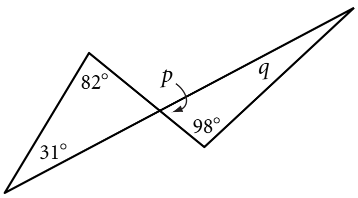
Lesson 4.1 • Triangle Sum Conjecture

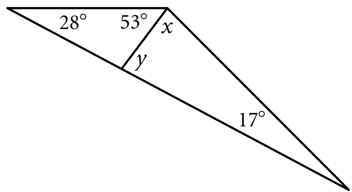
Name ______________________________ **Period** __________ **Date** ____________

In Exercises 1–9, determine the angle measures.

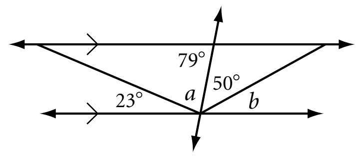
1. $p =$ ______, $q =$ ______



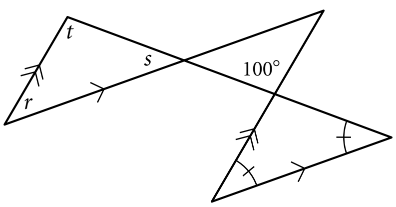
2. $x =$ ______, $y =$ ______



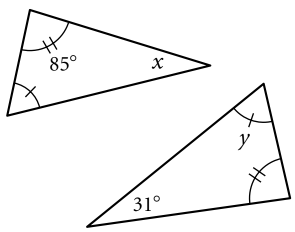
3. $a =$ ______, $b =$ ______



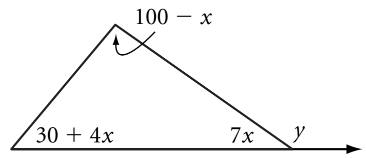
4. $r =$ ______, $s =$ ______, $t =$ ______



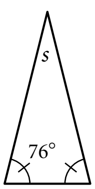
5. $x =$ ______, $y =$ ______



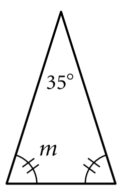
6. $y =$ ______



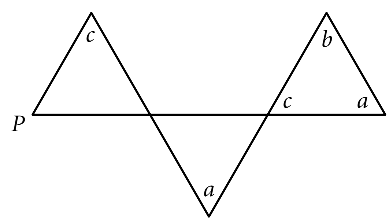
7. $s =$ ______



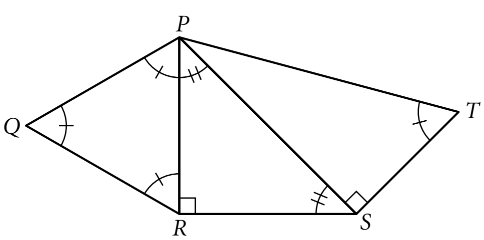
8. $m =$ ______



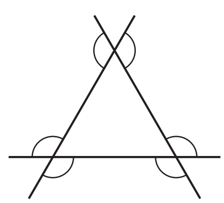
9. $m\angle P =$ ______



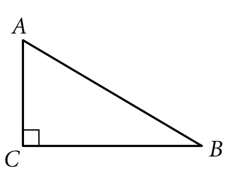
10. Find the measure of $\angle QPT$.



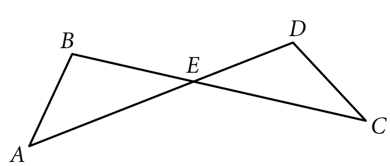
11. Find the sum of the measures of the marked angles.



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



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

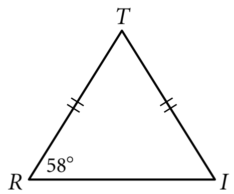


Lesson 4.2 • Properties of Isosceles Triangles

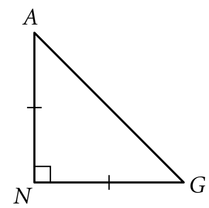
Name ______________________________ **Period** __________ **Date** ______________

In Exercises 1–3, find the angle measures.

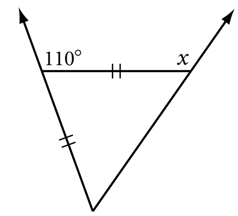
1. $m\angle T =$ ______



2. $m\angle G =$ ______

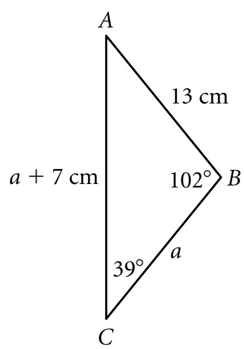


3. $x =$ ______

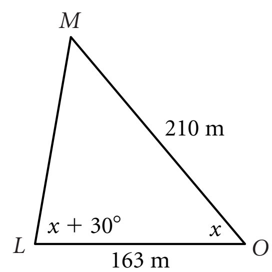


In Exercises 4–6, find the measures.

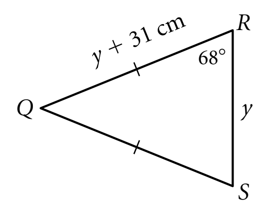
4. $m\angle A =$ ______, perimeter of $\triangle ABC =$ ______



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



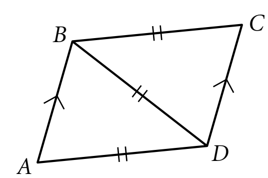
6. The perimeter of $\triangle QRS$ is 344 cm. $m\angle Q =$ ______, $QR =$ ______



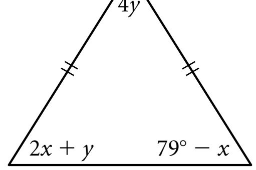
7. a. Name the angle(s) congruent to $\angle DAB$.

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

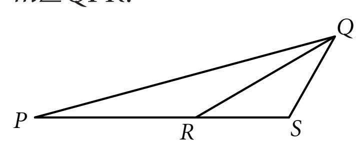
c. What can you conclude about $\overline{AD}$ and $\overline{BC}$? Why?



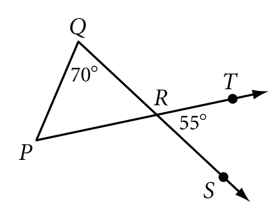
8. $x =$ _____, $y =$ _____



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.



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.

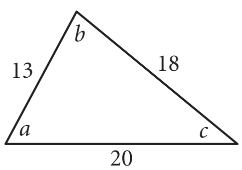
1. 16 cm, 30 cm, 45 cm

2. 9 km, 17 km, 28 km

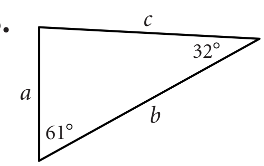
3. If 17 and 36 are the lengths of two sides of a triangle, what is the range of possible values for the length of the third side?

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

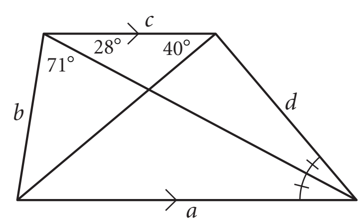
4.



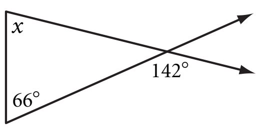
5.



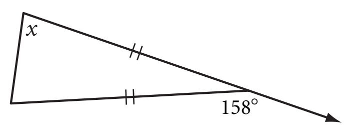
6.



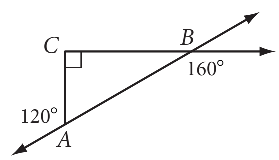
7. $x =$ ______



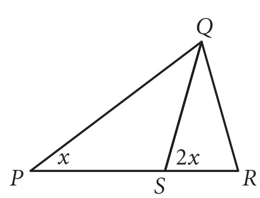
8. $x =$ ______



9. What's wrong with this picture?

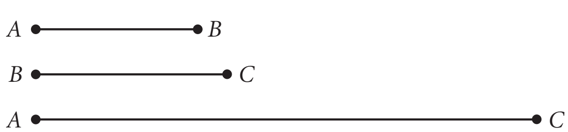


10. Explain why $\triangle PQS$ is isosceles.

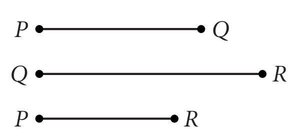


In Exercises 11 and 12, use a compass and straightedge to construct a triangle with the given sides. If it is not possible, explain why not.

11.



12.

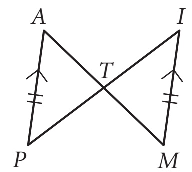


Lesson 4.4 • Are There Congruence Shortcuts?

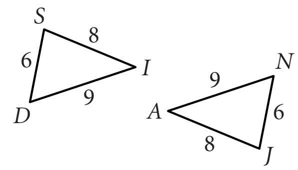
Name ______________________________ **Period** __________ **Date** ____________

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

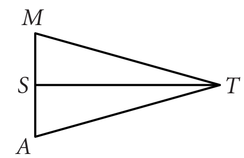
1. $\triangle PAT \cong \triangle IMT$



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



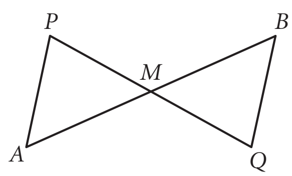
3. $\overline{TS}$ bisects $\overline{MA}$, $\overline{MT} \cong \overline{AT}$, and $\triangle MST \cong \triangle AST$



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.

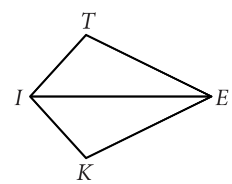
4. M is the midpoint of $\overline{AB}$ and $\overline{PQ}$.

$\triangle APM \cong \triangle$ ______

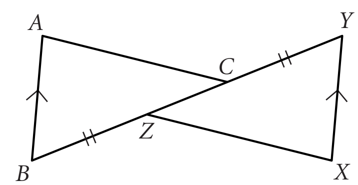


5. $KITE$ is a kite with $KI = TI$.

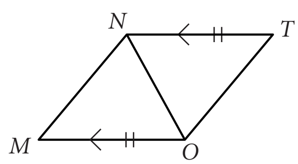
$\triangle KIE \cong \triangle$ ______



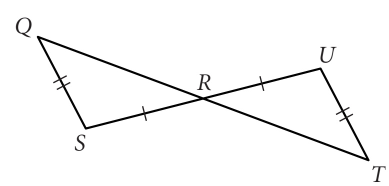
6. $\triangle ABC \cong$ ______



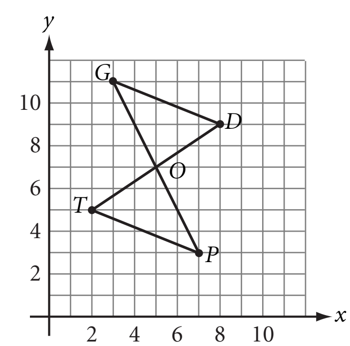
7. $\triangle MON \cong$ ______



8. $\triangle SQR \cong$ ______

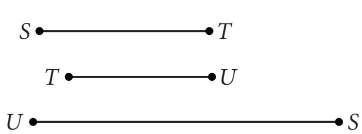


9. $\triangle TOP \cong$ ______

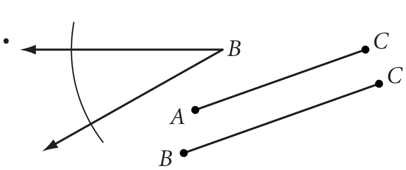


In Exercises 10–12, use a compass and a straightedge or patty paper and a straightedge to construct a triangle with the given parts. Then, if possible, construct a different (noncongruent) triangle with the same parts. If it is not possible, explain why not.

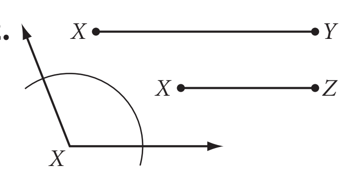
10.



11.



12.

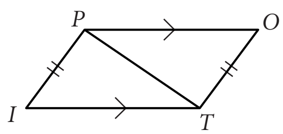


Lesson 4.5 • Are There Other Congruence Shortcuts?

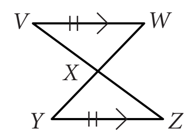
Name ______________________________ **Period** __________ **Date** ____________

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.

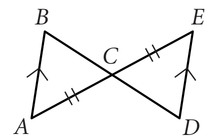
1. $\triangle PIT \cong \triangle$ _____



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

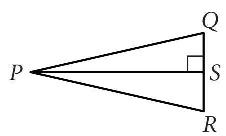


3. $\triangle ECD \cong \triangle$ _____

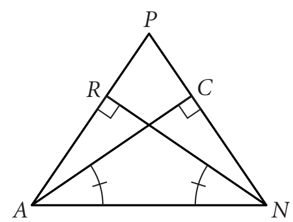


4. $\overline{PS}$ is the angle bisector of $\angle QPR$.

$\triangle PQS \cong \triangle$ _____

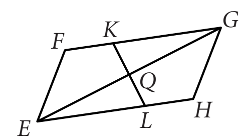


5. $\triangle ACN \cong \triangle$ _____

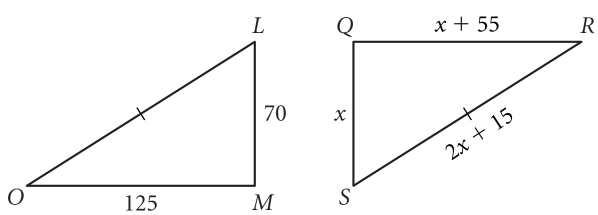


6. $EFGH$ is a parallelogram. $GQ = EQ$.

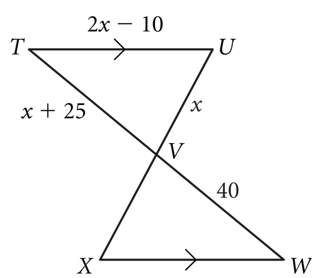
$\triangle EQL \cong \triangle$ _____



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

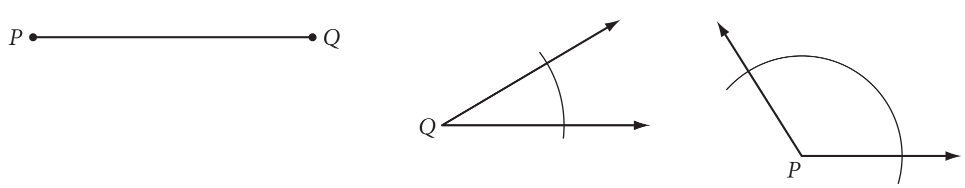


8. The perimeter of $\triangle TUV$ is 95 cm. Is $\triangle TUV \cong \triangle WXV$? Explain.

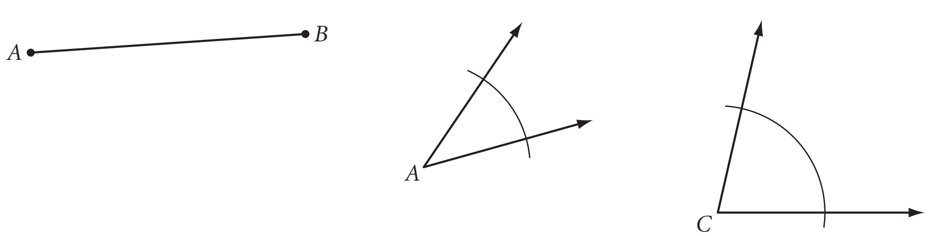


In Exercises 9 and 10, construct a triangle with the given parts. Then, if possible, construct a different (noncongruent) triangle with the same parts. If it is not possible, explain why not.

9.



10.

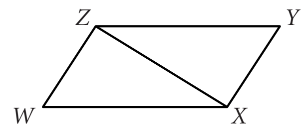


Lesson 4.6 • Corresponding Parts of Congruent Triangles

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.

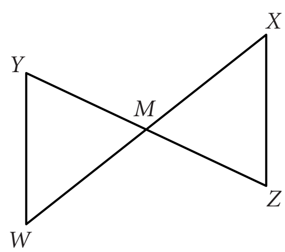


2. $\angle WXZ \cong \angle YZX$ **3.** $\angle WZX \cong \angle YXZ$

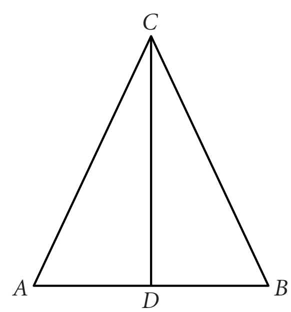
4. $\triangle WZX \cong \triangle YXZ$ **5.** $\angle W \cong \angle Y$

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.

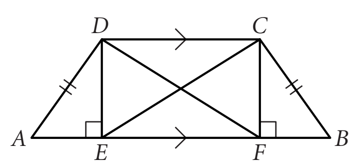
6. M is the midpoint of $\overline{WX}$ and $\overline{YZ}$. Is $\overline{YW} \cong \overline{ZX}$? Why?



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

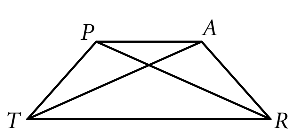


In Exercises 8 and 9, use the figure at right to write a paragraph proof for each statement.



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 $\overline{TA} \cong \overline{RP}$.



Lesson 4.7 • Flowchart Thinking

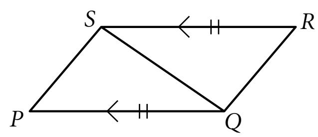
Name ______________________ **Period** __________ **Date** ______________

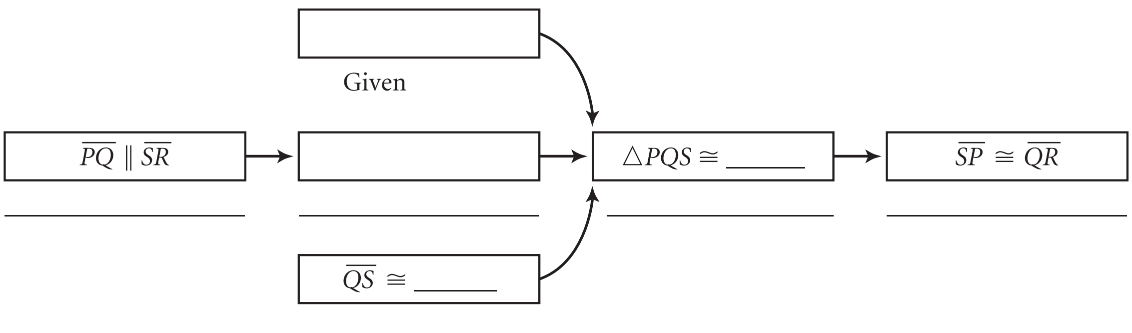
Complete the flowchart for each proof.

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

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

   Flowchart Proof

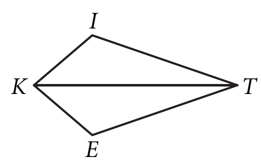


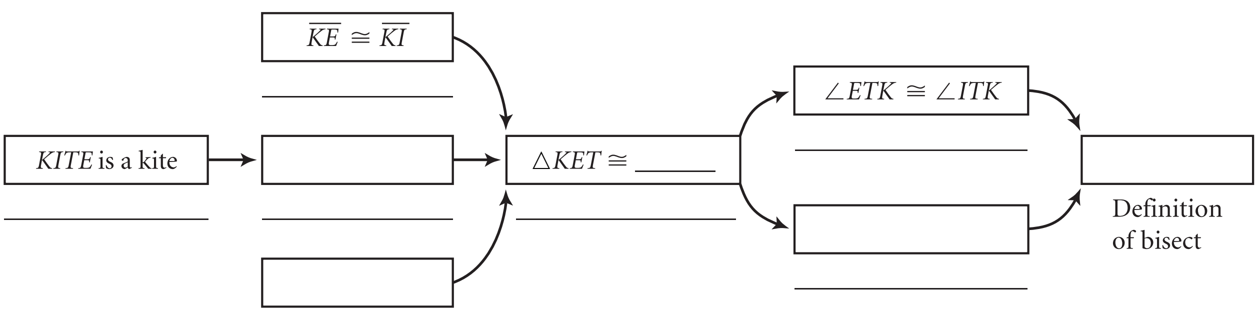


2. **Given:** Kite *KITE* with $\overline{KE} \cong \overline{KI}$

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

   Flowchart Proof

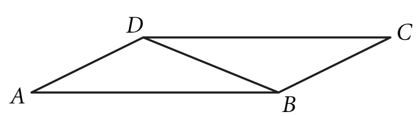


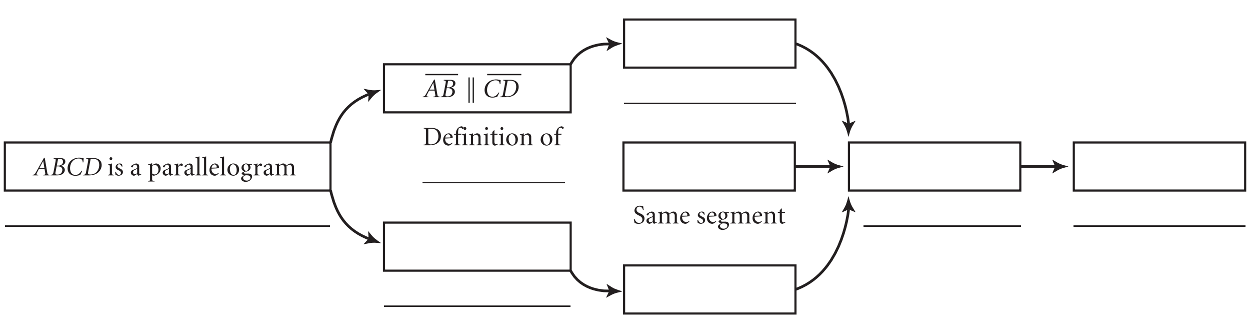


3. **Given:** *ABCD* is a parallelogram

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

   Flowchart Proof

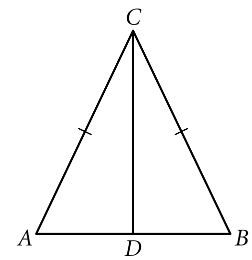




Lesson 4.8 • Proving Special Triangle Conjectures

Name ______________________ **Period** ________ **Date** __________

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



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

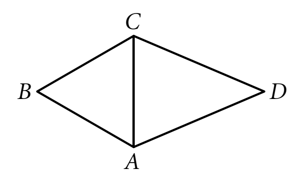
2. $\overline{CD}$ is an angle bisector, and $m\angle A = 54°$. $m\angle ACD =$ _____

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 $\triangle ANG = 51$.
$AN =$ _____

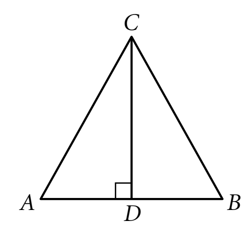
6. $\triangle ABC$ is equilateral, $\triangle ACD$ is isosceles with base $\overline{AC}$, perimeter $\triangle ABC = 66$, and perimeter $\triangle ACD = 82$.
Perimeter $ABCD =$ _____



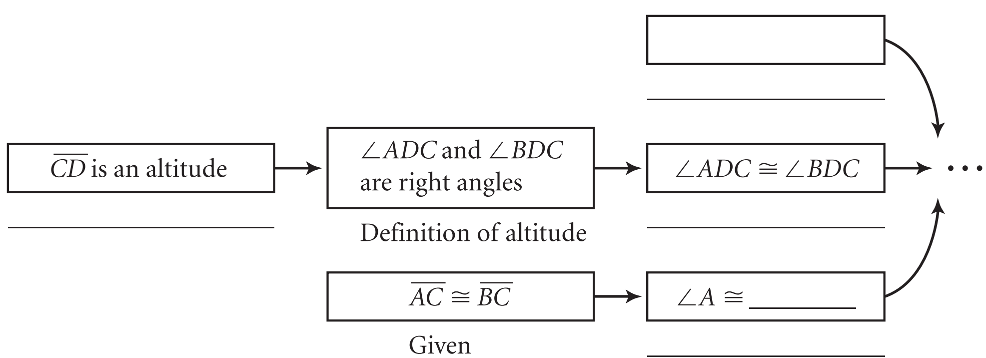
7. Complete a flowchart proof for this conjecture: In an isosceles triangle, the altitude from the vertex angle is the median to the base.

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

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



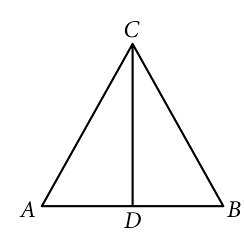
Flowchart Proof



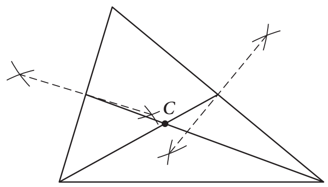
8. Write a flowchart proof for this conjecture: In an isosceles triangle, the median to the base is also the angle bisector of the vertex angle.

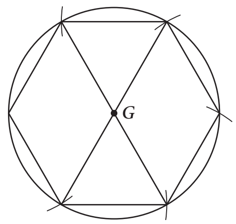
Given: Isosceles $\triangle ABC$ with $\overline{AC} \cong \overline{BC}$ and median $\overline{CD}$

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

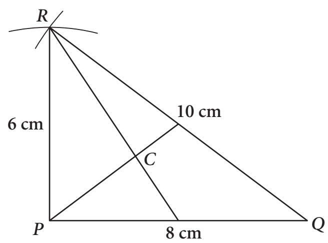


LESSON 3.8 • The Centroid

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

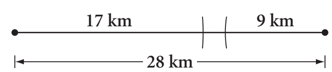
1. $p = 67°$, $q = 15°$
2. $x = 82°$, $y = 81°$
3. $a = 78°$, $b = 29°$
4. $r = 40°$, $s = 40°$, $t = 100°$
5. $x = 31°$, $y = 64°$
6. $y = 145°$
7. $s = 28°$
8. $m = 72\frac{1}{2}°$
9. $m\angle P = a$
10. $m\angle QPT = 135°$
11. 720°
12. The sum of the measures of $\angle A$ and $\angle B$ is 90° because $m\angle C$ 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.

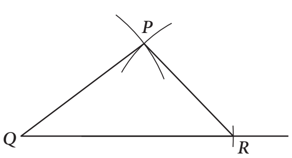
LESSON 4.2 • Properties of Isosceles Triangles

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

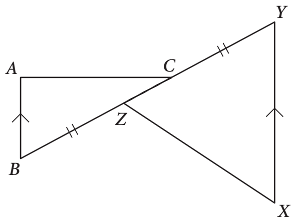


3. $19 < x < 53$
4. $b > a > c$
5. $b > c > a$
6. $a > c = d > b$
7. $x = 76°$
8. $x = 79°$
9. The interior angle at A is 60°. The interior angle at B is 20°. But now the sum of the measures of the triangle is not 180°.
10. By the Exterior Angles Conjecture, $2x = x + m\angle PQS$. So, $m\angle PQS = x$. 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?

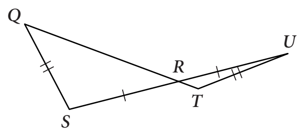
1. SAA or ASA
2. SSS
3. SSS
4. $\triangle BQM$ (SAS)
5. $\triangle TIE$ (SSS)

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



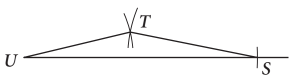
7. $\triangle TNO$ (SAS)

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

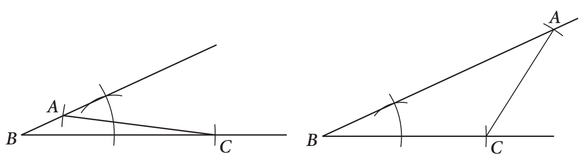


9. $\triangle DOG$ (SAS)

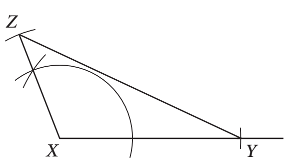
10. Only one triangle because of SSS.



11. Two possible triangles.

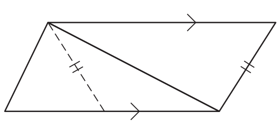


12. Only one triangle because of SAS.



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)

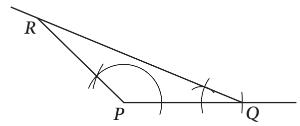
5. $\triangle NRA$ (SAA)

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

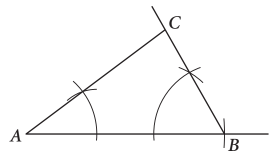
7. Yes, $\triangle QRS \cong \triangle MOL$ by SSS.

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. $m\angle B = 52°$, $CB = 13$

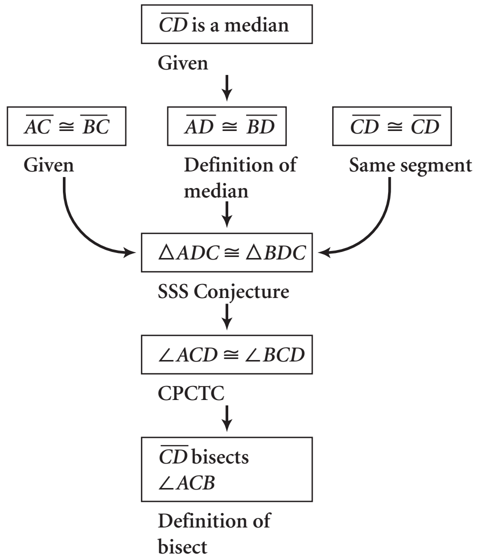
4. $m\angle E = 60°$

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

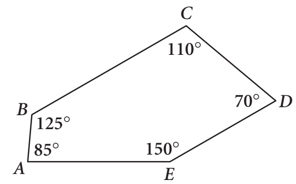
1. $a = 103°$, $b = 103°$, $c = 97°$, $d = 83°$, $e = 154°$

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

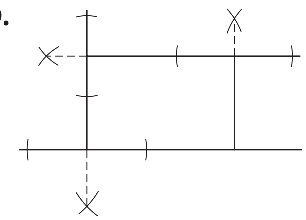
1. 12 sides **2.** 24 sides **3.** 4 sides **4.** 6 sides

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

7. $a = 156°$, $b = 132°$, $c = 108°$

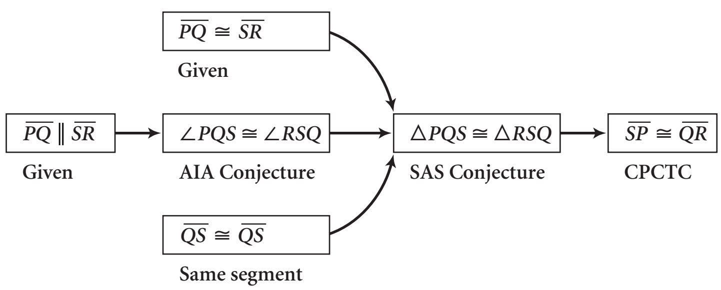
8. $a = 135°$, $b = 40°$, $c = 105°$, $d = 135°$

9.

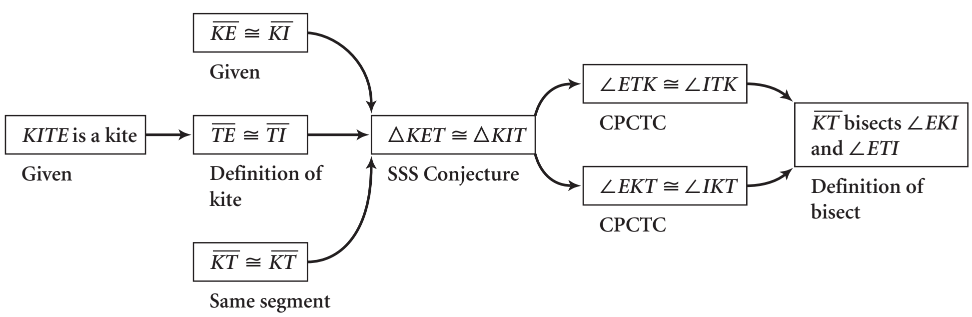


Lesson 4.7, Exercises 1, 2, 3

1.



2.



3.