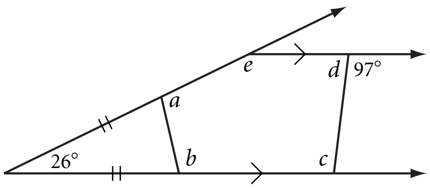
Lesson 5.1 • Polygon Sum Conjecture

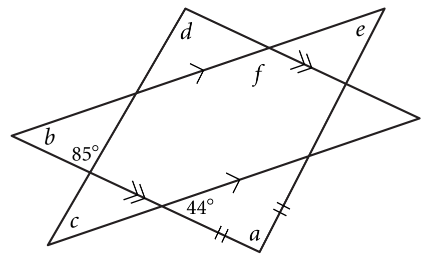
Name ______________________________ Period __________ Date ____________

In Exercises 1 and 2, find each lettered angle measure.

1. $a =$ _____, $b =$ _____, $c =$ _____, $d =$ _____, $e =$ _____



2. $a =$ _____, $b =$ _____, $c =$ _____, $d =$ _____, $e =$ _____, $f =$ _____

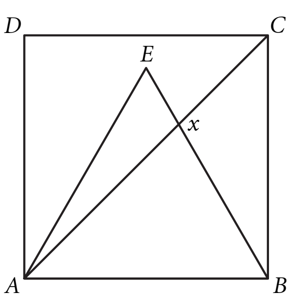


3. One exterior angle of a regular polygon measures 10°. What is the measure of each interior angle? How many sides does the polygon have?

4. The sum of the measures of the interior angles of a regular polygon is 2340°. How many sides does the polygon have?

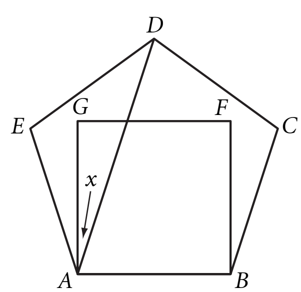
5. *ABCD* is a square. *ABE* is an equilateral triangle.

$x =$ _____



6. *ABCDE* is a regular pentagon. *ABFG* is a square.

$x =$ _____



7. Use a protractor to draw pentagon *ABCDE* with $m\angle A = 85°$, $m\angle B = 125°$, $m\angle C = 110°$, and $m\angle D = 70°$. What is $m\angle E$? Measure it, and check your work by calculating.

Lesson 5.2 • Exterior Angles of a Polygon

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

1. How many sides does a regular polygon have if each exterior angle measures 30°?

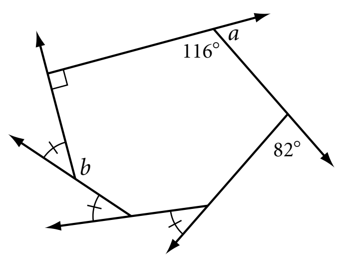
2. How many sides does a polygon have if the sum of the measures of the interior angles is 3960°?

3. If the sum of the measures of the interior angles of a polygon equals the sum of the measures of its exterior angles, how many sides does it have?

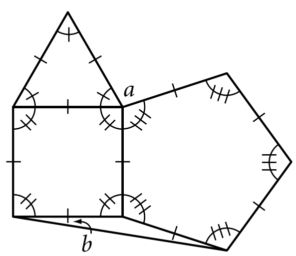
4. If the sum of the measures of the interior angles of a polygon is twice the sum of its exterior angles, how many sides does it have?

In Exercises 5–7, find each lettered angle measure.

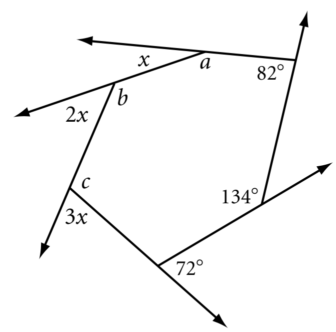
5. $a =$ _____, $b =$ _____



6. $a =$ _____, $b =$ _____



7. $a =$ _____, $b =$ _____, $c =$ _____



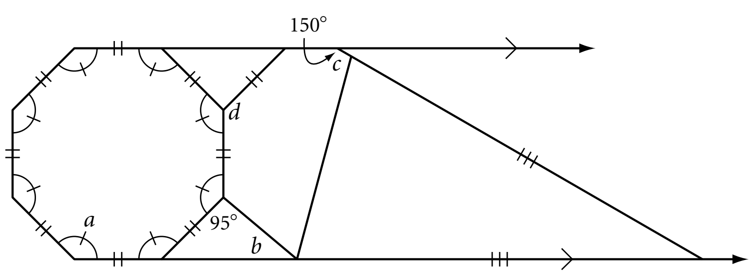
8. Find each lettered angle measure.

$a =$ _____

$b =$ _____

$c =$ _____

$d =$ _____



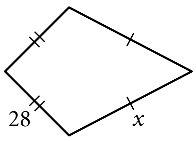
9. Construct an equiangular quadrilateral that is not regular.

Lesson 5.3 • Kite and Trapezoid Properties

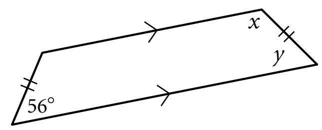
Name ______________________________ **Period** __________ **Date** ____________

In Exercises 1–4, find each lettered measure.

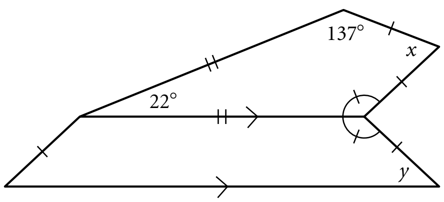
1. Perimeter = 116. x = _____



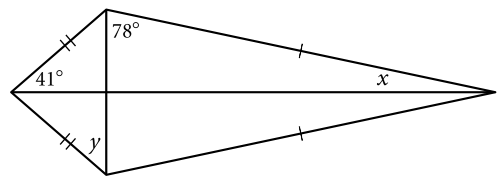
2. x = _____, y = _____



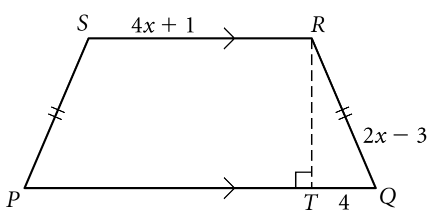
3. x = _____, y = _____



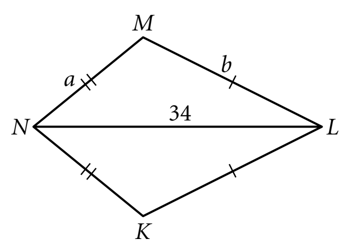
4. x = _____, y = _____



5. Perimeter $PQRS$ = 220. PS = _____

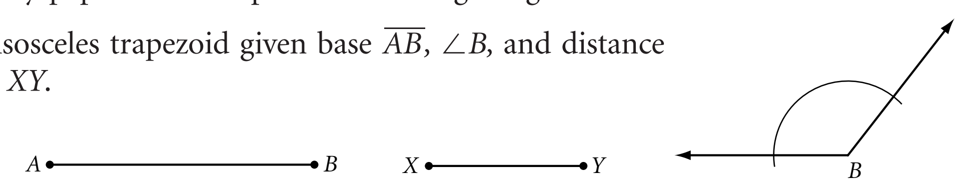


6. $b = 2a + 1$. $a >$ _____

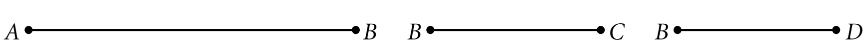


In Exercises 7 and 8, use the properties of kites and trapezoids to construct each figure. Use patty paper or a compass and a straightedge.

7. Construct an isosceles trapezoid given base $\overline{AB}$, $\angle B$, and distance between bases XY.



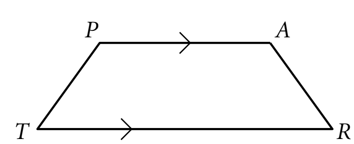
8. Construct kite $ABCD$ with $\overline{AB}$, $\overline{BC}$, and $\overline{BD}$.



9. Write a paragraph or flowchart proof of the Converse of the Isosceles Trapezoid Conjecture. *Hint:* Draw $\overline{AE}$ parallel to $\overline{TP}$ with E on $\overline{TR}$.

Given: Trapezoid $TRAP$ with $\angle T \cong \angle R$

Show: $\overline{TP} \cong \overline{RA}$

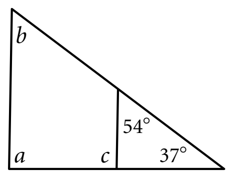


Lesson 5.4 • Properties of Midsegments

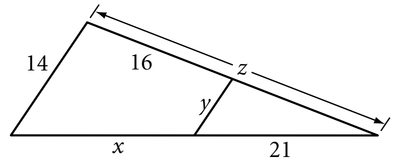
Name ______________________________ **Period** __________ **Date** ______________

In Exercises 1–3, each figure shows a midsegment.

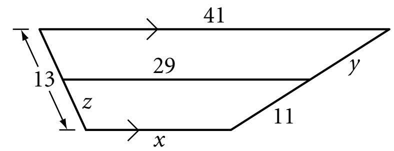
1. $a =$ _____, $b =$ _____, $c =$ _____



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



3. $x =$ _____, $y =$ _____, $z =$ _____

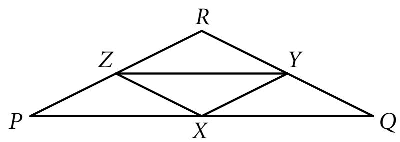


4. X, Y, and Z are midpoints. Perimeter $\triangle PQR = 132$, $RQ = 55$, and $PZ = 20$.

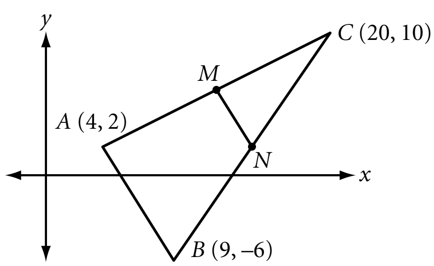
Perimeter $\triangle XYZ =$ _____

$PQ =$ _____

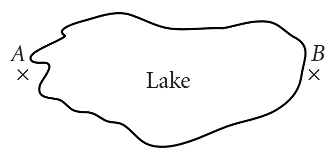
$ZX =$ _____



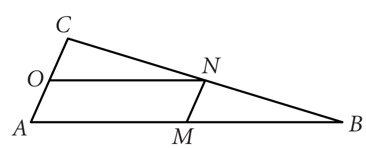
5. $\overline{MN}$ is the midsegment. Find the coordinates of M and N. Find the slopes of $\overline{AB}$ and $\overline{MN}$.



6. Explain how to find the width of the lake from A to B using a tape measure, but without using a boat or getting your feet wet.



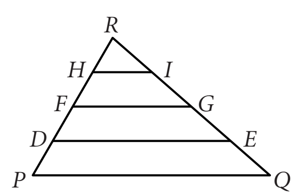
7. M, N, and O are midpoints. What type of quadrilateral is $AMNO$? How do you know? Give a flowchart proof showing that $\triangle ONC \cong \triangle MBN$.



8. Give a paragraph or flowchart proof.

Given: $\triangle PQR$ with $PD = DF = FH = HR$ and $QE = EG = GI = IR$

Show: $\overline{HI} \parallel \overline{FG} \parallel \overline{DE} \parallel \overline{PQ}$

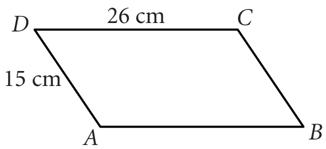


Lesson 5.5 • Properties of Parallelograms

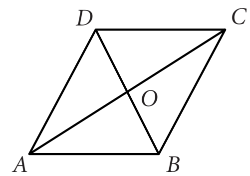
Name ______________________________ **Period** __________ **Date** ______________

In Exercises 1–7, *ABCD* is a parallelogram.

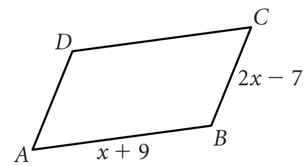
1. Perimeter $ABCD =$ _____



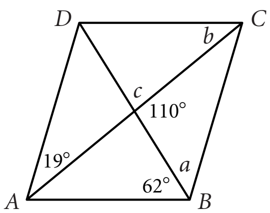
2. $AO = 11$, and $BO = 7$.
$AC =$ _____, $BD =$ _____



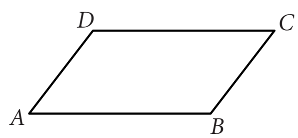
3. Perimeter $ABCD = 46$.
$AB =$ _____, $BC =$ _____



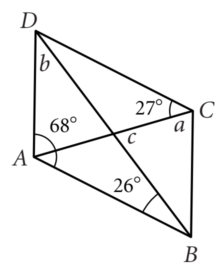
4. $a =$ _____, $b =$ _____,
$c =$ _____



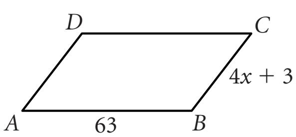
5. Perimeter $ABCD = 119$, and
$BC = 24$. $AB =$ _____



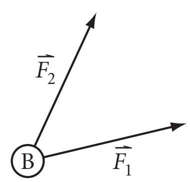
6. $a =$ _____, $b =$ _____,
$c =$ _____



7. Perimeter $ABCD = 16x - 12$. $AD =$ _____

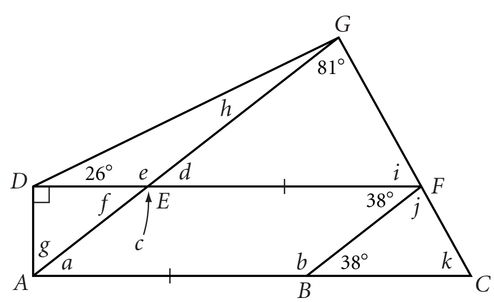


8. Ball B is struck at the same instant by two forces, $\vec{F}_1$ and $\vec{F}_2$. Show the resultant force on the ball.

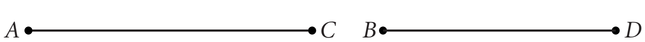


9. Find each lettered angle measure.

$a =$ _____ $g =$ _____
$b =$ _____ $h =$ _____
$c =$ _____ $i =$ _____
$d =$ _____ $j =$ _____
$e =$ _____ $k =$ _____
$f =$ _____



10. Construct a parallelogram with diagonals $\overline{AC}$ and $\overline{BD}$.
Is your parallelogram unique? If not, construct a different (noncongruent) parallelogram.



Lesson 5.6 • Properties of Special Parallelograms

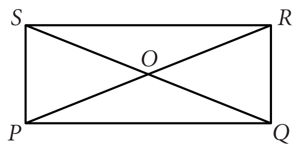
Name ______________________________ **Period** __________ **Date** ______________

1. *PQRS* is a rectangle and $OS = 16$.

$OQ =$ _____

$m\angle QRS =$ _____

$PR =$ _____

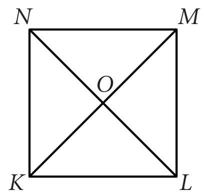


2. *KLMN* is a square and $NM = 8$.

$m\angle OKL =$ _____

$m\angle MOL =$ _____

Perimeter $KLMN =$ _____

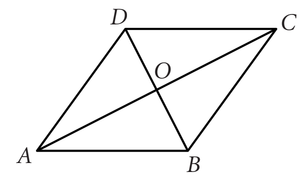


3. *ABCD* is a rhombus, $AD = 11$, and $DO = 6$.

$OB =$ _____

$BC =$ _____

$m\angle AOD =$ _____



In Exercises 4–11, match each description with *all* the terms that fit it.

a. Trapezoid **b.** Isosceles triangle **c.** Parallelogram **d.** Rhombus

e. Kite **f.** Rectangle **g.** Square **h.** All quadrilaterals

4. _____ Diagonals bisect each other.

5. _____ Diagonals are perpendicular.

6. _____ Diagonals are congruent.

7. _____ Measures of interior angles sum to 360°.

8. _____ Opposite sides are congruent.

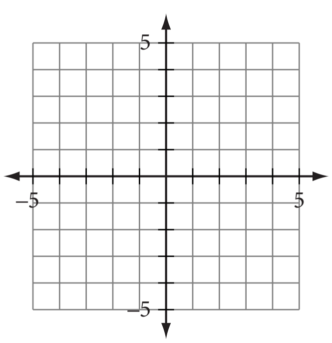
9. _____ Opposite angles are congruent.

10. _____ Both diagonals bisect angles.

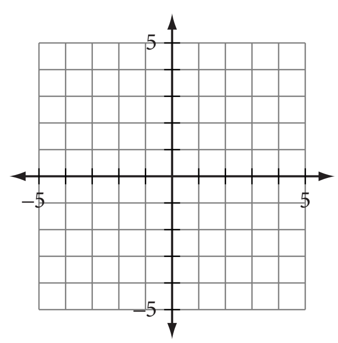
11. _____ Diagonals are perpendicular bisectors of each other.

In Exercises 12 and 13, graph the points and determine whether *ABCD* is a trapezoid, parallelogram, rectangle, or none of these.

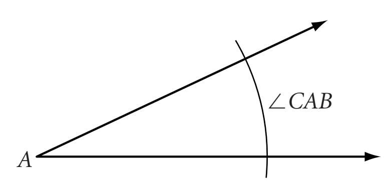
12. $A(-4, -1)$, $B(0, -3)$, $C(4, 0)$, $D(-1, 5)$



13. $A(0, -3)$, $B(-1, 2)$, $C(-3, 4)$, $D(-2, -1)$



14. Construct rectangle *ABCD* with diagonal $\overline{AC}$ and $\angle CAB$.



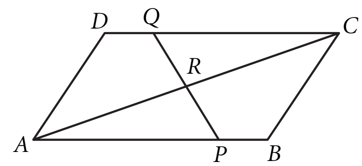
Lesson 5.7 • Proving Quadrilateral Properties

Name ______________________ **Period** __________ **Date** ____________

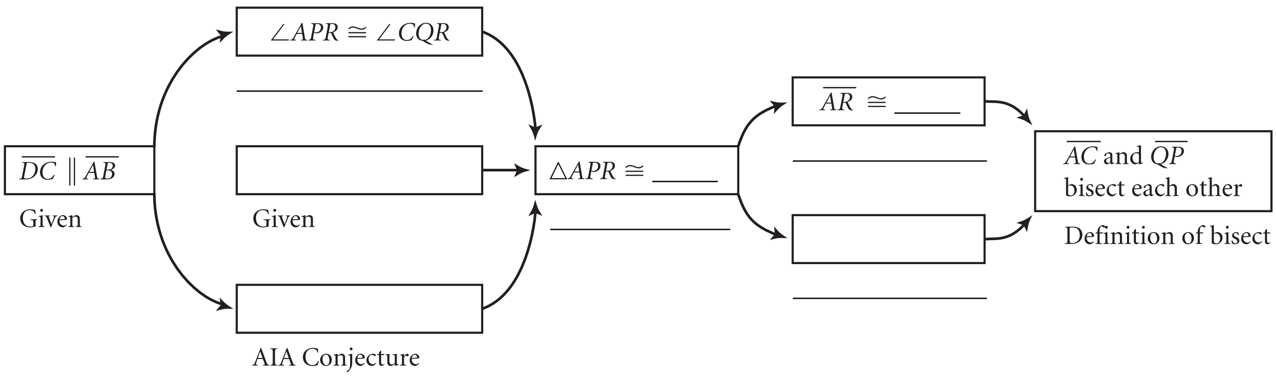
Write or complete each flowchart proof.

1. Given: $ABCD$ is a parallelogram and $\overline{AP} \cong \overline{QC}$

Show: $\overline{AC}$ and $\overline{PQ}$ bisect each other

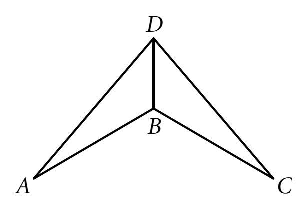


Flowchart Proof



2. Given: Dart $ABCD$ with $\overline{AB} \cong \overline{BC}$ and $\overline{CD} \cong \overline{AD}$

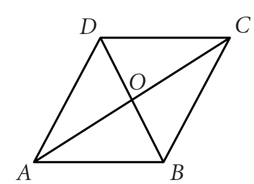
Show: $\angle A \cong \angle C$



3. Show that the diagonals of a rhombus divide the rhombus into four congruent triangles.

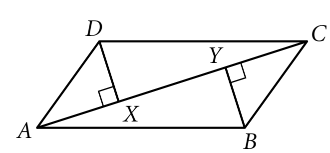
Given: Rhombus $ABCD$

Show: $\triangle ABO \cong \triangle CBO \cong \triangle CDO \cong \triangle ADO$



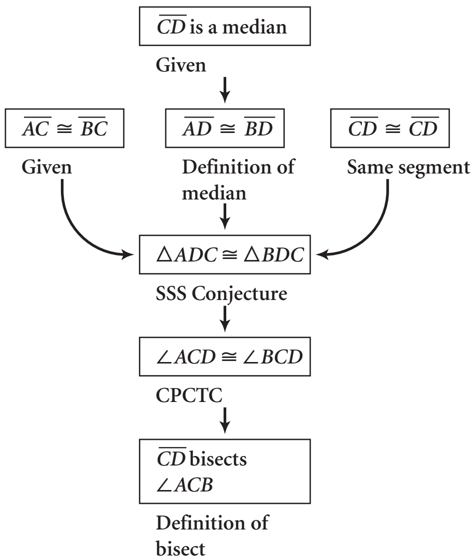
4. Given: Parallelogram $ABCD$, $\overline{BY} \perp \overline{AC}$, $\overline{DX} \perp \overline{AC}$

Show: $\overline{DX} \cong \overline{BY}$



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

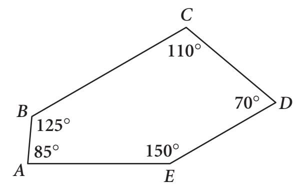
3. 170°; 36 sides

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

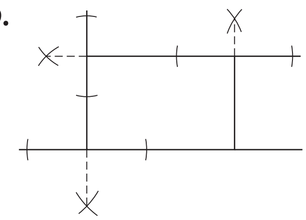
5. $a = 64°$, $b = 138\frac{2}{3}°$

6. $a = 102°$, $b = 9°$

7. $a = 156°$, $b = 132°$, $c = 108°$

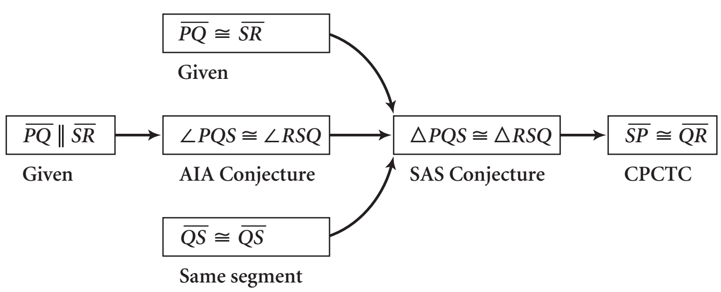
8. $a = 135°$, $b = 40°$, $c = 105°$, $d = 135°$

9.

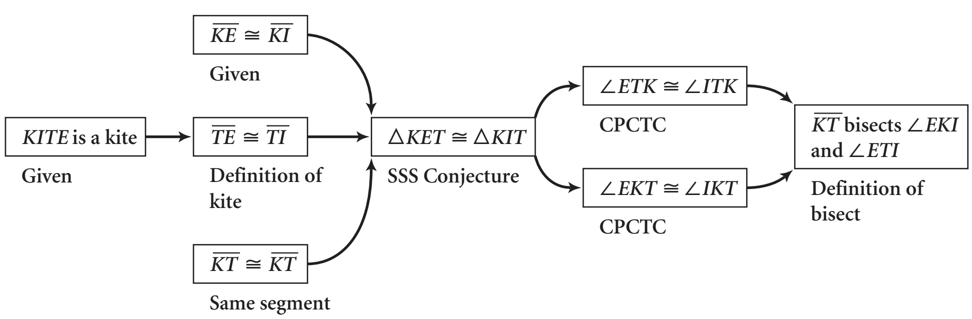


Lesson 4.7, Exercises 1, 2, 3

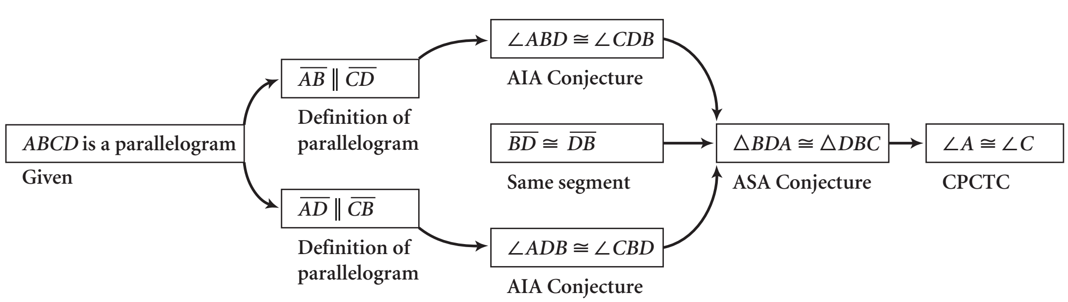
1.



2.



3.



LESSON 5.3 • Kite and Trapezoid Properties

1. $x = 30$

2. $x = 124°$, $y = 56°$

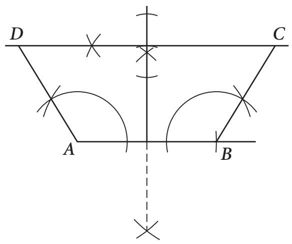
3. $x = 64°$, $y = 43°$

4. $x = 12°$, $y = 49°$

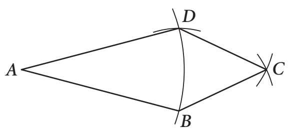
5. $PS = 33$

6. $a > 11$

7.



8.



9. Possible answer:

Paragraph proof: Draw $\overline{AE} \parallel \overline{PT}$ with E on $\overline{TR}$. $TEAP$ is a parallelogram. $\angle T \cong \angle AER$ because they are corresponding angles of parallel lines. $\angle T \cong \angle R$ because it is given, so $\angle AER \cong \angle R$, because both are congruent to $\angle T$. Therefore, $\triangle AER$ is isosceles by the Converse of the Isosceles Triangle Conjecture. $\overline{TP} \cong \overline{EA}$ because they are opposite sides of a parallelogram and $\overline{AR} \cong \overline{EA}$ because $\triangle AER$ is isosceles. Therefore, $\overline{TP} \cong \overline{RA}$ because both are congruent to $\overline{EA}$.

LESSON 5.4 • Properties of Midsegments

1. $a = 89°$, $b = 54°$, $c = 91°$

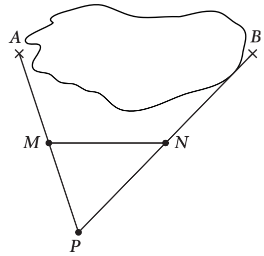
2. $x = 21$, $y = 7$, $z = 32$

3. $x = 17$, $y = 11$, $z = 6.5$

4. Perimeter $\triangle XYZ = 66$, $PQ = 37$, $ZX = 27.5$

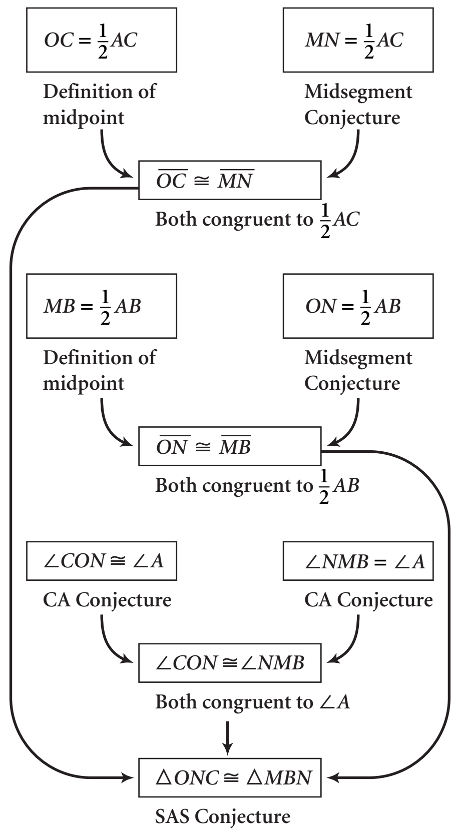
5. $M(12, 6)$, $N(14.5, 2)$; slope $\overline{AB} = -1.6$, slope $\overline{MN} = -1.6$

6. Pick a point P from which A and B can be viewed over land. Measure AP and BP and find the midpoints M and N. $AB = 2MN$.



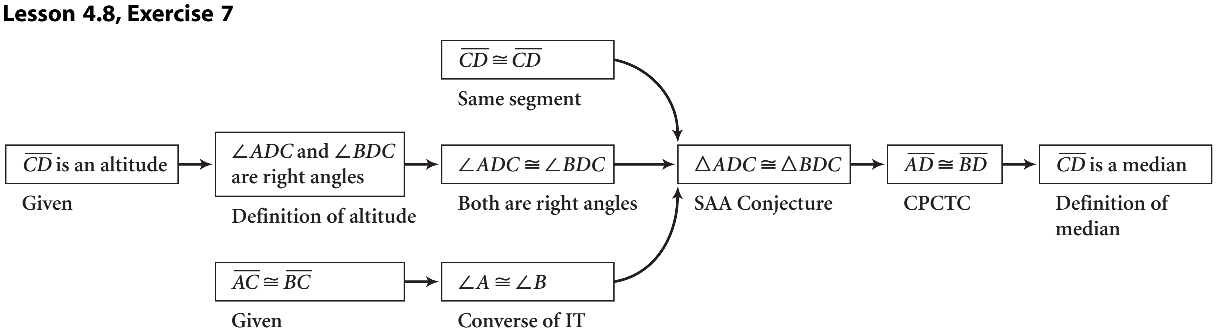
7. $AMNO$ is a parallelogram. By the Triangle Midsegment Conjecture, $\overline{ON} \parallel \overline{AM}$ and $\overline{MN} \parallel \overline{AO}$.

Flowchart Proof



8. **Paragraph proof:** Looking at $\triangle FGR$, $\overline{HI} \parallel \overline{FG}$ by the Triangle Midsegment Conjecture. Looking at $\triangle PQR$, $\overline{FG} \parallel \overline{PQ}$ for the same reason. Because $\overline{FG} \parallel \overline{PQ}$, quadrilateral $FGQP$ is a trapezoid and $\overline{DE}$ is the midsegment, so it is parallel to $\overline{FG}$ and $\overline{PQ}$. Therefore, $\overline{HI} \parallel \overline{FG} \parallel \overline{DE} \parallel \overline{PQ}$.

Lesson 4.8, Exercise 7



LESSON 5.5 • Properties of Parallelograms

1. Perimeter $ABCD = 82$ cm

2. $AC = 22$, $BD = 14$

3. $AB = 16$, $BC = 7$

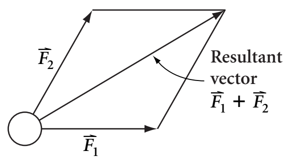
4. $a = 51°$, $b = 48°$, $c = 70°$

5. $AB = 35.5$

6. $a = 41°$, $b = 86°$, $c = 53°$

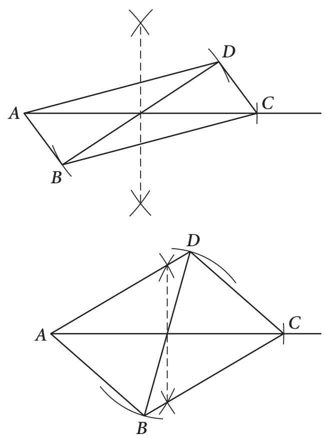
7. $AD = 75$

8.



9. $a = 38°$, $b = 142°$, $c = 142°$, $d = 38°$, $e = 142°$, $f = 38°$, $g = 52°$, $h = 12°$, $i = 61°$, $j = 81°$, $k = 61°$

10. No



LESSON 5.6 • Properties of Special Parallelograms

1. $OQ = 16$, $m\angle QRS = 90°$, $PR = 32$

2. $m\angle OKL = 45°$, $m\angle MOL = 90°$, perimeter $KLMN = 32$

3. $OB = 6$, $BC = 11$, $m\angle AOD = 90°$

4. c, d, f, g

5. d, e, g

6. f, g

7. h

8. c, d, f, g

9. c, d, f, g

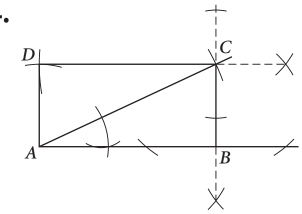
10. d, g

11. d, g

12. None

13. Parallelogram

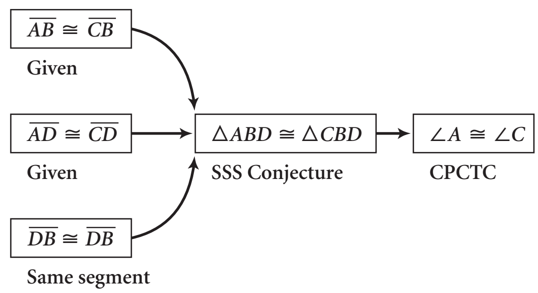
14.



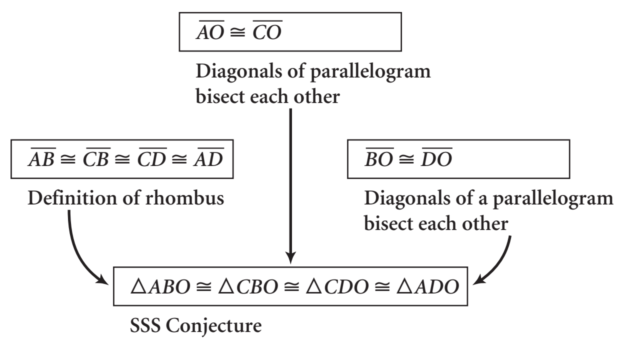
LESSON 5.7 • Proving Quadrilateral Properties

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

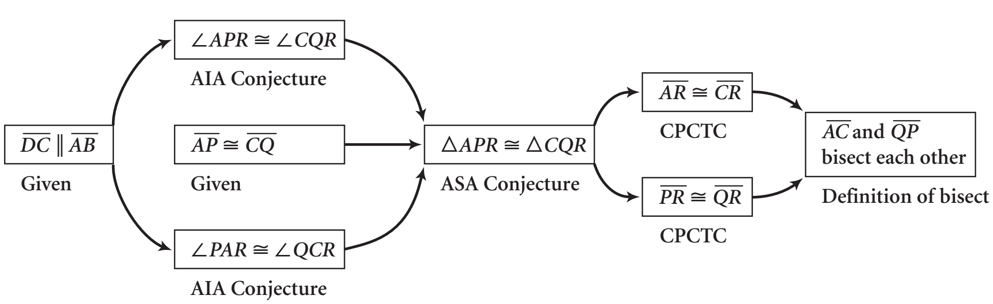
2. Flowchart Proof



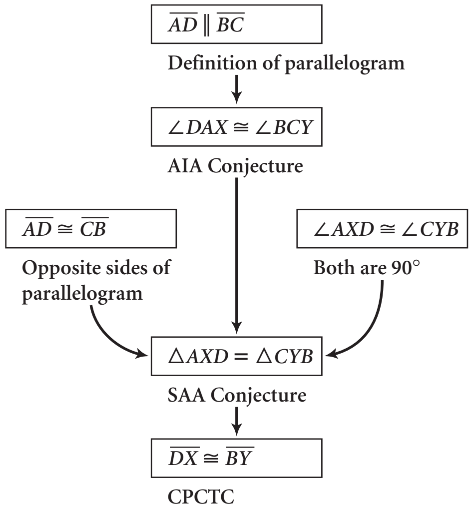
3. Flowchart Proof



Lesson 5.7, Exercise 1



4. Flowchart Proof



LESSON 6.1 • Tangent Properties

1. $w = 126°$

2. $m\angle BQX = 65°$

3. a. $m\angle NQP = 90°$, $m\angle MPQ = 90°$

b. Trapezoid. Possible explanation: $\overline{MP}$ and $\overline{NQ}$ are both perpendicular to $\overline{PQ}$, so they are parallel to each other. The distance from M to $\overline{PQ}$ is MP, and the distance from N to $\overline{PQ}$ is NQ. But the two circles are not congruent, so $MP \neq NQ$. Therefore, $\overline{MN}$ is not a constant distance from $\overline{PQ}$ and they are not parallel. Exactly one pair of sides is parallel, so $MNQP$ is a trapezoid.

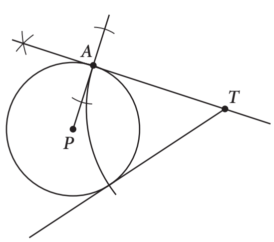
4. $y = -\frac{1}{3}x + 10$

5. Possible answer: Tangent segments from a point to a circle are congruent. So, $\overline{PA} \cong \overline{PB}$, $\overline{PB} \cong \overline{PC}$, and $\overline{PC} \cong \overline{PD}$. Therefore, $\overline{PA} \cong \overline{PD}$.

6. a. 4.85 cm

b. 11.55 cm

7.



LESSON 6.2 • Chord Properties

1. $a = 95°$, $b = 85°$, $c = 47.5°$

2. v cannot be determined, $w = 90°$

3. $z = 45°$

4. $w = 100°$, $x = 50°$, $y = 110°$

5. $w = 49°$, $x = 122.5°$, $y = 65.5°$

6. $x = 16$ cm, y cannot be determined

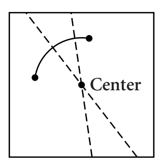
7. Kite. Possible explanation: $\overline{OM} \cong \overline{ON}$ because congruent chords $\overline{AB}$ and $\overline{AC}$ are the same distance from the center. $\overline{AM} \cong \overline{AN}$ because they are halves of congruent chords. So, $AMON$ has two pairs of adjacent congruent sides and is a kite.

8. The perpendicular segment from the center of the circle bisects the chord, so the chord has length 12 units. But the diameter of the circle is 12 units, and the chord cannot be as long as the diameter because it doesn't pass through the center of the circle.

9. $P(0,1)$, $M(4, 2)$

10. $m\overset{\frown}{AB} = 49°$, $m\overset{\frown}{ABC} = 253°$, $m\overset{\frown}{BAC} = 156°$, $m\overset{\frown}{ACB} = 311°$

11. Possible answer: Fold and crease to match the endpoints of the arc. The crease is the perpendicular bisector of the chord connecting the endpoints. Fold and crease so that one endpoint falls on any other point on the arc. The crease is the perpendicular bisector of the chord between the two matching points. The center is the intersection of the two creases.



LESSON 6.3 • Arcs and Angles

1. $m\angle XNM = 40°$, $m\overset{\frown}{XN} = 180°$, $m\overset{\frown}{MN} = 100°$

2. $x = 120°$, $y = 60°$, $z = 120°$

3. $a = 90°$, $b = 55°$, $c = 35°$

4. $a = 50°$, $b = 60°$, $c = 70°$

5. $x = 140°$

6. $m\angle A = 90°$, $m\overset{\frown}{AB} = 72°$, $m\angle C = 36°$, $m\overset{\frown}{CB} = 108°$

7. $m\overset{\frown}{AD} = 140°$, $m\angle D = 30°$, $m\overset{\frown}{AB} = 60°$, $m\overset{\frown}{DAB} = 200°$

8. $p = 128°$, $q = 87°$, $r = 58°$, $s = 87°$

9. $a = 50°$, $b = 50°$, $c = 80°$, $d = 50°$, $e = 130°$, $f = 90°$, $g = 50°$, $h = 50°$, $j = 90°$, $k = 40°$, $m = 80°$, $n = 50°$