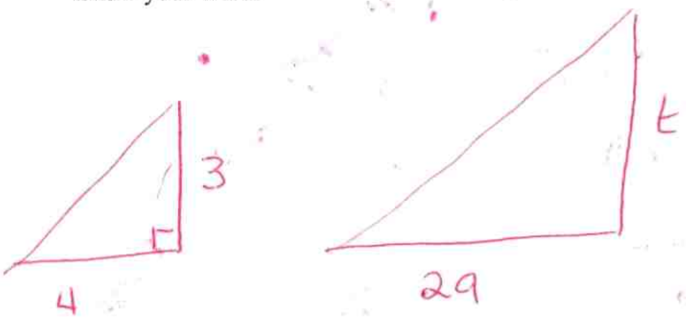
MATH 304 Similar Triangles Name SOLUTION KEY Seat # _____

1. A tree casts a shadow 29 m long on horizontal ground. At the same time, a vertical pole 3 meters high casts a shadow 4 m long. Draw a diagram representing this situation and calculate the height of the tree to the nearest meter. Show your work.



$$\frac{3}{4} = \frac{t}{29}$$

$$87 = 4t$$

$$\frac{87}{4} = t$$

$$\boxed{t = 21.75 \text{ m.}}$$

2. Find the distance across the canyon, BD, using the distances in the diagram. Assume that AB is parallel to CD.

$\triangle EDC \sim \triangle EBA$

$$\frac{30}{60} = \frac{40}{(40+d)}$$

DC / BA = ED / EB

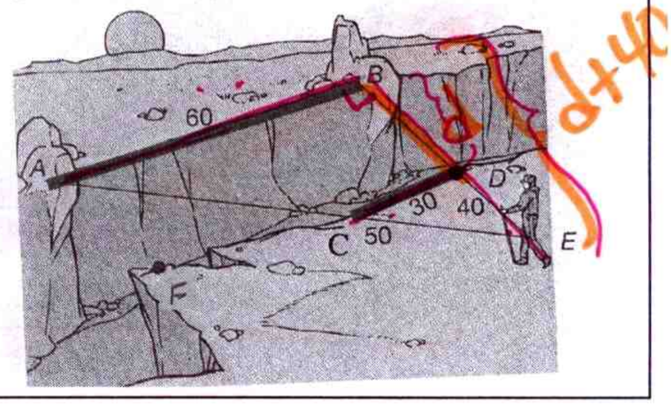
$$30(40+d) = 2400$$

$$1200 + 30d = 2400$$

$$30d = 1200$$

$$\boxed{d = 40 \text{ (units)}}$$

Find the distance across the canyon, *BD*, using the distances in the diagram. Assume that $\overleftrightarrow{AB} \parallel \overleftrightarrow{CD}$.



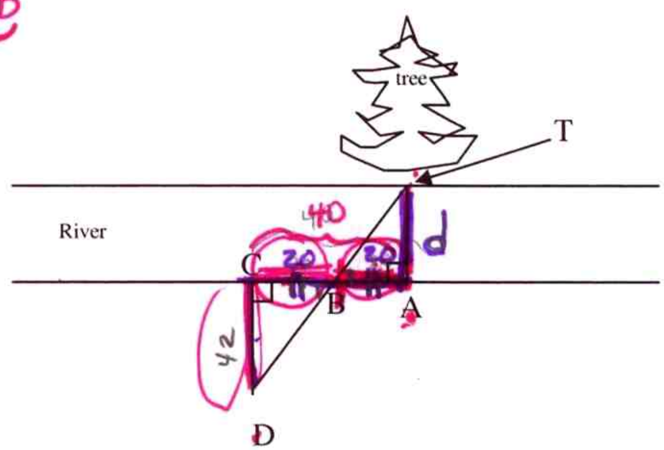
3. Two hikers are standing on the edge of a river at point A, directly across from tree T. They mark off a certain distance to point B, were Betty remains. Ken travels that same distance to point C. Then he turns and walks directly away from the river 42 feet to point D where he can see Betty lined up with the tree. If the distance from A to C is 40 ft, how wide is the river at AT?

$\triangle TAB \sim \triangle DCB$

$$\frac{20}{42} = \frac{20}{d}$$

BC / CD = AB / TA

$$\boxed{d = 42 \text{ ft}}$$

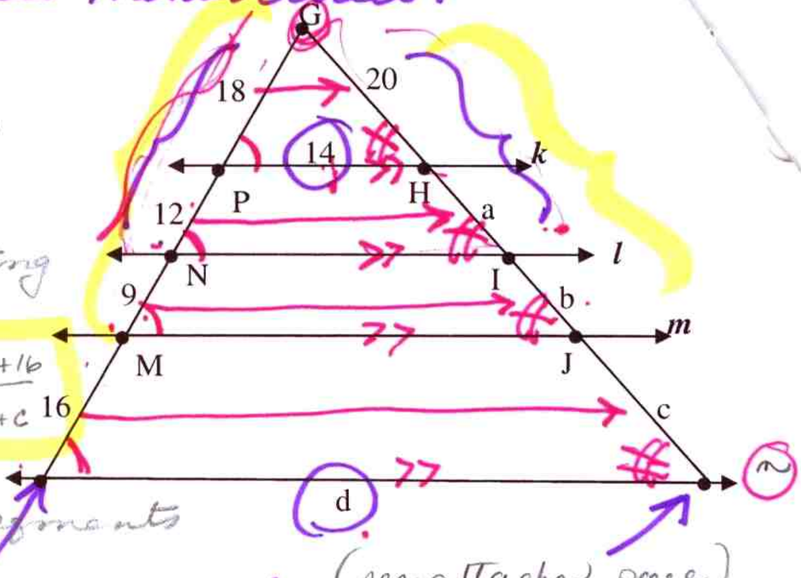


parallel lines cut off proportional segments on all transversals

Lines k, l, m, and n are parallel.

4.

Find a, b, c, and d. Show your work and if you use similar triangles, name them and tell why they are similar.



because the lines K, l, m, n are parallel all the resulting triangles are similar

so $\frac{18}{20} = \frac{18+12}{20+a} = \frac{18+12+9}{20+a+b} = \frac{18+12+9+16}{20+a+b+c}$

OR by a theorem that says parallels cut proportional segments

$\frac{18}{20} = \frac{12}{a} = \frac{9}{b} = \frac{16}{c}$

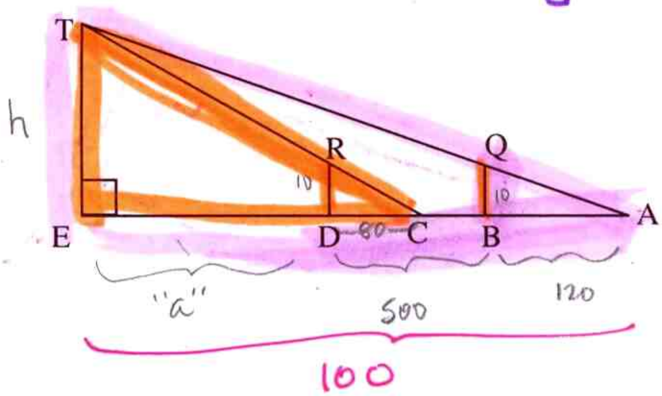
transversal

(see attached page)

transversal

5. 8. TE in the diagram is a communication tower. Find the height of the communication tower using the information given.

$\frac{14}{d} = \frac{18}{18+12+9+16}$ $\frac{14}{d} = \frac{18}{55}$



- Segments DR and BQ represent poles that are 10 feet tall.
- The two poles, DR and BQ are 500 ft apart.
- In order to "sight" the top of the tower using DR, the surveyor must step back 80 ft from pole DR.
- In order to "sight" the top of the tower using QB, the surveyor must step back 120 feet from pole QB.

(a) Is the diagram above drawn "to scale"? How can you tell?

C is 80 ft from D but it looks like 250 ft (½ way)

(b) How far is point A from point D?

620

(c) How far is point A from point pole DR?

620°

$\triangle TEA \sim \triangle QBA$

(d) You have two pairs of similar triangles. (Hint: one pair is $\Delta TEC \sim \Delta RDC$.)
Find the other pair. Color coding may help. Then write a "true" proportion statement for each of them.

$\frac{10}{120} = \frac{h}{a+620}$ $\frac{10}{80} = \frac{h}{a+80}$ $\frac{TE}{EC} = \frac{RD}{DC}$

(e) How tall is the communication tower?

$120h = 10a + 6200$ $10a + 800 = 80h$ $\frac{h}{a+80} = \frac{10}{80}$

$h = \frac{10a + 6200}{}$ $\frac{10a+800}{} = h$

#4 short way (parallel lines cut proportional segmen

$$\frac{18}{20} = \frac{9}{10} = \frac{12}{a} = \frac{9}{b} = \frac{16}{c} \quad \text{and} \quad \frac{18}{14} = \frac{18+12+9+16}{d}$$

FIND A

$$\frac{9}{10} = \frac{12}{a}$$

$$9a = 120$$

$$a = \frac{120}{9}$$

$$\boxed{a = \frac{40}{3} = 13\tfrac{1}{3}}$$

FIND B

$$\frac{9}{10} = \frac{9}{b}$$

$$\boxed{b = 10}$$

FIND C

$$\frac{9}{10} = \frac{16}{c}$$

$$9c = 160$$

$$\boxed{c = \frac{160}{9} = 17\tfrac{7}{9}}$$

FIND D

$$\frac{9}{7} = \frac{55}{d}$$

$$9d = 7(55)$$

$$9d = 385$$

$$d = \frac{385}{9}$$

$$\boxed{d = 42\tfrac{7}{9}}$$

#5

$$\frac{10a+6200}{120} = \frac{10a+800}{80}$$

$$\frac{a+620}{12} = \frac{a+80}{8}$$

$$8(a+620) = 12(a+80)$$

$$8a + 4960 = 12a + 960$$

$$\frac{-960}{4000} = 4a$$

$$1000 = a$$

but looky for heigth

so $\frac{10}{120}$ as $\frac{h}{a+500+120}$

$$\frac{10}{120} = \frac{h}{a+620}$$

$$10(\overset{1000}{a}+620) = 120h$$

$$\frac{10(\overset{1000}{a}+620)}{120} = h$$

$$\frac{10(1620)}{120} = h$$