Geometry 1-2
Proving Triangle Properties

UNIT 4

Name:_____
Teacher: _____ Per:___

My academic goal for this unit is...

Check for Understanding Key:

- ● Understanding at start of the unit
- | Understanding after practice
- ▲ Understanding before unit test

LEARNING TARGETS		How is my understanding?	Test Score	Retake?
4a	I can apply the triangle sum conjecture.	1 2 3 4		
4b	I can apply the isosceles triangle conjecture and its converse.	1 2 3 4		
4c	I can write a linear equation.	1 2 3 4		
4d	I can apply triangle inequalities to determine a range of possible side lengths.	1 2 3 4		
4e	I can determine if triangles are congruent using the congruence shortcuts (SSS, SAS, ASA, AAS).	1 2 3 4		
4f	I can prove corresponding parts of congruent triangles are congruent (CPCTC).	1 2 3 4		
4g	I can prove the isosceles triangle conjectures.	1 2 3 4		

What was your favorite geometric construction using compass and straightedge?

DP/1 **Developing Proficiency** Not yet, Insufficient	CP/2 **Close to Proficient** Yes, but..., Minimal	PR/3 **Proficient** Yes, Satisfactory	HP/4 **Highly Proficient** WOW, Excellent
I can't do it and am not able to explain process or key points	I can sort of do it and am able to show process, but not able to identify/explain key math points	I can do it and able to both explain process and identify/explain math points	I'm great at doing it and am able to explain key math points accurately in a variety of problems

Unit 4 Conjectures

Title	*Conjecture*	*Diagram*
Triangle Sum Conjecture	The sum of the measures of the angles in every triangle is…	
Third Angle Conjecture	If two angles of one triangle are congruent to two angles of another triangle, then the third angle in each triangle…	
Isosceles Triangle Conjecture	If a triangle is isosceles, then…	
Converse of the Isosceles Tri. Conjecture	If a triangle has two congruent angles, then…	
Triangle Inequality Conjecture	The sum of the lengths of two sides of a triangle are _____ the length of the third side.	
Side-Angle Inequality Conjecture	In a triangle, if one side is longer than another side, then the angle opposite the longer side is…	
Triangle Exterior Angle Conjecture	The measure of an exterior angle of a triangle…	
Side-Side-Side (SSS) Congruence Conjecture	If the three sides of one triangle are congruent to the three sides of another triangle, then…	

Unit 4 Conjectures

Title	***Conjecture***	***Diagram***
Side-Angle-Side (SAS) Congruence Conjecture	If two sides and the included angle of one triangle are congruent to two side and the included angle of another triangle, then…	
Angle-Side-Angle (ASA) Congruence Conjecture	If two angles and the included side of one triangle are congruent to two angles and the included side of another triangle, then…	
Angle-Angle-Side (AAS) Congruence Conjecture	If two angles and a non-included side of one triangle are congruent to two angles and a non-included side of another triangle, then…	
Vertex Angle Bisector Conjecture	In an isosceles triangle, the angle bisector of the vertex angle is also… and…	
Equilateral/ Equiangular Triangle Conjecture	Every equilateral triangle is… and conversely, every equiangular triangle is also…	

Notes

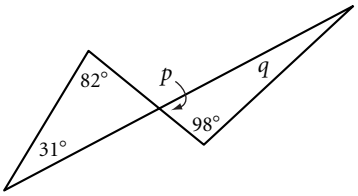
Notes

Lesson 4.1 • Triangle Sum Conjecture

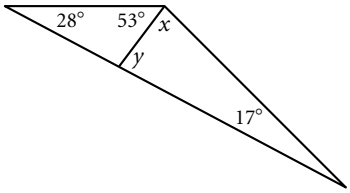
Name _____ **Period** _____ **Date** _____

In Exercises 1–9, determine the angle measures.

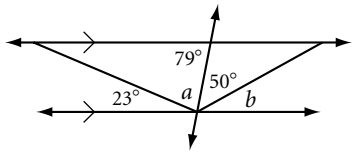
1. $p =$ _____, $q =$ _____



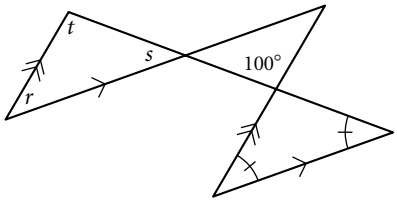
2. $x =$ _____, $y =$ _____



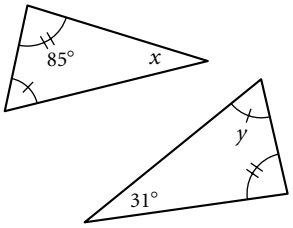
3. $a =$ _____, $b =$ _____



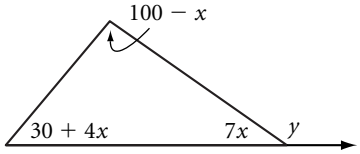
4. $r =$ _____, $s =$ _____, $t =$ _____



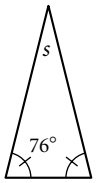
5. $x =$ _____, $y =$ _____



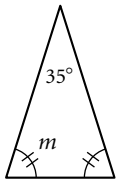
6. $y =$ _____



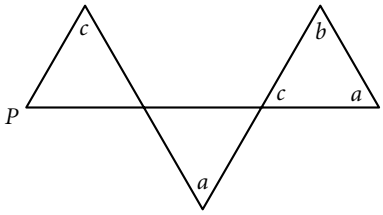
7. $s =$ _____



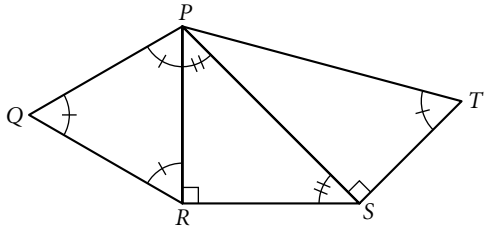
8. $m =$ _____



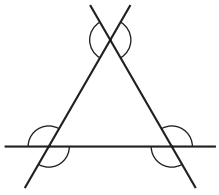
9. $m\angle P =$ _____



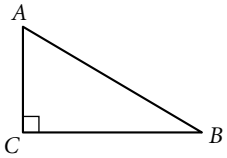
10. Find the measure of $\angle QPT$.



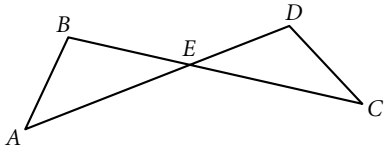
11. Find the sum of the measures of the marked angles.



12. Use the diagram to explain why $\angle A$ and $\angle B$ are complementary.



13. Use the diagram to explain why $m\angle A + m\angle B = m\angle C + m\angle D$.



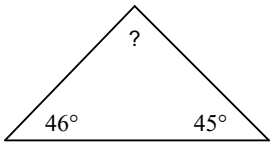
Geometry 1-2 Name: _____

Triangle Sum Conjecture

Date: _____ Period: _____

Find the measure of each angle indicated.

1)



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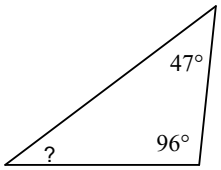

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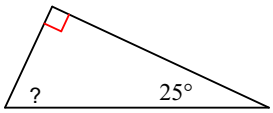
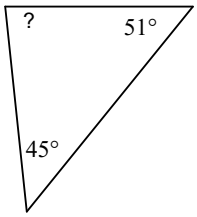
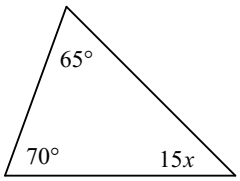


4)



Solve for *x*.

5)



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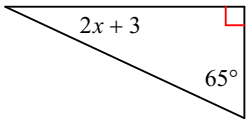
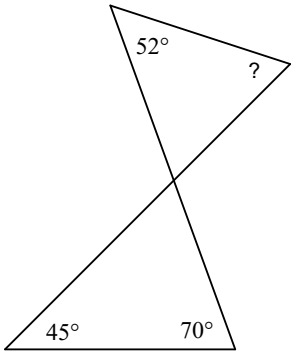


Find the measure of each angle indicated.

7)



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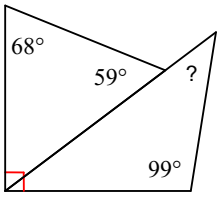

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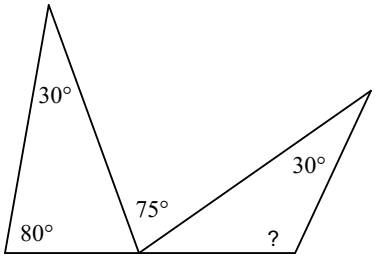
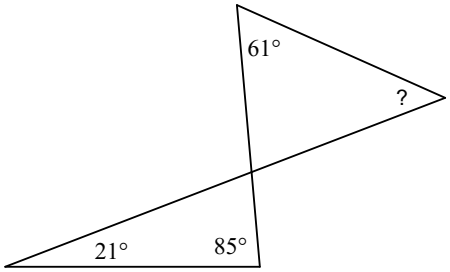


10)

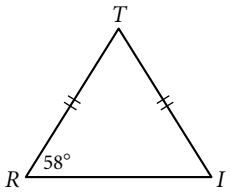


Lesson 4.2 • Properties of Isosceles Triangles

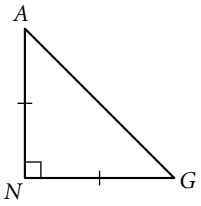
Name _____ **Period** _____ **Date** _____

In Exercises 1–3, find the angle measures.

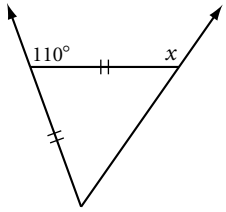
1. $m\angle T =$ _____



2. $m\angle G =$ _____

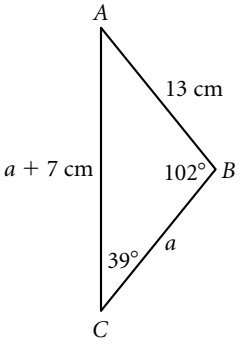


3. $x =$ _____

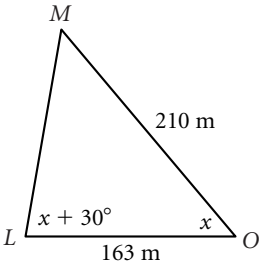


In Exercises 4–6, find the measures.

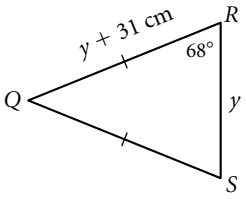
4. $m\angle A =$ _____, perimeter of $\triangle ABC =$ _____



5. The perimeter of $\triangle LMO$ is 536 m. $LM =$ _____, $m\angle M =$ _____



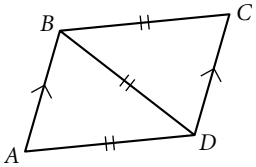
6. The perimeter of $\triangle QRS$ is 344 cm. $m\angle Q =$ _____, $QR =$ _____



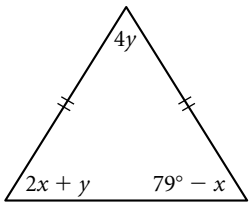
7. a. Name the angle(s) congruent to $\angle DAB$.

b. Name the angle(s) congruent to $\angle ADB$.

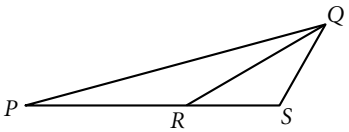
c. What can you conclude about $\overline{AD}$ and $\overline{BC}$? Why?



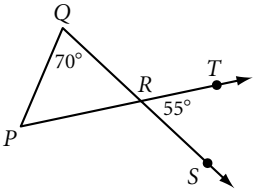
8. $x =$ _____, $y =$ _____



9. $PR = QR$ and $QS = RS$. If $m\angle RSQ = 120°$, what is $m\angle QPR$?



10. Use the diagram to explain why $\triangle PQR$ is isosceles.



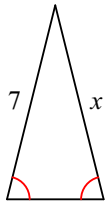
Geometry 1-2 Name: _____

Isosceles and Equilateral Triangles

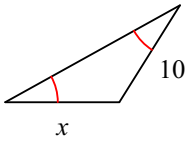
Date: _____ Period: _____

Find the value of *x*.

1)



2)



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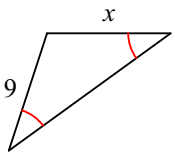

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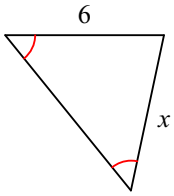
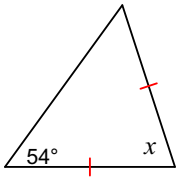


5)



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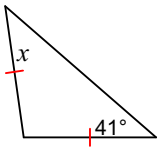

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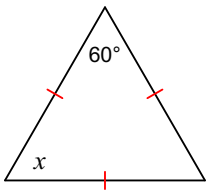

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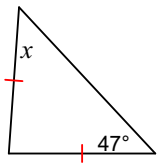

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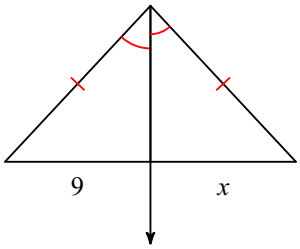

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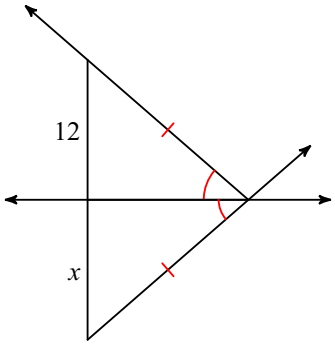

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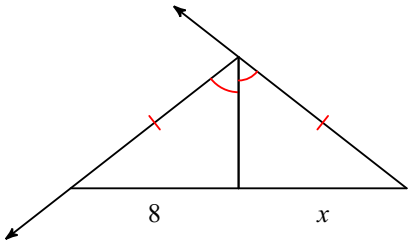

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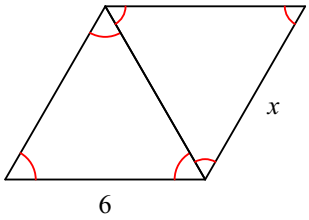
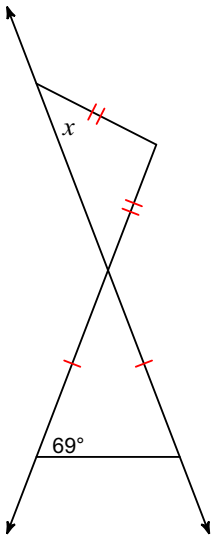


13)



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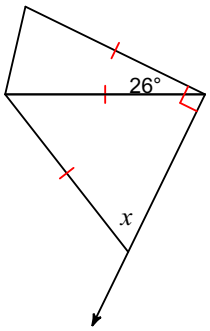

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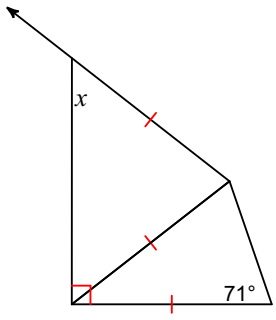

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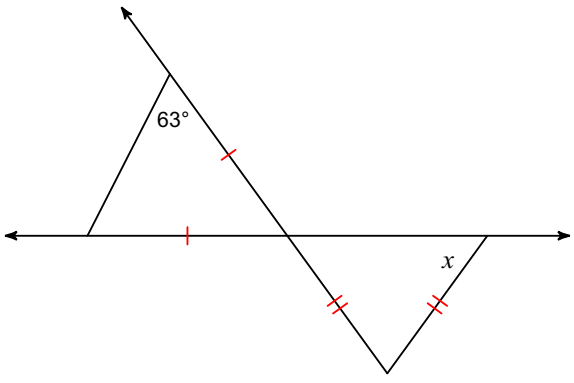


Lesson 4.3 • Triangle Inequalities

Name _____ **Period** _____ **Date** _____

In Exercises 1 and 2, determine whether it is possible to draw a triangle with sides of the given measures. If it is possible, write yes. If it is not possible, write no and make a sketch demonstrating why it is not possible.

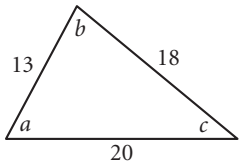
1. 16 cm, 30 cm, 45 cm

2. 9 km, 17 km, 28 km

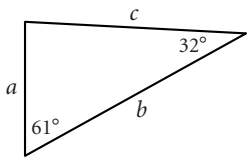
3. If 17 and 36 are the lengths of two sides of a triangle, what is the range of possible values for the length of the third side?

In Exercises 4–6, arrange the unknown measures in order from greatest to least.

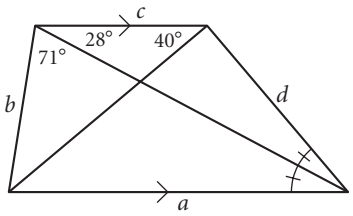
4.



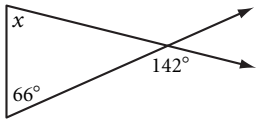
5.



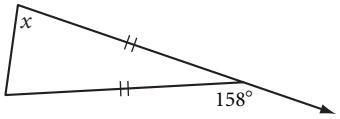
6.



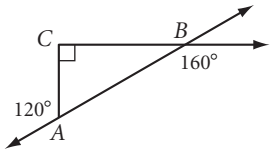
7. $x =$ _____



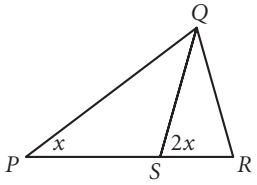
8. $x =$ _____



9. What's wrong with this picture?



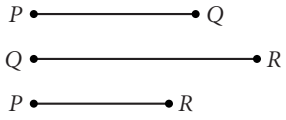
10. Explain why $\triangle PQS$ is isosceles.



In Exercises 11 and 12, use a compass and straightedge to construct a triangle with the given sides. If it is not possible, explain why not.

11.

12.



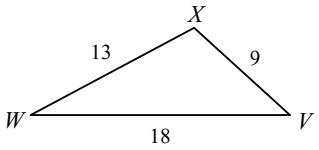
Geometry 1-2 Name: _____

Triangle Inequalities

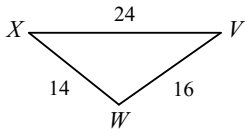
Date: _____ Period: _____

Order the angles in each triangle from smallest to largest.

1)

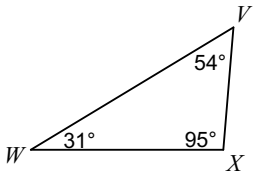


2)

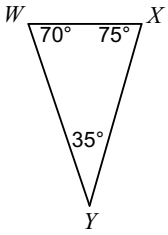


Order the sides of each triangle from shortest to longest.

3)



4)



State if the three numbers can be the measures of the sides of a triangle.

5) 6, 7, 9

6) 7, 7, 3

Two sides of a triangle have the following measures. Find the range of possible measures for the third side.

7) 10, 11

8) 7, 12

9) 8, 8

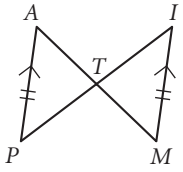
10) 12, 8

Lesson 4.4 • Are There Congruence Shortcuts?

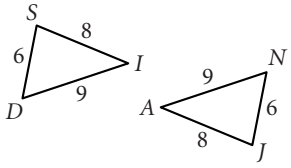
Name _____ **Period** _____ **Date** _____

In Exercises 1–3, name the conjecture that leads to each congruence.

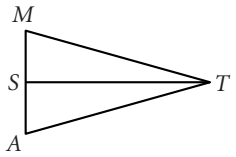
1. $\triangle PAT \cong \triangle IMT$



2. $\triangle SID \cong \triangle JAN$



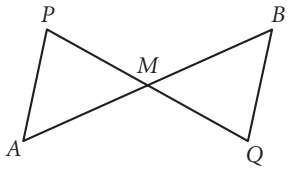
3. $\overline{TS}$ bisects $\overline{MA}$, $\overline{MT} \cong \overline{AT}$, and $\triangle MST \cong \triangle AST$



In Exercises 4–9, name a triangle congruent to the given triangle and state the congruence conjecture. If you cannot show any triangles to be congruent from the information given, write "cannot be determined" and redraw the triangles so that they are clearly not congruent.

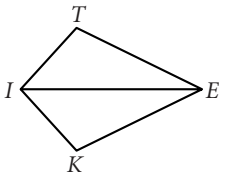
4. M is the midpoint of $\overline{AB}$ and $\overline{PQ}$.

$\triangle APM \cong \triangle$ _____

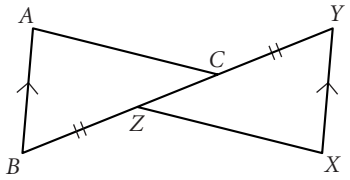


5. $KITE$ is a kite with $KI = TI$.

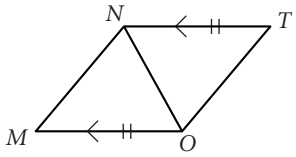
$\triangle KIE \cong \triangle$ _____



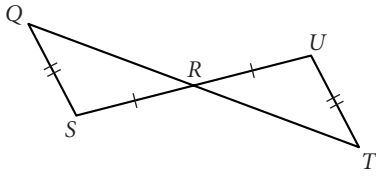
6. $\triangle ABC \cong$ _____



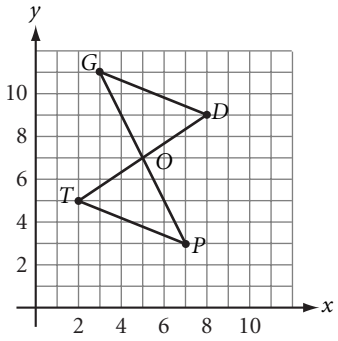
7. $\triangle MON \cong$ _____



8. $\triangle SQR \cong$ _____

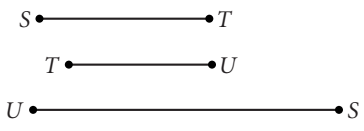


9. $\triangle TOP \cong$ _____

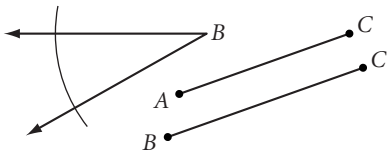


In Exercises 10–12, use a compass and a straightedge or patty paper and a straightedge to construct a triangle with the given parts. Then, if possible, construct a different (noncongruent) triangle with the same parts. If it is not possible, explain why not.

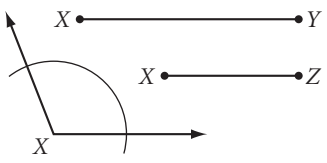
10.



11.



12.

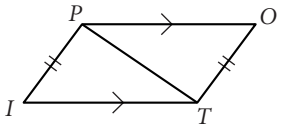


Lesson 4.5 • Are There Other Congruence Shortcuts?

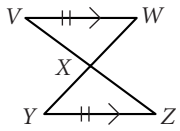
Name _____ **Period** _____ **Date** _____

In Exercises 1–6, name a triangle congruent to the given triangle and state the congruence conjecture. If you cannot show any triangles to be congruent from the information given, write "cannot be determined" and explain why.

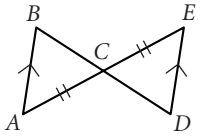
1. $\triangle PIT \cong \triangle$ _____



2. $\triangle XVW \cong \triangle$ _____

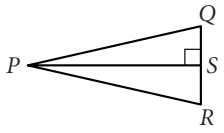


3. $\triangle ECD \cong \triangle$ _____

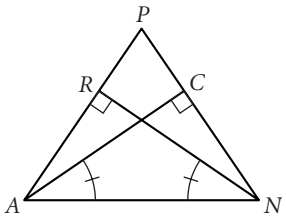


4. $\overline{PS}$ is the angle bisector of $\angle QPR$.

$\triangle PQS \cong \triangle$ _____

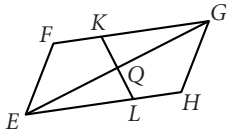


5. $\triangle ACN \cong \triangle$ _____

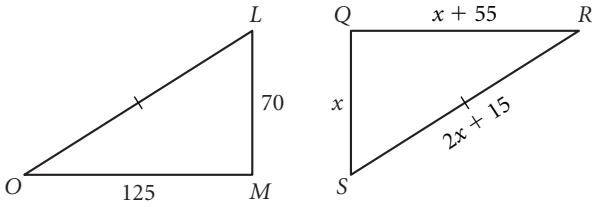


6. $EFGH$ is a parallelogram. $GQ = EQ$.

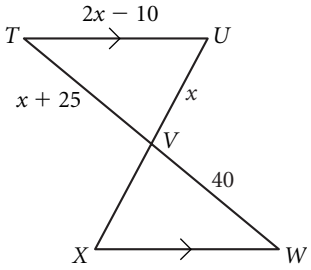
$\triangle EQL \cong \triangle$ _____



7. The perimeter of $\triangle QRS$ is 350 cm. Is $\triangle QRS \cong \triangle MOL$? Explain.

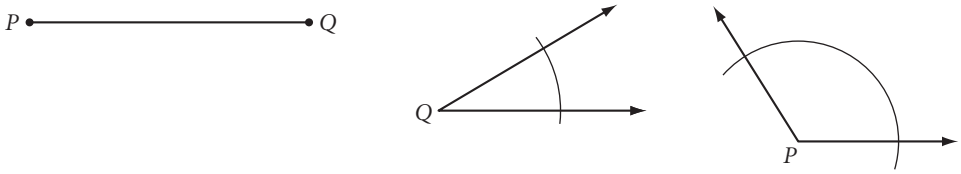


8. The perimeter of $\triangle TUV$ is 95 cm. Is $\triangle TUV \cong \triangle WXV$? Explain.

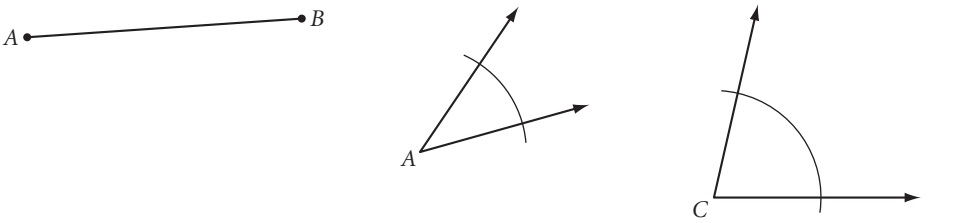


In Exercises 9 and 10, construct a triangle with the given parts. Then, if possible, construct a different (noncongruent) triangle with the same parts. If it is not possible, explain why not.

9.



10.



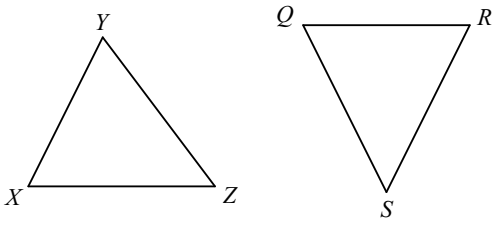
Geometry 1-2 Name: _____

Triangle Congruence

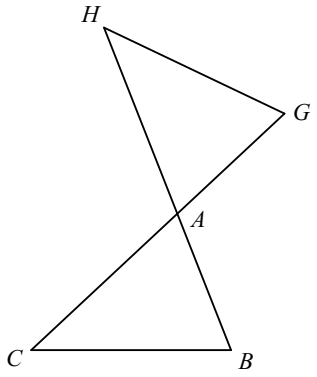
Date: _____ Period: _____

Mark the angles and sides of each pair of triangles to indicate that they are congruent.

1) $\triangle XYZ \cong \triangle QRS$

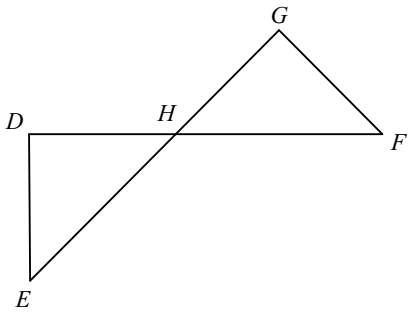


2) $\triangle ABC \cong \triangle AGH$



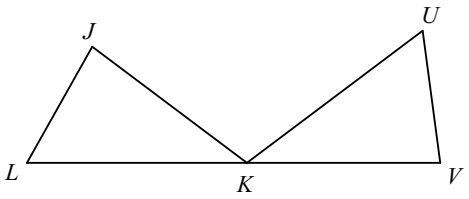
Complete each congruence statement by naming the corresponding angle or side.

3) $\triangle HGF \cong \triangle HDE$



$\overline{HG} \cong$?

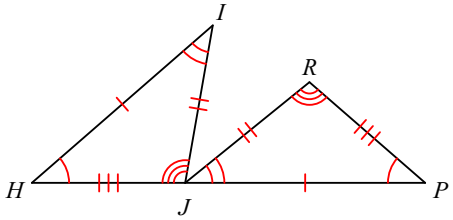
4) $\triangle LJK \cong \triangle UVK$



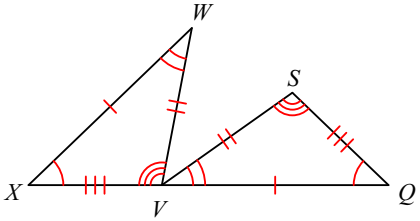
$\angle J \cong$?

Write a statement that indicates that the triangles in each pair are congruent.

5)

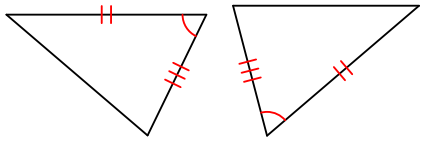


6)

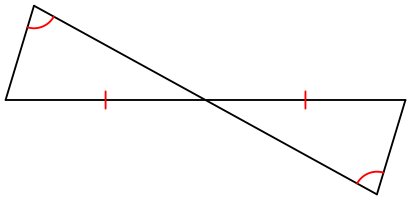


State if the two triangles are congruent. If they are, state how you know.

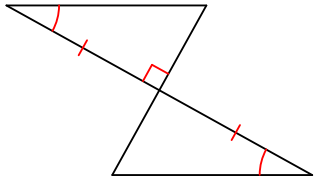
7)



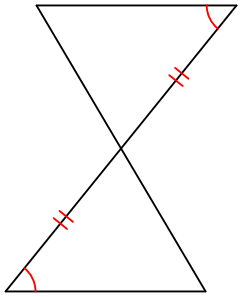
8)



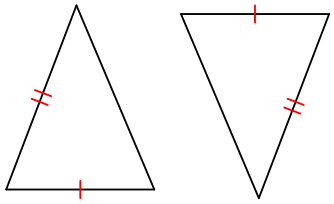
9)



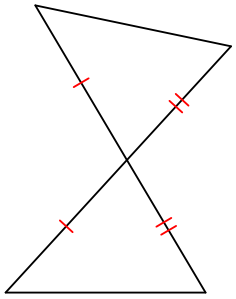
10)



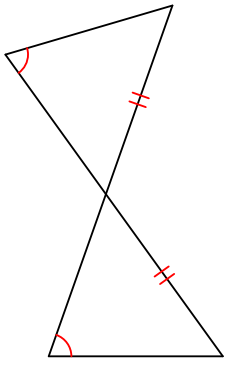
11)



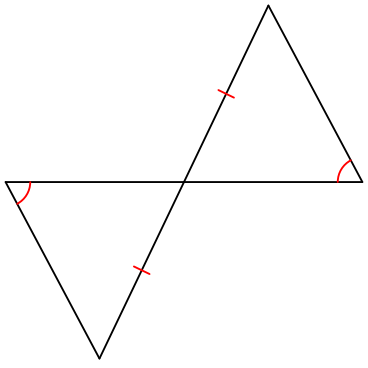
12)



13)



14)

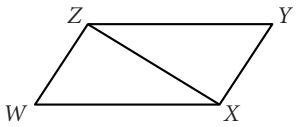


Lesson 4.6 • Corresponding Parts of Congruent Triangles

Name _____ **Period** _____ **Date** _____

1. Give the shorthand name for each of the four triangle congruence conjectures.

In Exercises 2–5, use the figure at right to explain why each congruence is true. *WXYZ* is a parallelogram.

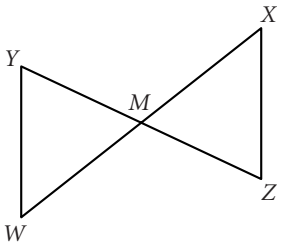


2. $\angle WXZ \cong \angle YZX$ **3.** $\angle WZX \cong \angle YXZ$

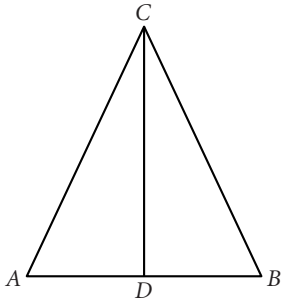
4. $\triangle WZX \cong \triangle YXZ$ **5.** $\angle W \cong \angle Y$

For Exercises 6 and 7, mark the figures with the given information. To demonstrate whether the segments or the angles indicated are congruent, determine that two triangles are congruent. Then state which conjecture proves them congruent.

6. *M* is the midpoint of $\overline{WX}$ and $\overline{YZ}$. Is $\overline{YW} \cong \overline{ZX}$? Why?

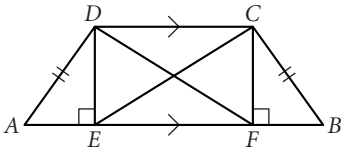


7. $\triangle ABC$ is isosceles and $\overline{CD}$ is the bisector of the vertex angle. Is $\overline{AD} \cong \overline{BD}$? Why?

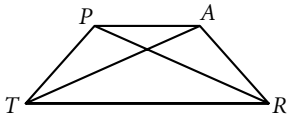


In Exercises 8 and 9, use the figure at right to write a paragraph proof for each statement.

8. $\overline{DE} \cong \overline{CF}$ **9.** $\overline{EC} \cong \overline{FD}$



10. *TRAP* is an isosceles trapezoid with $TP = RA$ and $\angle PTR \cong \angle ART$. Write a paragraph proof explaining why $\overline{TA} \cong \overline{RP}$.



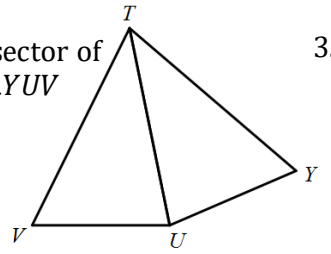
Geometry 1-2

Two-Column Triangle Proofs

Complete each two-column proof.

1.) **Given:** $\overline{TU}$ is an angle bisector of both $\angle VTY$ and $\angle YUV$

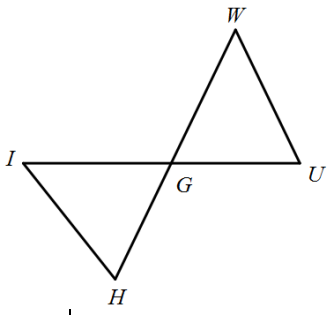
Prove: $\angle V \cong \angle Y$



Statement	Justification
$\overline{TU}$ is an angle bisector of both $\angle VTY$ and $\angle YUV$	Given
$\angle VTU \cong \angle YTU$	Definition of Angle Bisector
_____	Definition of Angle Bisector
$\overline{TU} \cong \overline{TU}$	_____
$\Delta VTU \cong \Delta YTU$	_____
_____	CPCTC

2.) **Given:** $\angle I \cong W$
$\overline{GH} \cong \overline{GU}$

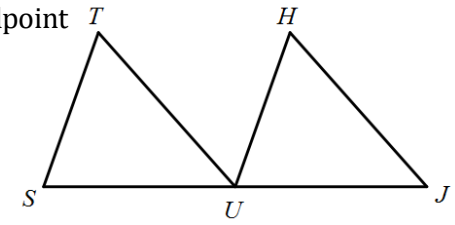
Prove: $\overline{IH} \cong \overline{WU}$



Statement	Justification
$\angle I \cong \angle W$	Given
$\overline{GH} \cong \overline{GU}$	_____
_____	Vertical Angles
$\Delta IGH \cong \Delta WGU$	_____
$\overline{IH} \cong \overline{WU}$	_____

3.) **Given:** U is a midpoint
$\overline{ST} \parallel \overline{UH}$
$\angle T \cong \angle H$

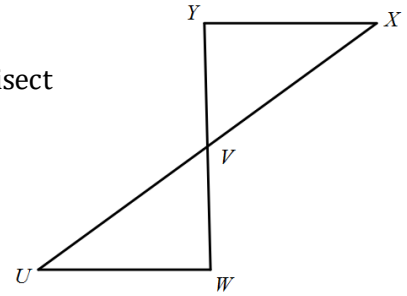
Prove: $\overline{ST} \cong \overline{UH}$



Statement	Justification
U is a midpoint $\overline{ST} \parallel \overline{UH}$ $\angle T \cong \angle H$	Given
_____	Corresponding Angles
$\overline{SU} \cong \overline{UJ}$	_____
_____	AAS
_____	CPCTC

4.) **Given:** $\overline{YW}$ and $\overline{UX}$ bisect each other

Prove: $\overline{YX} \cong \overline{WU}$

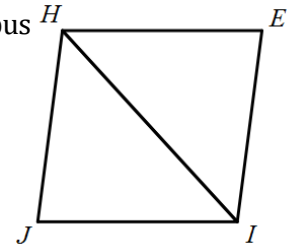


Statement	Justification
$\overline{YW}$ and $\overline{UX}$ bisect each other	Given
$\overline{YV} \cong \overline{WV}$	Definition of a bisector
_____	Definition of a bisector
_____	Vertical Angles
$\Delta YXV \cong \Delta WUV$	_____
$\overline{YX} \cong \overline{WU}$	_____

Create each two-column proof.

5.) **Given:** $HEIJ$ is a rhombus

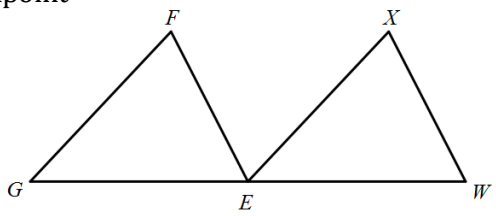
Prove: $\angle HIJ \cong \angle HIE$



Statement	Justification
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

7.) **Given:** E is a midpoint
$\overline{GF} \parallel \overline{EX}$
$\overline{EF} \parallel \overline{WX}$

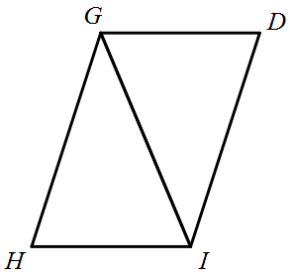
Prove: $\angle F \cong \angle X$



Statement	Justification
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

6.) **Given:** $\overline{GD} \parallel \overline{HI}$
$\overline{GH} \parallel \overline{DI}$

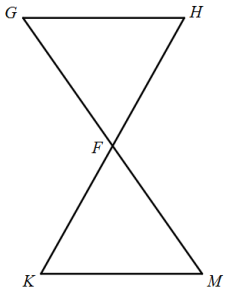
Prove: $\overline{GH} \cong \overline{ID}$



Statement	Justification
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

8.) **Given:** $\overline{HK}$ bisects $\overline{GM}$
$\overline{GH} \parallel \overline{KM}$

Prove: $\overline{KM} \cong \overline{HG}$



Statement	Justification
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

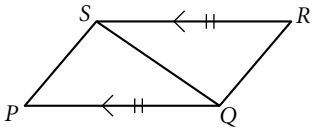
Lesson 4.7 • Flowchart Thinking

Name _____ **Period** _____ **Date** _____

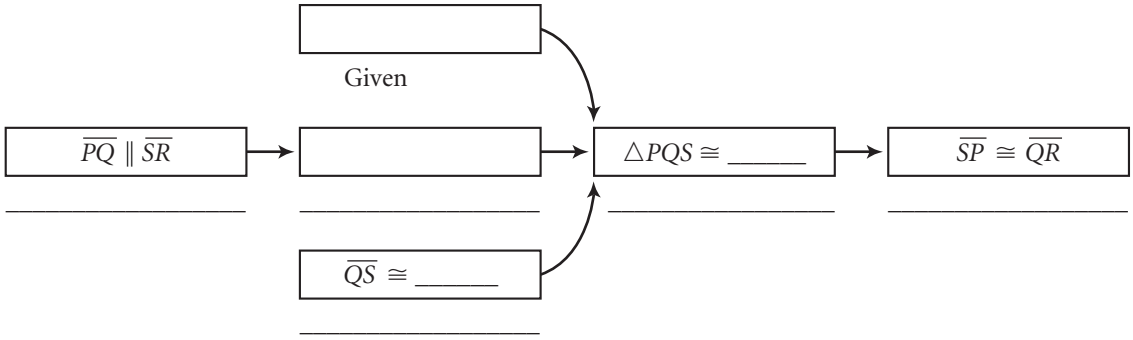
Complete the flowchart for each proof.

1. Given: $\overline{PQ} \parallel \overline{SR}$ and $\overline{PQ} \cong \overline{SR}$

Show: $\overline{SP} \cong \overline{QR}$

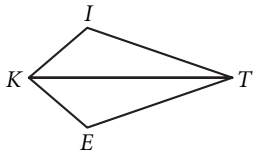


Flowchart Proof

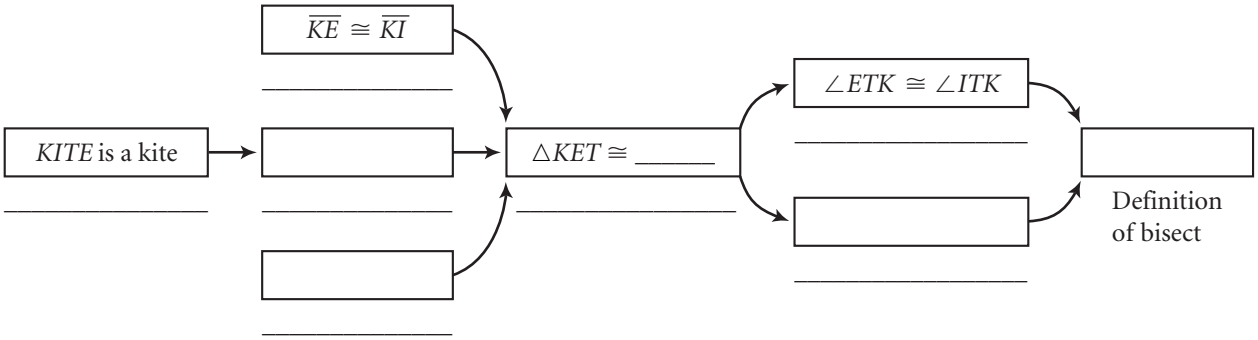


2. Given: Kite *KITE* with $\overline{KE} \cong \overline{KI}$

Show: $\overline{KT}$ bisects $\angle EKI$ and $\angle ETI$

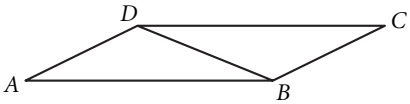


Flowchart Proof

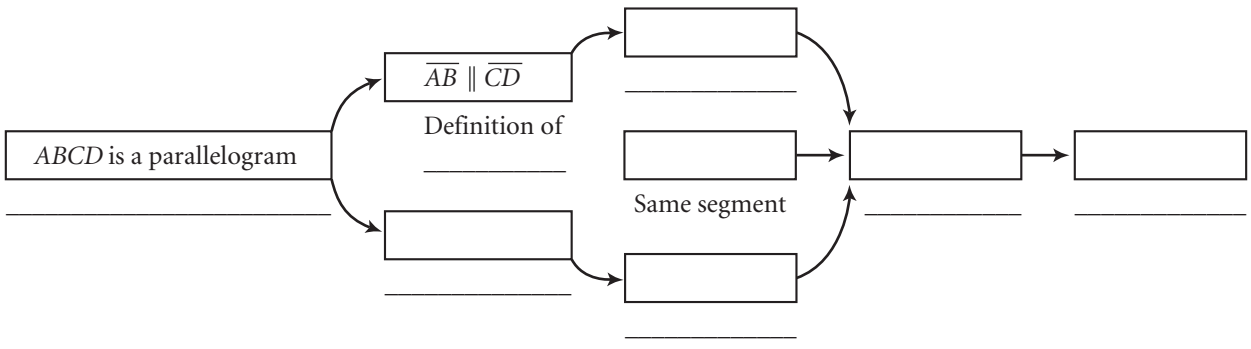


3. Given: *ABCD* is a parallelogram

Show: $\angle A \cong \angle C$



Flowchart Proof



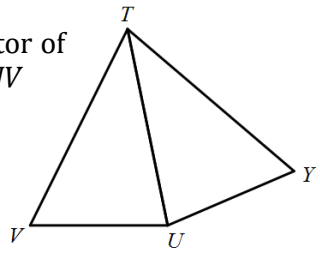
Geometry 1-2

Flow-Chart Triangle Proofs

Complete each flow-chart proof.

1.) **Given:** $\overline{TU}$ is an angle bisector of both $\angle VTY$ and $\angle YUV$

Prove: $\angle V \cong \angle Y$



$\angle VTU \cong \angle YTU$

Definition of angle bisector

i.

Definition of angle bisector

$\overline{TU} \cong \overline{TU}$

ii. _____

$\Delta VTU \cong \Delta YTU$

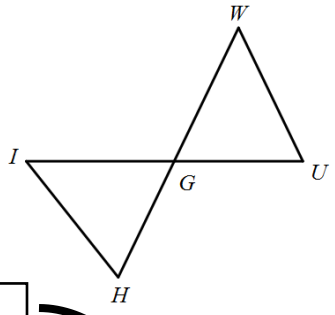
iii. _____

iv.

CPCTC

2.) **Given:** $\angle I \cong W$
$\overline{GH} \cong \overline{GU}$

Prove: $\overline{IH} \cong \overline{WU}$



$\angle I \cong \angle W$

Given

$\overline{GH} \cong \overline{GU}$

i. _____

ii.

Vertical angles

$\Delta IGH \cong \Delta WGU$

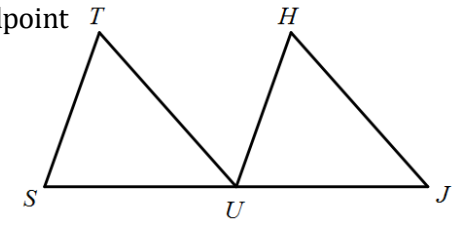
iii. _____

$\overline{IH} \cong \overline{WU}$

iv. _____

3.) **Given:** U is a midpoint
$\overline{ST} \parallel \overline{UH}$
$\angle T \cong \angle H$

Prove: $\overline{ST} \cong \overline{UH}$



$\angle T \cong \angle H$
Given

i.
Corresponding Angles

$\overline{SU} \cong \overline{UJ}$

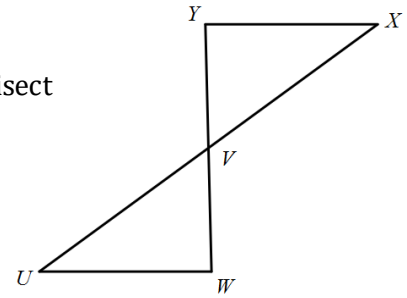
ii. _____

iii.
AAS

iv.
CPCTC

4.) **Given:** $\overline{YW}$ and $\overline{UX}$ bisect each other

Prove: $\overline{YX} \cong \overline{WU}$



$\overline{YV} \cong \overline{WV}$
Definition of a bisector

i.
Definition of a bisector

ii.
Vertical Angles

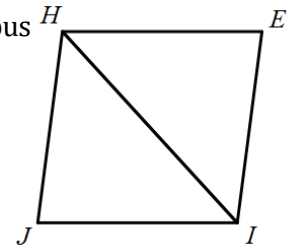
$\Delta YXV \cong \Delta WUV$
iii. _____

$\overline{YX} \cong \overline{WU}$
iv. _____

Create each flow-chart proof.

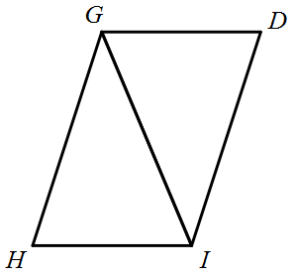
5.) **Given:** $HEIJ$ is a rhombus

Prove: $\angle HIJ \cong \angle HIE$



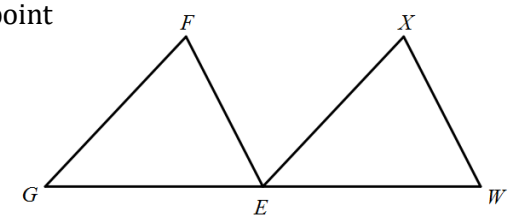
6.) **Given:** $\overline{GD} \parallel \overline{HI}$
$\overline{GH} \parallel \overline{DI}$

Prove: $\overline{GH} \cong \overline{ID}$



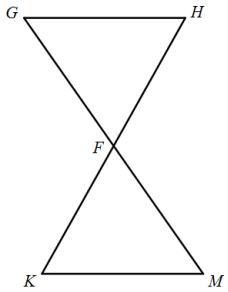
7.) **Given:** E is a midpoint
$\overline{GF} \parallel EX$
$\overline{EF} \parallel \overline{WX}$

Prove: $\angle F \cong \angle X$



8.) **Given:** $\overline{HK}$ bisects $\overline{GM}$
$\overline{GH} \parallel \overline{KM}$

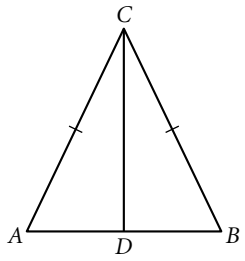
Prove: $\overline{KM} \cong \overline{HG}$



Lesson 4.8 • Proving Special Triangle Conjectures

Name _____ **Period** _____ **Date** _____

In Exercises 1–3, use the figure at right.



1. $\overline{CD}$ is a median, perimeter $\triangle ABC = 60$, and $AC = 22$. $AD =$ _____

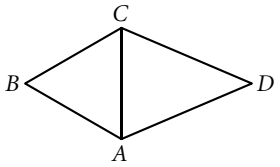
2. $\overline{CD}$ is an angle bisector, and $m\angle A = 54°$. $m\angle ACD =$ _____

3. $\overline{CD}$ is an altitude, perimeter $\triangle ABC = 42$, $m\angle ACD = 38°$, and $AD = 8$. $m\angle B =$ _____, $CB =$ _____

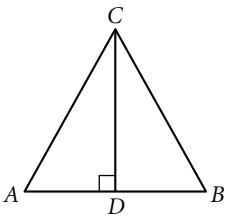
4. $\triangle EQU$ is equilateral. $m\angle E =$ _____

5. $\triangle ANG$ is equiangular and perimeter $\triangle ANG = 51$. $AN =$ _____

6. $\triangle ABC$ is equilateral, $\triangle ACD$ is isosceles with base $\overline{AC}$, perimeter $\triangle ABC = 66$, and perimeter $\triangle ACD = 82$. Perimeter $ABCD =$ _____



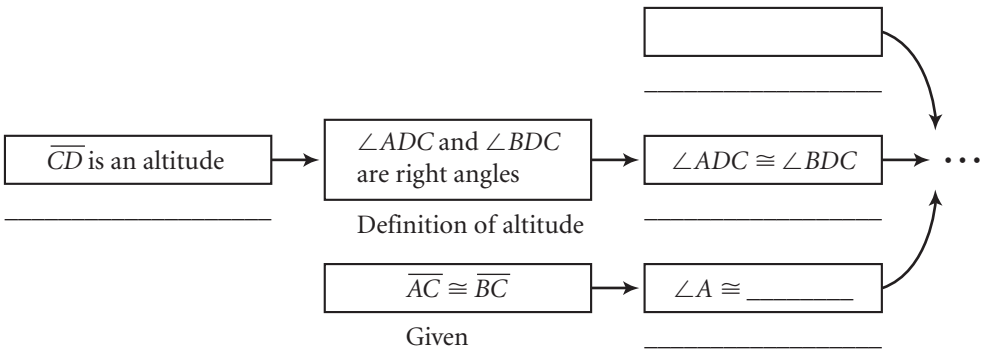
7. Complete a flowchart proof for this conjecture: In an isosceles triangle, the altitude from the vertex angle is the median to the base.



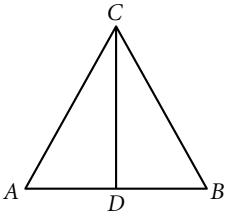
Given: Isosceles $\triangle ABC$ with $\overline{AC} \cong \overline{BC}$ and altitude $\overline{CD}$

Show: $\overline{CD}$ is a median

Flowchart Proof



8. Write a flowchart proof for this conjecture: In an isosceles triangle, the median to the base is also the angle bisector of the vertex angle.



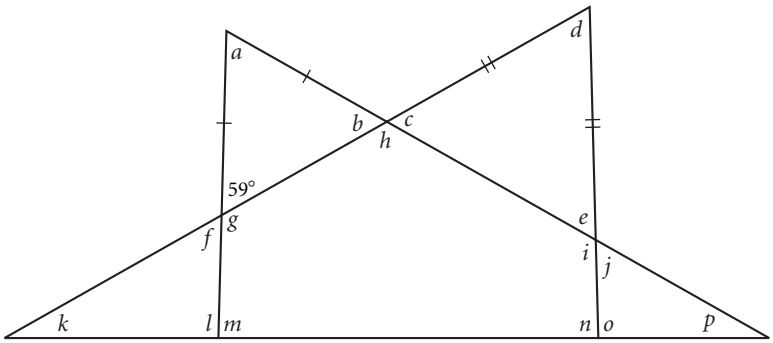
Given: Isosceles $\triangle ABC$ with $\overline{AC} \cong \overline{BC}$ and median $\overline{CD}$

Show: $\overline{CD}$ bisects $\angle ACB$

Unit 4 • Challenge Problems

1. (*Target 4a, 4b & 4c*)
   Draw an isosceles triangle. Extend the base of the triangle to create an exterior angle. Label the exterior angle x, and label the vertex angle of the triangle y.
   a. Pick two possible values for x and determine the corresponding values for y.
   b. Write an equation for the measure of the vertex angle y in terms of the measure of the exterior angle x. Explain how you found your equation.

2. (*Target 4a & 4b*)
   The following problem appeared on Chloe's geometry quiz: *Without measuring,* find the measure of each lettered angle.



   Chloe claims that there isn't enough information to complete the problem. Is she correct?
   - If you agree with Chloe, fill in the *minimum* number of additional angle measures and/or congruence marks needed so that it is possible to find the remaining angle measures without measuring. Then find the measure of each lettered angle and give a brief description of how you found it.
   - If you disagree with Chloe, give the measure of each lettered angle and give a brief description of how you found each measure.

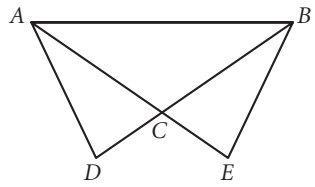
Unit 4 • Challenge Problems

3. (*Target 4b*)
   Picture the isosceles triangle below toppling side over side to the right along the line. Construct the path of point P through two cycles. Where on the number line will the vertex point land?

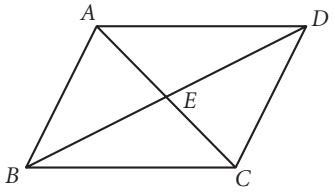
4. (*Target 4d*)
   Mario is making a triangular wind chime out of a 12-foot-long steel rod. He starts by bending the rod 4 feet from one end.
   a. Describe one place Mario could make the second bend to form a triangle. Explain how you know a triangle would be formed.
   b. Describe all the possible places Mario could make the second bend to form a triangle.

Unit 4 • Challenge Problems

5. (*Targets 4e & 4f*)
Write two flowchart proofs based on this figure. For each proof, specify what information you are assuming is "given" and what fact you are going to "show."

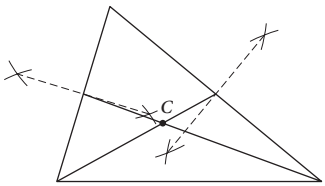


6. (*Target 4e & 4f*)
Write two flowchart proofs based on this figure. For each proof, specify what information you are assuming is "given" and what fact you are going to "show."

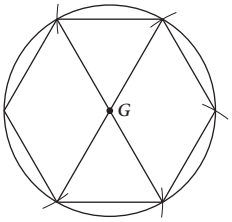


LESSON 3.8 • The Centroid

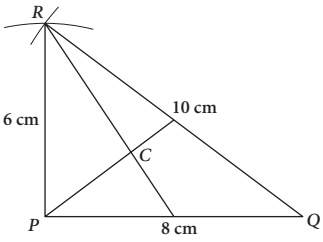
1.



2.



3. $CP = 3.3$ cm, $CQ = 5.7$ cm, $CR = 4.8$ cm



4. (3, 4)

5. $PC = 16$, $CL = 8$, $QM = 15$, $CR = 14$

6. **a.** Incenter **b.** Centroid
c. Circumcenter **d.** Circumcenter
e. Orthocenter **f.** Incenter
g. Centroid

LESSON 4.1 • Triangle Sum Conjecture

1. $p = 67°$, $q = 15°$ **2.** $x = 82°$, $y = 81°$

3. $a = 78°$, $b = 29°$

4. $r = 40°$, $s = 40°$, $t = 100°$

5. $x = 31°$, $y = 64°$ **6.** $y = 145°$

7. $s = 28°$ **8.** $m = 72\frac{1}{2}°$

9. $m\angle P = a$ **10.** $m\angle QPT = 135°$

11. 720°

12. The sum of the measures of $\angle A$ and $\angle B$ is 90° because $m\angle C$ is 90° and all three angles must be 180°. So, $\angle A$ and $\angle B$ are complementary.

13. $m\angle BEA = m\angle CED$ because they are vertical angles. Because the measures of all three angles in each triangle add to 180°, if equal measures are subtracted from each, what remains will be equal.

LESSON 4.2 • Properties of Isosceles Triangles

1. $m\angle T = 64°$ **2.** $m\angle G = 45°$

3. $x = 125°$

4. $m\angle A = 39°$, perimeter of $\triangle ABC = 46$ cm

5. $LM = 163$ m, $m\angle M = 50°$

6. $m\angle Q = 44°$, $QR = 125$

7. **a.** $\angle DAB \cong \angle ABD \cong \angle BDC \cong \angle BCD$
b. $\angle ADB \cong \angle CBD$
c. $\overline{AD} \parallel \overline{BC}$ by the Converse of the AIA Conjecture.

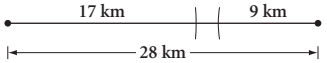
8. $x = 21°$, $y = 16°$ **9.** $m\angle QPR = 15°$

10. $m\angle PRQ = 55°$ by VA, which makes $m\angle P = 55°$ by the Triangle Sum Conjecture. So, $\triangle PQR$ is isosceles by the Converse of the Isosceles Triangle Conjecture.

LESSON 4.3 • Triangle Inequalities

1. Yes

2. No



3. $19 < x < 53$ **4.** $b > a > c$

5. $b > c > a$ **6.** $a > c = d > b$

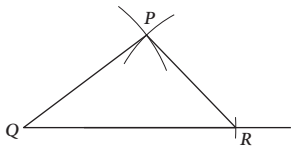
7. $x = 76°$ **8.** $x = 79°$

9. The interior angle at A is 60°. The interior angle at B is 20°. But now the sum of the measures of the triangle is not 180°.

10. By the Exterior Angles Conjecture, $2x = x + m\angle PQS$. So, $m\angle PQS = x$. So, by the Converse of the Isosceles Triangle Conjecture, $\triangle PQS$ is isosceles.

11. Not possible. $AB + BC < AC$

12.

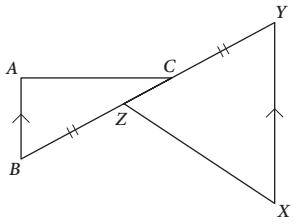


LESSON 4.4 • Are There Congruence Shortcuts?

1. SAA or ASA **2.** SSS **3.** SSS

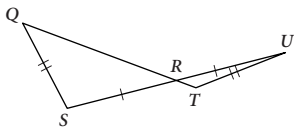
4. $\triangle BQM$ (SAS) **5.** $\triangle TIE$ (SSS)

6. Cannot be determined, as shown by the figure.



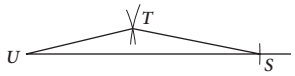
7. $\triangle TNO$ (SAS)

8. Cannot be determined, as shown by the figure.

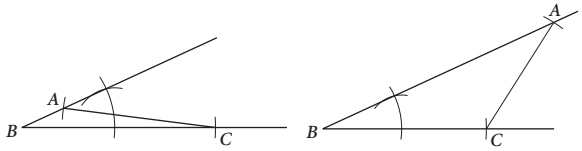


9. $\triangle DOG$ (SAS)

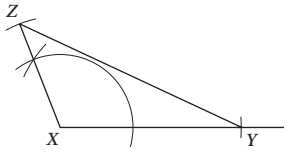
10. Only one triangle because of SSS.



11. Two possible triangles.

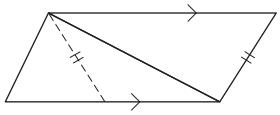


12. Only one triangle because of SAS.



LESSON 4.5 • Are There Other Congruence Shortcuts?

1. Cannot be determined



2. $\triangle XZY$ (SAA)

3. $\triangle ACB$ (ASA or SAA)

4. $\triangle PRS$ (ASA)

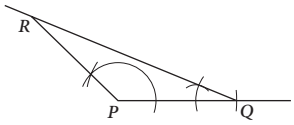
5. $\triangle NRA$ (SAA)

6. $\triangle GQK$ (ASA or SAA)

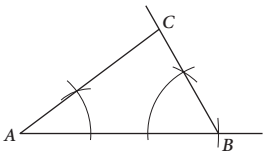
7. Yes, $\triangle QRS \cong \triangle MOL$ by SSS.

8. No, corresponding sides $\overline{TV}$ and $\overline{WV}$ are not congruent.

9. All triangles will be congruent by ASA. Possible triangle:



10. All triangles will be congruent by SAA. Possible procedure: Use $\angle A$ and $\angle C$ to construct $\angle B$ and then copy $\angle A$ and $\angle B$ at the ends of $\overline{AB}$.



LESSON 4.6 • Corresponding Parts of Congruent Triangles

1. SSS, SAS, ASA, SAA

2. $\overline{YZ} \parallel \overline{WX}$, AIA Conjecture

3. $\overline{WZ} \parallel \overline{XY}$, AIA Conjecture

4. ASA

5. CPCTC

6. $\triangle YWM \cong \triangle ZXM$ by SAS. $\overline{YW} \cong \overline{ZX}$ by CPCTC.

7. $\triangle ACD \cong \triangle BCD$ by SAS. $\overline{AD} \cong \overline{BD}$ by CPCTC.

8. Possible answer: DE and CF are both the distance between $\overleftrightarrow{DC}$ and $\overleftrightarrow{AB}$. Because the lines are parallel, the distances are equal. So, $\overline{DE} \cong \overline{CF}$.

9. Possible answer: $\overline{DE} \cong \overline{CF}$ (see Exercise 8). $\angle DEF \cong \angle CFE$ because both are right angles, $\overline{EF} \cong \overline{FE}$ because they are the same segment. So, $\triangle DEF \cong \triangle CFE$ by SAS. $\overline{EC} \cong \overline{FD}$ by CPCTC.

10. Possible answer: It is given that $TP = RA$ and $\angle PTR \cong \angle ART$, and $\overline{TR} \cong \overline{RT}$ because they are the same segment. So $\triangle PTR \cong \angle ART$ by SAS and $\overline{TA} \cong \overline{RP}$ by CPCTC.

LESSON 4.7 • Flowchart Thinking

1. *(See flowchart proof at bottom of page 101.)*

2. *(See flowchart proof at bottom of page 101.)*

3. *(See flowchart proof at bottom of page 101.)*

LESSON 4.8 • Proving Special Triangle Conjectures

1. $AD = 8$

2. $m\angle ACD = 36°$

3. $m\angle B = 52°$, $CB = 13$

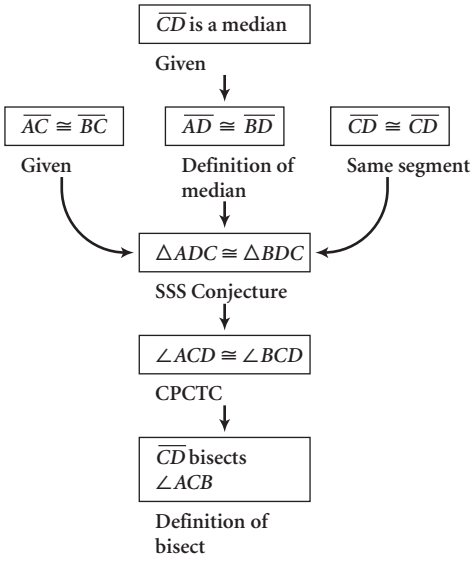
4. $m\angle E = 60°$

5. $AN = 17$

6. Perimeter $ABCD = 104$

7. *(See flowchart proof at bottom of page 102.)*

8. Flowchart Proof



LESSON 5.1 • Polygon Sum Conjecture

1. $a = 103°$, $b = 103°$, $c = 97°$, $d = 83°$, $e = 154°$

2. $a = 92°$, $b = 44°$, $c = 51°$, $d = 85°$, $e = 44°$, $f = 136°$

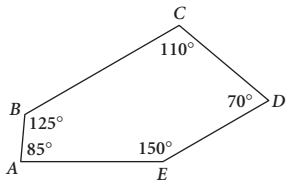
3. 170°; 36 sides

4. 15 sides

5. $x = 105°$

6. $x = 18°$

7. $m\angle E = 150°$



LESSON 5.2 • Exterior Angles of a Polygon

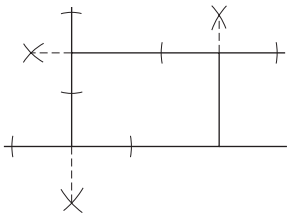
1. 12 sides **2.** 24 sides **3.** 4 sides **4.** 6 sides

5. $a = 64°$, $b = 138\frac{2}{3}°$ **6.** $a = 102°$, $b = 9°$

7. $a = 156°$, $b = 132°$, $c = 108°$

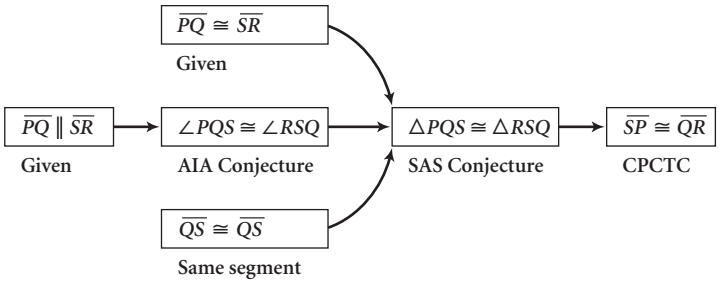
8. $a = 135°$, $b = 40°$, $c = 105°$, $d = 135°$

9.

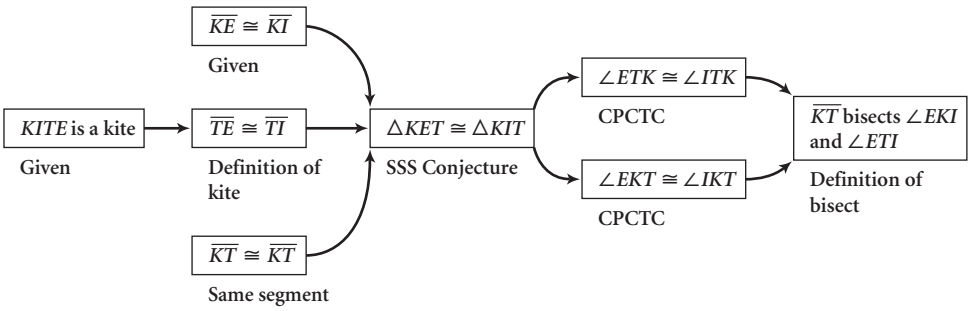


Lesson 4.7, Exercises 1, 2, 3

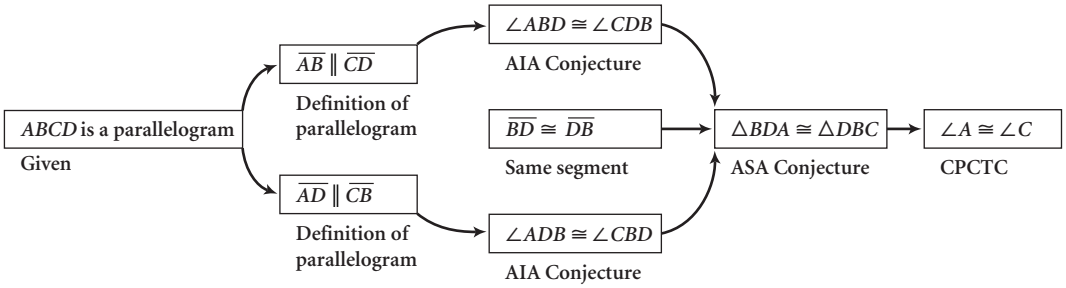
1.



2.



3.

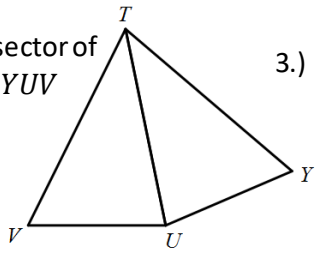


Two-Column Triangle Proofs: Answers

Complete each two-column proof.

1.) **Given:** $\overline{TU}$ is an angle bisector of both $\angle VTY$ and $\angle YUV$

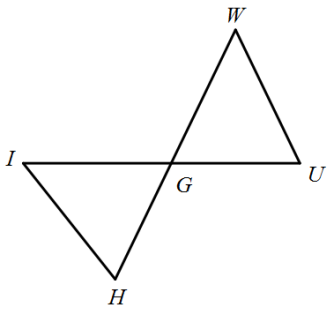
Prove: $\angle V \cong \angle Y$



Statement	Justification
$\overline{TU}$ is an angle bisector of both $\angle VTY$ and $\angle YUV$	Given
$\angle VTU \cong \angle YTU$	Definition of Angle Bisector
$\boldsymbol{\angle VTU \cong \angle YTU}$	Definition of Angle Bisector
$\overline{TU} \cong \overline{TU}$	**Reflexive Property**
$\Delta VTU \cong \Delta YTU$	**ASA**
$\boldsymbol{\angle V \cong \angle Y}$	CPCTC

2.) **Given:** $\angle I \cong W$
$\overline{GH} \cong \overline{GU}$

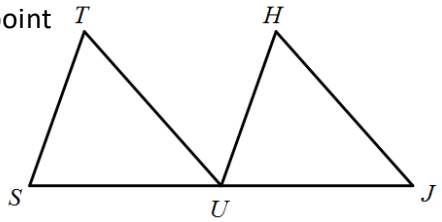
Prove: $\overline{IH} \cong \overline{WU}$



Statement	Justification
$\angle I \cong \angle W$	Given
$\overline{GH} \cong \overline{GU}$	**Given**
$\boldsymbol{\angle IGH \cong \angle WGU}$	Vertical Angles
$\Delta IGH \cong \Delta WGU$	**AAS**
$\overline{IH} \cong \overline{WU}$	**CPCTC**

3.) **Given:** U is a midpoint
$\overline{ST} \parallel \overline{UH}$
$\angle T \cong \angle H$

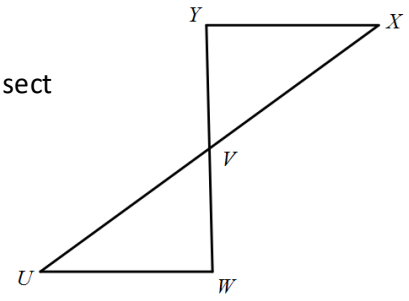
Prove: $\overline{ST} \cong \overline{UH}$



Statement	Justification
U is a midpoint $\overline{ST} \parallel \overline{UH}$ $\angle T \cong \angle H$	Given
$\boldsymbol{\angle TSU \cong \angle HUJ}$	Corresponding Angles
$\overline{SU} \cong \overline{UJ}$	**Def. of Midpoint**
$\boldsymbol{\Delta TSU \cong \Delta HUJ}$	AAS
$\boldsymbol{\overline{ST} \cong \overline{UH}}$	CPCTC

4.) **Given:** $\overline{YW}$ and $\overline{UX}$ bisect each other

Prove: $\overline{YX} \cong \overline{WU}$

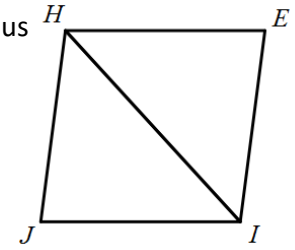


Statement	Justification
$\overline{YW}$ and $\overline{UX}$ bisect each other	Given
$\overline{YV} \cong \overline{WV}$	Definition of a bisector
$\boldsymbol{\overline{XV} \cong \overline{UV}}$	Definition of a bisector
$\boldsymbol{\angle XVY \cong \angle UVW}$	Vertical Angles
$\Delta YXV \cong \Delta WUV$	**SAS**
$\overline{YX} \cong \overline{WU}$	**CPCTC**

Create each two-column proof.

5.) **Given:** $HEIJ$ is a rhombus

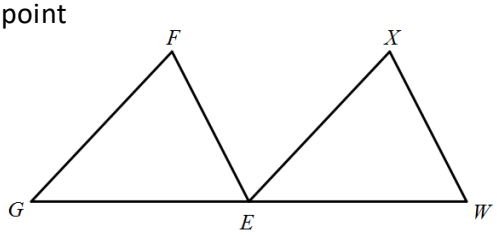
Prove: $\angle HIJ \cong \angle HIE$



Statement	Justification
Answers may vary Can be proven using: **SSS** **ASA** **SAS** or **AAS**	Answers may vary, justifications must align to proof.

7.) **Given:** E is a midpoint
$\overline{GF} \parallel EX$
$\overline{EF} \parallel \overline{WX}$

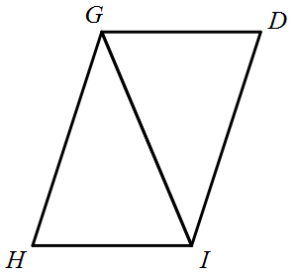
Prove: $\angle F \cong \angle X$



Statement	Justification
Answers may vary Can be proven using: **ASA**	Answers may vary, justifications must align to proof.

6.) **Given:** $\overline{GD} \parallel \overline{HI}$
$\overline{GH} \parallel \overline{DI}$

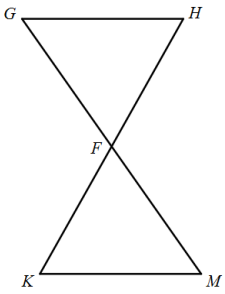
Prove: $\overline{GH} \cong \overline{ID}$



Statement	Justification
Answers may vary Can be proven using: **SSS** **ASA** **SAS** or **AAS**	Answers may vary, justifications must align to proof.

8.) **Given:** $\overline{HK}$ bisects $\overline{GM}$
$\overline{GH} \parallel \overline{KM}$

Prove: $\overline{KM} \cong \overline{HG}$



Statement	Justification
Answers may vary Can be proven using: **ASA**	Answers may vary, justifications must align to proof.

Flow-Chart Triangle Proofs – Answers

1. i. $\angle VTU \cong \angle YTU$
   ii. Reflexive Property
   iii. ASA
   iv. $\angle V \cong \angle Y$

2. i. Given
   ii. $\angle IGH \cong \angle WGU$
   iii. AAS
   iv. CPCTC

3. i. $\angle TSU \cong \angle HUJ$
   ii. Definition of Midpoint
   iii. $\Delta TSU \cong \Delta HUJ$
   iv. $\overline{ST} \cong \overline{UH}$

4. i. $\overline{XV} \cong \overline{UV}$
   ii. $\angle XVY \cong \angle UVW$
   iii. SAS
   iv. CPCTC

5. Answers may vary. Congruence may be proven using: SSS, ASA, SAS or AAS

6. Answers may vary. Congruence may be proven using: SSS, ASA, SAS or AAS

7. Answers may vary. Congruence may be proven using: ASA

8. Answers may vary. Congruence may be proven using: ASA

Answers to Triangle Sum Conjecture

1) 89° 2) 37° 3) 65° 4) 84°
5) 3 6) 11 7) 63° 8) 44°
9) 115° 10) 45°

Answers to Isosceles and Equilateral Triangles

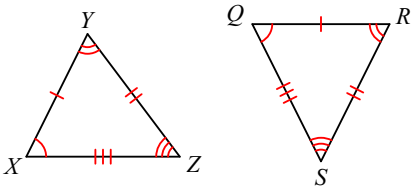
1) 7 2) 10 3) 9 4) 6
5) 72° 6) 41° 7) 60° 8) 47°
9) 9 10) 12 11) 8 12) 6
13) 42° 14) 64° 15) 52° 16) 54°

Answers to Triangle Inequalities

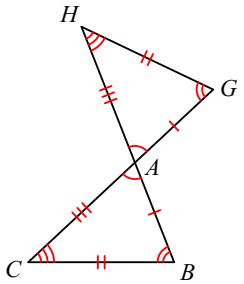
1) $\angle W, \angle V, \angle X$ 2) $\angle V, \angle X, \angle W$ 3) $\overline{XV}, \overline{XW}, \overline{WV}$ 4) $\overline{WX}, \overline{XY}, \overline{WY}$
5) Yes 6) Yes 7) $1 < x < 21$ 8) $5 < x < 19$
9) $0 < x < 16$ 10) $4 < x < 20$

Answers to Triangle Congruence

1)



2)



3) $\overline{HD}$

4) $\angle V$ 5) $\triangle HIJ \cong \triangle PJR$ 6) $\triangle XWV \cong \triangle QVS$ 7) SAS
8) AAS 9) ASA 10) ASA 11) Not congruent
12) SAS 13) AAS 14) AAS