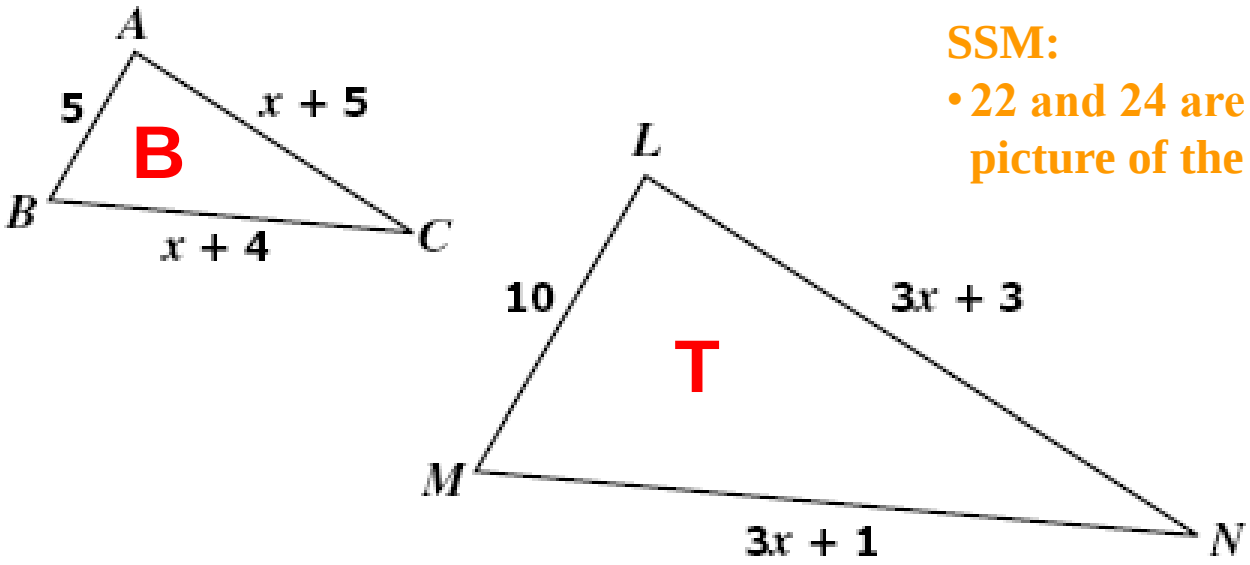
Modified and Animated By Chris Headlee
Dec 2011

CHAPTER 8 SOL PROBLEMS

SSM: Super Second-grader Methods

SOL Problems; not Dynamic Variable Problems

12 Given: $\triangle ABC \sim \triangle LMN$



SSM:

- **22 and 24 are "too big' for the picture of the ABC triangle**

What is the length of $\overline{AC}$?

F 11
G 12
H 22
J 24

Label Top and Bottom in figures:
similar triangles: (order rules → AC to LN)

$$\frac{10}{5} = \frac{(3x + 3)}{(x + 5)}$$

$$10(x + 5) = 5(3x + 3)$$
$$10x + 50 = 15x + 15$$
$$50 = 5x$$
$$35 = x$$
$$7 = x \qquad AC = 7 + 5 = 12$$

34 A man who is 6 feet tall casts a shadow that is 4 feet long. At the same time, a nearby flagpole casts a shadow that is 18 feet long. How tall is the flagpole?

F 10 ft
G 12 ft
H 22 ft
J 27 ft

SSM:

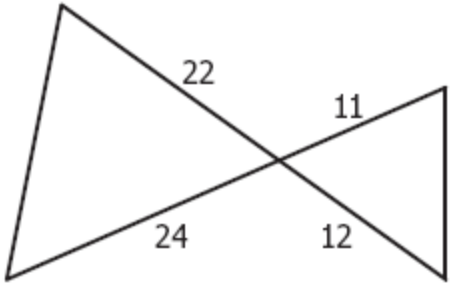
- **man's shadow is smaller than the man**
- **flagpole's shadow must be smaller than flagpole**
- **Eliminates F and G**

Similar Triangle problem:

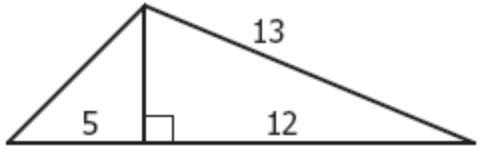
$$\frac{6}{4} = \frac{h}{18} \rightarrow 4h = 108 \quad h = 27$$

16 Which drawing contains a pair of similar triangles?

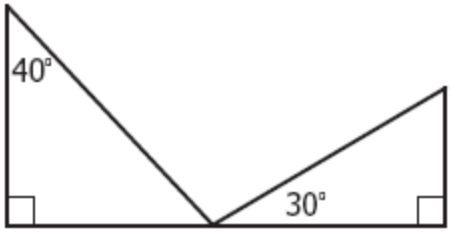
F



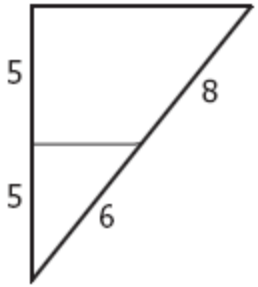
H



G



J



SSM:

- **similar triangles → same shape**

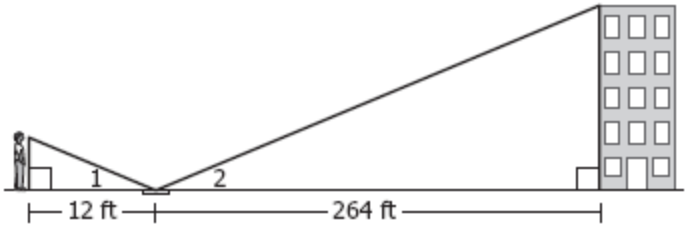
Check the ratios of the sides to see if they are the same

answer H and J don't

Similar triangles must have the same angles

answer G is wrong

16 Joseph is standing 12 feet from a mirror lying on the ground, and his eyes are 5 feet above the ground.



The line-of-sight reflection on the mirror makes ∠1 congruent to ∠2 . If the building is 264 feet from the mirror, which is closest to the height of the building?

F 100 ft
G 110 ft
H 130 ft
J 145 ft

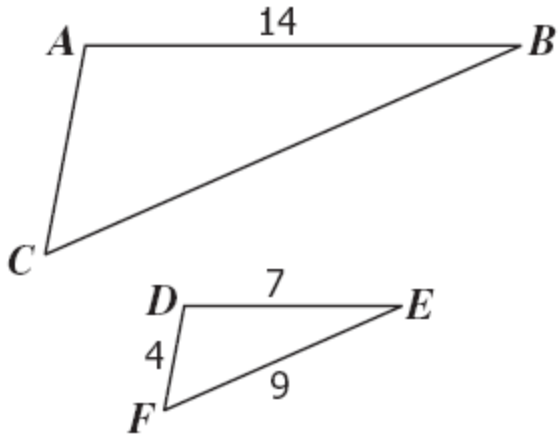
SSM:

- **not to scale!!**
- **use 264 distance to help estimate the height of the building**

Similar triangles:

$$\frac{5}{12} = \frac{h}{264} \qquad 12h = 5(264) \qquad h = 110$$

17



SSM:

- **Use DF as a measure to compare with AC**

In addition to the information given in the drawing, which statement would be sufficient to prove that $\triangle ABC \sim \triangle DEF$?

A $\frac{BC}{AC} = \frac{1}{2}$

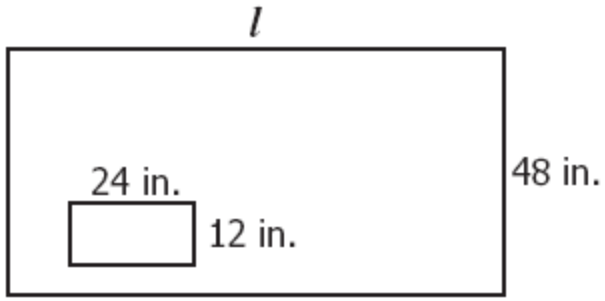
B $\frac{BC}{AC} = \frac{9}{4}$

C $AC = 18$ and $BC = 8$

D $AC = 8$ and $BC = 18$

Align the corresponding sides: AB and DE
Ratio is 2 : 1
So AC = 2×4 and BC = 2×9

38 A rectangular place mat is similar to the table upon which it is placed.



SSM:
- **length = 2 width = 96**
- **work out each proportion to determine which works**

According to the diagram, which proportion can be used to determine the length of the table, l ?

F $\frac{12}{48} = \frac{24}{l}$

G $\frac{12}{24} = \frac{l}{48}$

H $\frac{12}{l} = \frac{24}{48}$

J $12l = 48$

proportion needs to set up corresponding parts on both sides of the equation:

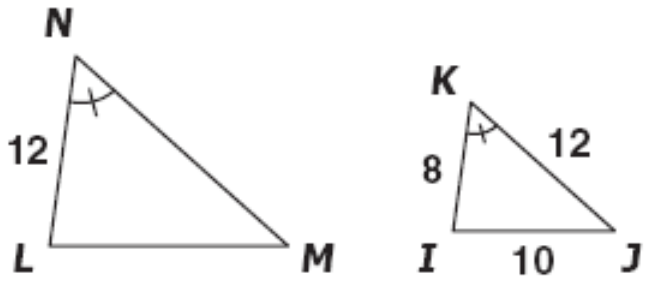
A. $w_s / w_b = l_s / l_b$

B. $w_s / l_s = l_b / w_b$

C. $w_s / l_b = l_s / w_b$

D. not a proportion (l = 4; can't be)

16



Which additional piece of information would prove that $\triangle IJK \sim \triangle LMN$?

F $NM = 18$

G $LM = 18$

H $NM = 15$

J $LM = 10$

SSM:
- not much help
- Answer J is same value as IJ so it must be wrong

12 is to 8 the same as 18 is to 12 or 15 is to 10

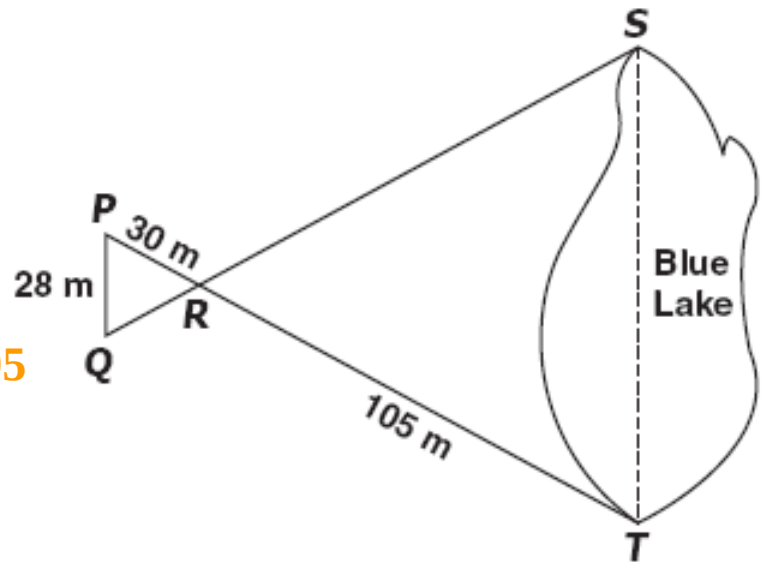
Need to match up correct sides (LM → IJ and NM → KJ)

38

SSM:

- **measure the 30 side**
- **measure the 105 side**
- **Not to scale!**

- **Answer closest # to 105 since 28 is close to 30**



If $\overleftrightarrow{PQ}$ is parallel to $\overleftrightarrow{ST}$, what is *ST*, the width of the lake?

F 62 meters
G 70 meters
H 84 meters
J 98 meters

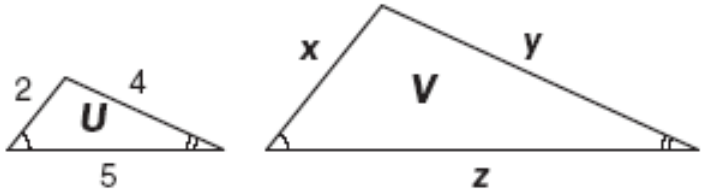
set up similar triangles:

$$\frac{28}{30} = \frac{ST}{105}$$

30 ST = 2940

ST = 98

39 The ratio of the perimeter of $\triangle U$ to the perimeter of $\triangle V$ is 1 : 2.



If the triangles are similar, what is the value of $x + y$?

A 3
B 6
C 12
D 18

SSM:

- must be bigger than 6!
- measure the 2 side measure the 4 side seems to scale!

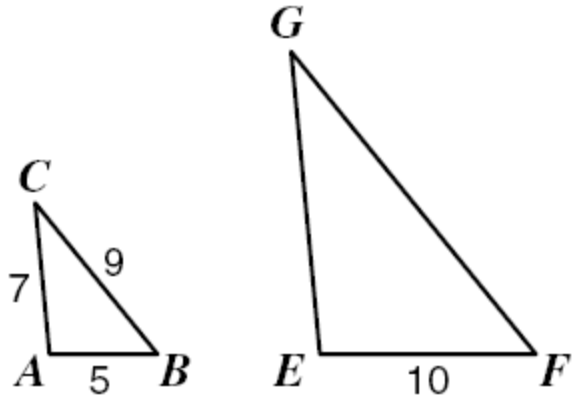
- Use 4 side to measure x and the y

Use scaling factor of similar triangles:

ΔV is twice as big as ΔU

2 + 4 = 6 and 6 $\times$ 2 = 12

14 **Triangles *ABC* and *EFG* are similar with measurements in centimeters as shown.**



What is the perimeter of triangle *EFG*?

F 21 cm

G 24 cm

H 36 cm

J 42 cm

SSM:

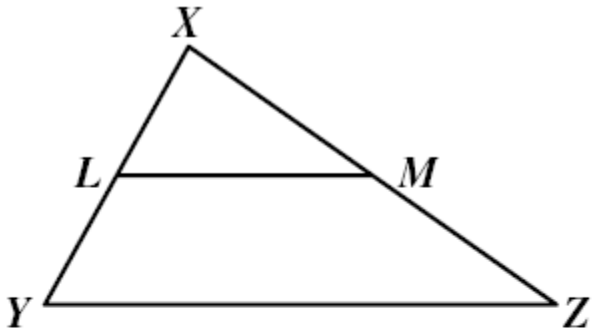
- **Use EF (measure of 10) as an estimator to measure perimeter of EFG**

perimeter of ABC is 21

scaling factor is 2:1 ABC to EFG

21 × 2 = 42

16



If triangle *XYZ* is similar to triangle *XLM*, then —

F $XM : XZ = XL : XY$

G $XM : XZ = XY : XL$

H $XL : LM = YZ : XZ$

J $XL : LY = XZ : MZ$

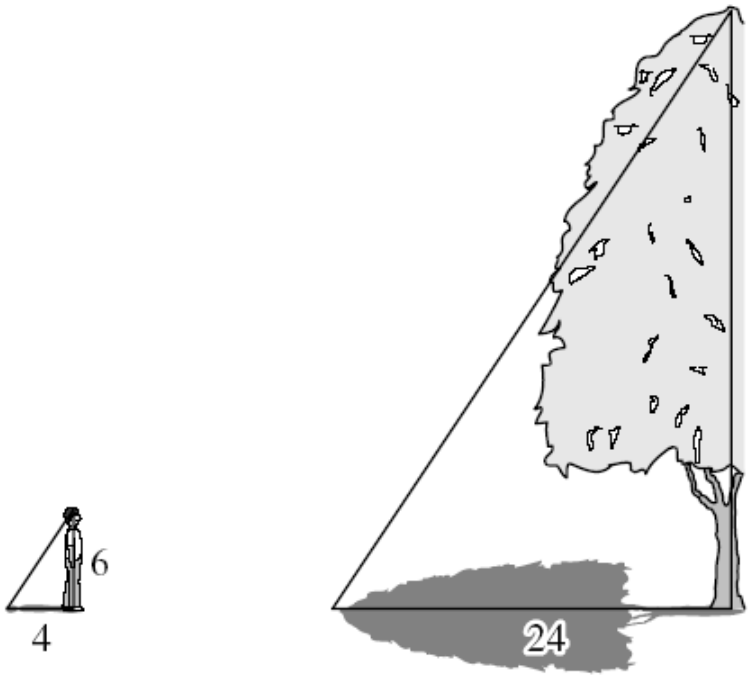
SSM:

- **not much help**

little side → bigger side

match up the sides of the little triangle to the sides of the big triangle

38 **A boy knows that his height is 6 feet. At the time of day when his shadow is 4 feet, a tree's shadow is 24 feet.**



What is the height of the tree?

F 36 ft
G 24 ft
H 18 ft
J 12 ft

SSM:

- **shadow is smaller than the height of the person**
- **must be the same for tree**

$$\frac{6}{4} = \frac{x}{24} \qquad 4x = 144 \qquad x = 36$$

12 ΔXYZ **is similar to** ΔSTR. $XY = 6$ **and** $ST = 12$. **If the perimeter of** ΔSTR **is 38, then what is the perimeter of** ΔXYZ**?**

F 19
G 38
H 52
J 76

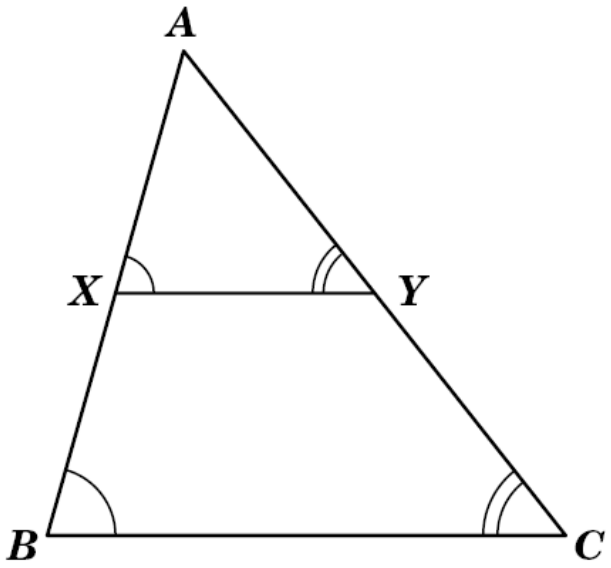
SSM:

- **Since ST > XY, then the perimeter of STR > the perimeter of XYZ**
- **Only one answer, F, fits**

Scaling factor ST/XY = 2

We divide 38 by 2 to get 19

16 Given: $\angle AXY \cong \angle ABC$
$\angle AYX \cong \angle ACB$



Which is a true proportion?

F $\frac{AX}{AB} = \frac{AY}{AC} = \frac{XY}{BC}$

G $\frac{AX}{XB} = \frac{AY}{YC} = \frac{XY}{BC}$

H $\frac{XB}{AX} = \frac{YC}{AY} = \frac{BC}{XY}$

J $\frac{AX}{AB} = \frac{AC}{AY} = \frac{XY}{BC}$

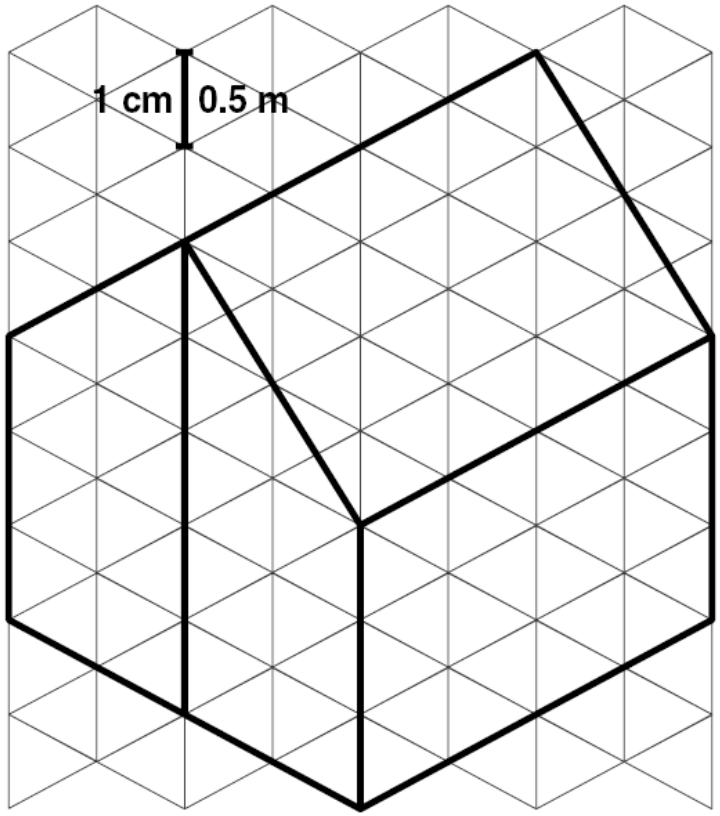
Line up sides of the small triangle to the sides of the large triangle

AX to AB; AY to AC; and XY to BC

SSM:

- **check answers to make sure that all the fractions follow the same groups**
- **Small Δ sides / large Δ sides**

34 This is a scale drawing of a tent where 1 centimeter represents 0.5 meter.



What is the height of the tent at its highest point?

F 10 m
G 5 m
H 3 m
J 2.5 m

SSM:

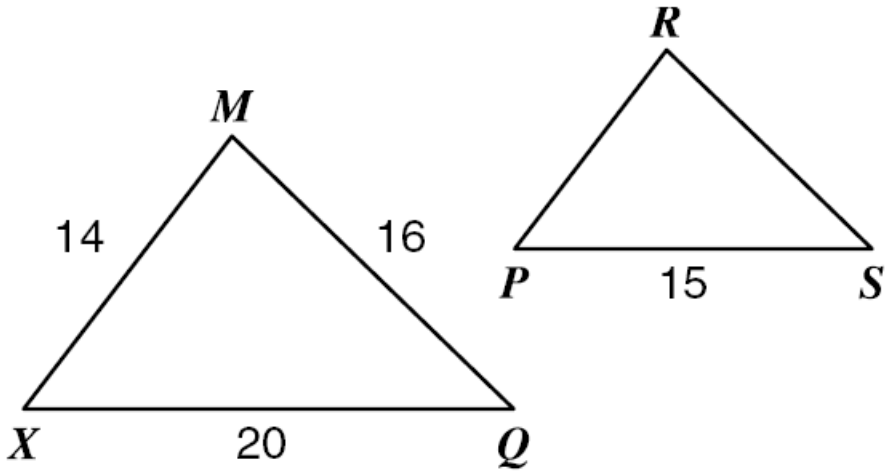
- count vertical lines from bottom to top
- think about meters ≈ 3 feet which answer could fit tents you have seen

5 vertical lines from bottom of the tent to the top

$5 \times 0.5 \text{ m} = 2.5 \text{ m}$

(slightly less than 8 feet)

38



Which proportion can be used to find the value of $\overline{PR}$ if ΔXMQ is similar to ΔPRS?

F $\frac{20}{15} = \frac{14}{PR}$

G $\frac{10}{5} = \frac{7}{PR}$

H $\frac{14}{20} = \frac{15}{PR}$

J $\frac{15}{20} = \frac{14}{PR}$

SSM:

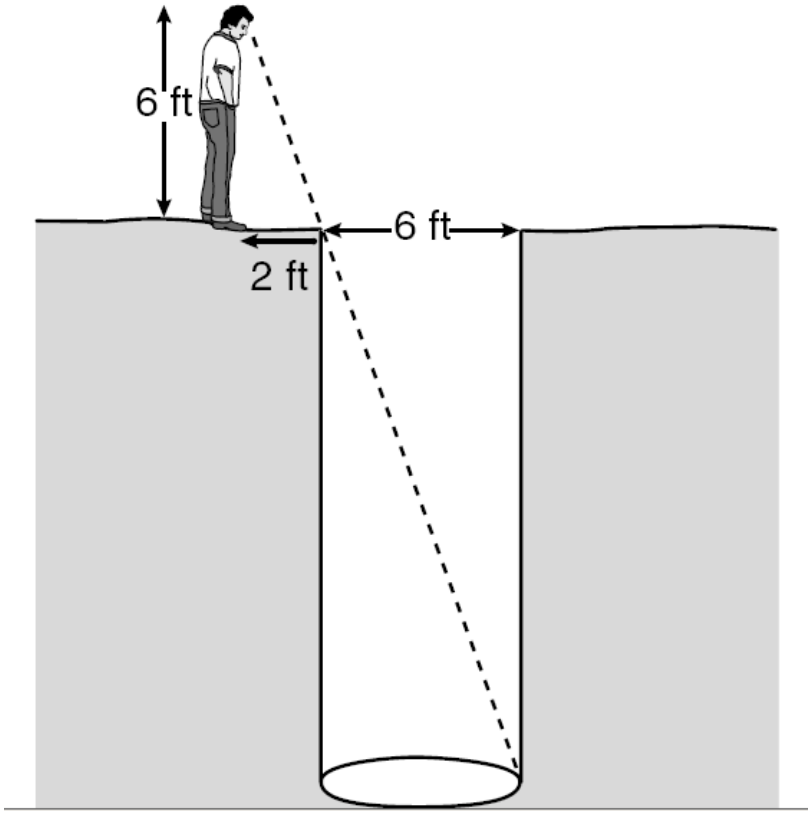
- **check answers to make sure that all the fractions follow the same groups**
- **Left Δ sides / right Δ sides**

Line up sides of the right triangle to the sides of the left triangle

15 matches up to 20

PR matches up to 14

39 When standing upright, Gary knows his eyes are 6 feet above ground level. To determine the depth of a well, he stands in the position shown.



Using the given measures, how deep is the well?

A 12 ft
B 14 ft
C 16 ft
D 18 ft

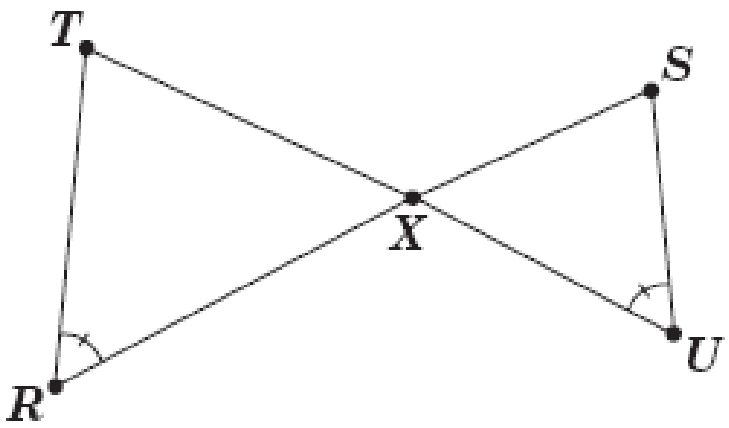
SSM:

- **6 wide / 2 distance = 3 scaling factor**
- **Depth of the well is 3 times the man's height**

Similar triangles

- **Man is 3 times taller than the distance from the well**
- **Depth of the well is 3 times the wells width**

16 Given: $\angle R \cong \angle U$.



Which proportion is true?

F $\frac{RT}{US} = \frac{TX}{SX}$

G $\frac{RX}{UX} = \frac{RT}{XS}$

H $\frac{RT}{US} = \frac{SX}{TX}$

J $\frac{XT}{RX} = \frac{RT}{UX}$

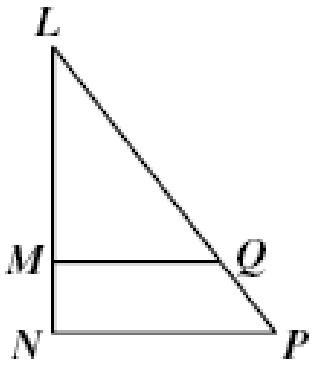
SSM:

- **not much help**

With vertical angles at X, the two triangles are similar via AA similarity

Match corresponding sides in same order (top / bottom)

17



SSM:
- **not much help**

Given: $\Delta LMQ \sim \Delta LNP$. Therefore —

A $\frac{LM}{MN} = \frac{PQ}{QL}$

B $\frac{LN}{LM} = \frac{NP}{MQ}$

C $\frac{LM}{LP} = \frac{MN}{QP}$

D $\frac{LN}{LP} = \frac{LQ}{LM}$

Match sides based on the similarity order stated
LM → LN
MQ → NP
LQ → LP

find which proportion is consistent:
matches correctly
same top / bottom relationship

39 Two ships leaving the same marina at the same time are 3.2 miles apart after sailing 2.5 hours. If they continue at the same rate and direction, how far apart will they be 2 hours later?

A 2.56 mi
B 3.52 mi
C 5.76 mi
D 6.08 mi

SSM:

- **a bit less than twice 3.2 or 6.4 eliminates A and B**

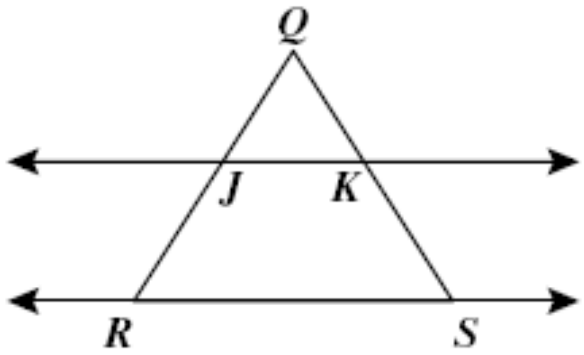
rates of change: 3.2 miles after 2.5 hours = 1.28 miles per hour

in 4.5 hours they will be 4.5 (1.28) = 5.76

or by proportions:

$$\frac{3.2}{2.5} = \frac{x}{4.5} \qquad 2.5x = 14.4 \qquad x = 5.76$$

13



$\overleftrightarrow{JK}$ and $\overleftrightarrow{RS}$ are parallel. Which of the following statements is true?

A $\frac{JR}{QJ} = \frac{KS}{RS}$

B $\frac{JK}{RS} = \frac{QK}{SK}$

C $\frac{QR}{KS} = \frac{QS}{RJ}$

D $\frac{QR}{QJ} = \frac{QS}{QK}$

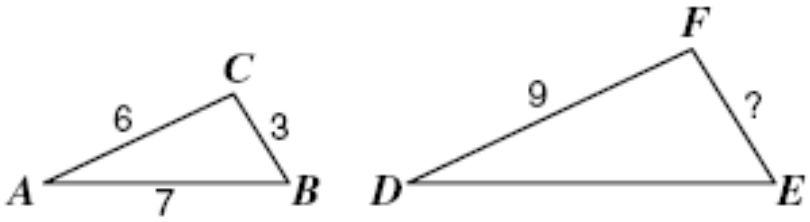
SSM:

- **not much help**

Make sure the sides are from triangles and not other figures (SK and RJ are sides of trapezoid!) this eliminates A, B, and C

Match corresponding sides in same order (top / bottom)

14 Triangles ABC and DEF are similar and have measurements as shown.



What is the measure of $\overline{EF}$?

F $\frac{21}{2}$

H $\frac{9}{2}$

G $\frac{15}{2}$

J $\frac{3}{2}$

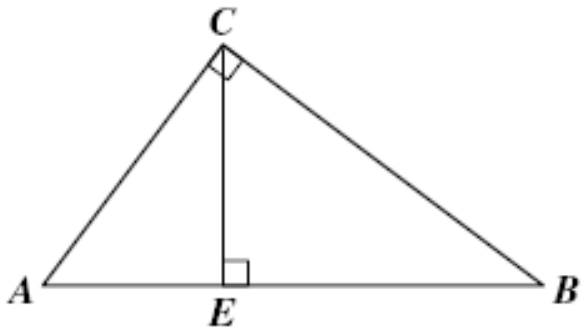
SSM:

- **not much help**

AC and DF match up and BC and EF match up

$$\frac{9}{6} = \frac{?}{3} \qquad 6? = 27 \qquad ? = 9/2$$

15 Altitude $\overline{CE}$ is drawn from right angle C of triangle ABC forming right triangles ACE and CBE.



Which statement concerning the 3 triangles is true?

A None of the triangles are similar.

B Only triangles ACE and CBE are similar.

C Triangle ABC is similar to only triangle ACE.

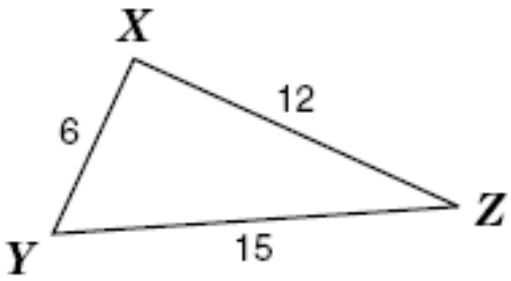
D Triangle ABC is similar to both triangle ACE and triangle CBE.

SSM:

- **not much help**

since all three triangles share a 90° angle and at least one other from the pair of triangles, then by AA similarity theorem they are all similar

23

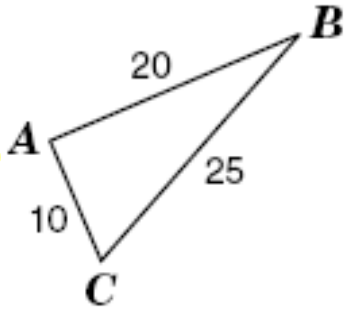


Which triangle is similar to ΔXYZ?

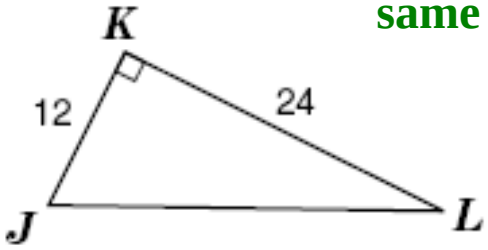
SSM:
- **C is wrong (right angle)**
- **D is wrong (2 sides 12)**

set up ratios
only answer A has
same ratios for all 3 sides

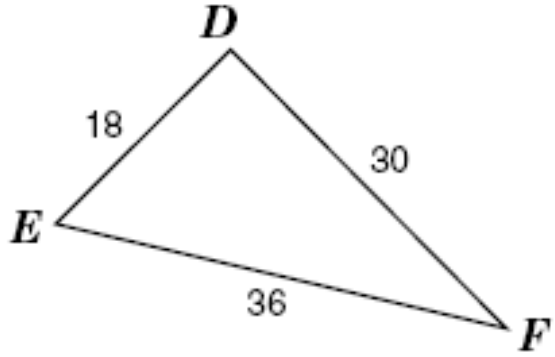
A



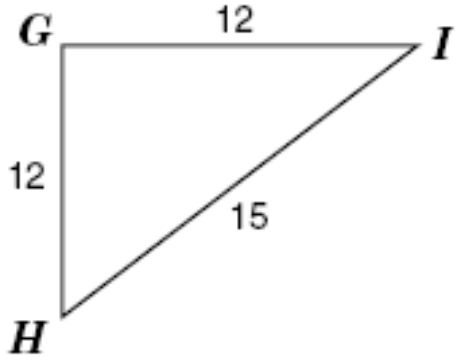
C



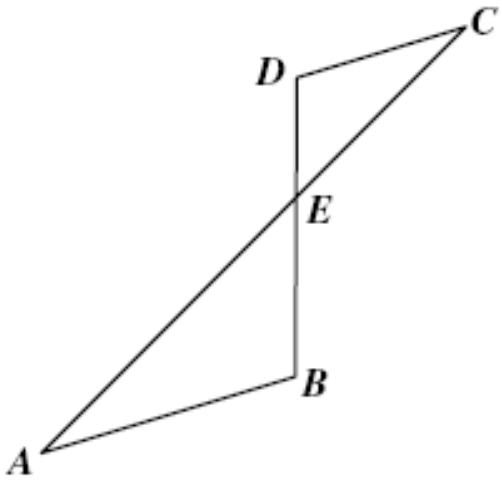
B



D



39 Line segments AC and BD intersect at E, as shown in the figure. $\overline{AB} \parallel \overline{CD}$, $DE = 10$, $BE = 15$, and $CE = 20$.



What is the measure of $\overline{AE}$?

A 13
B 17
C 25
D 30

SSM:

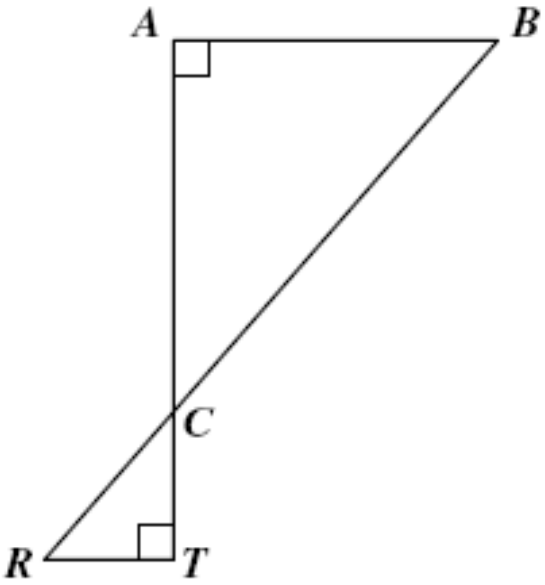
- **by sight or by scrap paper AE is longer than CD**

so only C or D can be correct

proportion needs to set up corresponding parts
10 : 15 and 20 : x have to have same ratio (2:3)

x = 30

14



Which of the following correctly describes the relationship between the sides of ΔABC and ΔTRC?

F $\frac{AB}{TR} = \frac{AC}{RC} = \frac{BC}{TC}$

G $\frac{AC}{AB} = \frac{BC}{RC} = \frac{TR}{TC}$

H $\frac{AB}{AC} = \frac{BC}{RC} = \frac{TR}{TC}$

J $\frac{AB}{TR} = \frac{AC}{TC} = \frac{BC}{RC}$

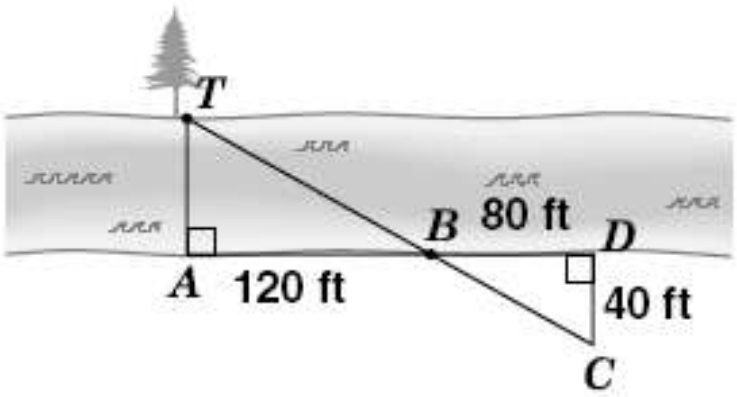
SSM:

- **Read the equations and see which look right**

Which angles match up?
A → T, C → C and B → R

look for ratios that match corresponding sides and are consistent – all one triangle on top and the other triangle on the bottom

16 A surveyor made this sketch from measurements he made along a river.



What is the distance across the river from point *A* to point *T*?

F 60 ft
G 69.3 ft
H 84.9 ft
J 120 ft

SSM:

- **Using 40 and 80 as scales then TA is between them this eliminates H and J**

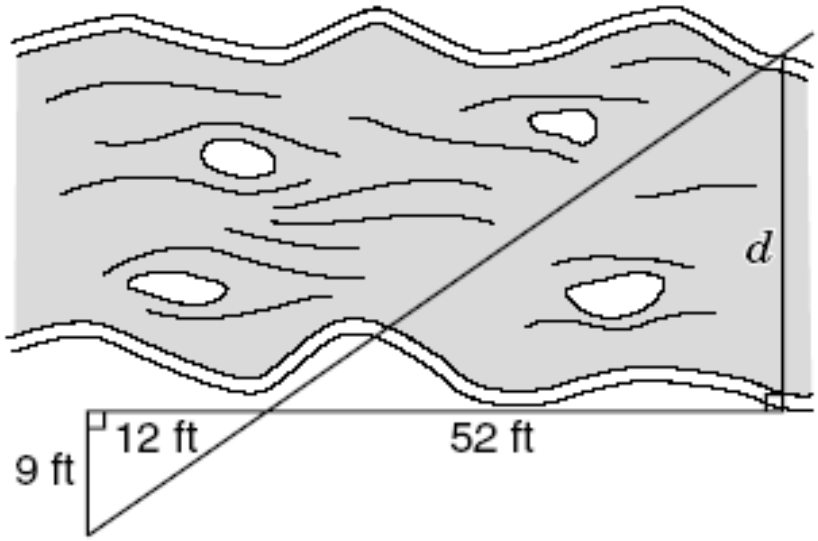
Similar triangles:

80 is twice as big as the 40
so 120 is twice as big as TA

$$\frac{120}{80} = \frac{TA}{40} \qquad 4800 = 80TA$$

$$60 = TA$$

39



The distance across a river was estimated by making the measurements shown. Which is a good estimate of the distance d?

A 20 ft
B 30 ft
C 40 ft
D 50 ft

SSM:

- **Use 9 as a scale to estimate how big d is**

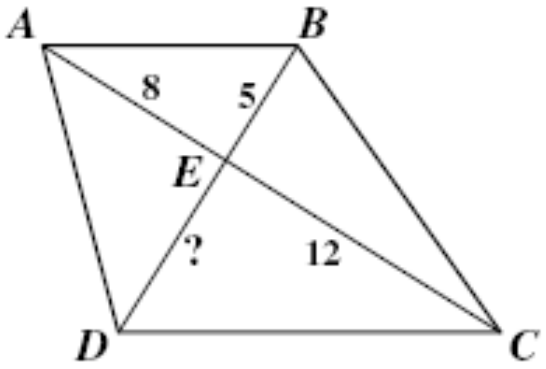
Similar triangles:

80 is twice as big as the 40
so 120 is twice as big as TA

$$\frac{52}{12} = \frac{d}{9} \qquad 468 = 12d$$

$$39 = d$$

14



In the figure, $AE = 8$, $CE = 12$, and $BE = 5$. What value for the measure of $\overline{DE}$ would make ΔABE similar to ΔCDE?

F 3.3
G 7.5
H 8
J 15

SSM:

- **5 is less than 8 so ? has to be less than 12 (but bigger than 5) this eliminates F and J**

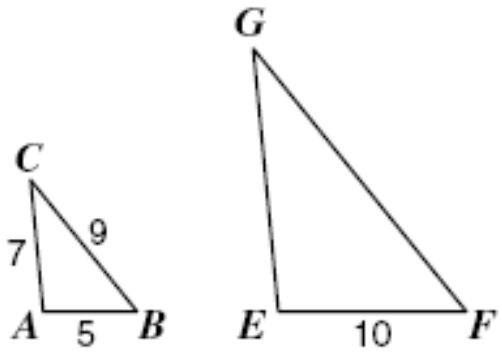
Similar Triangles:

Match up letters: A → C, B → D and E → E

$$\frac{EC}{AC} = \frac{DE}{BE} \rightarrow \frac{12}{8} = \frac{?}{5} \rightarrow 60 = 8?$$

7.5 = ?

17 Triangles ABC and EFG are similar with measurements as shown.



What is the ratio $\frac{AC}{EG}$?

A $\frac{1}{2}$

B $\frac{5}{7}$

C $\frac{7}{10}$

D $\frac{7}{9}$

SSM:

- **Since EG must be bigger (coming from larger triangle), ratio must be less than one**

Similar Triangles:

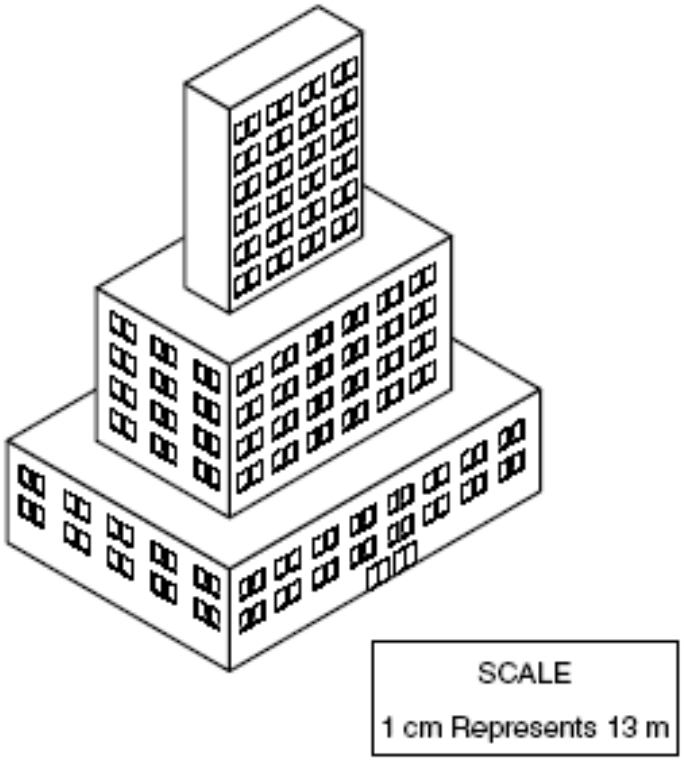
Match up letters: A → E, B → F and C → G

$$\frac{AC}{EG} = \frac{AB}{EF} \rightarrow \frac{7}{x} = \frac{5}{10} \rightarrow 70 = 5x$$

$$14 = x$$

7/14 reduces to 1/2

35



This is a scale drawing of a building. What is the actual height of the building?

A 58.5 m
B 71.5 m
C 78 m
D 84.5 m

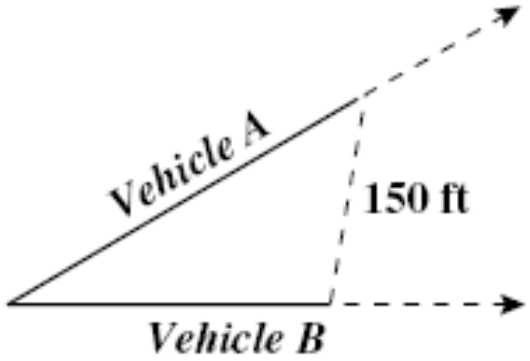
SSM:

- **use ruler to measure the height (in cm)**
- **multiply by 13**

use ruler to measure the height of the building in cm

4.5 cm × 13 m/cm = 58.5 m

38 Two vehicles, each moving from a point in a straight line away from each other at an angle, are 150 feet apart after 6 seconds. Both are moving at a constant rate, vehicle *A* at 50 feet per second and vehicle *B* at 40 feet per second.



How far apart are they after 15 seconds?

F 150 ft
G 375 ft
H 600 ft
J 750 ft

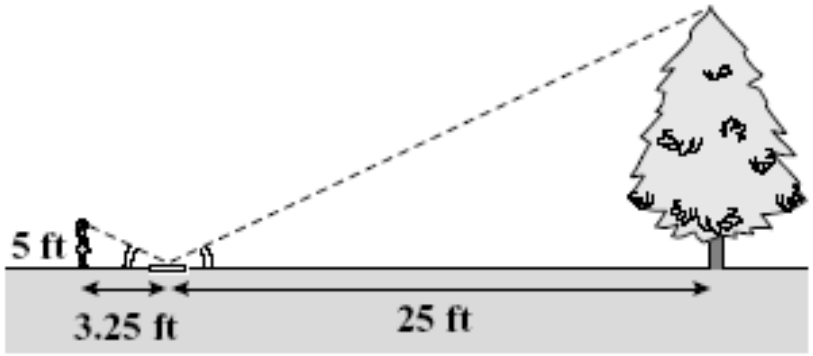
SSM:

- **150 ft apart after 6 seconds**
- **15 seconds is 2 ½ times the time**

Similar triangles:

$$\frac{150}{6} = \frac{x}{15} \rightarrow 6x = 2250 \qquad x = 375$$

39 In order to determine the height of a tree, María places a mirror flat on the ground 25 feet from the base. After backing 3.25 feet, she can just see the top of the tree in the mirror.



María knows that her eyes are exactly 5 feet above ground level and that the angle between her eyes, the mirror, and the ground is the same as the angle between the tree top, the mirror, and the ground. Which is closest to the height of the tree?

A 24 ft
B 28 ft 4 in.
C 38 ft 6 in.
D 40 ft

SSM:

- **picture not to scale**
- **Maria taller than distance to mirror, so tree taller than distance to mirror eliminates answer A**

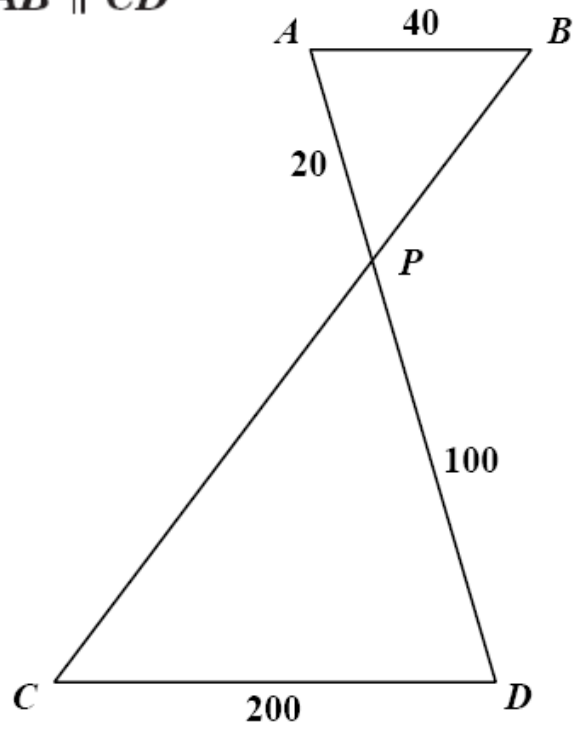
Similar triangles:

$$\frac{5}{3.25} = \frac{x}{25}$$

$$3.25x = 125$$

$$x = 38.46$$

14 $\overline{AB} \parallel \overline{CD}$



Which relationship is true about ΔAPB and ΔDPC?

F They are congruent.

G They are similar.

H They are equal in area.

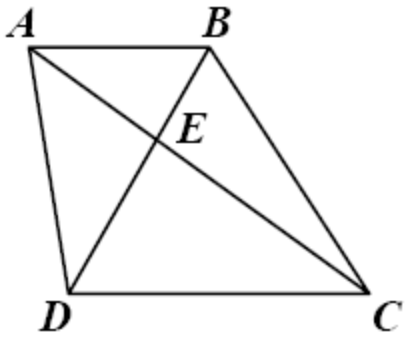
J They are equal in perimeter.

SSM:

- **use your eyes**
- **F – no way**
- **G – maybe**
- **H – no way**
- **J – no way**

Similar fits → scaling factor of 5

15



In quadrilateral $ABCD$, $\overline{AB}$ is parallel to $\overline{DC}$ and the diagonals intersect at E. Which statement is true?

A No triangles in the figure are similar.

B ΔADE is similar to ΔBCE.

C ΔABD is similar to ΔABC.

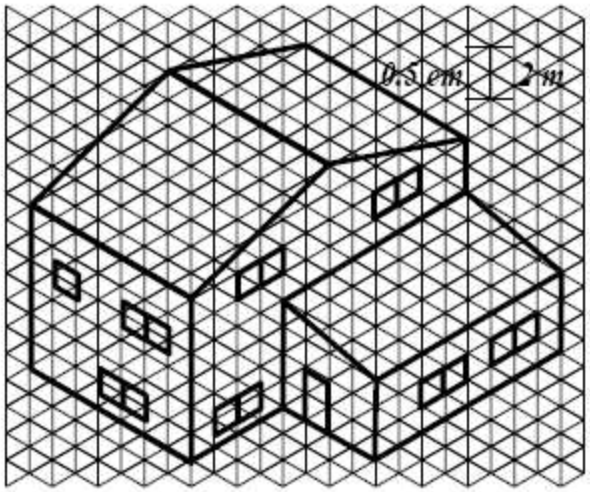
D ΔABE is similar to ΔCDE.

SSM:

- **not much help**

parallel lines and vertical angles have all three angles of the two triangles the same

34 This is an architect's scale drawing of a house that was built, where 0.5 cm represents 2 m.



How tall is the house at its highest point?

F 6 m
G 8 m
H 12 m
J 16 m

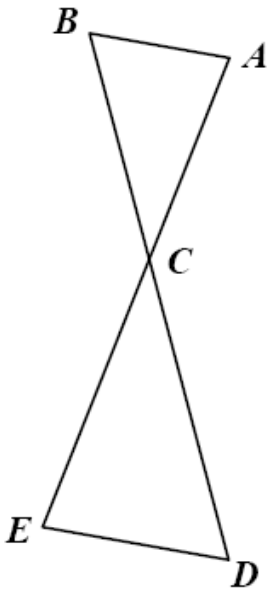
SSM:

- **use your eyes**

each vertical block is a meter
house corner is 6 blocks tall
and from corner to the top of
the roof is 2 more blocks

38 $AB \parallel DE$.

$AB = 6$
$AC = 9$
$BC = 10$
$CE = 12$



What is DE?

F 7.2
G 8
H 16
J 20

SSM:
- measure AB and BC and compare to DE
- AB < DE < BC 6 < DE < 10
- only answer G fits

parallel lines → similar triangles

$$\frac{AB}{DE} = \frac{AC}{CE} \rightarrow \frac{6}{x} = \frac{9}{12} \qquad 72 = 9x \qquad 8 = x$$