Chapter 12 Answers

Alternative Activity 12-1
1. C (3, 2), r = 6 2. Check students' work. In the standard viewing window of some graphing calculators, a circle will appear more like an ellipse than a circle. 3. Adjust the scales for the two axes. Select a square viewing window. 4. C (0, 0), r = 5. Check students' work. 5. C (−7, 5); r = 4. Check students' work. 6. The circle has equation (x + 1)² + (y + 3)² = 64. Check students' work. 7. (3, −4), (−32/13, 36/13)

Alternative Activity 12-4
1-3. Check students' work. 4. The measures of the angle and the arc do not change. 5. The measures of both angle and arc change. 6. Angle measure remains one-half that of its intercepted arc. 7. 90 degrees 8. Check students' work.

Alternative Activity 12-5
1-2. Check students' work. 3. The angle measure is one-half the sum of the measures of its intercepted arcs. 4-5. Check students' work. 6. The angle measure is one-half the difference of the measures of its intercepted arcs. 7-9. See answers for Exercises 3 and 6.

Reteaching 12-1
1. (x − 3)² + (y − 11)² = 4 2. (x + 5)² + y² = 225 3. (x − 6)² + (y + 6)² = 7 4. x² + y² = 20 5. (x + 2)² + (y + 2)² = 4 6. (x − 3)² + (y − 1)² = 50 7. (x − 5)² + (y − 2)² = 36 8. (x − 4)² + (y − 2)² = 25 9. (x + 2)² + (y − 3)² = 25 10. C (−3, −5), r = 5 11. C (0, 0); r = 0.2 12. C (4, 0); r = \sqrt{6} 13. C (3, 5); r = 4

Reteaching 12-2
1. \sqrt{157} 2. \sqrt{741} 3. \sqrt{2} 4. 7.5

Reteaching 12-3
1. 5\sqrt{5} 2. 12\sqrt{2} 3. 4\sqrt{14} 4. 2\sqrt{35} cm 5. 2\sqrt{161} = 2.54 cm 6. 5\sqrt{3} in. 7. \sqrt{7.75} = 2.78 in.

Reteaching 12-4
1. 87 2. 40 3. 60 4. 55 5. x = 94, y = 80 6. 120 7. 40 8. 20 9. 70

Reteaching 12-5
1. 93 2. 156 3. 42 4. 35 5. 60 6. 55 7. x = 36; y = 60; z = 48 8. x = 64; y = 64; z = 52 9. x = 46; y = 90; z = 44

Reteaching 12-6
1. \frac{35}{6} 2. \frac{103}{4} 3. 8 4. 4\sqrt{3} 5. 3\sqrt{5} − 3 6. 3 7. \frac{32}{5}

Practice 12-1: Example Exercises
1. x² + y² = 9 2. (x − 4)² + (y − 5)² = 4 3. (x − 1)² + (y − 8)² = 81 4. (x + 2)² + (y − 5)² = \frac{1}{4} 5. (x + 4)² + (y + 6)² = 5 6. (x − 6)² + (y + 3)² = 7 7. x² + y² = 16 8. (x − 3)² + (y + 1)² = 9 9. (x − 1)² + (y − 3)² = 25 10. (x − 3)² + (y − 3)² = 11. (x + 4)² + y² = 1 12. (x − 3)² + (y + 3)² = 1 13. x² + (y + 8)² = 16 14. (x + 8)² + (y + 8)² = 64 15. (x − 12)² + y² = 9 16. x² + y² = 9 17. (x − 2)² + (y − 3)² = 25 18. (x + 3)² + (y − 5)² = 100 19. (x + 6)² + (y + 5)² = 85 20. (x − 2)² + (y + 5)² = 65 21. (x − 4)² + (y + 9)² = 90

Practice 12-1: Mixed Exercises
1. C (0, 0), r = 5 2. C (3, 5), r = 3 3. C (−1, −6), r = 4 4. C (−3, 11), r = 2\sqrt{3} 5. x² + y² = 49 6. (x − 4)² + (y − 3)² = 64 7. (x − 5)² + (y − 3)² = 4 8. (x + 5)² + (y − 4)² = \frac{1}{3} 9. (x + 2)² + (y + 5)² = 2 10. (x + 1)² + (y − 6)² = 5 11. x² + y² = 4 12. (x + 3)² + (y − 3)² = 1 13. x² + (y − 3)² = 16 14. (x − 7)² + (y + 2)² = 4 15. x² + (y + 20)² = 100 16. (x + 4)² + (y + 6)² = 25

Geometry Chapter 12

Chords, Secants, and Tangents
20. \[ (-1, 7) \]

21. \[ x^2 + y^2 = 25 \]

22. \[ (x - 5)^2 + (y - 9)^2 = 9 \]

23. \[ (x + 4)^2 + (y + 3)^2 = 61 \]

24. \[ (x - 7)^2 + (y + 2)^2 = 80 \]

### Practice 12-2: Example Exercises

1. 3 2. 5 3. 8 4. 15 5. 9 6. 5 7. 2\( \sqrt{101} \) 8. 4\( \sqrt{37} \)

9. \( \sqrt{209} \) 10. 66 cm 11. 28 in. 12. 64 ft 13. 12 in. 14. 22 cm 15. 48 ft

### Practice 12-2 Mixed Exercises

1. 32 2. 50 3. 72 4. 15 5. \( \sqrt{91} \) 6. 6 7. \( \sqrt{634} \) 8. \( \sqrt{901} \)

9. 4\( \sqrt{3} \) 10. 24 cm 11. 28 in. 12. 52 ft

### Practice 12-3 Example Exercises

1. \( r = 5; mAB = 106.3\) 2. \( r = \sqrt{34}; mAB = 61.9\)

3. \( r = \sqrt{26}; mAB = 157.4\) 4-6. Check students' work.

7. Construct radii \( CA \) and \( CB \). Then \( \triangle CAX \cong \triangle CBX \) by SSS. And, by CPCTC, \( \triangle CXA \cong \triangle CBX \). Since \( \triangle CXA \) and \( \triangle CBX \) are supplementary as well, each has measure 90, and \( CX \perp AB \).

8. Construct radii \( CA, CB, CX, CY \). By SSS, \( \triangle CAB \cong \triangle CXY \). And, by CPCTC, \( m\angle ACB = m\angle XCY \). Then \( m\angle ACB = m\triangle XCY \) since congruent central angles have congruent arcs.

9. Construct radii \( CA, CB, CX, CY \). Since congruent arcs have congruent central angles, \( \triangle ACB \cong \triangle XCY \). Then, by SAS, \( \triangle ACB \cong \triangle XCY \). And, by CPCTC, \( AB = XY \).

### Practice 12-3: Mixed Exercises

1. \( r = 13; mAB = 134.8\) 2. \( r = 3\sqrt{5}; mAB = 53.1\)

3. \( r = \sqrt{41}; mAB = 102.7\) 4. 3 5. \( 2\sqrt{5} \) 6. 3 7. 12\( \sqrt{3} \)

8. \( x = 13.7\) 9. 6\( \sqrt{2} \) 10. Check students' work.

11. Construct radii \( OD \) and \( OB \). \( FD = EB \) since a diameter perpendicular to a chord bisects it, and chords \( CD \) and \( AB \) are congruent (given). Then, by HL, \( \triangle OEB \cong \triangle OFD \), and by CPCTC, \( OE \cong OF \).

12. Since congruent arcs have congruent chords, \( AB = BC = CA \). Then since an equilateral triangle is equiangular, \( m\angle ABC = m\angle BCA = m\angle CAB \).

### Practice 12-4: Example Exercises

1. \( x = 100; y = 20 \) 2. \( x = 70; y = 140 \) 3. \( x = 44; y = 90 \)

4. \( x = 50; y = 100 \) 5. \( x = 84; y = 52 \) 6. \( x = 100; y = 130 \) 7. \( \angle EAD \) and \( \angle EBD \) 8. \( \angle A \) and \( \angle B \)

9. \( \angle DAC \) and \( \angle BDA \) 10. \( x = 60; y = 90 \) 11. \( z = 50 \) 12. \( x = 54; y = 36 \) 13. \( x = 60 \) 14. \( x = 75; y = 30 \) 15. \( x = 66; y = 67; z = 47 \)

### Practice 12-4: Mixed Exercises

1. \( \angle A \) and \( \angle D \) 2. \( \angle B \) and \( \angle C \) 3. \( \angle ADB \) and \( \angle CDB \)

4. \( \angle ADB \) and \( \angle CAD \) 5. \( x = 45; y = 50; z = 85 \)

6. \( x = 90; y = 70 \) 7. 180 8. 70 9. \( x = 120; y = 60 \) 10. \( x = 60; y = 100 \) 11. \( x = 63 \) 12. \( x = 50; y = 80; z = 80 \)

13a. \( mACE = 170 \) 13b. \( m\angle C = 85 \) 13c. \( m\angle BEC = 10 \)

13d. \( m\angle D = 85 \) 14a. \( m\angle A = 90 \) 14b. \( m\angle B = 80 \)

14c. \( m\angle C = 90 \) 14d. \( m\angle D = 100 \)

### Practice 12-5: Example Exercises


### Practice 12-5: Mixed Exercises

1. 87 2. 35 3. 45 4. 120 5. 72 6. 186 7. 135 8. 64 9. 215 10. \( x = 58; y = 59; z = 63 \) 11. \( x = 30; y = 66 \)

12. \( x = 30; y = 30; z = 120 \) 13. \( x = 16; y = 52 \)

14. \( x = 138; y = 111; z = 111 \) 15. \( x = 30; y = 60 \)

### Practice 12-6: Example Exercises

1. \( \frac{15}{2} \) 2. \( \frac{179}{8} \) 3. 60 4. \( \frac{19}{2} \) 5. 8 6. 26 7. 4 8. 15 9. 4 10. \( \frac{169}{10} \) 11. \( \frac{41}{4} \) 12. \( \frac{51}{3} \) 13. \( \frac{34}{5} \) 14. \( \frac{25}{6} \) 15. \( \sqrt{42} \)

### Practice 12-6: Mixed Exercises

1. 1.0 2. \( \frac{59}{2} \) 3. \( \sqrt{22} \) 4. 4 5. \( \sqrt{27} - 6 \) 6. 6 7. 5 8. \( \frac{24}{5} \) 9. \( 3\sqrt{5} \) 10. \( \frac{15}{2} \) 11. \( \frac{43}{6} \) 12. \( \sqrt{205} \) 13. \( \frac{169}{5} \)

14. \( \frac{119}{2} \) 15. 9

### Checkpoint 1

1. \( x^2 + y^2 = 8 \) 2. \( (x - \frac{5}{2})^2 + (y + \frac{5}{2})^2 = \frac{1}{2} \)

3. \( (x - 3)^2 + (y - 3)^2 = 18 \) 4. 72 in. 5. 52 cm 6. 38 ft 7. 13 cm 8. \( 6\sqrt{5} \) cm 9. \( \sqrt{11} \) in.
Chapter 12 Answers (continued)

Checkpoint 2
1. 200  2. 3a = 105; b = 110; c = 75; d = 70  3. x = 28; y = 90  4. A secant is a line that meets a circle at two points. A tangent is a line that meets a circle in exactly one point. 

Chapter Assessment, Form A
1. C(0,0); r = 10  2. C(11, -6); r = 9  3. C(-1, -4); r = \sqrt{7}  4. (x + 3)^2 + (y - 2)^2 = 1  5. (x - 2)^2 + (y - 1)^2 = 16  6. x^2 + (y - 2)^2 = 9  7. C = 10\pi = 31.4; A = 25\pi = 78.5  8. (x + 3)^2 + (y - 4)^2 = 41

9. 

10. Measure the length of each chord. Chords are congruent if and only if they are equidistant from the center.  11. Check students' work.  12. 8  13. 120  14. 105  15. 118.0  16. 40  17. 70  18. 115  19. 6  20. 11.8  21. 5.5  22. 45  23. 35  24. 80  25. 4  26. 5.7  27. x = 63, y = 71  28. x = 87, y = 95, w = 85, z = 93  29. x = 120, y = 64, z = 176  30. 44

Chapter Assessment, Form B
1. C(0,0); r = 9  2. C(-5, 2); r = 4  3. C(4, -8); r = \sqrt{2}  4. (x - 1)^2 + (y - 3)^2 = 4  5. (x - 1)^2 + y^2 = 1  6. (x + 3)^2 + (y - 1)^2 = 16  7. C = 8\pi = 25.1; A = 16\pi = 50.3  8. (x - 5)^2 + (y - 1)^2 = 89

9. 

10. Construct two radii. Measure the same distance (for example, 1 cm) along each. At the points you measured, construct chords perpendicular to each of the two radius. These chords are congruent.  11. Check students' work.  12. A  13. 110.3  14. 77.4  15. 120  16. 42  17. 80  18. x = 125; y = 90  19. 84  20. 20  21. 2  22. 40  23. 145  24. 74  25. 45  26. 35  27. x = 60; y = 80  28. x = 88; y = 93; z = 92; w = 87  29. x = 116; y = 80; z = 164  30. 45.5

Alternative Assessment
Task 1: (a) Center (2, 5), radius = 4  (b) The distance from point (x, y) on a circle to the center (2, 5) is given by the formula D = \sqrt{(x - 2)^2 + (y - 5)^2}. In any circle, the distance, or radius, is the same for all points on the circle. Therefore the distance formula, when applied to the circle in this problem, becomes 16 = (x - 2)^2 + (y - 5)^2 for all points (x, y) on the circle. Squaring both sides of this equation yields the equation of the circle, 16 = (x - 2)^2 + (y - 5)^2.

Scoring Guide:
3 Student gives accurate answers and correct explanation.  2 Student gives answers or explanation which may contain minor errors.  1 Student gives wrong answers, or incomplete or inaccurate explanation.  0 Student makes little or no effort.

Task 2: (a) Construct the perpendicular bisector of two chords. The point at which they meet is the center of the circle. (b) Since the pentagon is regular, all chords are congruent. Therefore the corresponding arcs are congruent. Since there are 5 congruent arcs in a circle, each arc, and in particular arc AB, has measure of 72 degrees. To find AB, call the center O, and consider triangle AOB. Since arc AB has measure 72, so does angle AOB. Since \angle AOB is isosceles. Therefore the bisector of angle AOB is perpendicular to (and bisects) chord AB, forming a 36°-54°-90° triangle. Then

\[ \frac{2AB}{OA} = \sin 36^\circ = \frac{1}{2}, \] yielding AB = 7.05.

Scoring guide:
3 Student devises correct method, and gives correct answer and valid explanation.  2 Student devises method, gives answers, and gives explanation which may contain some errors.  1 Student gives method, answers, and explanations which may contain major errors or omissions.  0 Student makes little or no effort.

Task 3: (a) Angles A and C are inscribed angles. Each is inscribed in a different arc, but together the arc in which they are inscribed comprise the entire circle. Therefore, \[ m\angle A + m\angle C = \frac{1}{2}(360) = 180 \]. And, since ABCD is a parallelogram, angles A and C are congruent. Finally, if angles are congruent and supplementary, then they are right. (b) The diagonals of ABCD bisect each other since ABCD is parallelogram. Suppose they intersect at point X. Then AX = CX and BX = DX. Also, since ABCD is inscribed in a circle, the diagonals are chords and therefore AX • CX = BX • DX.
Chapter 12 Answers (continued)

Substituting yields $AX^2 = BX^2$, and therefore $AX = BX = CX = DX$. Then $AC = BD$. (c) Either (a) or (b) allows you to conclude that $ABCD$ must be a rectangle.

Scoring guide:
3 Student gives valid and accurate arguments and explanations.
2 Student gives arguments which, while basically valid, may contain minor flaws.
1 Student gives arguments containing major flaws.
0 Student makes little or no attempt.

Task 4: (a) Because the circumscribing lines are tangent to the circle, $AB = AX$, $CB = CY$, and $DX = DY$. Then, since it is given that $AB = BC$, we have $AX = CY$. Adding segments together yields $DA = DC$, showing that $\triangle ACD$ is isosceles. Secondly, since arc $XY$ has measure 100, arc $XBY$ has measure 260. Then $m\angle D = \frac{1}{2}(260 - 100) = 80$, and since $\triangle ACD$ is isosceles, $m\angle A = m\angle C = 50$. Finally, $AC = 20$ since $AB = BC = 10$, and, by trigonometry, $\cos 50 = \frac{AB}{AD}$, $AD = \frac{AB}{\cos 50} = \frac{10}{0.6428} = 15.56$. And again, $AD = CD$.
(b) Since angle $A$ has measure 50 and line $AB$ is tangent at $B$, triangle $AOB$ is a 25°-65°-90° triangle. Therefore, by trigonometry, $\tan 25 = \frac{OB}{AB}$, $OB = 10 \cdot \tan 25 = 4.66$.

Scoring guide:
3 Student gives accurate answers and explanation.
2 Student gives answers and explanations which may contain minor errors.
1 Student gives answers and explanations which contain significant errors.
0 Student makes little or no attempt.

Cumulative Review

Standardized Test Practice