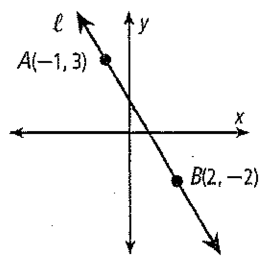
Ratio: ______________________________

Ratios can be written: ______________________________

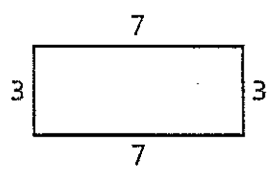
REMEMBER: Denominators of fractions CANNOT be ZERO!

Example:
Write a ratio expressing the slope of L.



Given that two points on *m* are C(–2, 3) and *D*(6, 5), write a ratio expressing the slope of *m*.

Ratios can be written with more than two numbers.



Ratio: ______________

The ratio of the side lengths of a triangle is 4:7:5, and its perimeter is 96 cm. What is the length of the shortest side?

The ratio of the angle measures in a triangle is 1:6:13. What is the measure of each angle?

Proportion: ____________________

Means: ____________________

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

Extremes: ____________________

Cross Product: ____________________

Cross Products Property

In a proportion, if $\frac{a}{b} = \frac{c}{d}$ and b and $d \neq 0$, then $ad = bc$.

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

$ad = bc$

Solve the proportion:

$\frac{7}{x} = \frac{56}{72}$ $\qquad$ $\frac{z-4}{5} = \frac{20}{z-4}$ $\qquad$ $\frac{3}{8} = \frac{x}{56}$ $\qquad$ $\frac{2y}{9} = \frac{8}{4y}$

Cross Products can be written in different ways:

Properties of Proportions

ALGEBRA	NUMBERS
The proportion $\frac{a}{b} = \frac{c}{d}$ is equivalent to the following:	The proportion $\frac{1}{3} = \frac{2}{6}$ is equivalent to the following:
$ad = bc$	$1(6) = 3(2)$
$\frac{b}{a} = \frac{d}{c}$	$\frac{3}{1} = \frac{6}{2}$
$\frac{a}{c} = \frac{b}{d}$	$\frac{1}{2} = \frac{3}{6}$

Example:

Given that $18c = 24d$, find the ratio of d to c in simplest form.

Given that $16s = 20t$, find the ratio $t{:}s$ in simplest form.

Name ______________________ Date __________ Class __________

LESSON 7-1

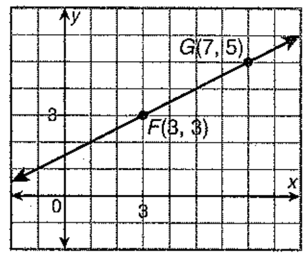
Reteach

Ratio and Proportion

A **ratio** is a comparison of two numbers by division. Ratios can be written in various forms.

Ratios comparing x and y			Ratios comparing 3 and 2		
x to y	$x : y$	$\frac{x}{y}$, where $y \neq 0$	3 to 2	3 : 2	$\frac{3}{2}$

Slope is a ratio that compares the rise, or change in y, to the run, or change in x.



Slope $= \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$ Definition of slope

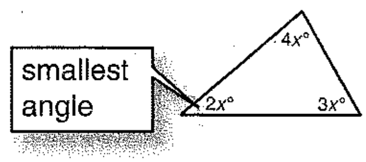
$= \frac{5-3}{7-3}$ Substitution

$= \frac{2}{4}$ or $\frac{1}{2}$ Simplify.

A ratio can involve more than two numbers.

The ratio of the angle measures in a triangle is 2 : 3 : 4. What is the measure of the smallest angle?

Let the angle measures be $2x°$, $3x°$, and $4x°$.



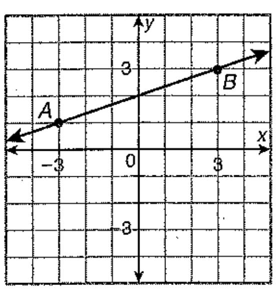
$2x + 3x + 4x = 180$ Triangle Sum Theorem

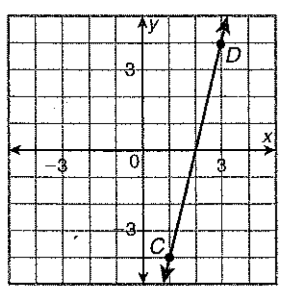
$9x = 180$ Simplify.

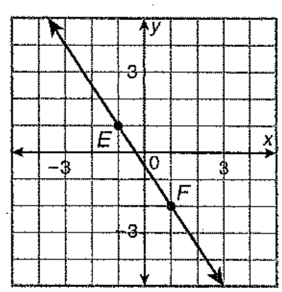
$x = 20$ Divide both sides by 9.

The smallest angle measures $2x°$. So $2x = 2(20) = 40°$.

Write a ratio expressing the slope of each line.

1. 

2. 

3. 

_______________ _______________ _______________

4. The ratio of the side lengths of a triangle is 2 : 4 : 5, and the perimeter is 55 cm. What is the length of the shortest side?

____

5. The ratio of the angle measures in a triangle is 7 : 13 : 16. What is the measure of the largest angle?

____

Name ______________________ Date __________ Class __________

LESSON 7-1

Reteach

Ratio and Proportion continued

A proportion is an equation stating that two ratios are equal. In every proportion, the product of the extremes equals the product of the means.

means: b and c

$a : b = c : d$

extremes: a and d

Cross Products Property	In a proportion, if $\frac{a}{b} = \frac{c}{d}$ and b and $d \neq 0$, then $ad = bc$. *a* and *d* are the *extremes*. $\frac{a}{b} = \frac{c}{d}$ *b* and *c* are the *means*.

You can solve a proportion like $\frac{x}{8} = \frac{35}{56}$ by finding the cross products.

$\frac{x}{8} = \frac{35}{56}$

$x(56) = 8(35)$ Cross Products Property

$56x = 280$ Simplify.

$x = 5$ Divide both sides by 56.

You can use properties of proportions to find ratios.

Given that $8a = 6b$, find the ratio of a to b in simplest form.

$8a = 6b$

$\frac{a}{b} = \frac{6}{8}$ Divide both sides by b.

$\frac{a}{b} = \frac{3}{4}$ Simplify $\frac{6}{8}$.

The ratio of a to b in simplest form is 3 to 4.

Solve each proportion.

6. $\frac{9}{t} = \frac{36}{28}$

____

7. $\frac{x}{32} = \frac{15}{16}$

____

8. $\frac{24}{42} = \frac{y}{7}$

____

9. $\frac{2a}{3} = \frac{8}{3a}$

____

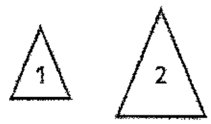
10. Given that $5b = 20c$, find the ratio $\frac{b}{c}$ in simplest form.

____

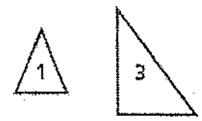
11. Given that $24x = 9y$, find the ratio $x : y$ in simplest form.

____

Figures that are SIMILAR (   ) have the ____.

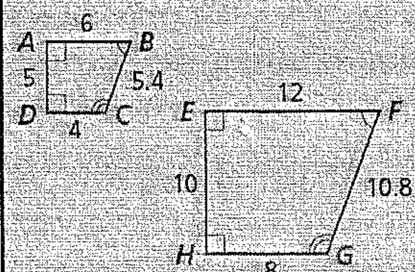


$\triangle 1$ is similar to $\triangle 2$ ($\triangle 1 \sim \triangle 2$).

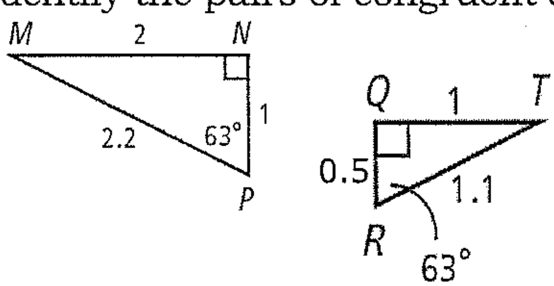


$\triangle 1$ is not similar to $\triangle 3$ ($\triangle 1 \nsim \triangle 3$).

Similar Polygons

DEFINITION	DIAGRAM	STATEMENTS
Two polygons are **similar polygons** if and only if their corresponding angles are congruent and their corresponding side lengths are proportional.	 $ABCD \sim EFGH$	$\angle A \cong \angle E$ $\angle B \cong \angle F$ $\angle C \cong \angle G$ $\angle D \cong \angle H$ $\frac{AB}{EF} = \frac{BC}{FG} = \frac{CD}{GH} = \frac{DA}{HE} = \frac{1}{2}$

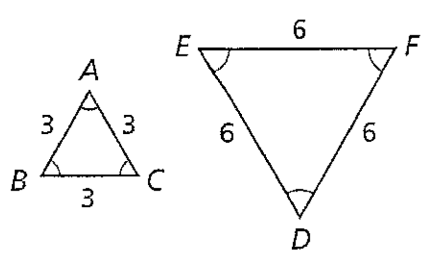
Identify the pairs of congruent angles and corresponding sides.



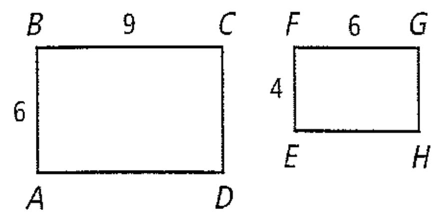
Similarity Ratio: ______________________________________

The similarity ratio of ΔABC to ΔDEF is ____________________.

The similarity ratio of ΔDEF to ΔABC is ____________________.



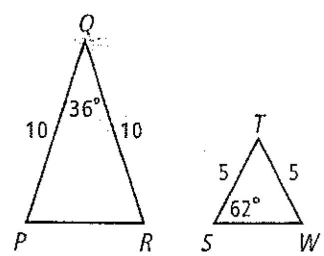
Determine whether the polygons are similar. If so, write the similarity ratio and a similarity statement.



Step 1 Identify pairs of congruent angles.

Step 2 Compare corresponding sides.

Are these similar?



Step 1 Identify pairs of congruent angles.

Step 2 Compare corresponding angles.

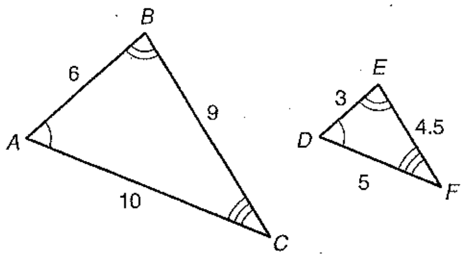
Name ______________________ Date ___________ Class ___________

LESSON 7-2

Reteach

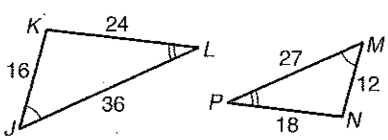
Ratios in Similar Polygons

Similar polygons are polygons that have the same shape but not necessarily the same size.

Similar Polygons	
 $\triangle ABC \sim \triangle DEF$	Corresponding angles are congruent. $\angle A \cong \angle D$ $\angle B \cong \angle E$ $\angle C \cong \angle F$ Corresponding sides are proportional. $\frac{AB}{DE} = \frac{6}{3} = 2$ $\frac{BC}{EF} = \frac{9}{4.5} = 2$ $\frac{CA}{FD} = \frac{10}{5} = 2$

A similarity ratio is the ratio of the lengths of the corresponding sides. So, for the similarity statement $\triangle ABC \sim \triangle DEF$, the similarity ratio is 2. For $\triangle DEF \sim \triangle ABC$, the similarity ratio is $\frac{1}{2}$.

Identify the pairs of congruent angles and corresponding sides.

1. 

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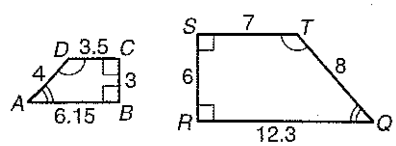
2. 

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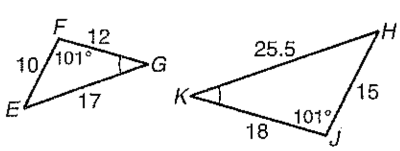
Determine whether the polygons are similar. If so, write the similarity ratio and a similarity statement.

3. $\triangle EFG$ and $\triangle HJK$



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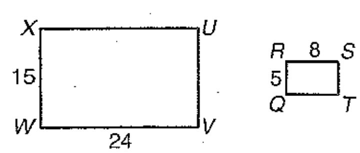
4. rectangles *QRST* and *UVWX*



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Name ______________________________ Date ____________ Class ____________

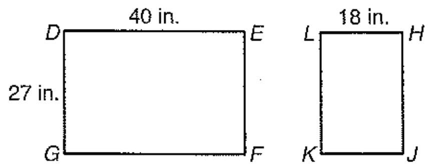
LESSON **7-2**

Reteach

Ratios in Similar Polygons continued

You can use properties of similar polygons to solve problems.

Rectangle *DEFG* ~ rectangle *HJKL*. What is the length of *HJKL*?



$$\frac{\text{length of } DEFG}{\text{length of } HJKL} = \frac{\text{width of } DEFG}{\text{width of } HJKL}$$ Write a proportion.

$$\frac{40}{x} = \frac{27}{18}$$ Substitute the known values.

$$40(18) = 27(x)$$ Cross Products Property

$$720 = 27x$$ Simplify.

$$26\frac{2}{3} = x$$ Divide both sides by 27.

The length of *HJKL* is $26\frac{2}{3}$ in.

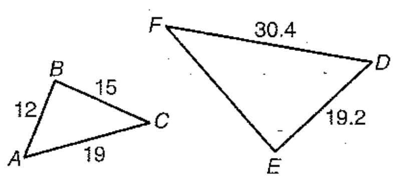
5. A rectangle is 3.2 centimeters wide and 8 centimeters long. A similar rectangle is 5 centimeters long. What is the width of the second rectangle?

____

6. Rectangle *CDEF* ~ rectangle *GHJK*, and the similarity ratio of *CDEF* to *GHJK* is $\frac{1}{16}$. If *DE* = 20, what is ~~*HK*?~~ HJ ?

____

7. △*ABC* is similar to △*DEF*. What is *EF*?



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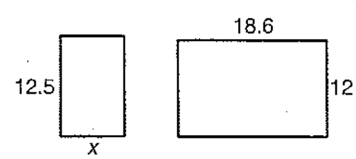
8. The two rectangles are similar. What is the value of *x* to the nearest tenth?



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9. △*MNP* ~ △*QRS*, and the ratio of △*MNP* to △*QRS* is 5 : 2. If *MN* = 42 meters, what is *QR*?

____

10. Triangle *HJK* has side lengths 21, 17, and 25. The two shortest sides of triangle *WXY* have lengths 48.3 and 39.1. If △*HJK* ~ △*WXY*, what is the length of the third side of △*WXY*?

____

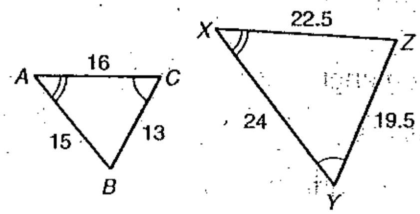
Name ______________________ Date __________ Class __________

LESSON 7-2

Practice B

Ratios in Similar Polygons

Identify the pairs of congruent corresponding angles and the corresponding sides.

1. 

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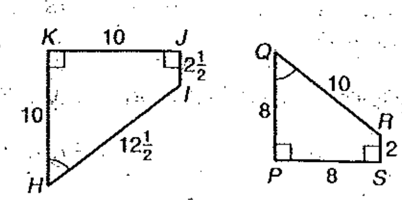
2. 

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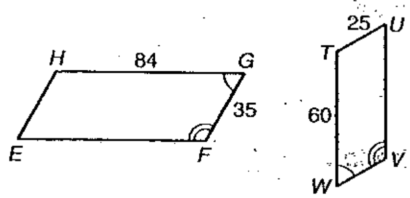
Determine whether the polygons are similar. If so, write the similarity ratio and a similarity statement. If not, explain why not.

3. parallelograms *EFGH* and *TUVW*



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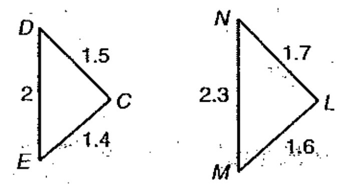
4. $\triangle CDE$ and $\triangle LMN$



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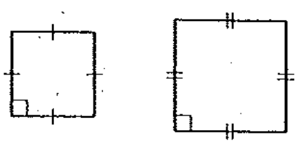
Tell whether the polygons must be similar based on the information given in the figures.

5. 

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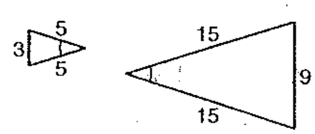
6. 

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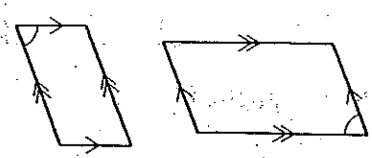
7. 

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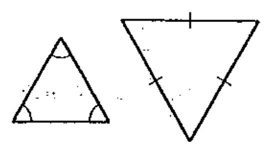
8. 

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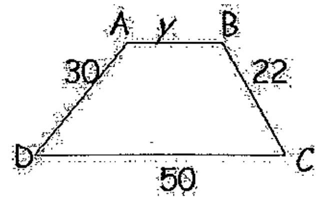
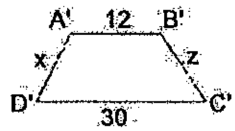
1. *Quadrilateral ABCD ~ Quadrilateral A′B′C′D′.* **Find the following:**



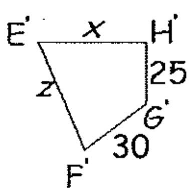


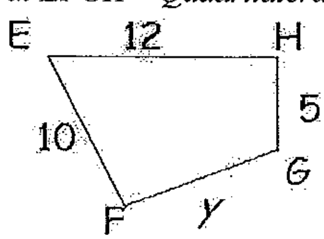
a. Their scale factor.

b. The values of x, y, and z.

c. The ratio of the perimeters.

2. *Quadrilateral EFGH ~ Quadrilateral E′F′G′H′.* **Find the following:**



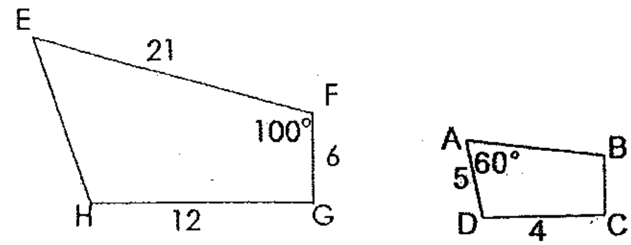


a. Their scale factor.

b. The values of x, y, and z.

c. The ratio of the perimeters.

3. *Quadrilateral ABCD ~ Quadrilateral EFGH*



Complete.

a. m∠E =

b. m∠B =

c. If m∠D = 110, then m∠G =

d. The scale factor is

e. EH =

f. BC =

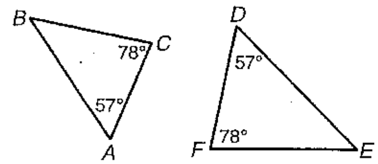
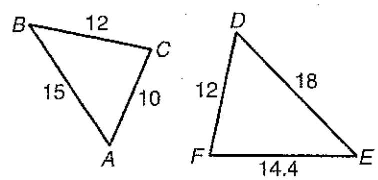
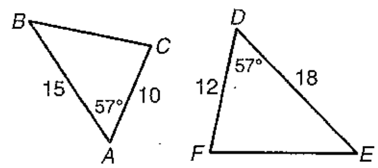
g. AB =

Name ______________________ Date __________ Class __________

LESSON 7-3

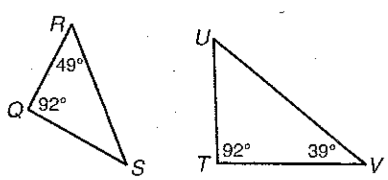
Reteach

Triangle Similarity: AA, SSS, and SAS

Angle-Angle (AA) Similarity	If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.	 $\triangle ABC \sim \triangle DEF$
Side-Side-Side (SSS) Similarity	If the three sides of one triangle are proportional to the three corresponding sides of another triangle, then the triangles are similar.	 $\triangle ABC \sim \triangle DEF$
Side-Angle-Side (SAS) Similarity	If two sides of one triangle are proportional to two sides of another triangle and their included angles are congruent, then the triangles are similar.	 $\triangle ABC \sim \triangle DEF$

Explain how you know the triangles are similar, and write a similarity statement.

1.



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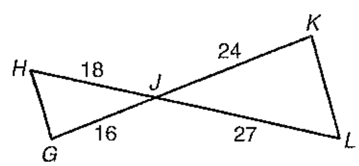
2.



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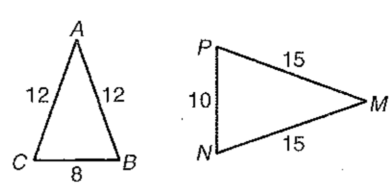
3. Verify that $\triangle ABC \sim \triangle MNP$.



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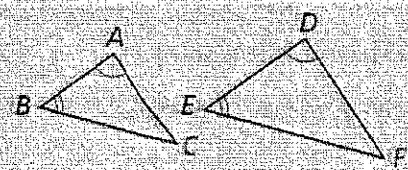
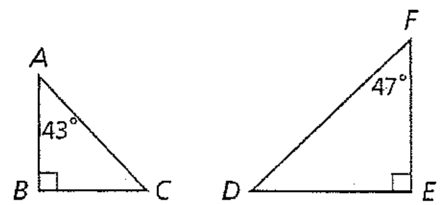
We can use many different ways to prove triangles congruent, ie. SSS, SAS, ASA, HL, AAS.

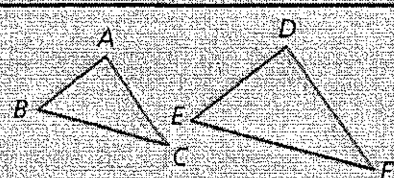
Postulate 7-3-1 Angle-Angle (AA) Similarity

POSTULATE	HYPOTHESIS	CONCLUSION
If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.		$\triangle ABC \sim \triangle DEF$

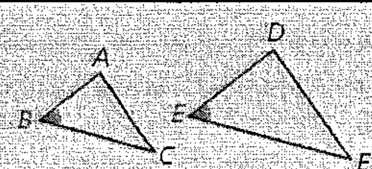
Explain why the triangles are similar and write a similarity statement.



Theorem 7-3-2 Side-Side-Side (SSS) Similarity

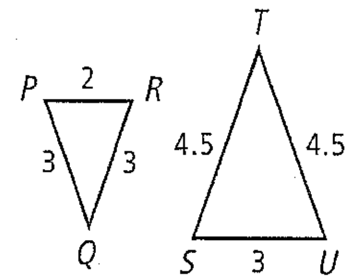
THEOREM	HYPOTHESIS	CONCLUSION
If the three sides of one triangle are proportional to the three corresponding sides of another triangle, then the triangles are similar.		$\triangle ABC \sim \triangle DEF$

Theorem 7-3-3 Side-Angle-Side (SAS) Similarity

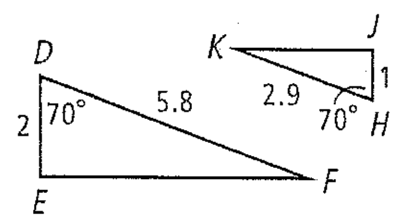
THEOREM	HYPOTHESIS	CONCLUSION
If two sides of one triangle are proportional to two sides of another triangle and their included angles are congruent, then the triangles are similar.	 $\angle B \cong \angle E$	$\triangle ABC \sim \triangle DEF$

Verify that the triangles are similar.

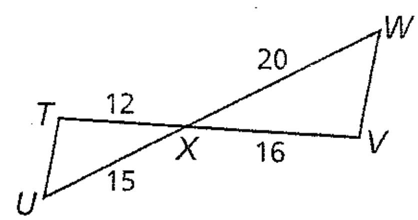
$\triangle PQR$ and $\triangle STU$



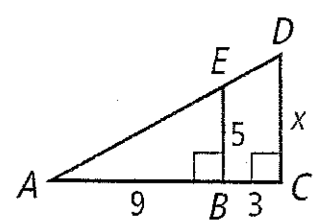
$\triangle DEF$ and $\triangle HJK$



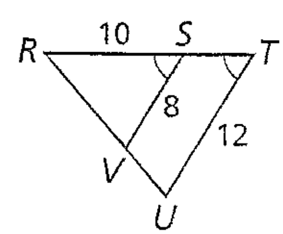
Verify that $\triangle TXU \sim \triangle VXW$.



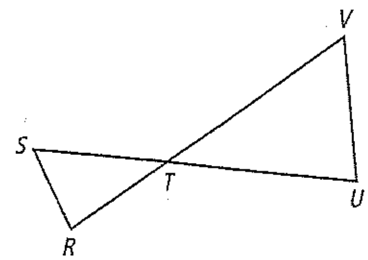
Explain why $\triangle ABE \sim \triangle ACD$, and then find CD.



Explain why $\triangle RSV \sim \triangle RTU$ and then find RT.



Given: $3UT = 5RT$ and $3VT = 5ST$
Prove: $\Delta UVT \sim \Delta RST$



Properties to prove similarity of triangles:

Properties of Similarity

Reflexive Property of Similarity

$\triangle ABC \sim \triangle ABC$ (Reflex. Prop. of ~)

Symmetric Property of Similarity

If $\triangle ABC \sim \triangle DEF$, then $\triangle DEF \sim \triangle ABC$. (Sym. Prop. of ~)

Transitive Property of Similarity

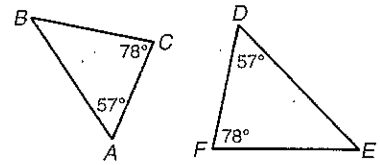
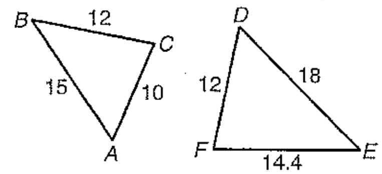
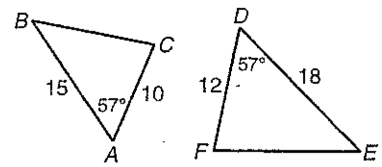
If $\triangle ABC \sim \triangle DEF$ and $\triangle DEF \sim \triangle XYZ$, then $\triangle ABC \sim \triangle XYZ$. (Trans. Prop. of ~)

Name ________________________ Date ____________ Class ____________

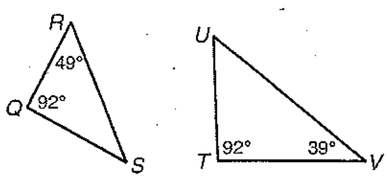
LESSON 7-3

Reteach

Triangle Similarity: AA, SSS, and SAS

Angle-Angle (AA) Similarity	If two angles of one triangle are congruent to two angles of another triangle, then the triangles are similar.	 $\triangle ABC \sim \triangle DEF$
Side-Side-Side (SSS) Similarity	If the three sides of one triangle are proportional to the three corresponding sides of another triangle, then the triangles are similar.	 $\triangle ABC \sim \triangle DEF$
Side-Angle-Side (SAS) Similarity	If two sides of one triangle are proportional to two sides of another triangle and their included angles are congruent, then the triangles are similar.	 $\triangle ABC \sim \triangle DEF$

Explain how you know the triangles are similar, and write a similarity statement.

1. 

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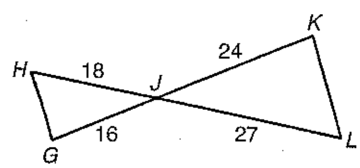
2. 

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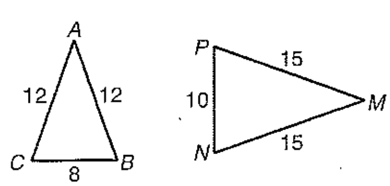
3. Verify that $\triangle ABC \sim \triangle MNP$.



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Name ______________________ Date ____________ Class ____________

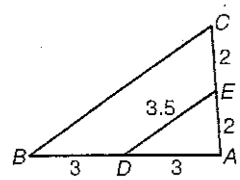
LESSON 7-3

Reteach

Triangle Similarity: AA, SSS, and SAS continued

You can use AA Similarity, SSS Similarity, and SAS Similarity to solve problems. First, prove that the triangles are similar. Then use the properties of similarity to find missing measures.

Explain why $\triangle ADE \sim \triangle ABC$ and then find BC.



Step 1 Prove that the triangles are similar.

$\angle A \cong \angle A$ by the Reflexive Property of $\cong$.

$$\frac{AD}{AB} = \frac{3}{6} = \frac{1}{2}$$

$$\frac{AE}{AC} = \frac{2}{4} = \frac{1}{2}$$

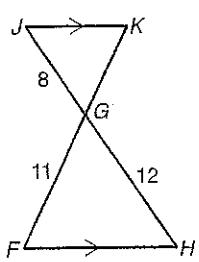
Therefore, $\triangle ADE \sim \triangle ABC$ by SAS $\sim$.

Step 2 Find BC.

$\frac{AD}{AB} = \frac{DE}{BC}$	Corresponding sides are proportional.
$\frac{3}{6} = \frac{3.5}{BC}$	Substitute 3 for AD, 6 for AB, and 3.5 for DE.
$3(BC) = 6(3.5)$	Cross Products Property
$3(BC) = 21$	Simplify.
$BC = 7$	Divide both sides by 3.

Explain why the triangles are similar and then find each length.

4. *GK*



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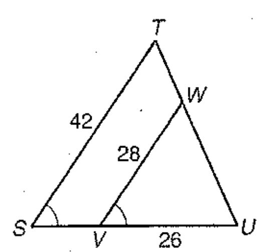
5. *US*



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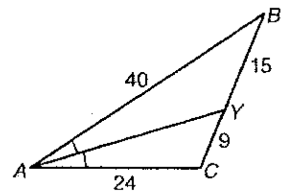
Name ______________________________ Date __________ Class __________

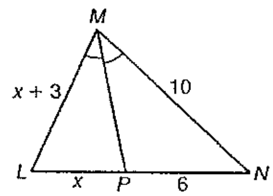
LESSON 7-4

Reteach

Applying Properties of Similar Triangles continued

Triangle Angle Bisector Theorem	Example
An angle bisector of a triangle divides the opposite side into two segments whose lengths are proportional to the lengths of the other two sides. (△ ∠ Bisector Thm.)	 $\frac{BY}{YC} = \frac{15}{9} = \frac{5}{3}$ $\frac{AB}{AC} = \frac{40}{24} = \frac{5}{3}$

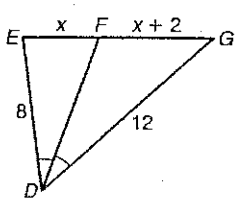
Find *LP* and *LM*.



$\frac{LP}{PN} = \frac{ML}{NM}$	△ ∠ Bisector Thm.
$\frac{x}{6} = \frac{x+3}{10}$	Substitute the given values.
$x(10) = 6(x + 3)$	Cross Products Property
$10x = 6x + 18$	Distributive Property
$4x = 18$	Simplify.
$x = 4.5$	Divide both sides by 4.
$LP = x = 4.5$	
$LM = x + 3 = 4.5 + 3 = 7.5$	

Find the length of each segment.

4. $\overline{EF}$ and $\overline{FG}$



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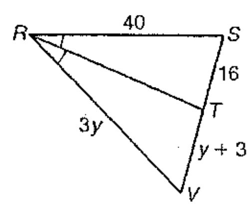
5. $\overline{RV}$ and $\overline{TV}$



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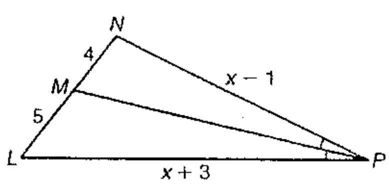
6. $\overline{NP}$ and $\overline{LP}$



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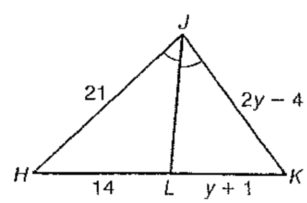
7. $\overline{JK}$ and $\overline{LK}$



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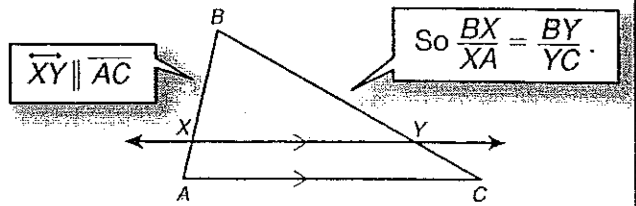
Name ______________________________ Date ____________ Class ____________

LESSON 7-4

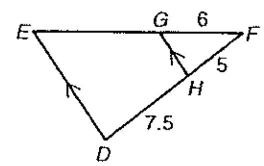
Reteach

Applying Properties of Similar Triangles

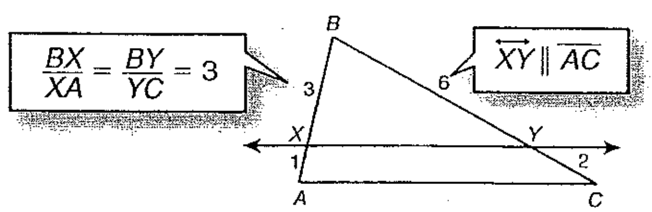
Triangle Proportionality Theorem	Example
If a line parallel to a side of a triangle intersects the other two sides, then it divides those sides proportionally.	

You can use the Triangle Proportionality Theorem to find lengths of segments in triangles.

Find *EG*.

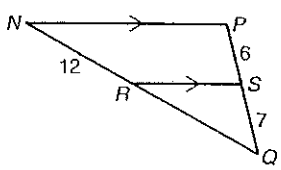


$\frac{EG}{GF} = \frac{DH}{HF}$	Triangle Proportionality Theorem
$\frac{EG}{6} = \frac{7.5}{5}$	Substitute the known values.
$EG(5) = 6(7.5)$	Cross Products Property
$5(EG) = 45$	Simplify.
$EG = 9$	Divide both sides by 5.

Converse of the Triangle Proportionality Theorem	Example
If a line divides two sides of a triangle proportionally, then it is parallel to the third side.	

Find the length of each segment in Exercises 1 and 2.

1. $\overline{RQ}$



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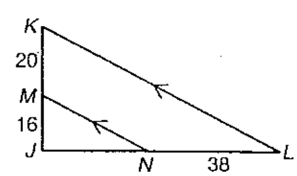
2. $\overline{JN}$



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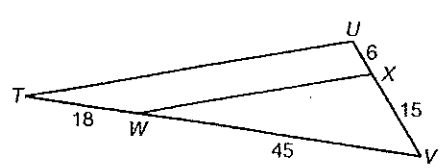
3. Show that $\overline{TU}$ and $\overline{WX}$ are parallel.



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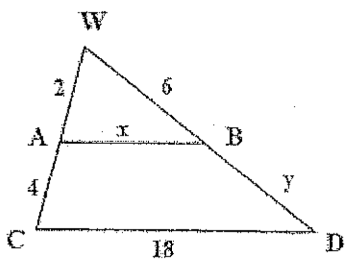
Geometry
7-4 Practice

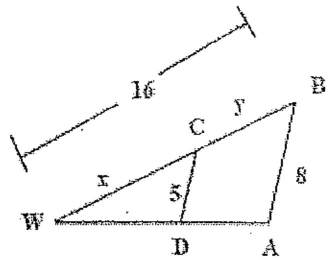
Name: ______________________

If $\overline{AB} \parallel \overline{CD}$, find the values of x and y.

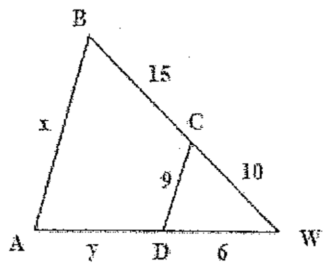
1.



2.

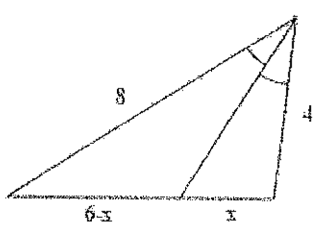


3.

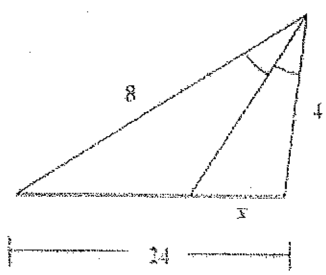


Find the value of x.

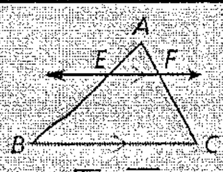
4.



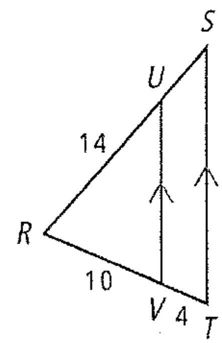
5.



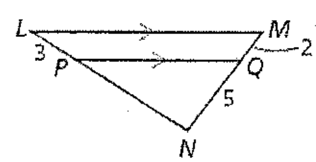
Theorem 7-4-1 Triangle Proportionality Theorem

THEOREM	HYPOTHESIS	CONCLUSION
If a line parallel to a side of a triangle intersects the other two sides, then it divides those sides proportionally.	 $\overline{EF} \parallel \overline{BC}$	$\frac{AE}{EB} = \frac{AF}{FC}$

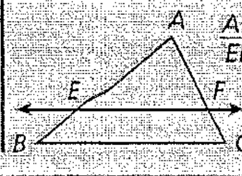
Find *US*.



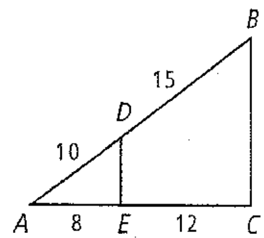
Find *PN*.



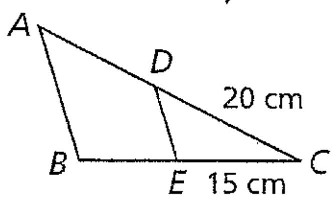
Theorem 7-4-2 Converse of the Triangle Proportionality Theorem

THEOREM	HYPOTHESIS	CONCLUSION
If a line divides two sides of a triangle proportionally, then it is parallel to the third side.	 $\frac{AE}{EB} = \frac{AF}{FC}$	$\overleftrightarrow{EF} \parallel \overline{BC}$

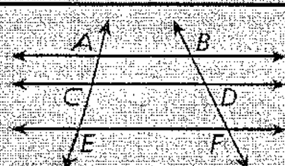
Verify that $\overline{DE} \parallel \overline{BC}$



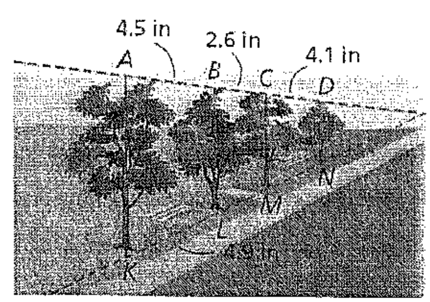
***AC* = 36 cm, and *BC* = 27 cm. Verify that $\overline{DE} \parallel \overline{AB}$**



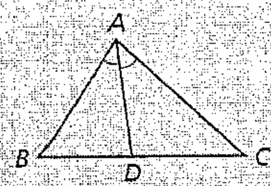
Corollary 7-4-3 Two-Transversal Proportionality

THEOREM	HYPOTHESIS	CONCLUSION
If three or more parallel lines intersect two transversals, then they divide the transversals proportionally.		$\frac{AC}{CE} = \frac{BD}{DF}$

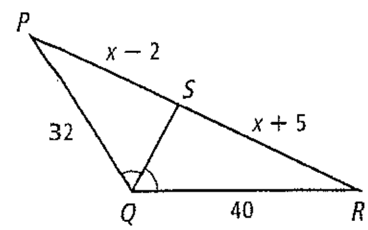
Suppose that an artist decided to make a larger sketch of the trees. In the figure, if $AB = 4.5$ in., $BC = 2.6$ in., $CD = 4.1$ in., and $KL = 4.9$ in., find LM and MN to the nearest tenth of an inch.



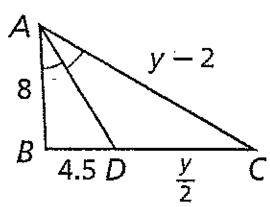
Theorem 7-4-4 Triangle Angle Bisector Theorem

THEOREM	HYPOTHESIS	CONCLUSION
An angle bisector of a triangle divides the opposite side into two segments whose lengths are proportional to the lengths of the other two sides. (△ ∠ Bisector Thm.)		$\frac{BD}{DC} = \frac{AB}{AC}$

Find *PS* and *SR*.



Find *AC* and *DC*.



Indirect Measurement: ______________________________

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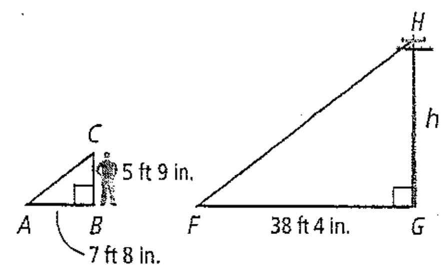
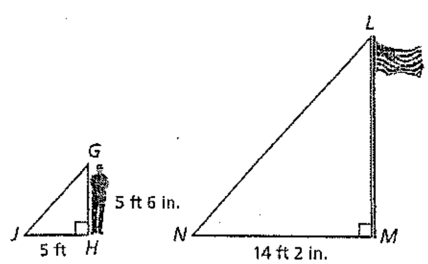
Hint:
Whenever dimensions are given in both feet and inches, you MUST convert them to either feet or inches before doing any calculations.

Example:
Tyler wants to find the height of a telephone pole. He measured the pole's shadow and his own shadow and then made a diagram. What is the height *h* of the pole?

Step 1 Convert the measurements to inches.
Step 2 Find similar triangles.
Step 3 Find *h*.



A student who is 5 ft 6 in. tall measured shadows to find the height *LM* of a flagpole. What is *LM*?



Scale Drawing: ____

Scale: ____

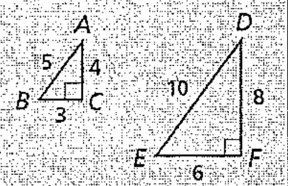
REMEMBER:
A proportion may compare measurements that have different units!

Example:
On a Wisconsin road map, Kristin measured a distance of 11 in. from Madison to Wausau. The scale of this map is 1inch:13 miles. What is the actual distance between Madison and Wausau to the nearest mile?

Lady Liberty holds a tablet in her left hand. The tablet is 7.19 m long and 4.14 m wide. If you made a scale drawing using the scale 1 cm:0.75 m, what would be the dimensions to the nearest tenth?

The rectangular central chamber of the Lincoln Memorial is 74 ft long and 60 ft wide. Make a scale drawing of the floor of the chamber using a scale of 1 in.:20 ft.

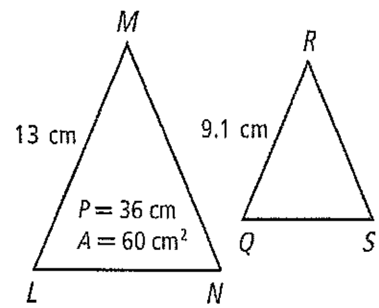
Similar Triangles **Similarity, Perimeter, and Area Ratios**

STATEMENT	RATIO
$\triangle ABC \sim \triangle DEF$ 	Similarity ratio: $\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF} = \frac{1}{2}$ Perimeter ratio: $\frac{\text{perimeter } \triangle ABC}{\text{perimeter } \triangle DEF} = \frac{12}{24} = \frac{1}{2}$ Area ratio: $\frac{\text{area } \triangle ABC}{\text{area } \triangle DEF} = \frac{6}{24} = \frac{1}{4} = \left(\frac{1}{2}\right)^2$

Theorem 7-5-1 **Proportional Perimeters and Areas Theorem**

If the similarity ratio of two similar figures is $\frac{a}{b}$, then the ratio of their perimeters is $\frac{a}{b}$, and the ratio of their areas is $\frac{a^2}{b^2}$, or $\left(\frac{a}{b}\right)^2$.

Given that ΔLMN:ΔQRT, find the perimeter P and area A of ΔQRS.

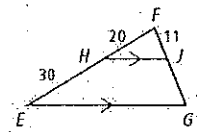


$\Delta ABC \sim \Delta DEF$, $BC = 4$ mm, and $EF = 12$ mm. If $P = 42$ mm and $A = 96\text{ mm}^2$ for ΔDEF, find the perimeter and area of ΔABC.

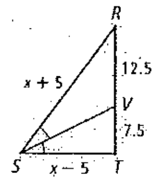
Warm Up

Find the length of each segment.

1. $\overline{JG}$



2. $\overline{SR}$ and $\overline{ST}$

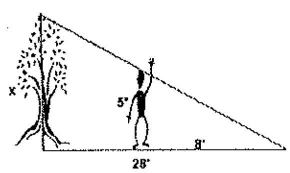


Indirect Measurement

- **Indirect Measurement**: A method of calculating a value that is difficult to measure directly
  - ***Example***: finding the height of a building or the distance across a lake

Example 1

At a certain time of the day, the shadow of a 5' boy is 8' long. The shadow of a tree at this same time is 28' long. How tall is the tree?



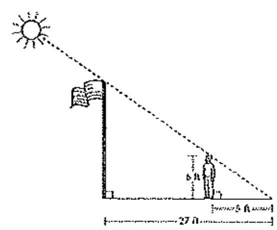
$$\frac{5}{8}=\frac{x}{28}$$

$$140 = 8x$$

$$x = 17.5$$

Example 2

Find the height of the flagpole.



$$\frac{6}{5}=\frac{x}{27}$$

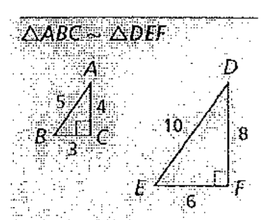
$$6 \cdot 27 = 5x$$

$$x = 32.4$$

Proportional Perimeters Theorem

If two triangles are ___similar___, then the ___perimeters___ are proportional to the measures of the corresponding sides.

Proportional Areas



- What is the ratio of the perimeters?
- What is the ratio of the areas?

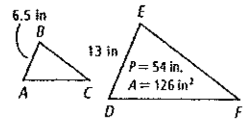
Video 3:30 minutes

Proportional Areas Theorem

If the scale factor of two similar figures is $\frac{a}{b}$, then the ratio of their areas is $\frac{a^2}{b^2}$ *or* $\left(\frac{a}{b}\right)^2$

Example 3

$\Delta ABC \sim \Delta DEF$. Find the perimeter and area of ΔABC.



Special Segments

Altitudes, Angle Bisectors, and Medians are all proportional to sides in similar triangles.

Name ______________________ Date __________ Class __________

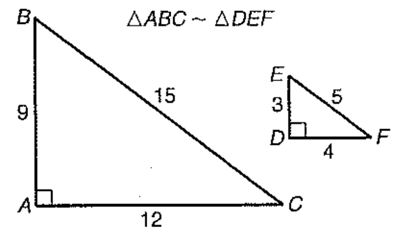
LESSON 7-5

Reteach

Using Proportional Relationships continued

Proportional Perimeters and Areas Theorem

If two figures are similar and their similarity ratio is $\frac{a}{b}$, then the ratio of their perimeters is $\frac{a}{b}$ and the ratio of their areas is $\left(\frac{a}{b}\right)^2$.

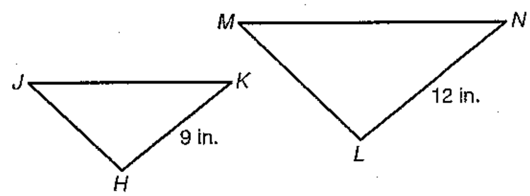


$$\frac{\text{perimeter of } \triangle ABC}{\text{perimeter of } \triangle DEF} = \frac{36}{12} = \frac{3}{1}$$

$$\frac{\text{area of } \triangle ABC}{\text{area of } \triangle DEF} = \frac{54}{6} = \frac{9}{1} = \left(\frac{3}{1}\right)^2$$

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD} = \frac{3}{1}$$

△*HJK* ~ △*LMN*. The perimeter of △*HJK* is 30 inches, and the area of △*HJK* is 36 square inches. Find the perimeter and area of △*LMN*.

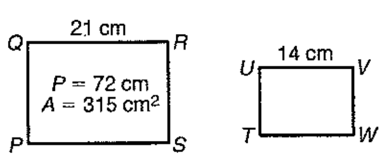


The similarity ratio of △*HJK* to △*LMN* = $\frac{9}{12} = \frac{3}{4}$.

$\frac{\text{perimeter of } \triangle HJK}{\text{perimeter of } \triangle LMN} = \frac{3}{4}$	The ratio of the perimeters equals the similarity ratio.
$\frac{30}{P} = \frac{3}{4}$	Substitute the known values.
$30(4) = P(3)$	Cross Products Property
$40 = P$	Simplify.
$\frac{\text{area of } \triangle HJK}{\text{area of } \triangle LMN} = \left(\frac{3}{4}\right)^2$	The ratio of the areas equals the square of the similarity ratio.
$\frac{36}{A} = \frac{9}{16}$	Substitute the known values.
$36(16) = A(9)$	Cross Products Property
$64 = A$	Simplify.

The perimeter of △*LMN* is 40 in., and the area is 64 in^2.

9. ▭*PQRS* ~ ▭*TUVW*. Find the perimeter and area of ▭*TUVW*.



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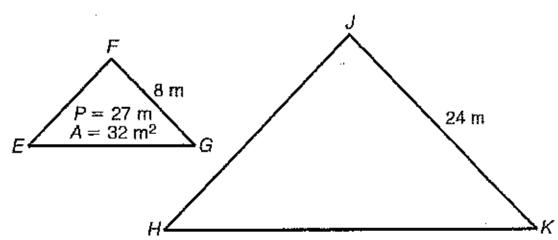
10. △*EFG* ~ △*HJK*. Find the perimeter and area of △*HJK*.



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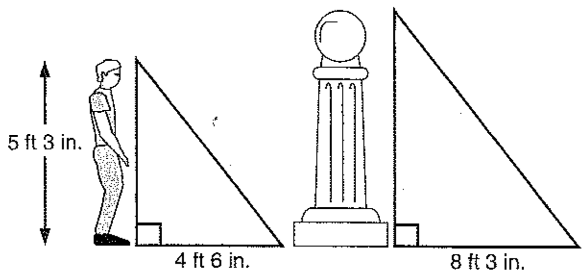
Name ______________________ Date __________ Class __________

LESSON 7-5

Problem Solving
Using Proportional Relationships

1. A student is standing next to a sculpture. The figure shows the shadows that they cast. What is the height of the sculpture?



____

2. At the halftime show during a football game, a marching band is to form a rectangle 50 yards by 16 yards. The conductor wants to plan out the band members' positions using a 14- by 8.5-in. sheet of paper. What scale should she use to fit both dimensions of the rectangle on the page? (Use whole inches and yards.)

____

3. An artist makes a scale drawing of a new lion enclosure at the zoo. The scale is 1 in : 25 ft. On the drawing, the length of the enclosure is $7\frac{1}{4}$ inches. What is the actual length of the lion enclosure?

____

4. A room is 14 feet long and 11 feet wide. If you made a scale drawing of the top view of the room using the scale $\frac{1}{2}$ in = 2 ft, what would be the length and width of the room in your drawing?

____

Choose the best answer.

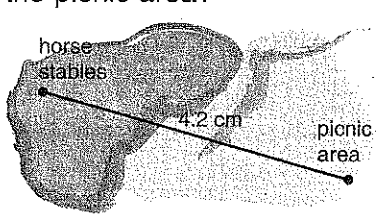
5. A visual-effects model maker for a movie draws a spaceship using a ratio of 1 : 24. The drawing of the spaceship is 22 inches long. What is the length of the spaceship in the movie?

   A 4 ft **C** 44 ft
   B 8 ft **D** 528 ft

6. A free-fall ride at an amusement park casts a shadow $43\frac{2}{3}$ feet long. At the same time, a 6-foot-tall person standing in line casts a shadow 2 feet long. What is the height of the ride?

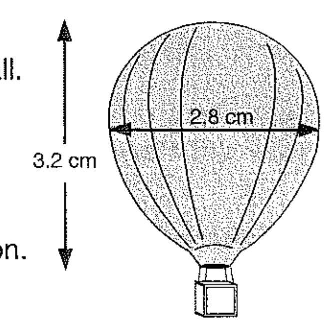
   F $21\frac{5}{6}$ ft **H** $98\frac{1}{4}$ ft
   G $65\frac{1}{2}$ ft **J** 131 ft

7. The scale of the park map is 1.5 cm = 60 m. Which is the best estimate for the actual distance between the horse stables and the picnic area?



   A 21.4 m **C** 168.0 m
   B 90.0 m **D** 288.0 m

8. A hot-air balloon is 26.8 meters tall. Use the scale drawing to find the actual distance across the hot-air balloon.



   F 23.45 m **H** 75.0 m
   G 30.6 m **J** 85.8 m

Name: ____________________________

Solve for x in each of the following proportions:

1. $\frac{x}{3}=\frac{15}{10}$

2. $\frac{1}{x}=\frac{5}{x+5}$

3. $\frac{x+4}{3}=\frac{5x-3}{8}$

Determine if each statement is *true* or *false.*

4. If $\frac{a}{b}=\frac{c}{d}$, then $\frac{a}{b}=\frac{d}{c}$.

5. If $\frac{a}{b}=\frac{c}{d}$, then $\frac{a+b}{b}=\frac{c+d}{d}$.

6. All congruent triangles are similar.

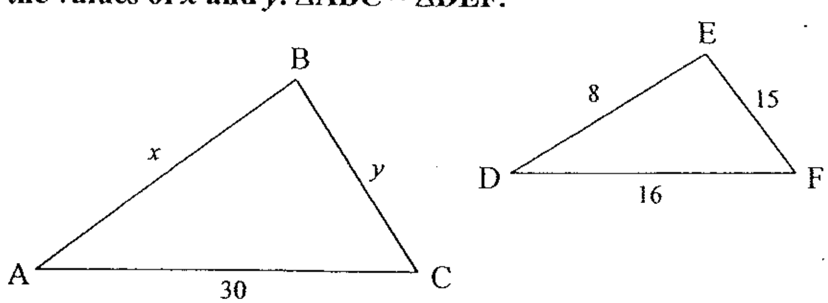
7. All similar triangles are congruent.

8. All isosceles triangles are similar.

9. All equilateral triangles are similar.

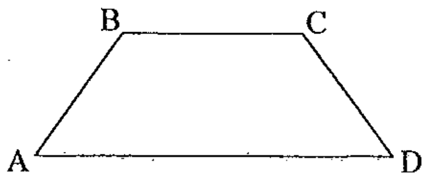
Find the values of x and y. $\triangle ABC \sim \triangle DEF$.

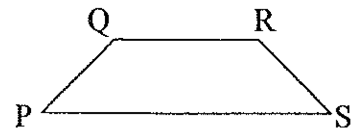
10.



What is the scale factor for $\triangle ABC$ and $\triangle DEF$?________

Use the fact that trap ABCD ~ trap PQRS to answer questions 11 and 12.





11. QR = $x + 3$ PQ = 4
BC = $x + 5$ AB = 5

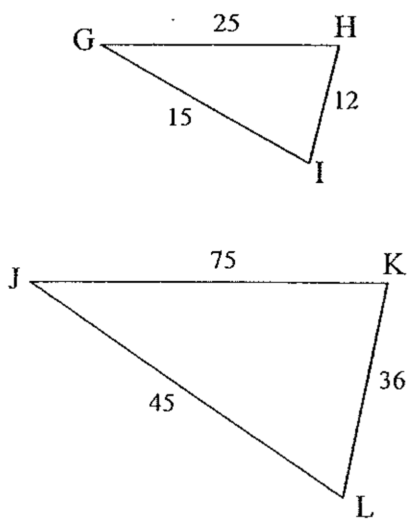
Find BC, QR.

12. DA = $x + 2$ PQ = 3
PS = 5 AB = $x - 3$

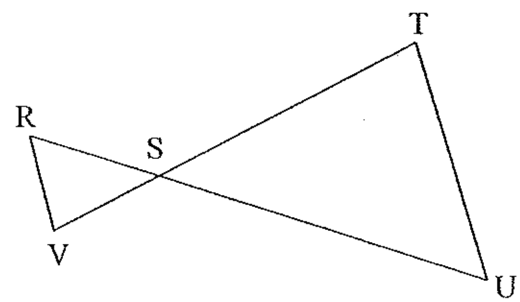
Find AB, DA.

Are the following pairs of triangles similar? If so, name the similar triangles. Then state the theorem you would use to prove they are similar.

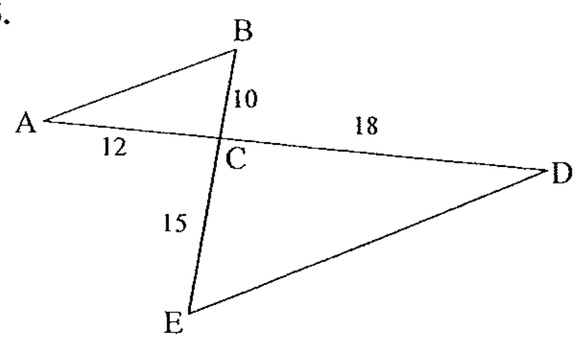
13.



14.

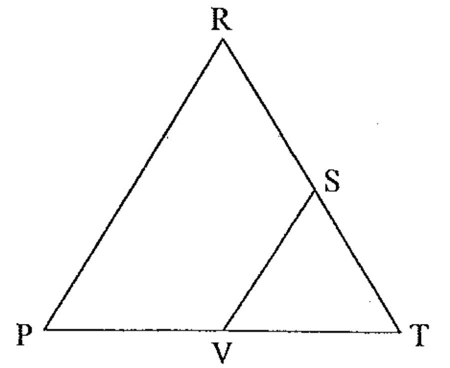


15.

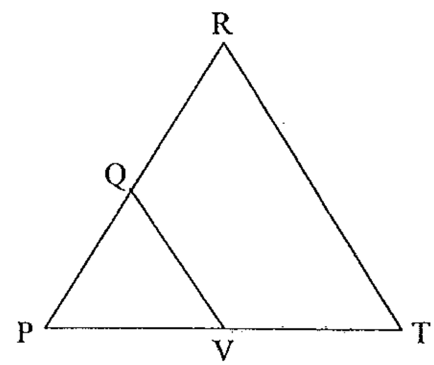


Solve for x in problems 16-17.

16. $\overline{SV} \parallel \overline{PR}$
TS = $5 + x$
TV = $8 + x$
VP = 4
SR = 3

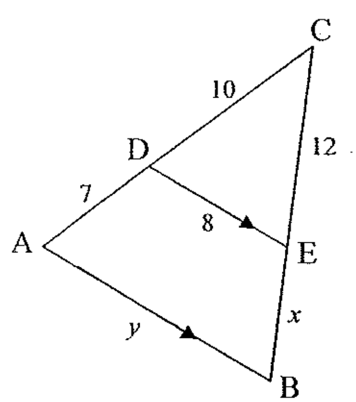


17. $\overline{RT} \parallel \overline{QV}$
TV = 45
PV = x
PQ = 9
QR = 27

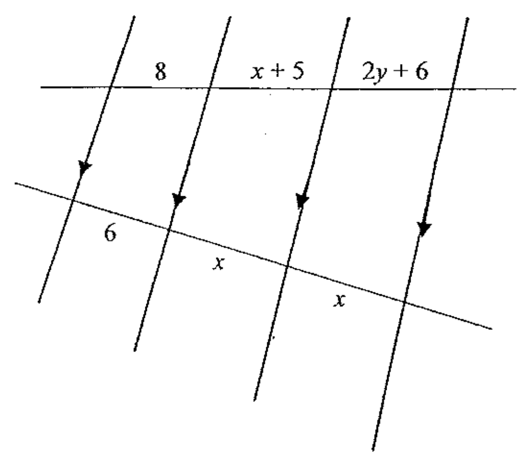


Solve for the variable(s) in each of the following problems.

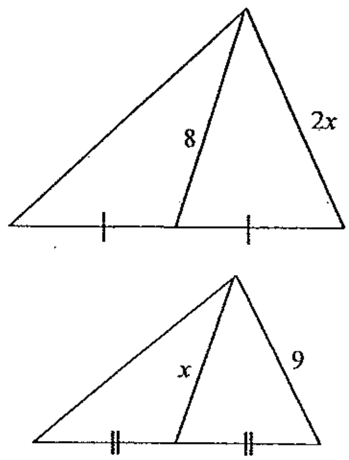
18.



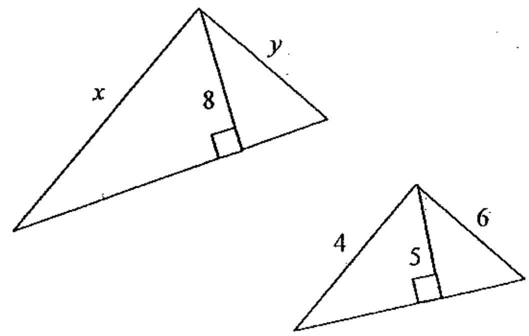
19.



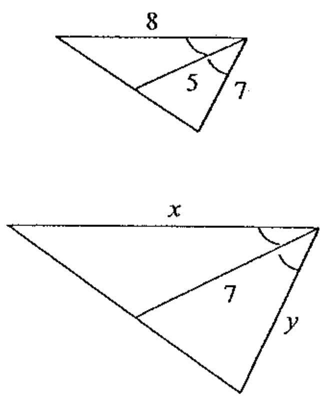
20.



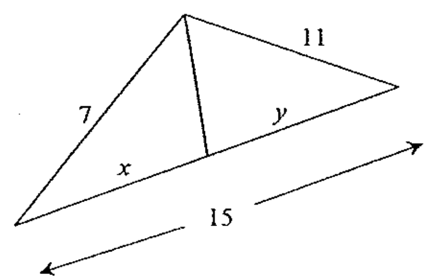
21.



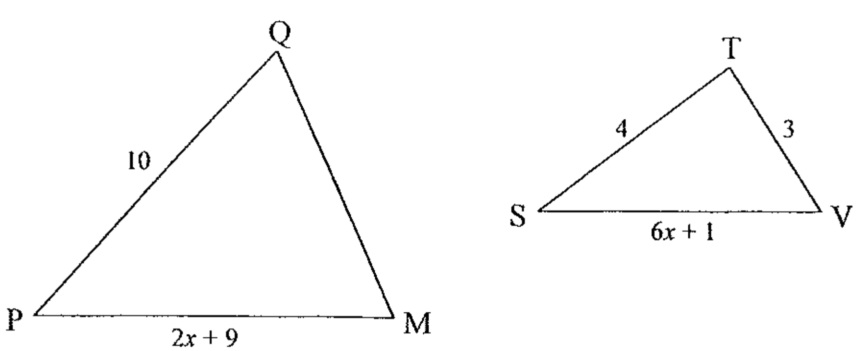
22.



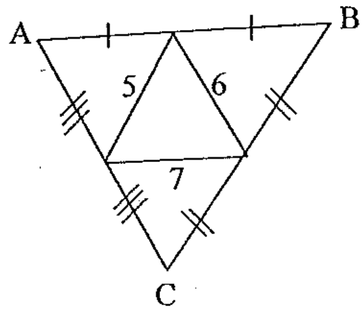
23.



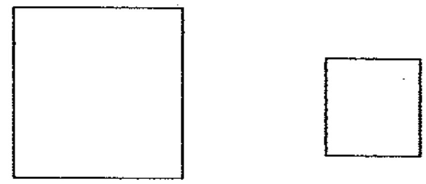
24. If ΔSTV ~ ΔPQM, find the perimeter of ΔPQM.



25. Find the perimeter of ΔABC.



26. Find the ratio of the sides if the areas are 25 and 9 square units.



27. If ΔDEC ~ ΔDAB, m∠A = 35, m∠DCE = 72, AE = 16, ED = 4, DC = 3, EC = 5, find:

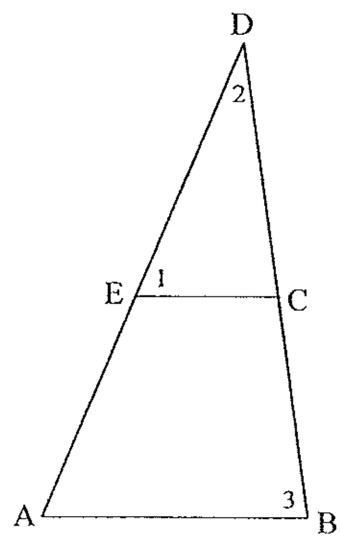
m∠1 =

m∠2 =

m∠3 =

DB =

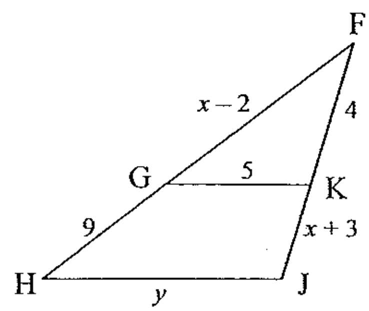
AB =



28. A twin-jet airplane has a length of 78 meters and a wingspan of 90 meters. If a scale model is made with a wingspan of 36 centimeters, find its length.

29. The ratio of the sides of a triangle is 2:3:4. If the perimeter of the triangle is 117, what is the length of each side?

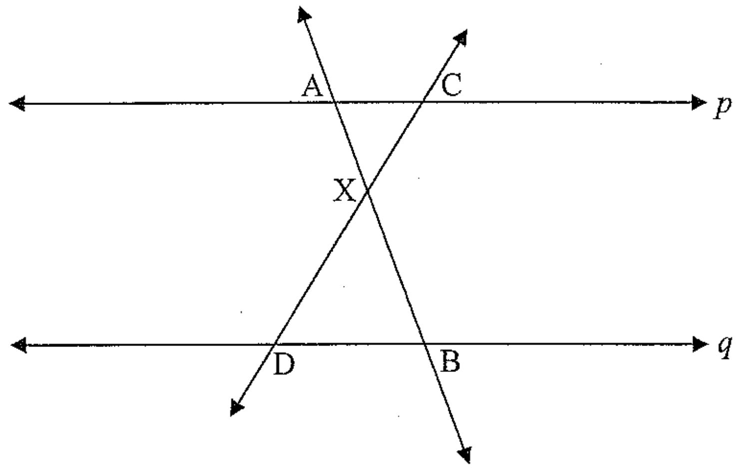
30. If $\overline{GK} \parallel \overline{HJ}$, find the perimeter of ΔHJF.



Name: ______________________

1. ***Given***: $p \parallel q$

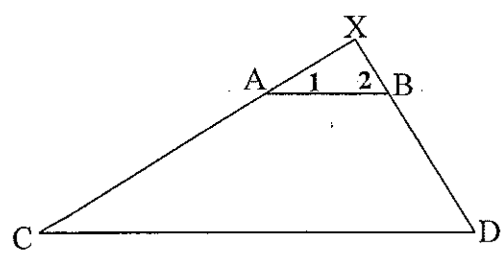
Prove: $\frac{AX}{BX} = \frac{CX}{DX}$

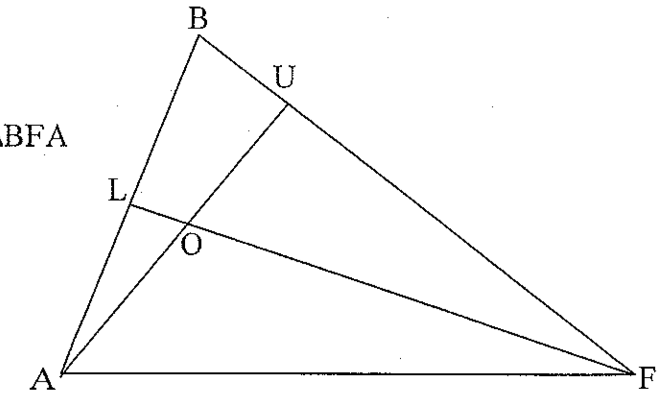


1. ______________________	1. ______________________
2. $\angle ACX \cong \angle XDB$	2. ______________________
3. ______________________	3. Vertical angles are congruent
4. Δ __________ $\sim \Delta$ __________	4. ______________________
5. ______________________	5. if Δ's ~ → sides proportional

2. ***Given***: $\overline{AB} \parallel \overline{CD}$

Prove: $\Delta XAB \sim \Delta XCD$

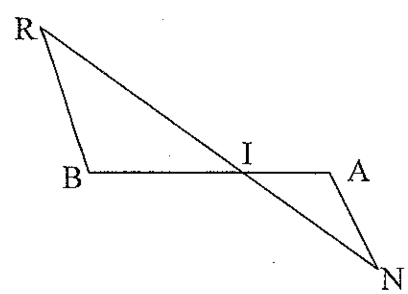




3. ***Given***: $\overline{AU}$ and $\overline{FL}$ are altitudes of ΔBFA

Prove: $\frac{AO}{FO} = \frac{OL}{OU}$

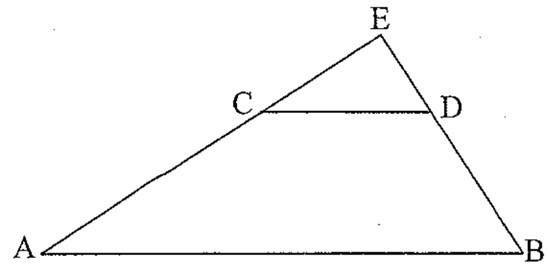
Statements	Reasons
1. ________	1. ________
2. ________	2. if altitude → ⊥ to opp side
3. ∠ALO & ∠OUF are right ∠'s	3. ________
4. ________	4. all right ∠'s are ≅
5. ________	5. vertical ∠'s are ≅
6. Δ ______ ~ Δ ______	6. ________
7. ________	7. ________



4. ***Given***: $\frac{BI}{IA} = \frac{RI}{IN}$

Prove: $\overline{RB} \parallel \overline{AN}$

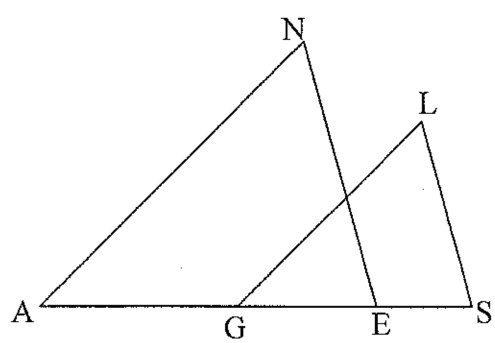
Statements	Reasons
1. ________	1. ________
2. ________	2. vertical ∠'s are ≅
3. Δ ______ ~ Δ ______	3. ________
4. ________	4. if Δ's ~ → corresponding ∠'s ≅
5. ________	5. ________



5. ***Given***: $\frac{ED}{EB} = \frac{EC}{EA}$

Prove: $\overline{AB} \parallel \overline{CD}$

1.	____________	1.	____________
2.	____________	2.	Reflexive
3.	____________	3.	SAS ~ (1, 2, 1)
4.	$\angle ECD \cong \angle A$	4.	____________
5.	____________	5.	____________



6. ***Given***: $\frac{AN}{GL} = \frac{NE}{LS} = \frac{AE}{GS}$

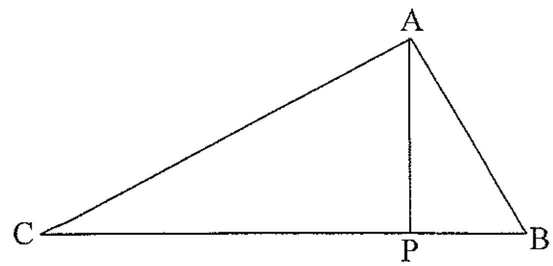
Prove: $\overline{NE} \parallel \overline{LS}$

1.	____________	1.	____________
2.	____________	2.	SSS ~ (1, 1, 1)
3.	____________	3.	____________
4.	____________	4.	____________

7. ***Given***: $\overline{AP}$ is an altitude of $\triangle ABC$

$$\frac{CP}{AP} = \frac{AP}{PB}$$

Prove: $\triangle APC \sim \triangle BPA$



8. ***Given***: $\overline{MI} \parallel \overline{HC}$

Prove: $\triangle MLI \sim \triangle CLH$