Answers to Geometry Unit 2 Practice

LESSON 9-1

1. B
2. $(x, y) \rightarrow (x + 3, y + 5)$
3. **a.** $(-3, 3)$
   b. $(-6, -2)$
   c. $(3, -9)$
   d. $(4, -6)$
4. **a.** rigid
   b. nonrigid
   c. rigid
   d. nonrigid
   e. nonrigid
5. **a.** $\sqrt{41}$ units
   b. A rigid transformation does not change lengths.

LESSON 9-2

6. D
7. **a.** $(-2, 2)$
   b. $(x, y) \rightarrow (x - 3, y - 3)$
8. **a.** They have the same length and they are parallel.
   b. $R(0, 3)$, $S(-1, 9)$
9. **a.** $(-1, 0)$
   b. $(x, y) \rightarrow (x + 6, y - 5)$
10. **a.** A
    b. C
    c. The image is translated 4 units to the left and 5 units up. The only two figures that satisfy that translation are triangle A for the original triangle and triangle C for the image.
    d. $(x, y) \rightarrow (x + 4, y - 5)$

LESSON 9-3

11. A
12. C
13. **a.** $x = 0$
    b. $y = 0$
    c. $y = -1$
    d. $x = -\frac{5}{2}$
    e. $x = 10$
14. **a.** $(10, 2)$
    b. $(4, -2)$
    c. $(4, 2)$
    d. $y = 2$
15. **a.** J, L, N, P
    b. K
    c. H, I, M, O
    d. $+$ and $\times$ each has four lines of symmetry; $-$ and $\div$ each has two lines of symmetry.

LESSON 9-4

16. **a.** right
    b. left
    c. up
    d. right
17. D
18. **a.** $(-2, -3)$
    b. $90°$ clockwise
19. **a.** angle S
    b. angle E
    c. $\overline{QR}$
    d. In a rotation, corresponding angles have the same measure and corresponding sides have the same length.
20. **a.** $180°$ about $(-2, 4)$
    b. $90°$ clockwise about $(-2, 3)$
    c. $90°$ counterclockwise about $(1, 5)$
    d. $180°$ about $(0, 1)$

LESSON 10-1

21. a. $R_{O,\,180^\circ}\,(r_{x=2})$

b. $r_{y=5}\,(T_{(0,\,5)})$

22. base (4, 2), tip (4, 7)

23. a. $T(-5, 1)$

b. $T_{(-2,\,-3)}\,(R_{O,\,180^\circ})$

24. a. $R_{(3,\,4),\,180^\circ}$

b. $T_{(-3,\,2)}$

25. C

LESSON 10-2

26. a. line m

b. 90° clockwise around C

c. by directed line segment $\overline{DC}$

d. across $\overline{AD}$

27. Sample answer. If the diameter of circle A has the same length as the radius of circle B, then one circle can be transformed, using only translations and rotations, so the diameter of circle A coincides with the radius of circle B. Translations and rotations are rigid motions, so the two segments are congruent.

28. B

29. a. Sample answer. $T_{(0,\,-6)}\,(r_{x=4.5})$

b. $r_{(0,\,4.5),\,180^\circ}$

c. Sample answer. $r_{y=0}\,(r_{x=4.5})$

d. Sample answer. $R_{(1.5,\,3),\,180^\circ}\,(T_{(0,\,-1)})$

30. Sample answer. The composition involves rigid motions so the size and shape of $CHGB$ is not changed. After the composition, rectangle $CHGB$ coincides with rectangle $ACED$, so they are congruent.

LESSON 11-1

31. a. $\angle Q$

b. $\angle X$

c. $\overline{QR}$

d. $\overline{XZ}$

e. $\triangle ZXY$

32. a. $\overline{CP}$ or $\overline{PC}$

b. $\angle CBP$ or $\angle PBC$

c. $\angle PAB$ or $\angle BAP$

d. $\triangle PBC$

33. a. $\overline{MN}$ and $\overline{RP}$, $\overline{NT}$ and $\overline{PQ}$, $\overline{MT}$ and $\overline{RQ}$

b. $\angle MNT$ and $\angle RPQ$, $\angle NTM$ and $\angle PQR$, $\angle NMT$ and $\angle PRQ$

34. D

35. a. SSS

b. SAS

c. ASA

d. SAS

LESSON 11-2

36. a. AAS

b. ASA

c. SAS

d. SSS

37. a. $\angle C \cong \angle F$

b. $\angle B \cong \angle E$ or $\angle C \cong \angle F$ Or ($\angle B$ and $\angle F$) or ($\angle C$ and $\angle E$)

c. $\overline{AC} \cong \overline{DF}$, $\overline{BC} \cong \overline{EF}$

d. $\overline{AB} \cong \overline{DE}$

38. D

39. Sample answer. Yes, two triangles can have side lengths 5, 5, and 9. The two triangles are congruent by SSS, and they can be described as both obtuse and isosceles.

40. (4, −7), (4, 5)

LESSON 11-3

41. Sample answer. You have to show that a sequence of rigid motions maps one of the triangles to the other.

42. a. $m\angle 1 = \frac{1}{2}m\angle ABC = \frac{1}{2}\,m\angle BCD = m\angle 2$

b. $\triangle DCB$

c. $\overline{BC}$

d. ASA

43. B

44. **a.** $\overline{QR} \cong \overline{RQ}$

b. HL

c. $\triangle QPR$

d. $\overline{PQ} \cong \overline{SR}$, $\angle P \cong \angle S$, $\angle PRQ \cong \angle SQR$

45. 11

LESSON 11-4

46. A

47. **a.** Yes. If a triangle has a right angle, then it is a right triangle.

b. $BC - \sqrt{(3-15)^2 + (9-4)^2} = \sqrt{144+25} = 13;$

$YZ = \sqrt{(-16-(-4))^{22} + (-1-(-6))^2} =$

$\sqrt{144+25} = 13$

c. $AB = \sqrt{(3-3)^2 + (9-4)^2} = 5;$

$XY = \sqrt{(-4-(-4)^2 + (-1-(-6))^2} = 5$

d. Yes, the triangles are congruent by the HL congruence criterion.

48. B

49. **a.** It bisects the vertex angle.

b. It is a right angle.

50. **a.** $\triangle SRP$

b. $\overline{PS}$ is perpendicular to $\overline{QR}$ and $\overline{PS}$ bisects $\overline{QR}$.

LESSON 12-1

51. **a.** $\angle 1 \cong \angle 4$, $\overline{MN} \cong \overline{PT}$

b. Vertical angles are congruent.

c. $\angle 2 \cong \angle 3$

d. $\overline{MT} \cong \overline{TM}$

e. $\triangle MNT \cong \triangle TPM$

52. **a.** $m\angle QPS = m\angle QPR + m\angle RPS$, $m\angle RPT = m\angle TPS + m\angle RPS$

b. Subtraction Property of Equality

c. Reflexive Property

d. $m\angle QPR = m\angle TPS$

e. ASA

53. The preceding statements must list two pairs of congruent sides and a pair of congruent angles that are between the sides.

54. D

55. CPCTC

LESSON 12-2

56. The boxes correspond to Statements; the lines below the boxes correspond to Reasons.

57. Sample answer. The arrows show the logical flow between statements.

58. A

59. C

60. Sample answer. Yes. It is given that $\overline{FJ} \cong \overline{HG}$ and $\overline{FG} \cong \overline{HJ}$. Also, $\overline{FJ} \cong \overline{FH}$ by the Reflexive Property. So $\triangle JFH \cong \triangle GHF$ by SSS. Since the two triangles are congruent, $\angle 1 \cong \angle 2$ by CPCTC.

LESSON 13-1

61. **a.** 100°

b. 40°

c. 120°

d. 60°

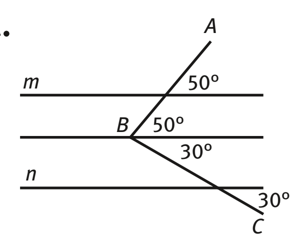
62. **a.** 40°

b. 25°

c. 115°

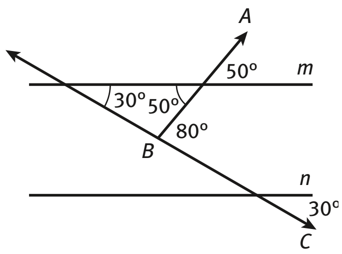
d. 65°

63. **a.**



The two angles formed at B are 50° and 30° because they are corresponding angles for parallel lines. So the measure of $\angle ABC$ is 80°.

b.



Angle ABC is an exterior angle of a triangle whose remote interior angles measure 30° and 50°. So the measure of angle ABC is 80°.

64. **a.** $\angle ADC \cong \angle 2$, $\angle ACD \cong \angle 1$, $\angle CAD \cong \angle 3$

b. $\angle DCP \cong \angle 2$, $\angle CDP \cong \angle 1$, $\angle P \cong \angle 3$

c. $\angle BCA$, $\angle ACD$, $\angle PCD$

d. Sample answer. The three angles with vertex C form a straight angle, so $m\angle BCA + m\angle ACD + m\angle PCD = 180°$. Those same angles represent the sum of the interior angles of a triangle, so this diagram is another way to prove the Triangle Sum Theorem.

65. D

LESSON 13-2

66. **a.** Definition of right triangle

b. TP = TP

c. HL

d. $\angle M \cong \angle N$

e. CPCTC

67. 63°

68. **a.** If two angles of a triangle are congruent, then the sides opposite those angles are congruent.

b. Sample answer. It is given that $\overline{ZW}$ bisects angle XYZ, so $\angle 1 \cong \angle 2$ by the definition of angle bisector. It is also given that $m\angle X = m\angle Y$, so $\angle X \cong \angle Y$ by the definition of angle congruence. Since $\overline{WZ} \cong \overline{WZ}$ by the Reflexive Property, $\triangle WXZ \cong \triangle WYZ$ by AAS. $\overline{XZ}$ and $\overline{YZ}$ are corresponding sides in those triangles, so $\overline{XZ} \cong \overline{YZ}$ by CPCTC.

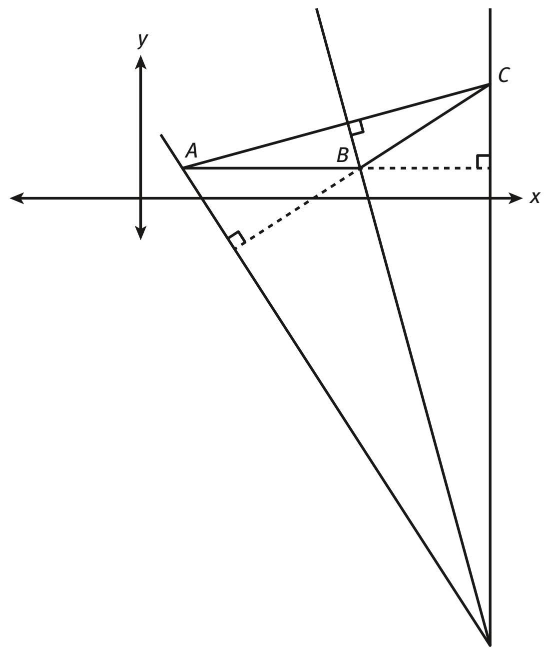
69. B

70. **a.** The two base angles are congruent and their sum is equal to the exterior angle at the vertex, so $(2x + 5) + (2x + 5) = 5x - 3$. So $4x + 10 = 5x - 3$ and $13 = x$.

b. $2x + 5 = 31$. The three angle measures are 31°, 31°, and $180 - 62 = 118°$.

LESSON 14-1

71. **a.**



b. outside

c. Yes, $\triangle ABC$ is an obtuse triangle, and the altitudes of an obtuse triangle intersect outside the triangle.

d. (11, −9)

72. (3, 1)

73. **a.** 4°

b. 36°

c. 50°

d. 54°

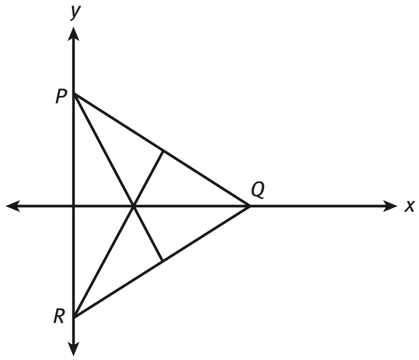
e. 126°

74. D

75. Sample answer. Select one side of the triangle. Using the two vertices of that side, find an equation of the line that contains that side. Then use the negative reciprocal of the slope of that line, along with the third vertex, to find an equation for the altitude to that side.

LESSON 14-2

76. a.



b. inside

c. No. The medians of any triangle meet inside the triangle.

d. (2, 0)

77. (3, 2)

78. a. 1.5

b. 13.5

c. 6

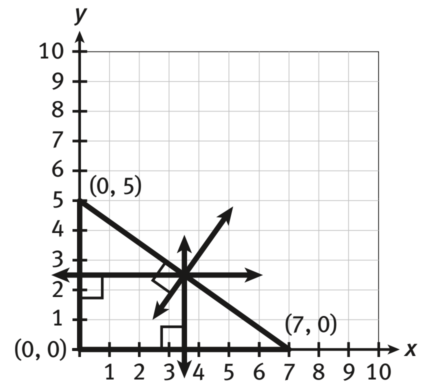
d. 4.5

79. B

80. Sample answer. Find the midpoints of the sides. Then use the midpoints to draw two (or three) medians. The centroid is at the intersection of the medians.

LESSON 14-3

81. a.

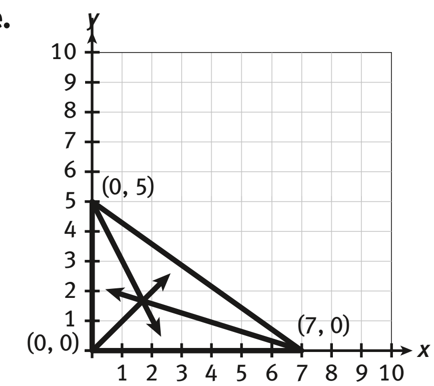


b. on

c. Yes, $\triangle VWX$ is a right triangle, and the perpendicular bisectors of the sides of a right triangle meet on the triangle.

d. (3.5, 2.5)

e.



The angle bisectors intersect at approximately (1.8, 1.8).

82. a. 8

b. 21

c. 4

d. 42

83. D

84. Sample answer. Find the angle bisectors for two (or three) of the angles of the triangle. The incenter is at the intersection of the angle bisectors.

85. Sample answer. Find the perpendicular bisectors for two (or three) of the sides of the triangle. The circumcenter is at the intersection of the perpendicular bisectors of the sides.

LESSON 15-1

86. **a.** 26 in.

b. 13 in.

c. 13 in.

d. 65°

87. **a.** kite

b. $\triangle TPS$ and $\triangle TQS$

c. Sample answer. $\overline{TS}$ is the perp. bisector of $\overline{PQ}$, so $\overline{PR} \cong \overline{RQ}$ and $\angle PRT \cong \angle QRT$ by the def. of perp. bisector. Also, $\overline{TR} \cong \overline{TR}$ by the Reflexive Property. So $\triangle PTR \cong \triangle QTR$ by SAS.

d. Sample answer. By a proof similar to the one in Part c, we can show that $\triangle PRS \cong \triangle QRS$ by SAS. Then $\overline{PT} \cong \overline{BT}$ and $\overline{PS} \cong \overline{QS}$ by CPCTC in the two pairs of congruent triangles. So $PTQS$ is a kite by the def. of kite.

88. Sample answer. It is given that $\triangle ABC$ is isosceles with base $\overline{BC}$, so $AB = AC$ by the def. of isos. triangle. Also, it is given that $\triangle BMC$ is equilateral so $MB = MC$ by the def. of equilateral triangle. That means each of points A and M is equidistant from points B and C, so $\overline{AB}$ is the perp. bisector of $\overline{BC}$.

89. A

90. **a.** 50°

b. 110°

c. 30°

d. 60°

LESSON 15-2

91. **a.** 100°

b. 25°

c. 30°

d. 125°

e. 55°

92. **a.** 23

b. 31

c. $2\sqrt{2}$

d. 118°

e. 45°

93. **a.** corresponding angles

b. $\overline{AY} \cong \overline{DY}$

c. $DC + CY$

d. $AB = DC$

e. def. of congruent segments

94. C

95. **a.** 55°

b. 70°

c. 55°

d. 85°

e. 140°

LESSON 15-3

96. **a.** 13

b. 100°

c. 6

d. 100°

97. $TP = RQ = 18$, $TR = PQ = 10$

98. **a.** $ABCD$ is a parallelogram because both pairs of opposite sides are congruent.

b. They are the diagonals of the parallelogram.

c. The diagonals of a parallelogram bisect each other.

d. Find point E so that $CE = AB$ and $BE = AC$.

99. B

100. **a.** parallelogram

b. X, Y, Z, and W are midpoints.

c. $\overline{WZ}$ U $\overline{AC}$, $\overline{XY}$ U $\overline{AC}$

d. $WXYZ$ is a parallelogram.

LESSON 15-4

101. **a.** (1, 9.5)

b. $RE = TC = 13$, $RT = EC = 26$

c. The length of each segment is about 14.5 units.

d. The slope of $\overline{RE}$ is $-\frac{5}{12}$; the slope of $\overline{EC}$ is $\frac{12}{5}$; the product of those two fractions is -1.

102. D

103. **a.** 6

b. 8

c. 16

d. 53°

e. 106°

104. **a.** 15

b. $\angle 2$, $\angle 5$, $\angle 6$

c. $\angle TBE$, $\angle UBR$, $\angle UBE$

d. area of TRUE $= \frac{1}{2}(TU)(ER)$

e. Sample answer. The area of the rhombus is $\frac{1}{2}(TU)(ER) = \frac{1}{2}(24)(18) = 216$. A formula for the area of any parallelogram (or any rhombus) is $A = b \cdot h$, where b is a base and h is the height for that base. Using that formula with $A = 216$ and $b = 15$ from Part a, then $216 = 15h$ and $h = 14.4$.

105. **a.** $6\sqrt{2}$ or 8.49 units. Sample answer. The diagonal of a square is the length of a side times the square root of 2.

b. 45°. Sample answer. The diagonal of a square bisects its two angles, and half of 90° is 45°.

c. 22.5°. Sample answer. The diagonal of a rhombus bisects its two angles, and half of 45° is 22.5°.

d. 18 square units. Sample answer. The area of triangle ABD is half the area of the square, and the area of the square is 36 square units.

e. 18 square units. Sample answer. Each diagonal of a rhombus divides it into two congruent triangles. Using $\triangle BCD$ and Part d, we can conclude that half of the area of the rhombus is 18 square units. Then, noting that $\triangle BCE$ is also half of the rhombus, we can conclude that the area of $\triangle BCE$ is 18 square units.

LESSON 16-1

106. Sample answer. The midpoint of $\overline{AC}$ is $\left(\frac{1+2}{2}, \frac{5-5}{2}\right) = (1.5, 0)$ and the midpoint of $\overline{BD}$ is $\left(\frac{-2+5}{2}, \frac{3+(-3)}{2}\right) = (1.5, 0)$. The midpoints are the same so the diagonals of $ABCD$ bisect each other. We can conclude that $ABCD$ is a parallelogram.

107. **a.** 11

b. $m\angle A = 125°$, $m\angle B = 55°$, $m\angle C = 130°$, $m\angle D = 50°$

c. No. There are no interior same-side angles that are supplementary, so no lines are parallel.

d. No. The figure does not have any pairs of parallel sides, so it is not a parallelogram.

108. **a.** Both pairs of opposite sides are congruent.

b. Yes. If both pairs of opposite sides of a quadrilateral are congruent, the quadrilateral is a parallelogram.

109. $n = 14$, $m = 20$

110. D

LESSON 16-2

111. Sample answer. The midpoint of diagonal $\overline{MP}$ is $\left(\frac{4+3}{2}, \frac{8+0}{2}\right) = (3.5, 4)$ and the midpoint of diagonal $\overline{NQ}$ is $\left(\frac{7+0}{2}, \frac{2+6}{2}\right) = (3.5, 4)$. Since the diagonals bisect each other, $MNPQ$ is a parallelogram. Also, the length of $\overline{MP}$ is $\sqrt{(4-3)^2 + (8-0)^2} = \sqrt{1^2 + 8^2} = \sqrt{65}$, and the length of $\overline{NQ}$ is $\sqrt{(7-0)^2 + (2-6)^2} = \sqrt{7^2 + (-4)^2} = \sqrt{65}$. Using the result that the diagonals of parallelogram $MNPQ$ are congruent, we can conclude that $MNPQ$ is a rectangle.

112. (5, 1)

113. A

114. A

115. **a.** $(-6, -4)$

b. $AC = \sqrt{(0-(-4))^2+(2-(-6)^2} = \sqrt{16+64}$

$= \sqrt{80} = 4\sqrt{5}$

$BD = \sqrt{(-6-2)^2+(-4-0)^2} = \sqrt{64+16}$

$= \sqrt{80} = 4\sqrt{5}$

c. $AB = \sqrt{(0-2)^2+(2-0)^2} = \sqrt{4+4} = \sqrt{8}$

$= 2\sqrt{2}$

$BC = \sqrt{(2-(-4))^2+(0-(-6))^2} = \sqrt{36+36}$

$= 6\sqrt{2}$

d. No. Consecutive sides of *ABCD* are not congruent.

LESSON 16-3

116. The midpoint of diagonal $\overline{QA}$ is $\left(\frac{-3+7}{2}, \frac{3+3}{2}\right)$ $= (2, 3)$ and the midpoint of diagonal $\overline{UD}$ is $\left(\frac{2+2}{2}, \frac{10+(-4)}{2}\right) = (2, 3)$. The diagonals bisect each other so *QUAD* is a parallelogram. Also, $\overline{QA}$ is a horizontal line (the y-coordinates are the same) and $\overline{UD}$ is a vertical line (the x-coordinates are the same). That means the diagonals are perpendicular, and if a parallelogram has perpendicular diagonals, then it is a rhombus.

117. Sample answer. The four triangles are congruent, so $\overline{MT} \cong \overline{TQ} \cong \overline{QP} \cong \overline{PM}$ by CPCTC. Since all four sides of *MTQP* are congruent, we can conclude that *MTQP* is a rhombus.

118. C

119. $x = -4$

120. *QUAD* is a rectangle, so it has all right angles. Also, *QUAD* is a rhombus so it has four congruent sides. Therefore *QUAD* is a square by the definition of square.

LESSON 16-4

121. B

122. $(4, -1)$ and $(-6, 3)$

123. **a.** 45°

b. are complementary

c. parallelogram

d. consecutive congruent sides

e. *AFGD* is a square

124. $(7, 9)$, $(13, 3)$, $(7, -3)$

125. **a.** $10\sqrt{2}$

b. $(0, 5\sqrt{2})$, $(5\sqrt{2}, 0)$, $(0, -5\sqrt{2})$, $(-5\sqrt{2}, 0)$