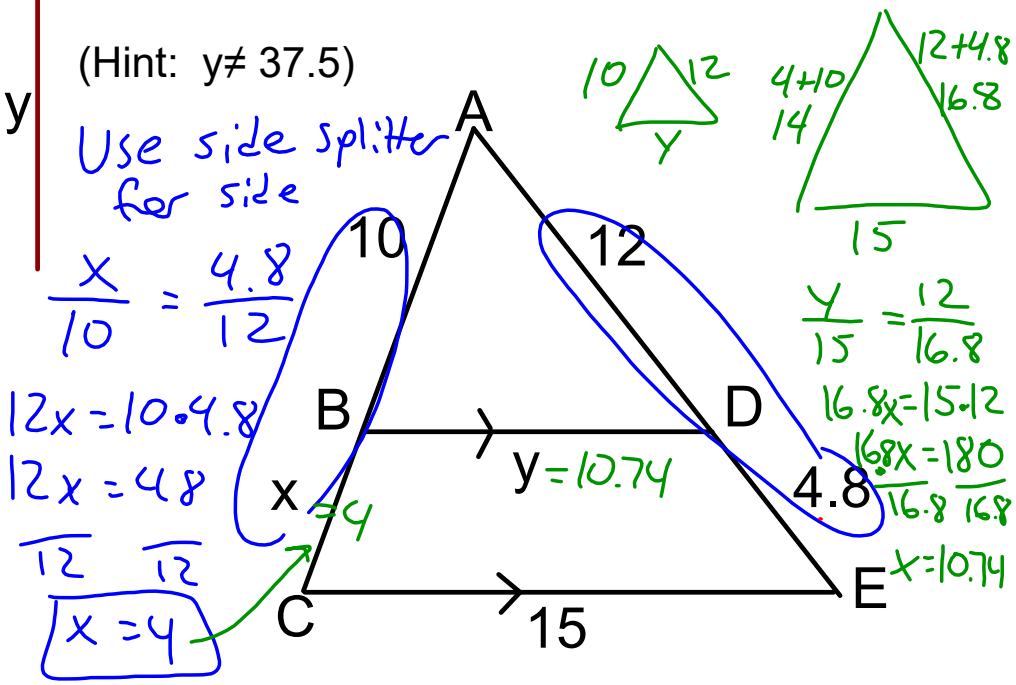
Example #4

Re-Draw the Triangles Separately

Sides inside are **not split** with same ratio

Find the values of the variables below.

(Hint: y≠ 37.5)



$\frac{x}{10} = \frac{4.8}{12}$

$12x = 10 \cdot 4.8$

$12x = 48$

$\frac{12}{12} \quad \frac{12}{12}$

$x = 4$

$\frac{y}{15} = \frac{12}{16.8}$

$16.8x = 15 \cdot 12$

$16.8x = 180$

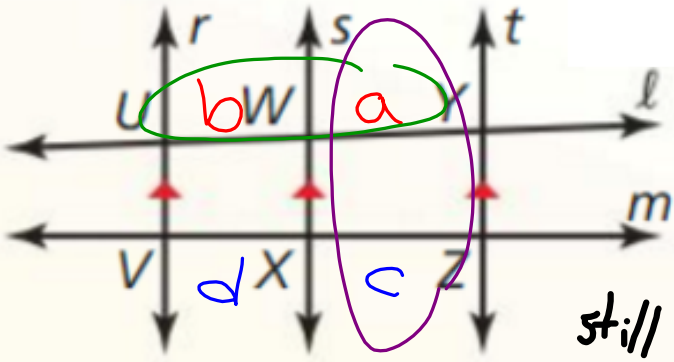
$\frac{16.8}{16.8} \quad \frac{16.8}{16.8}$

$x = 10.74$

Extended Side Splitter

If three parallel lines intersect two transversals, then they divide the transversals proportionally.

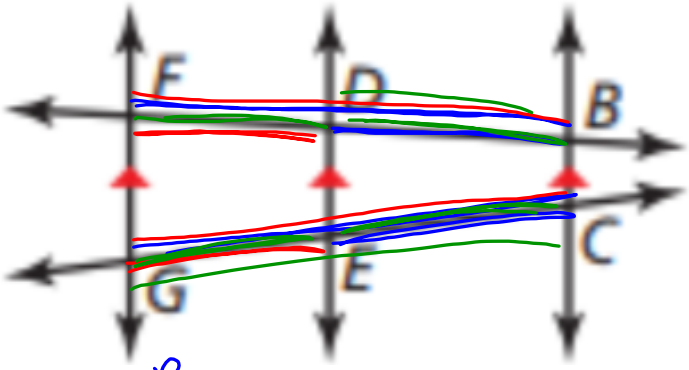
- Multiple lines are parallel
- Not in a Triangle



$\frac{a}{b} = \frac{c}{d}$ or $\frac{a}{c} = \frac{b}{d}$ still $ad = bc$

$$\frac{UW}{WY} = \frac{VX}{XZ}$$

In Exercises 13–16, use the diagram to complete the proportion.



13. $\frac{BD}{BF} = \frac{CE}{CG}$ (Part/Whole = Part/Whole)

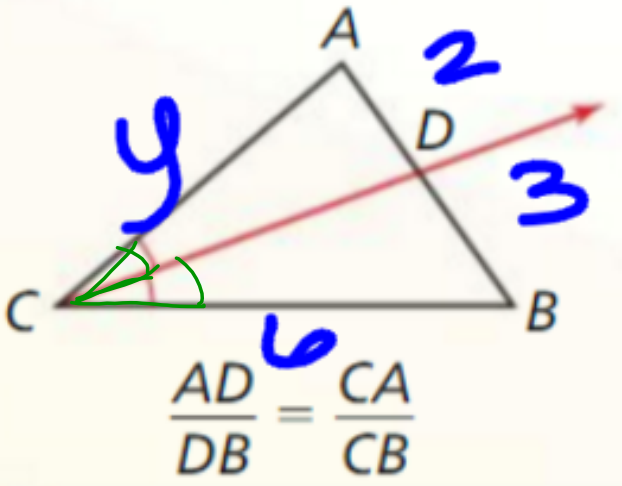
14. $\frac{CG}{EG} = \frac{BF}{DF}$ (Whole/Part = Whole/Part)

15. $\frac{EG}{CE} = \frac{DF}{BD}$ (Part/Part = Part/Part)

16. $\frac{BF}{BD} = \frac{CG}{CE}$ (Whole/Part = Whole/Part)

Triangle Angle Bisector Theorem

If a ray bisects an angle of a triangle, then it divides the opposite side into segments whose lengths are proportional to the lengths of the other two sides.



$$\frac{AD}{DB} = \frac{CA}{CB}$$

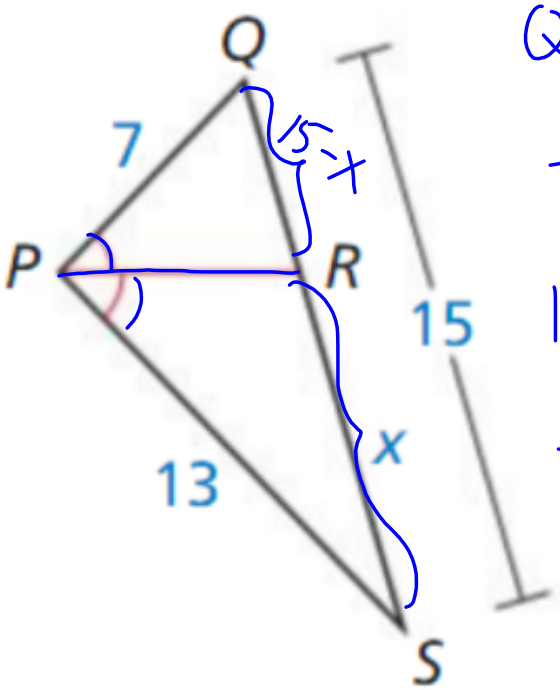
$$\frac{2}{3} = \frac{y}{6}$$

$$3y = 12$$

$$y = 4$$

Example #5 **Using the Triangle Angle Bisector Theorem**

In the diagram, $\angle QPR \cong \angle RPS$. Use the given side lengths to find the length of $\overline{RS}$.



$\overline{QR} = ?$

$$\frac{15 - x}{x} = \frac{7}{13}$$

$$13(15 - x) = 7 \cdot x$$

$$195 - 13x = 7x$$

$$+13x \quad +13x$$

$$195 = 20x$$

$$\frac{195}{20} = \frac{20x}{20}$$

$$x = 9.75 = RS$$

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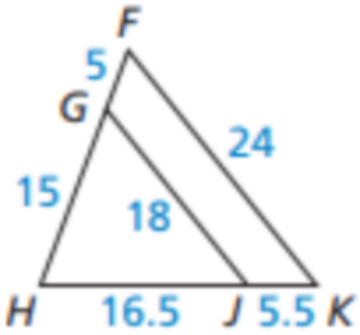
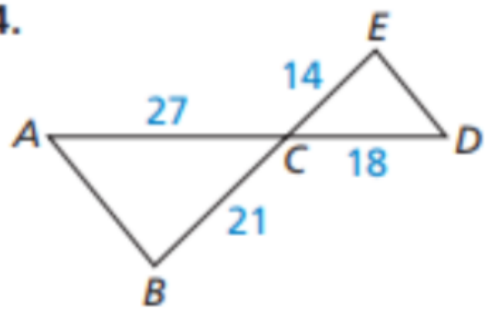
In Exercises 13–16, show that the triangles are similar and write a similarity statement. Explain your reasoning.

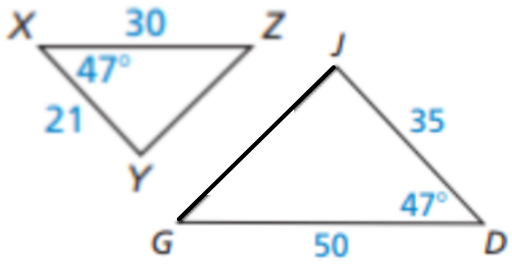
13.



14.

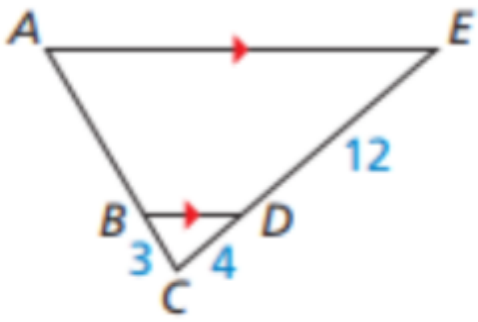


15.

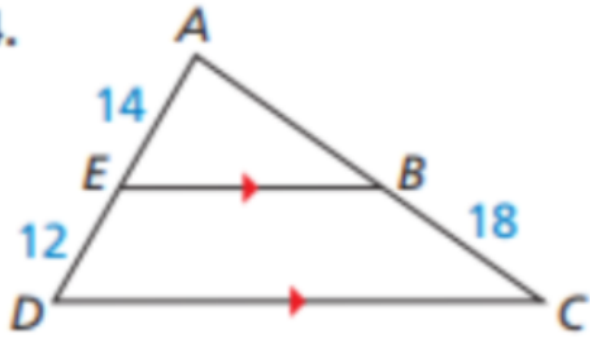


In Exercises 3 and 4, find the length of $\overline{AB}$.
(See Example 1.)

3.

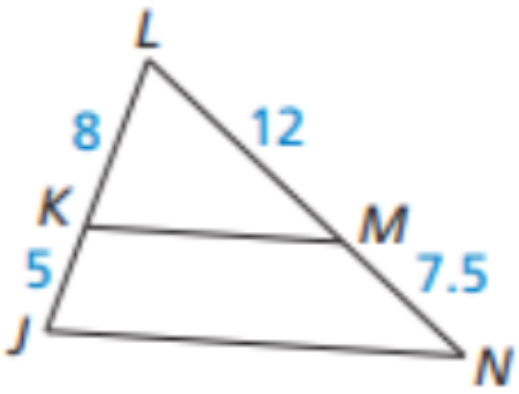


4.

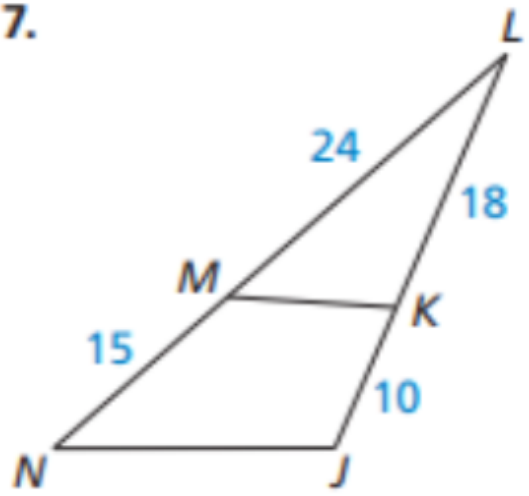


In Exercises 5–8, determine whether $\overline{KM} \parallel \overline{JN}$. *(See Example 2.)*

5.

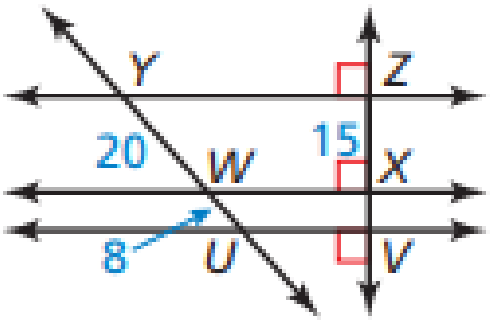


7.

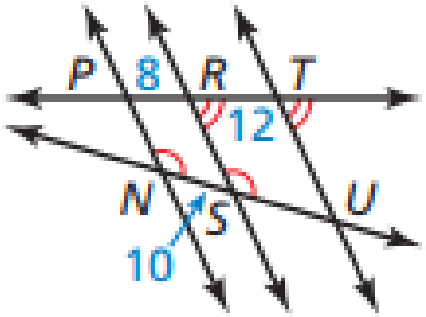


In Exercises 17 and 18, find the length of the indicated line segment. *(See Example 3.)*

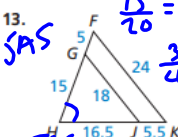
17. $\overline{VX}$



18. $\overline{SU}$



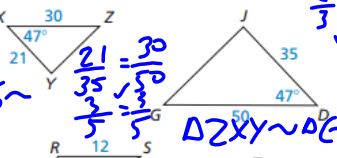
In Exercises 13–16, show that the triangles are similar and write a similarity statement. Explain your reasoning.

13. 

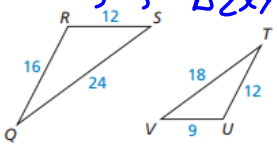
SAS ~ $\frac{15}{20} = \frac{16.5}{22}$ $\frac{3}{4} = \frac{3}{4}$ $\triangle JHG \sim \triangle FHF$

14. 

SAS ~ $\triangle BCA \sim \triangle ECD$ $\frac{14}{21} = \frac{18}{27}$ $\frac{2}{3} = \frac{2}{3}$ ✓

15. 

SAS ~ $\frac{21}{35} = \frac{30}{50}$ ✓ $\frac{3}{5} = \frac{3}{5}$ $\triangle ZXY \sim \triangle GDJ$

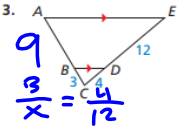
16. 

SSS ~ $\triangle SQR \sim \triangle TVU$

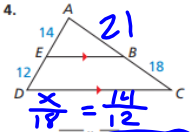
$\frac{18}{24} = \frac{9}{12} = \frac{12}{16}$

$\frac{3}{4} = \frac{3}{4} = \frac{3}{4}$ ✓ ✓

In Exercises 3 and 4, find the length of $\overline{AB}$. *(See Example 1.)*

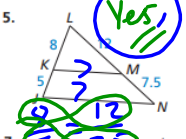
3. 

$\frac{3}{x} = \frac{4}{12}$

4. 

$\frac{x}{18} = \frac{14}{12}$

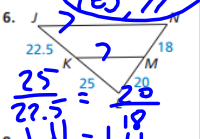
In Exercises 5–8, determine whether $\overline{KM} \parallel \overline{JN}$. *(See Example 2.)*

5. 

Yes ∥

$\frac{8}{5} = \frac{12}{7.5}$

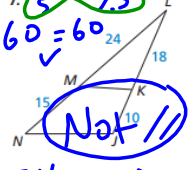
$60 = 60$ ✓

6. 

Yes ∥

$\frac{25}{22.5} = \frac{20}{18}$

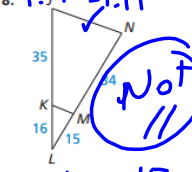
$1.11 = 1.11$ ✓

7. 

Not ∥

$\frac{24}{15} = \frac{18}{10}$

$240 \neq 270$

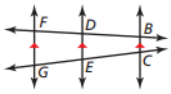
8. 

Not ∥

$\frac{16}{35} = \frac{15}{34}$

$544 \neq 525$

In Exercises 13–16, use the diagram to complete the proportion.



13. $\frac{BD}{BF} = \frac{\square}{CG}$

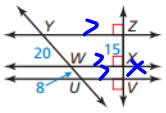
14. $\frac{CG}{\square} = \frac{BF}{DF}$

15. $\frac{EG}{CE} = \frac{DF}{\square}$

16. $\frac{\square}{BD} = \frac{CG}{CE}$

In Exercises 17 and 18, find the length of the indicated line segment. *(See Example 3.)*

17. $\overline{VX}$

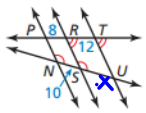


$\frac{x}{15} = \frac{8}{20}$

$120 = 20x$

$6 = x$

18. $\overline{SU}$



$\frac{12}{x} = \frac{8}{10}$

$8x = 120$

$x = 15$