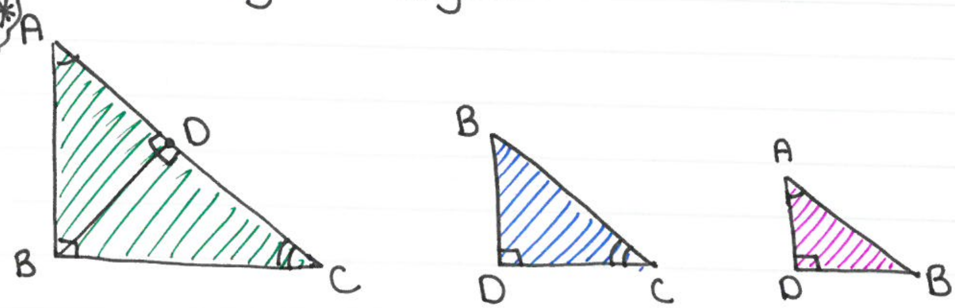
Unit 4A
day 6

4A.6 - Using Triangle Similarity in Right Triangles

Activity



$\triangle ABC \sim \triangle BDC \sim \triangle ADB$

thm: the altitude to the hypotenuse of a right triangle into two triangles that are similar to the original $\triangle$ and to eachother.

Ratios created: $\frac{AD}{BD} = \frac{BD}{CD}$

$\frac{BC}{CA} = \frac{DC}{BC}$

$\frac{AB}{AD} = \frac{AC}{AB}$

* Geometric Mean
  x is geometric mean of a & b
  if $\frac{a}{x} = \frac{x}{b}$ or $x^2 = ab$
  $x = \pm\sqrt{ab}$

↗ each of the above has a geometric mean!!

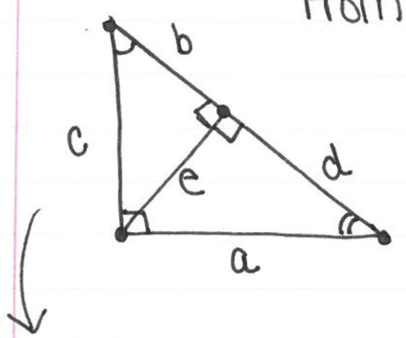
ex: Find the geometric mean of 2 and 8. $x = \pm 4$

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

ex. Find the geometric mean of 4 and 9. $x = \pm 6$

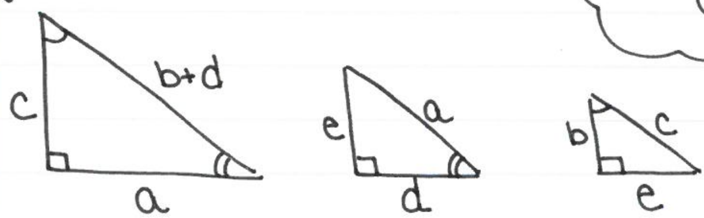
$\frac{4}{x} = \frac{x}{9}$

From previous page:

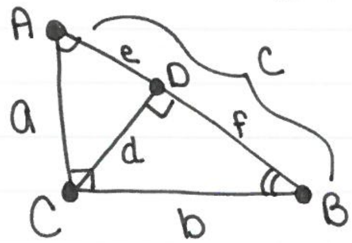


$$\frac{b}{c} = \frac{c}{b+d} \qquad \frac{b}{e} = \frac{e}{d}$$

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

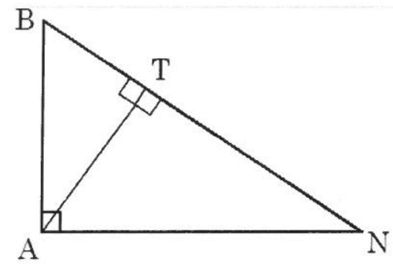


So fascinating:



$\triangle ABC \sim \triangle CBD$ $\triangle ABC \sim \triangle ACD$	Given
$\frac{a}{c} = \frac{e}{a}$ & $\frac{b}{f} = \frac{c}{b}$	Corr. sides of similar $\triangle$'s are proportional.
$a^2 = ce$ and $b^2 = cf$	Cross product property
$a^2 = ce$ $+\ b^2 = cf$ $a^2 + b^2 = ce + cf$	add. p.o.e
$a^2 + b^2 = c(e+f)$	distributive
$c = e + f$	seg add post.
$a^2 + b^2 = c^2$	substitution

1) If an altitude is drawn to the hypotenuse of triangle BAN below, then name and redraw the 3 similar triangles created.

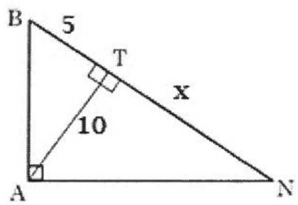


Write the similarity statement comparing the three triangles

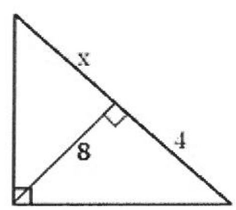
△_______~△_______~△_______

Determine the missing value "x" below:

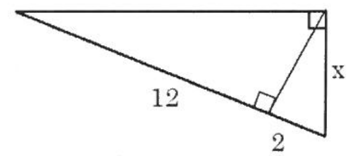
2)



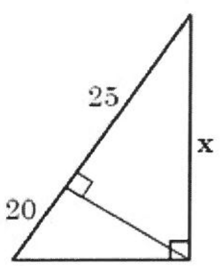
3)



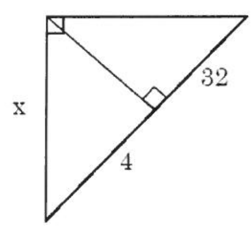
4)



5)

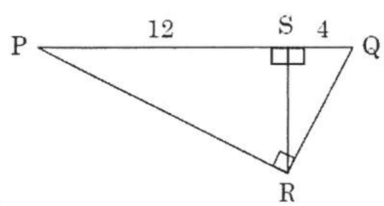


6)

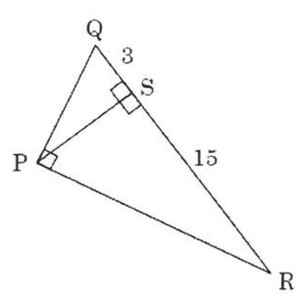


For 7-9 Set up and solve for the length of the altitude of right triangle PQR.

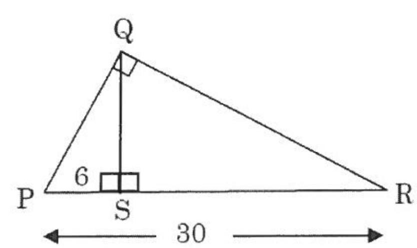
7)



8)



9)



Determine the geometric mean of the following numbers.

10) 5 and 8

11) 7 and 11

12) 4 and 9

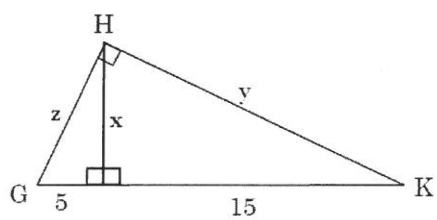
13) 2 and 25

14) 6 and 8

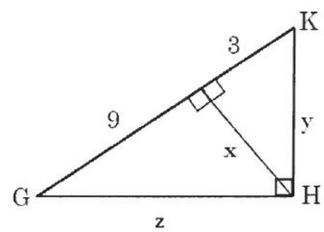
15) 8 and 32

Solve for the variables x, y, and z in each triangle.

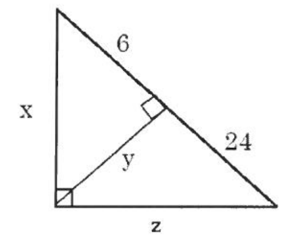
16)



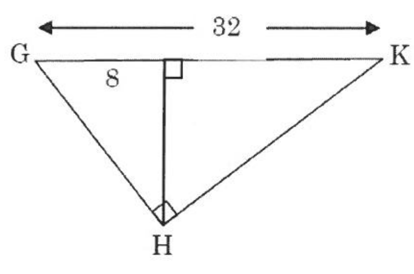
17)



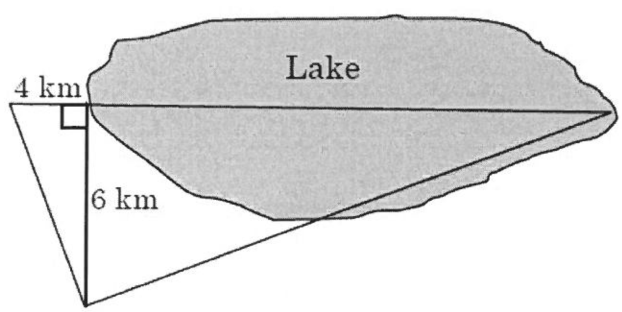
18)



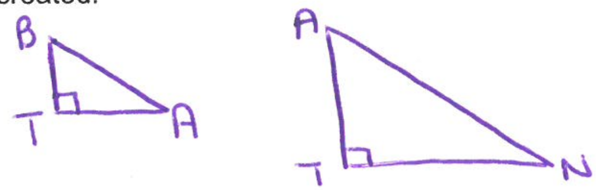
19) Determine the lengths of GH and HK.

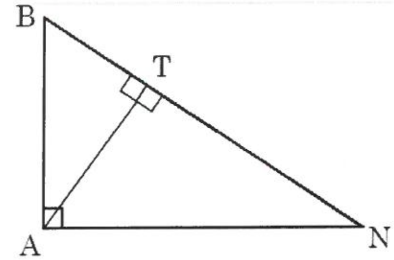


20) Determine the distance across the lake?



1) If an altitude is drawn to the hypotenuse of triangle BAN below, then name and redraw the 3 similar triangles created.



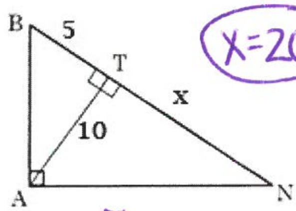


Write the similarity statement comparing the three triangles

△ BTA ~△ ATN ~△ BAN

Determine the missing value "x" below:

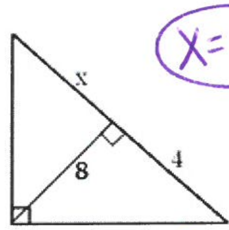
2)



X=20

$\frac{5}{10} = \frac{10}{x}$

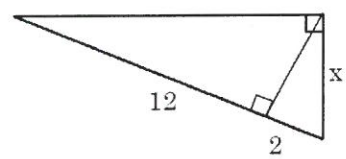
3)



X=16

$\frac{x}{8} = \frac{8}{4}$

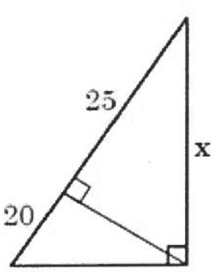
4)



$X=2\sqrt{7}$

$\frac{x}{2} = \frac{14}{x}$

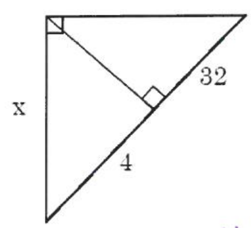
5)



$X=15\sqrt{5}$

$\frac{x}{25} = \frac{45}{x}$

6)

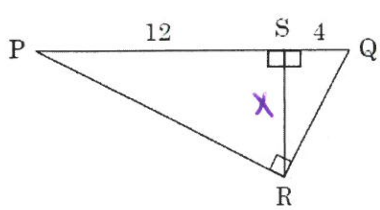


X=12

$\frac{x}{4} = \frac{36}{x}$

For 7-9 Set up and solve for the length of the altitude of right triangle PQR.

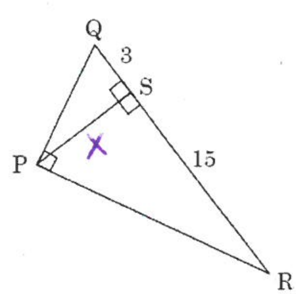
7)



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

$X=4\sqrt{3}$

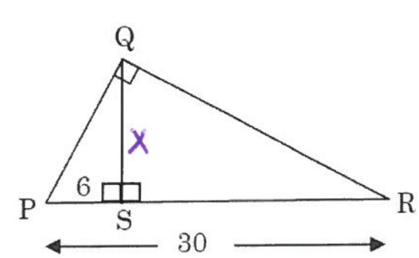
8)



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

$X=3\sqrt{5}$

9)



$\frac{x}{6} = \frac{24}{x}$

X=12

Determine the geometric mean of the following numbers.

10) 5 and 8

$\pm 2\sqrt{10}$

11) 7 and 11

$\pm \sqrt{77}$

12) 4 and 9

± 6

13) 2 and 25

$\pm 5\sqrt{2}$

14) 6 and 8

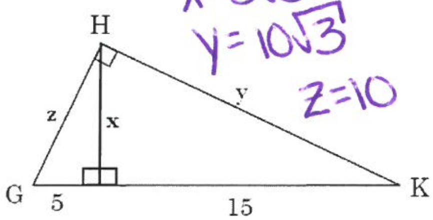
$\pm 4\sqrt{3}$

15) 8 and 32

± 16

Solve for the variables x, y, and z in each triangle.

16)

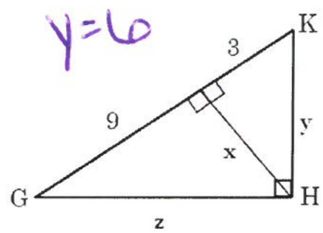


$x = 5\sqrt{3}$
$y = 10\sqrt{3}$
$z = 10$

$\frac{x}{5} = \frac{15}{x}$ $\quad \frac{5}{z} = \frac{z}{20}$

$\frac{y}{15} = \frac{20}{y}$

17)

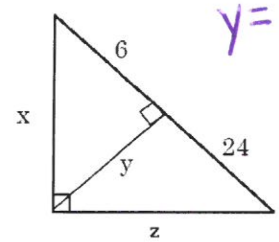


$x = 3\sqrt{3}$ $\quad z = 6\sqrt{3}$
$y = 6$

$\frac{x}{9} = \frac{3}{x}$ $\quad \frac{z}{9} = \frac{12}{z}$

$\frac{y}{3} = \frac{12}{y}$

18)

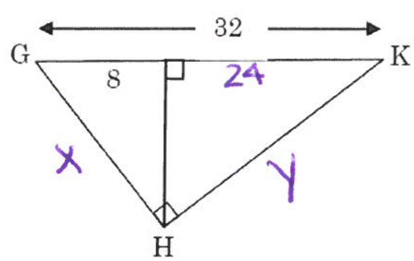


$z = 12\sqrt{5}$
$x = 6\sqrt{5}$
$y = 12$

$\frac{y}{6} = \frac{24}{y}$ $\quad \frac{z}{24} = \frac{30}{z}$

$\frac{x}{6} = \frac{30}{x}$

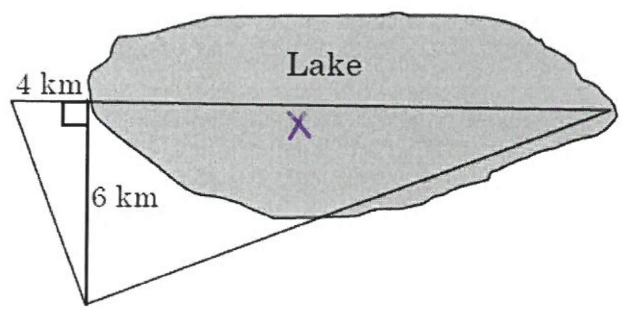
19) Determine the lengths of GH and HK.



$\frac{x}{8} = \frac{40}{x}$ $\quad \frac{y}{24} = \frac{32}{y}$

$x = 8\sqrt{5}$ $\quad y = 16\sqrt{3}$

20) Determine the distance across the lake?



$\frac{6}{4} = \frac{x}{6}$ $\quad 4x = 36$

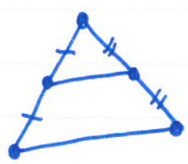
$x = 9$

Unit 4A
day 7

Triangle Midsegment

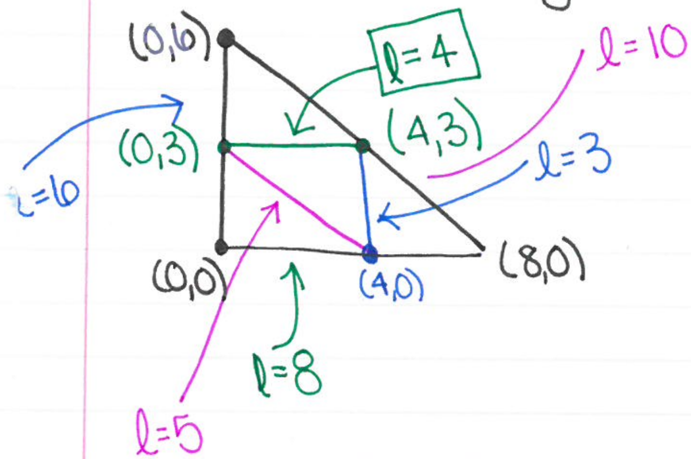
↓

def'n: a segment connecting the midpoints of 2 sides of a △



theorem: if a segment joins the midpoints of 2 sides of a △, then the segment is parallel to the third side and half its length.

ex: △ABC has vertices A(0, 6) B(8,0) and C(0,0).
Find the midpoints of each side.
Find the length of each side.
Find the length of each midsegment



$l = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

(4,0) to (0,3)

$l = \sqrt{(4-0)^2+(0-3)^2}$

$l = \sqrt{16+9}$

$\boxed{l = 5}$

do slopes support parallel-ness?

yes

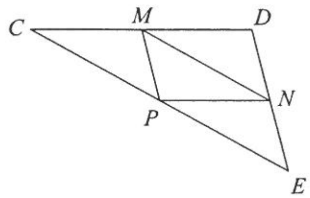
Kuta Software - Infinite Geometry Name________________________

Midsegment of a Triangle

Date________________ Period____

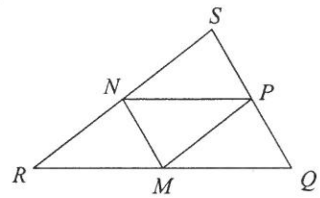
In each triangle, M, N, and P are the midpoints of the sides. Name a segment parallel to the one given.

1) $\overline{NP}$



$\overline{CD} \parallel$ ___

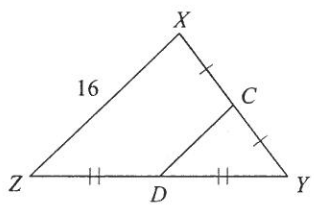
2) $\overline{MN}$



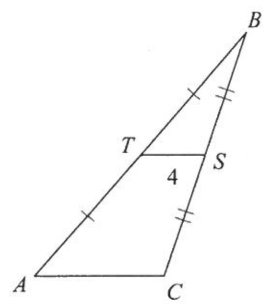
___ $\parallel \overline{QS}$

Find the missing length indicated.

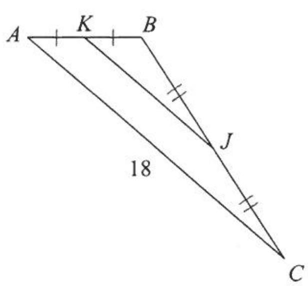
3) Find CD 8



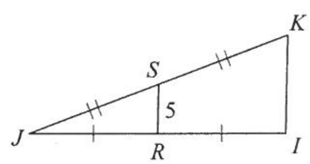
4) Find AC 8



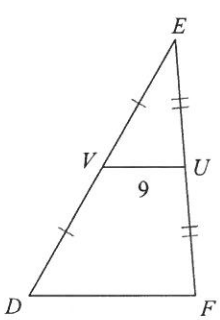
5) Find KJ 9



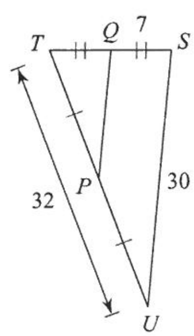
6) Find IK 10



7) Find DF 18

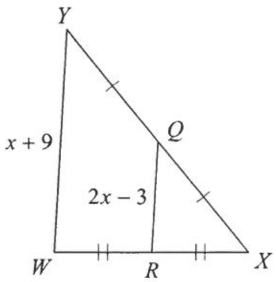


8) Find PQ 15



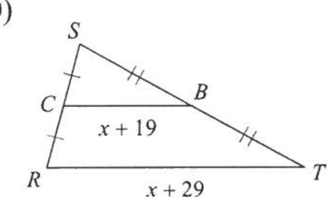
Solve for x.

9)

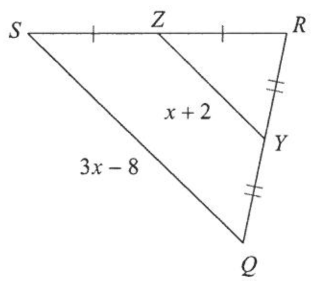


5

10) −9

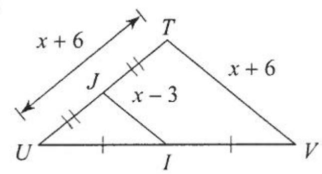


11)



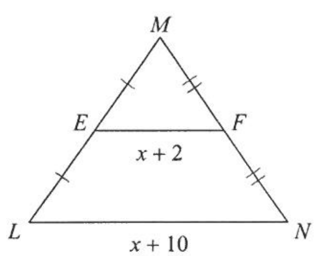
12

12) 12



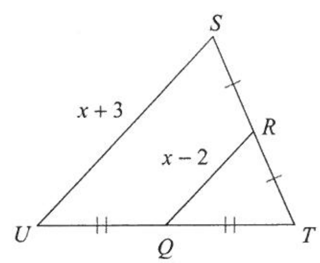
Find the missing length indicated.

13) Find LN



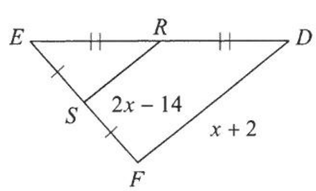
16

14) Find RQ

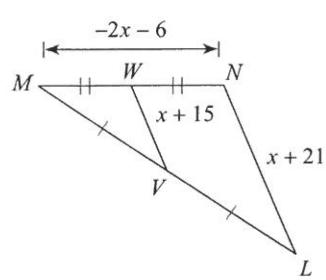


5

15) Find SR 6



16) Find VW 6



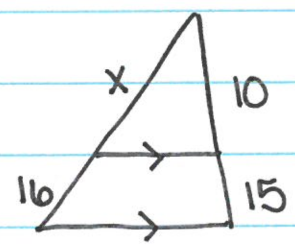
Unit 4A
day 8

4A.8 - Triangle Proportionality Thm.

Side Splitter Theorem:

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

ex: find the value of x.



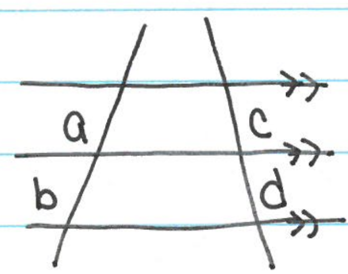
$$\frac{x}{16} = \frac{10}{15}$$

$$15x = 160$$

$$x = 10\tfrac{2}{3}$$

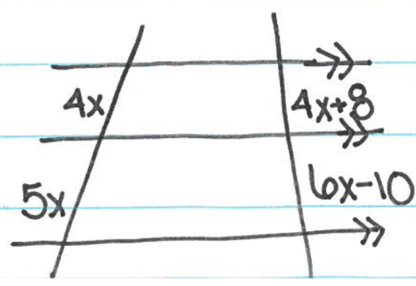
Side Splitter Corollary:

If 3 parallel lines intersect 2 transversals, then the segments intercepted on those transversals are proportional.



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

ex:



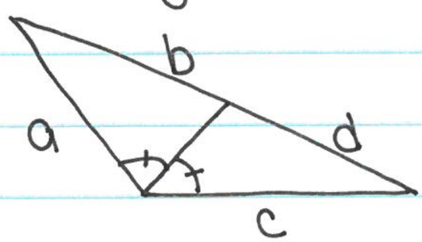
$$\frac{4x}{5x} = \frac{4x+8}{6x-10}$$

$$4(6x-10) = 5(4x+8)$$

$$4x = 80 \qquad \boxed{x=20}$$

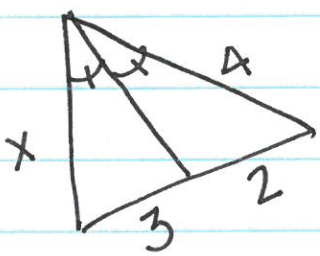
Triangle-Angle-Bisector Thm

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



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

ex.



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

$$2x = 12$$

$$x = 6$$

Kuta Software - Infinite Geometry

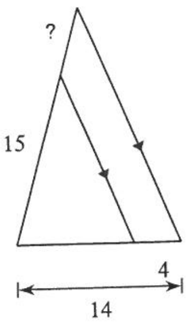
Name________________________

Proportional Parts in Triangles and Parallel Lines

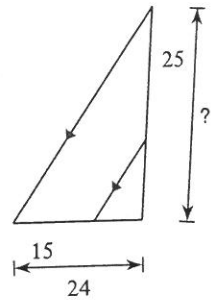
Date________________ Period____

Find the missing length indicated.

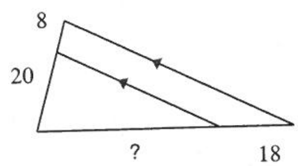
1)



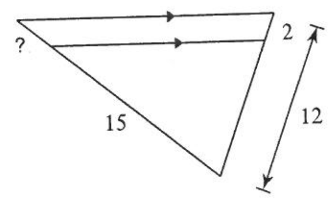
2)



3)

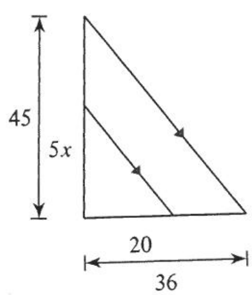


4)

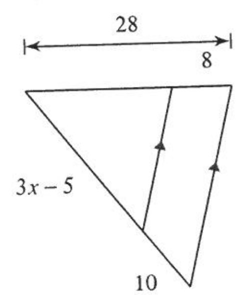


Solve for *x*.

5)

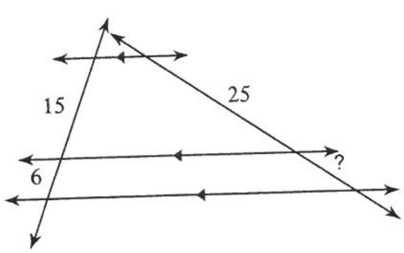


6)

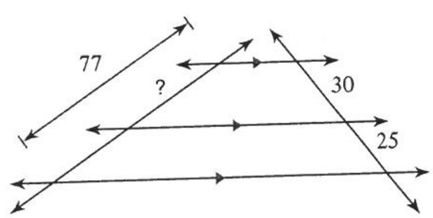


Find the missing length indicated.

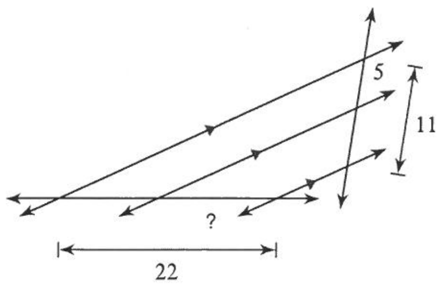
7)



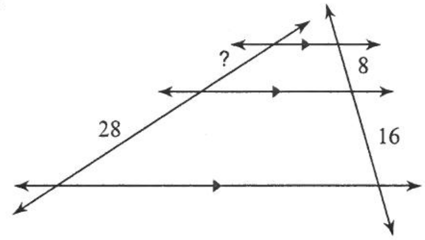
8)



9)

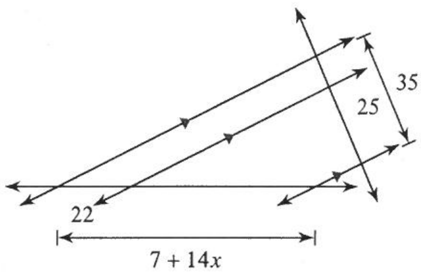


10)

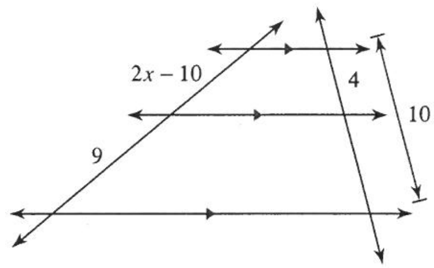


Solve for x.

11)

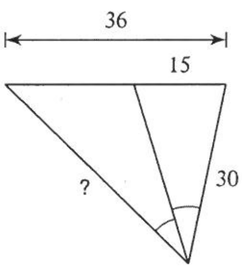


12)

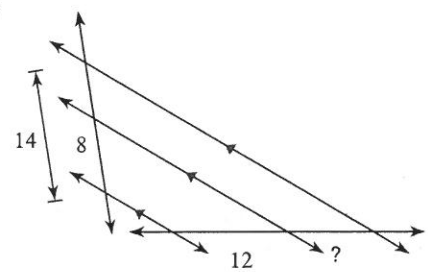


Find the missing length indicated.

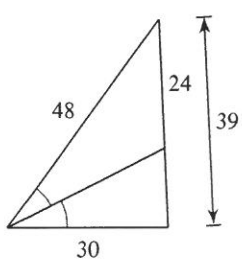
13)



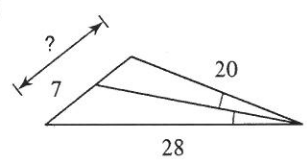
14)



15)

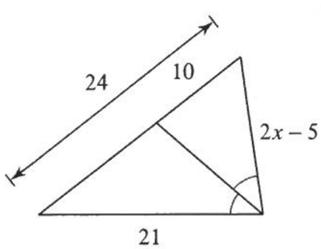


16)

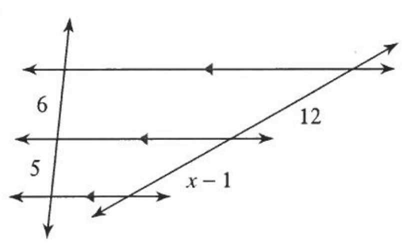


Solve for x.

17)



18)



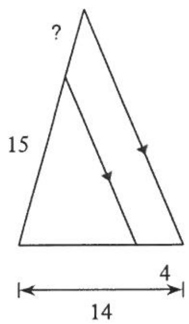
Kuta Software - Infinite Geometry

Name________________________________

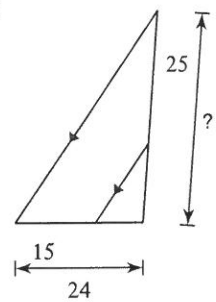
Proportional Parts in Triangles and Parallel Lines

Date________________ Period____

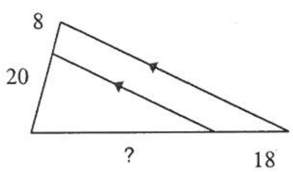
Find the missing length indicated.

1) 

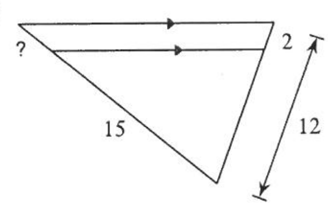
6

2) 

40

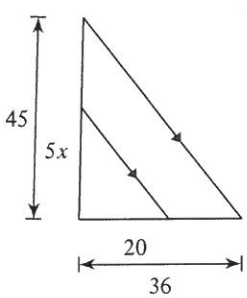
3) 

45

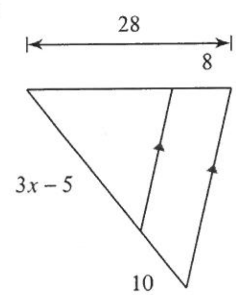
4) 

3

Solve for *x*.

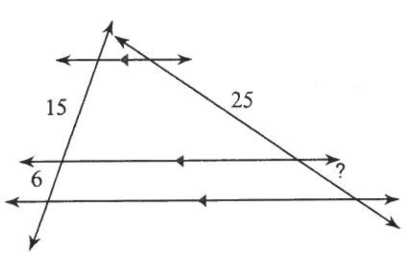
5) 

5

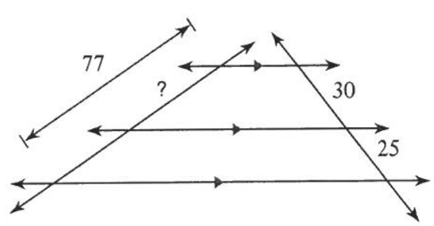
6) 

10

Find the missing length indicated.

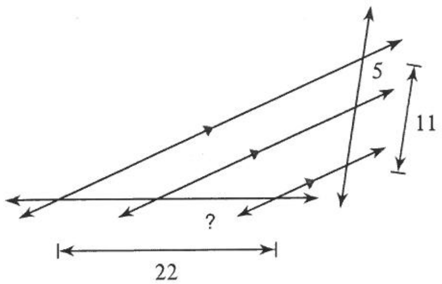
7) 

10

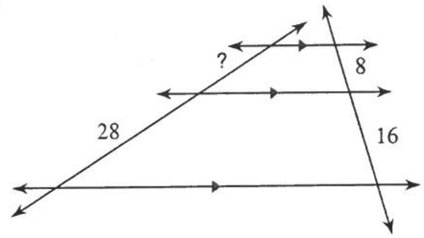
8) 

42

9) 12

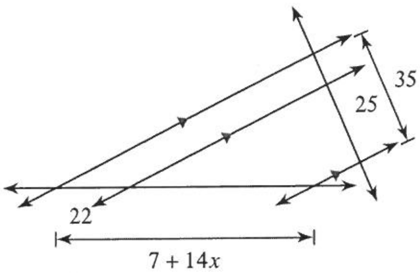


10) 14

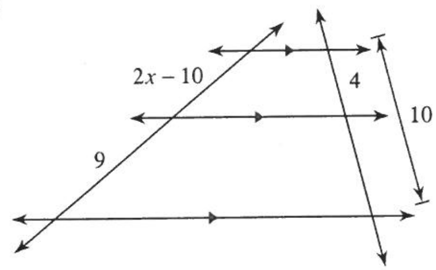


Solve for x.

11) 5

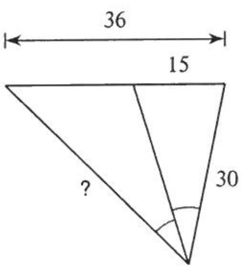


12) 8

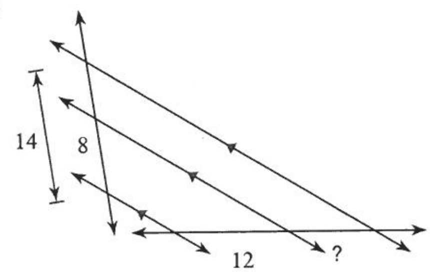


Find the missing length indicated.

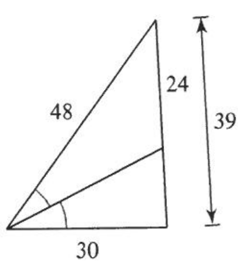
13) 42



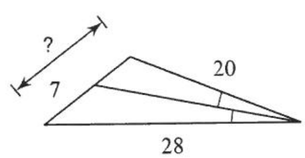
14) 9



15) 15



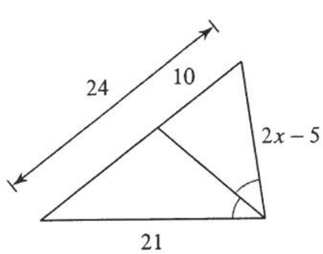
16)



12

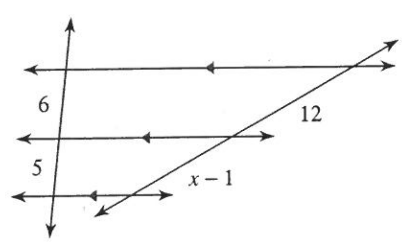
Solve for x.

17)



10

18)



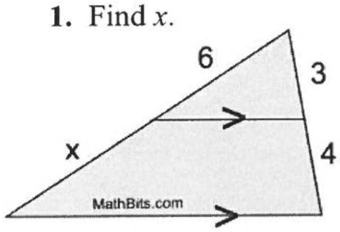
11

Side Splitter Theorem Practice

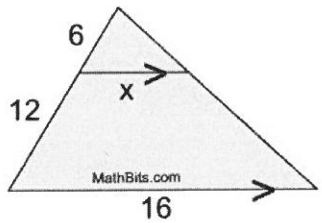
Name **ANSWERS**

Directions: Read carefully. Please show your work.

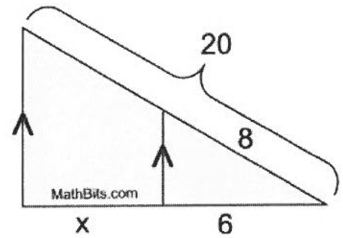
1. Find x.



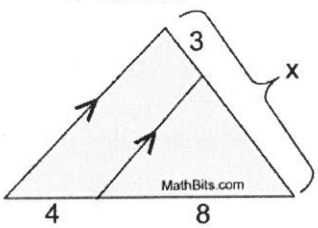
2. Find x.



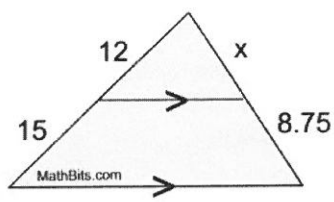
3. Find x.



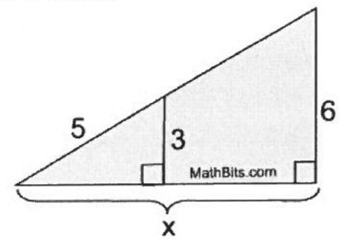
4. Find x.



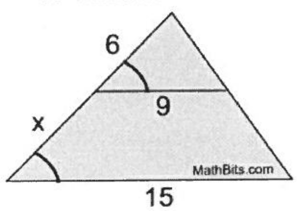
5. Find x.



6. Find x.

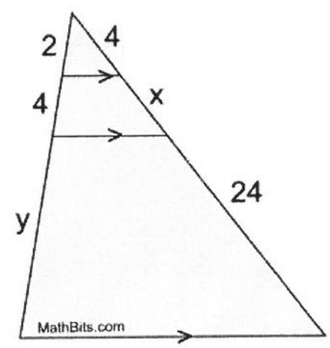


7. Find x.

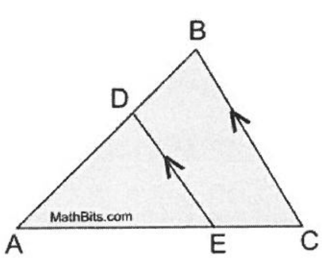


8. a) Find x.

b) Find y.



9. If $AB = AC$, which choice is FALSE?



(1) AD = AE

(2) DB = EC

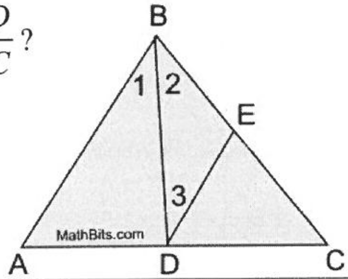
(3) $\frac{AD}{DB} = \frac{AE}{EC}$

(4) $\frac{AD}{AE} = \frac{DE}{BC}$

10. Given: $\overline{BD}$ bisects $\angle ABC$; $BE = ED$

Is $\frac{BE}{EC} = \frac{AD}{DC}$?

Explain.



ANSWERS

1. 8

2. $5\frac{1}{3}$

3. 9

4. 9

5. 7

6. 8

7. 4

8.a. 8

b. 12

9. (4)

10. Yes

The $\angle$ bisector gives $\angle 1 \cong \angle 2$. If $BE = ED$, ΔBED is isosceles, making base angles congruent, $\angle 2 \cong \angle 3$. By transitive property, $\angle 1 \cong \angle 3$. With $\cong$ alternate interior $\angle$s, $\overline{AB} \parallel \overline{DE}$. Side Splitter Th^{m} gives proportion true.