Chapter 7

7.1.1:

7-6. **a.** They are congruent by ASA$\cong$ or AAS$\cong$
b: $AC \approx 9.4$ units and $DF = 20$ units

7-7. Relationships used will vary, but may include alternate interior angles, Triangle Angle Sum Theorem, etc.; $a = 26°$, $b = 65°$, $c = 26°$, $d = 117°$

7-8. width $= 60$ mm, area $= 660\text{mm}^2$

7-9. a quadrilateral

7-10. **a:** $(6,-13)$ **b:** not possible, these curves do not intersect

7.1.2:

7-14. Using the Pythagorean Theorem, $AB = 8$ and $JH = 5$. Then, since $\frac{3}{6} = \frac{4}{8} = \frac{5}{10}$, $\Delta ABC \sim \Delta HGJ$ because of SSS ~.

7-15. 7 units

7-16. **a:** $3m = 5m - 28$, $m = 14°$ **b:** $3x + 38° + 7x - 8° = 180°$, $x = 15°$
c: $2(n+4) = 3n - 1$, $n = 9$ un **d:** $2(3x+12) = 11x - 1$, $x = 5$ un

7-17. Rotating about the midpoint of a base forms a hexagon (one convex and one non-convex). Rotating the trapezoid about the midpoint of either of the non-base sides forms a parallelogram.

7-18. **a:** 10 units **b:** $(-1,4)$
c: 5 units, it must be half of AB because C is the midpoint of $\overline{AB}$.

7.1.3:

7-26. **a:** The 90° angle is reflected so $m\measuredangle XZY' = 90°$. Then $m\measuredangle YZY' = 180°$.
b: They must be congruent because rigid transformations (such as reflection) do not alter shape or size of an object.
c: $\overline{XY} \cong \overline{XY'}$, $\overline{XZ} \cong \overline{XZ}$, $\overline{YZ} \cong \overline{Y'Z}$, $\measuredangle Y \cong \measuredangle Y'$, $\measuredangle YXZ \cong \measuredangle Y'XZ$ and $\measuredangle YZX \cong \measuredangle Y'ZX$

7-27. $M(0,7)$; A variety of methods are possible

7-28. **a:** The triangles are similar because corresponding sides are proportional (SSS ~).
b: The triangles are similar because parallel lines assure that corresponding angles have equal measure (AA ~).
c: Not enough information is provided.
d: The triangles are congruent by AAS □ or ASA □ .

7-29. **a:** It is a parallelogram; opposite sides are parallel.
b: 63.4°; They are equal.
c: $\overline{AC}: y = \frac{1}{2}x + \frac{1}{2}$, $\overline{BD}: y = -x + 5$: No
d: $(3,2)$

7-30. **a:** No solution; lines are parallel.
b: $(0,3)$ and $(4,11)$

7-31. Side length $= \sqrt{50}$ units, diagonal is $\sqrt{50} \cdot \sqrt{2} = \sqrt{100} = 10$ units

7-32. **a:** It is a rhombus. It has four sides of length 5 units.
b: $\overline{HJ}: y = -2x + 8$ and $\overline{GI}: \frac{1}{2}x + 3$
c: They are perpendicular.
d: $(6,-1)$
e: 20 square units

7-33. **a:** $6n - 3° = n + 17°$, $n = 4°$
b: $7x - 19° + 3x + 14° = 180°$ so $x = 18.5°$. Then $5y - 2° = 7(18.5) - 19°$, so $y = 22.5°$.
c: $5w + 36° + 3w = 180°$, $w = 18°$
d: $k^2 = 15^2 + 25^2 - 2(15)(25)\cos 120°$, $k = 35$

7-34. ≈ 35.24 units

7-35. **a:** $\frac{1}{8}$ **b:** $\frac{5}{6}$

7.1.4:

7-39. $360° \div 36° = 10$ sides **b:** regular decagon

7-40. If the diagonals intersect at E, then $BE = 12$ mm, since the diagonals are perpendicular bisectors. Then ΔABE is a right triangle and $AE = \sqrt{15^2 - 12^2} = 9$ mm. Thus, $AC = 18$ mm.

7-41. Yes, she is correct. One way: Show that the lengths on both sides of the midpoint are equal and that $(2, 4)$ lies on the line that connects $(-3, 5)$ and $(7, 3)$.

7-42. (a) and (c) are correct because if the triangles are congruent, then corresponding parts are congruent. Since alternate interior angles are congruent, then $AB \parallel DE$.

7-43. $AB = \sqrt{40} \approx 6.32$, $BC = \sqrt{34} \approx 5.83$, therefore C is closer to B.

7.2.1:

7-49. **a:** $x = 8.5°$ **b:** $x = 11$ **c:** $x = 14°$

7-50. **a:** $360° \div 72° = 5$ sides **b :** $360° \div 9 = 40°$

7-51. ≈ 36.4 feet from the point on the street closest to the Art Museum

7-52. **a:** $x + x + 82° = 180°$, $x = 49°$ **b:** $2(71°) + x = 180°$, $x = 38°$

7-53. **a:** similar (SSS ~) **b:** congruent (ASA $\cong$ or AAS $\cong$)
c: congruent, because if the Pythagorean Theorem is used to solve for each unknown side, then 3 pairs of corresponding sides are congruent; thus, the triangles are congruent by SSS $\cong$
d: similar (AA ~) but not congruent since the two sides of length 12 are not corresponding

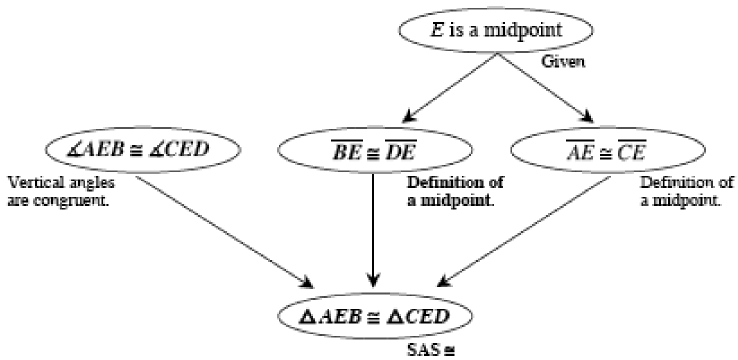
7.2.2:

7-58. $4x - 1 = x + 8,\ x = 3;\ \ 5y + 2 = 22,\ y = 4$

7-59. **a:** 83° **b:** 92°

7-60. **a:** It is a parallelogram, because $\overline{MN} \parallel \overline{PQ}$ and $\overline{NP} \parallel \overline{MQ}$
b: $(1, -5)$

7-61.



7-62.

7.2.3:

7-66. **a:** congruent (SSS $\cong$) **b:** not enough information
c: congruent (ASA $\cong$) **d:** congruent (HL $\cong$)

7-67. **a:** It is possible.
b: Same-side interior angles should add up to 180°.
c: One pair of alternate interior angles are equal, but the other is not for the same pair of lines cut by a transversal; or, the vertical angles are not equal.

7-68. **a:** Yes, HL$\cong$ **b:** $18°, 4$
c: $\tan 18° = \frac{4}{AD}$, $AD \approx 12.3$ units **d:** ≈ 49.2 square units

7-69. **a:** Parallelogram because the opposite sides are parallel.
b: $\overleftrightarrow{AC}: y = \frac{3}{4}x$; $\overleftrightarrow{BD}: y = -\frac{3}{2}x + 9$

7-70. **a:** $2x + 52° = 180°$, $64°$ **b:** $4x - 3° + 3x + 1° = 180°$, $26°$
c: $\frac{\sin 77°}{x} = \frac{\sin 72°}{8}$, $x \approx 8.2$ **d:** $5x + 6° = 2x + 21°$, $x = 5°$

7.2.4:

7-72. $36\sqrt{3} \approx 62.4$ square units

7-73. No; using the Pythagorean Theorem and the Law of Cosines, the perimeter of the triangle is ≈ 26.3 feet.

7-74. **a:** congruent (SAS$\cong$) and $x = 2$ **b:** congruent (HL$\cong$) and $x = 32$

7-75. $A = 24$ square units

7-76. ≈ 103.8 meters

7.2.5:

7-83. **b:** Since corresponding parts of congruent triangles are congruent, $2y+7=21$ and $y=7$.

7-84. $m\measuredangle a=132°$, $m\measuredangle b=108°$, $m\measuredangle c=120°$, $m\measuredangle a+m\measuredangle b+m\measuredangle c=360°$

7-85. $\overline{AB} \cong \overline{CD}$ and $\overline{AB} \parallel \overline{CD}$ (given), so $\measuredangle \text{BAC} \cong \measuredangle \text{DCA}$ (alt. int. angles). $\overline{AC} \cong \overline{CA}$ (Reflexive Property) so $\Delta ABC \cong \Delta CDA$ (SAS $\cong$). $\measuredangle BCA \cong \measuredangle DAC$ ($\cong \Delta s \rightarrow \cong$ parts). Thus, $\overline{BC} \parallel \overline{AD}$ $BC\ //\ AD$ (if alt. int. angles are congruent, then the lines cut by the transversal are congruent).

7-86. $A=42$ square units, $P \approx 30.5$ units

7-87. **a:** ΔADC ; $AAS \cong$ or $ASA \cong$
b: ΔSQR ; $HL \cong$
c: no solution, only angles are congruent
d: ΔTZY ; $SAS \cong$ and vertical angles
e: ΔGFE ; alternate interior angles equal and $ASA \cong$
f: ΔDEF , $SSS \cong$

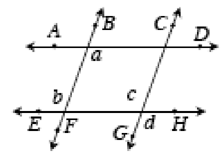
7.2.6:

7-94. **a:** The triangles should be $\cong$ by SSS $\cong$ but $80° \neq 50°$.
b: The triangles should be $\cong$ by SAS $\cong$ but $80° \neq 90°$ and $40° \neq 50°$.
c: The triangles should be $\cong$ by SAS $\cong$ but $10 \neq 12$.
d: Triangle is isosceles but the base angles are not equal.
e: The large triangle is isosceles but base angles are not equal.
f: The triangles should be $\cong$ by SAS $\cong$ but sides $13 \neq 14$.

7-95. **a:** 12 **b:** 15 **c:** 15.5

7-96.

Statements	Reasons
1. $\overline{AD} \parallel \overline{EH}$ and $\overline{BF} \parallel \overline{CG}$	**[Given]**
2. $a = b$	**[If lines are parallel, alternate interior angle measures are equal.]**
3. $b = c$	**[If lines are parallel, corresponding angle measures are equal.]**
4. $a = c$	**[Substitution]**
5. $c = d$	**[Vertical angle measures are equal.]**
6. $a = d$	**[Substitution]**



7-97. This problem is similar to the Interior Design problem (7-19). Her sink should be located $3\frac{2}{3}$ feet from the right front edge of the counter. This will make the perimeter ≈ 25.6 feet, which will meet industry standards.

7.3.1:

7-102. **a:** $(4.5, 3)$ **b:** $(-3, 1.5)$ **c:** $(1.5, -2)$

7-103. **a:** $\Delta SHR \sim \Delta SAK$ by AA~ **b:** $2HR = AK$, $2SH = SA$, $SH = HA$
c: 6 units

7-104. **a:** ΔCED; vertical angles are equal, ASA$\cong$
b: ΔEFG; SAS$\cong$
c: ΔHJK; $HI + IJ = LK + KJ$, $\measuredangle J \cong \measuredangle J$; SAS$\cong$
d: not $\cong$, all corresponding pairs of angles equal is not sufficient

7-105. No, her conclusion in Statement #3 depends on Statement #4, and thus must follow it.

7-106. **a:** must be a quadrilateral with all four sides of equal length
b: must be a quadrilateral with two pairs of opposite sides that are parallel

7.3.2:

7-112. Multiple answers are possible. Any order is valid as long as Statement #1 is first, Statement #6 is last, and Statement #4 follows both Statements #2 and #3. Statements #2, #3, and #5 are independent of each other and can be in any order as long as #2 and #3 follow Statement #1.

7-113. **a:** 6 **b:** 3 **c:** -6.5

7-114. **a:** yes, by SAS~ **b:** $\measuredangle FGH \cong \measuredangle FIJ$, $\measuredangle FHG \cong FJI$

c: Yes, because corresponding angles are congruent and because of the Triangle Midsegment Theorem.

d: $2(4x-3)=3x+14$, so $x=4$ and $GH=4(4)-3=13$ units

7-115. **a:** a right triangle. Some students may also call it a slope triangle.

b: B' is at $(2,7)$. $ABCB'$ is a kite.

7-116. **a:** Must be: trapezoid. Could be: isosceles trapezoid, parallelogram, rhombus, rectangle, and square.

b: Must be: parallelogram. Could be: rhombus, rectangle, and square.

7.3.3:

7-119. **a:** $(8,8)$ **b:** $(6.5,6)$ **c:** $(1,8.5)$ **d:** $(2,4)$

7-120. **a:** X and Y **b:** Y and Z

7-121. **a:** Must be: none. Could be: right trapezoid, rectangle, square.

b: Must be: none. Could be: Kite, rhombus, square.

7-122. **a:** $360° \div 18° = 20$ sides

b: It can measure 90° (which forms a square). It cannot be 180° (because this polygon would only have 2 sides) or 13° (because 13 does not divide evenly into 360°).

7-123. It must be a 30°- 60°- 90° triangle because it is a right triangle and the hypotenuse is twice the length of a leg.