Name: _____ Date: _____ Block: _____

Congruent/Similar Triangles STUDY GUIDE

Things to Know:

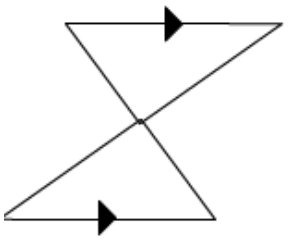
- Quizlet flashcards can be found here: http://quizlet.com/3886720/geometry-chapter-4-5-congruent-triangles-flash-cards/ and http://quizlet.com/3886755/geometry-chapter-6-similar-triangles-flash-cards/
- Triangles **can** be proven congruent by: SSS post., SAS post., HL thm., ASA post., AAS thm.
- Triangles **cannot** be proven congruent by: AAA or SSA
- Once triangles are proven congruent, corresponding parts can be concluded congruent by **CPCTC**.
- ***Base Angles Theorem and Converse***: Two sides of a triangle are congruent IFF the angles opposite them are congruent.
- ***Corollaries to Base Angle Theorem and Converse***: A triangle is equilateral IFF it is equiangular.
- **Proportions**: ratio, proportion, means, extremes, cross product property, geometric mean (mean proportional), extended ratios, proportion rules (reciprocals, interchanging means, adding denominators to numerators – basically make sure product of means = product of extremes)
- **Similarity**: similar vs. congruent polygons, similarity postulates/theorems: AA, SSS, SAS, similar polygon perimeters (have the same scale factor as corresponding sides)
- **Other similarity theorems**:
  - *Triangle Proportionality Theorem* (and converse): line is || to one side of a triangle IFF it intersects the other 2 sides proportionally
  - *Transversal similarity theorem*: 3 || lines intersect two transversals divide the transversals proportionally
  - *Angle bisector similarity theorem*: an angle bisector divides the opposite side proportionally to the other two sides
- **Triangle Segment Theorems/Properties**:
  - The segment connecting the midpoints of two sides (the midsegment) of a triangle is parallel to the third side and is half as long as that side.
  - In a plane, a point is on the perpendicular bisector of a segment IFF it is equidistant from the endpoints of the segment.
  - A perpendicular bisector intersects a side of a triangle at its midpoint.
  - A perpendicular bisector intersects a side of a triangle at a right angle.
  - A point is on the bisector of an angle IFF it is in the interior of the angle and is equidistant from the two sides of the angle.
  - Medians are segments in a triangle from a vertex to the midpoint of the opposite side.

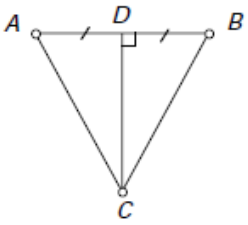
- The endpoints of an altitude are a vertex of a triangle and a point on the vertex's opposite side that makes the altitude and side perpendicular.

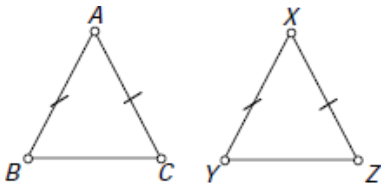
- DON'T LIMIT TEST PREPARATION TO THIS STUDY GUIDE! Look over notes, homework, checkpoints, and other assignments

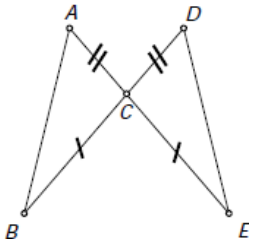
Practice questions:

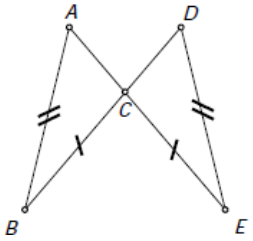
1) Are the triangles congruent? If so, what congruence theorem/postulate can be used. If not, why not?

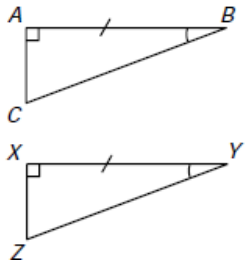
a) 

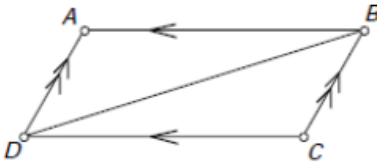
b) 

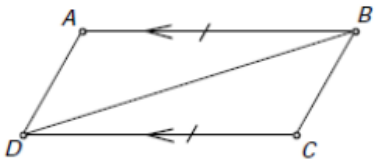
c) 

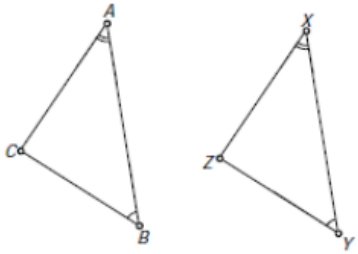
d) 

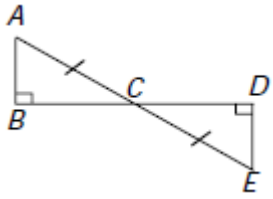
e) 

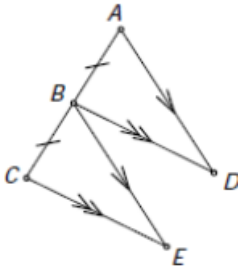
f) 

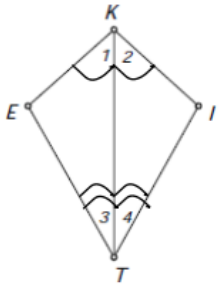
g) 

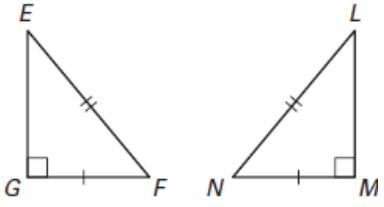
h) 

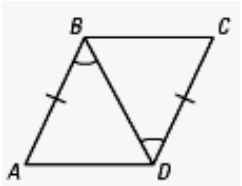
i) 

j) 

k) 

l) 

m) 

n) 

2) Use the given coordinates to determine if $\Delta ABC \cong \Delta DEF$. If not, why not?

a) $A(-4, -1)$, $B(-2, 0)$, $C(0, -3)$; $D(4, 1)$, $E(2, 0)$, $F(0, 3)$

b) $A(-3, 2)$, $B(6, 1)$, $C(-3, 4)$; $D(6, 5)$, $E(-2, 4)$, $F(-1, -7)$

3) Is it possible to prove $\Delta ABC \cong \Delta DEF$ using the given information? If so, state the postulate or theorem that you would use.

a) $\overline{AB} \cong \overline{DE}$, $\overline{AC} \cong \overline{DF}$, $\overline{BC} \cong \overline{EF}$

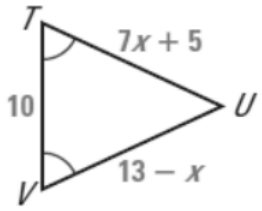
b) $\angle A \cong \angle D$, $\overline{AB} \cong \overline{DE}$, $\overline{BC} \cong \overline{EF}$

c) $\angle A \cong \angle D$, $\angle C \cong \angle F$, $\angle B \cong \angle E$

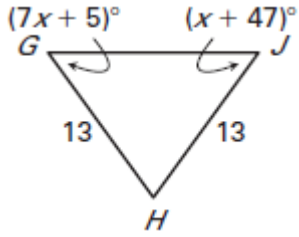
d) $\angle A \cong \angle D$, $\angle C \cong \angle F$, $\overline{BC} \cong \overline{EF}$

4) Find the value of the variables.

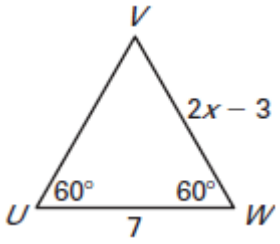
a)



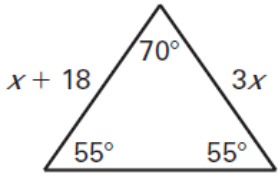
b)



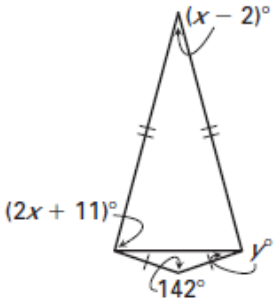
c)



d)



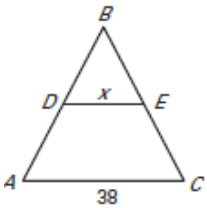
e)



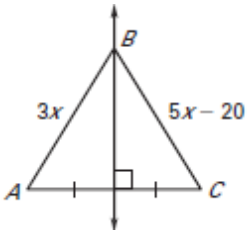
5) Answer the questions about triangle segments.

a) $\overline{DE}$ is a midsegment of ΔABC.

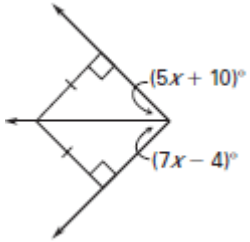
Find x.



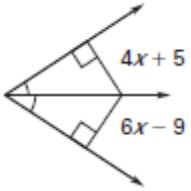
b) Find x. What theorem did you use?



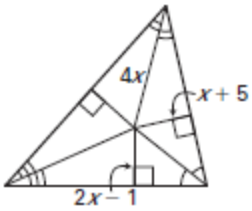
c) Find x.



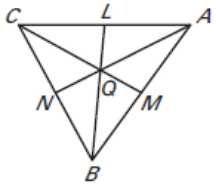
d) Find x.



e) Find x.



f) $QC = 12$. Find CM.

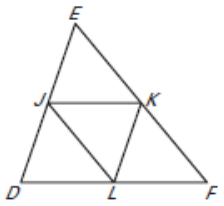


6) Use ΔDEF, where *J*, *K*, and *L* are midpoints of the sides, to answer the questions.

a) If $DE = 8x + 12$ and $KL = 10x - 9$, what is *DE*?

b) If $JL = 7x - 6$ and $EF = 9x + 8$, what is *EK*?

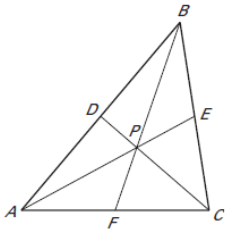
c) If $DF = 18x - 6$ and $JK = 3x + 11$, what is *JK*?



7) In the figure, P is the centroid of ΔABC and $BP=8$.

a) Find the length of $\overline{BF}$.

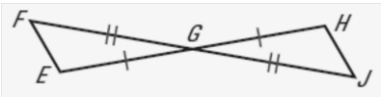
b) Find the length of $\overline{FP}$.



8) Write a proof.

Given: $\overline{FG} \cong \overline{JG}; \overline{EG} \cong \overline{HG}$

Prove: $\overline{EF} \cong \overline{HJ}$

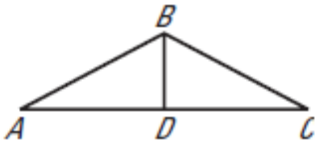


Statements	*Reasons*

9) Write a proof.

Given: ΔABC is isosceles; $\overline{BD}$ bisects $\angle ABC$.

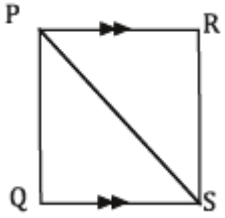
Prove: $\Delta ABD \cong \Delta CBD$



Statements	*Reasons*

10) Write a proof.

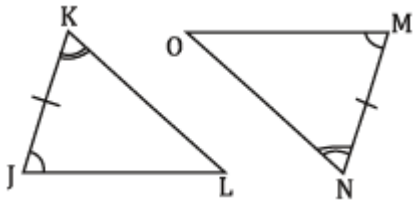
Given: $\overline{PR} \parallel \overline{QS}$, $\angle QPS \cong \angle RSP$.
Prove: $\Delta PQS \cong \Delta SRP$



Statements	*Reasons*

11) Write a proof.

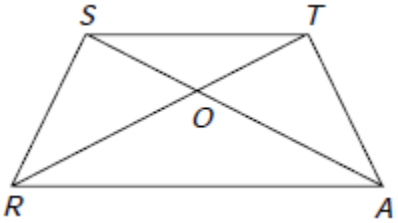
Given: $\angle J \cong \angle M$, $\overline{JK} \cong \overline{MN}$, and $\angle K \cong \angle N$
Prove: $\overline{JL} \cong \overline{MO}$



Statements	*Reasons*

12) Write a proof.

Given: $\overline{RT} \cong \overline{AS}$, $\overline{RS} \cong \overline{AT}$
Prove: $\angle TSA \cong \angle STR$



Statements	*Reasons*

13) The measures of the angles of a triangle are in the extended ratio 1:3:5. Find the measures of the angles of the triangle.

14) Solve the proportions:

a) $\frac{x+6}{3} = \frac{x-5}{2}$

b) $\frac{x-2}{4} = \frac{x+10}{10}$

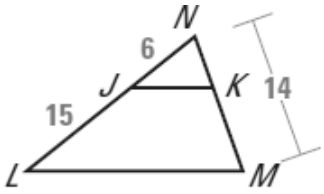
15) Find the geometric mean of the two numbers in simplest radical form:

a) 9 and 16 b) 7 and 11 c) 2 and 25

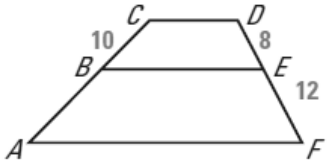
16) Complete the statement:

If $\frac{7}{x}=\frac{9}{y}$ then $\frac{x}{7}=\frac{?}{?}$

17) Given $\frac{NJ}{NK}=\frac{NL}{NM}$, find *NK*.

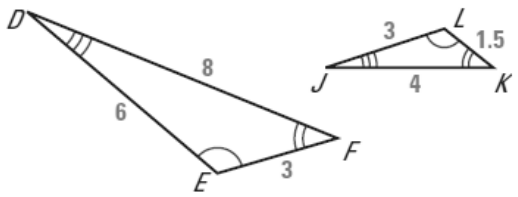


18) Given $\frac{CB}{DE}=\frac{BA}{EF}$, find *CA*.

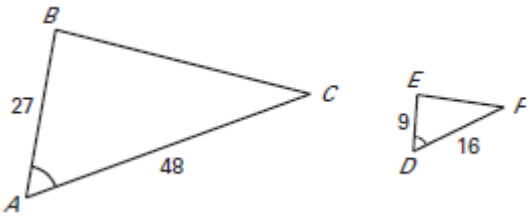


19) Determine whether the polygons are similar; if they are, state the similarity postulate/theorem used, write a similarity statement, and find the scale factor if possible.

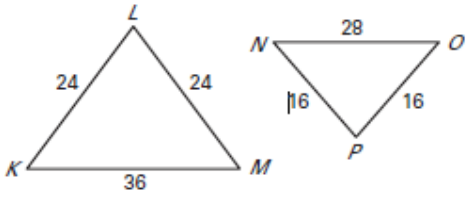
a)



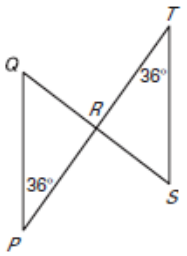
b)



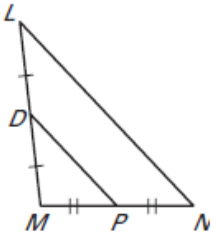
c)



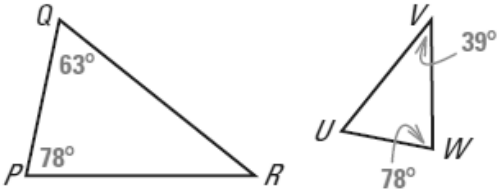
d)



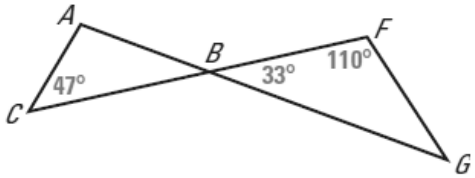
e)



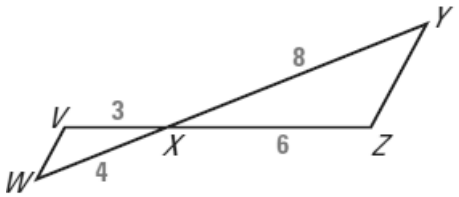
f)



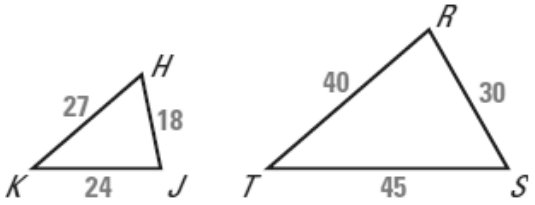
g)



h)



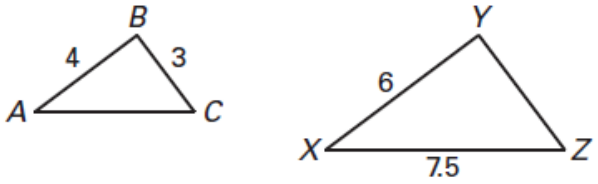
i)



20) In the diagram, $\Delta ABC \sim \Delta XYZ$.

a) Find YZ

b) Find AC

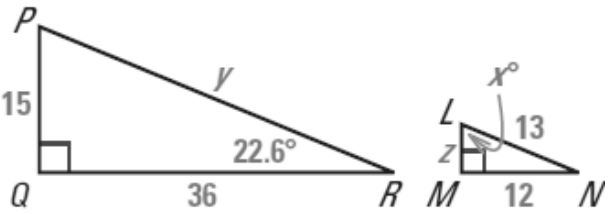


21) In the diagram, $\Delta PQR \sim \Delta LMN$

a) Find the scale factor of ΔPQR to ΔLMN.

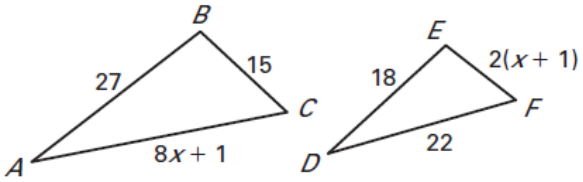
b) Find the values of x, y, and z.

c) Find the perimeter of each triangle.

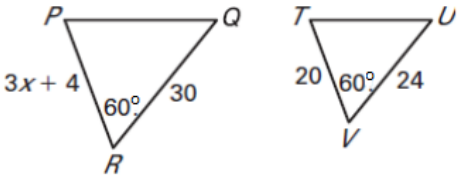


22) Find the value of x that makes the triangles similar.

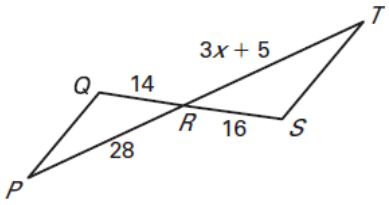
a)



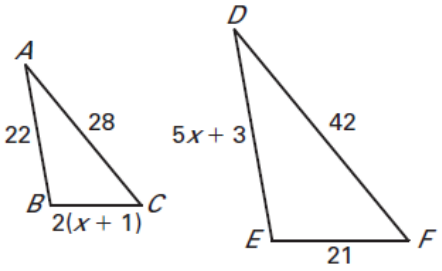
b)



c)

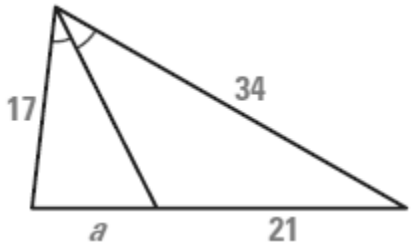


d)

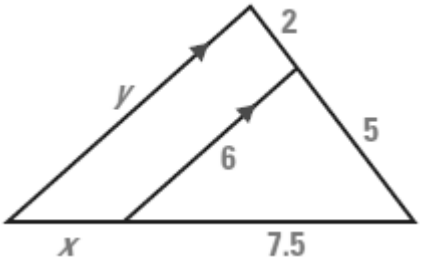


23) Use the diagram to find the value of each variable.

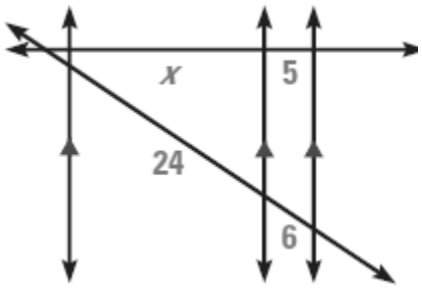
a)



b)



c)



Study Guide Answers

1) a) no, AAA insufficient for congruence b) yes, SAS c) yes, AAS d) yes, SAS e) no, SSA insufficient for congruence f) yes, ASA g) yes, ASA h) yes, SAS i) no, AAA insufficient for congruence j) yes, AAS k) yes, ASA l) yes, ASA m) yes, HL n) yes, SAS

2) a) yes, by SSS b) not congruent; corresponding sides are not congruent so not SSS

3) a) yes, SSS b) no c) no d) yes, AAS

4) a) $x=1$ b) $x = 7$ c) $x = 5$ d) $x=9$ e) $x = 32$, $y = 19$

5) a) $x=19$ b) $x=10$; perpendicular bisector theorem c) $x=7$ d) $x=7$ e) $x=6$ f) $CM = 18$

6) a) $DE = 32$ b) $EK = 22$ c) $JK = 18$

7) a) $BF=12$ b) $FP=4$

8) 1) $\overline{FG} \cong \overline{JG}; \overline{EG} \cong \overline{HG}$ (given) 2) $\angle FGE \cong \angle JGH$ (vertical angles are congruent) 3) $\Delta FGE \cong \Delta JGH$ (SAS) 4) $\overline{EF} \cong \overline{HJ}$ (CPCTC)

9) 1) ΔABC is isosceles (given) 2) $\overline{AB} \cong \overline{CB}$ (def. of isosceles Δ) 3) $\angle A \cong \angle C$ (angles opposite $\cong$ sides of isosceles Δ are $\cong$) 3) $\overline{BD}$ bisects $\angle ABC$ (given) 4) $\angle ABD \cong \angle CBD$ (definition of angle bisector) 4) $\Delta ABD \cong \Delta CBD$ (ASA)

10) 1) $\overline{PR} \parallel \overline{QS}$ (given) 2) $\angle RPS \cong \angle QSP$ (alt. int. $\angle$s of parallel lines are $\cong$) 3) $\overline{PS} \cong \overline{SP}$ (reflexive prop. of $\cong$) 4) $\angle QPS \cong \angle RSP$ (given) 5) $\Delta PQS \cong \Delta SRP$ (ASA)

11) 1) $\angle J \cong \angle M$ (given) 2) $\overline{JK} \cong \overline{MN}$ (given) 3) $\angle K \cong \angle N$ (given) 4) $\Delta JKL \cong \Delta MNO$ (ASA) 5) $\overline{JL} \cong \overline{MO}$ (CPCTC)

12) 1) $\overline{RT} \cong \overline{AS}$ (given) 2) $\overline{RS} \cong \overline{AT}$ (given) 3) $\overline{ST} \cong \overline{TS}$ (reflexive prop. of $\cong$) 4) $\Delta TSR \cong \Delta TSA$ (SSS) 5) $\angle TSA \cong \angle STR$ (CPCTC)

13) 20°, 60°, 100°

14) a) $x=27$ b) $x=10$

15) a) 12 b) $\sqrt{77}$ c) $5\sqrt{2}$

16) $\frac{y}{9}$

17) $NK=4$

18) $CA=25$

19) a) $\Delta EFD \sim \Delta LKJ$ by AA (other theorems/postulates may also be defended); s.f. 2:1
b) $\Delta ABC \sim \Delta DEF$ by SAS; s.f. 3:1
c) not similar (different scale factors)
d) $\Delta PQR \sim \Delta TSR$ by AA; don't know scale factor
e) $\Delta PMD \sim \Delta NML$ by SAS; don't know scale factor
f) $\Delta PQR \sim \Delta WUV$ by AA ($m\angle R = 39°$); don't know scale factor
g) Triangles are not similar, since angles are not the same measure
h) $\Delta XVW \sim \Delta XZY$ by SAS (vertical angles; sides in proportion); s.f. 1:2
i) $\Delta JHK \sim \Delta STR$ by SSS (sides are in proportion w/ s.f. 3:5 - $\frac{JH}{RS} = \frac{JK}{RT} = \frac{KH}{TS} = \frac{3}{5}$

20) a) $YZ=4.5$ b) $AC=5$

21) a) s.f.=3:1 b) $x = 67.4$, $y = 39$, $z = 5$ c) perimeter of ΔPQR =90; perimeter of ΔLMN = 30

22) a) $x=4$ b) $x=7$ c) $x=9$ d) $x=6$

23) a) $a=20.5$ b) $x=3$, y=8.4 c) $x=20$