PRACTICE SET 7: TRIANGLES, CIRCLES, AND COORDINATE GEOMETRY

---

1. A right triangle has legs of 9 and 12. Its hypotenuse is:

A. 13

B. 15

C. 18

D. 21

2. The distance between (1, 2) and (4, 6) is:

A. 3

B. 4

C. √7

D. 5

3. A circle has radius 8. Its area is:

A. 64π

B. 16π

C. 8π

D. 32π

4. In a 30-60-90 triangle, if the hypotenuse is 12, the side opposite 30° is:

A. 4

B. $4\sqrt{3}$

C. 6

D. $6\sqrt{3}$

5. The midpoint of the segment from (2, 4) to (8, 10) is:

A. (4, 6)

B. (6, 8)

C. (3, 5)

D. (5, 7)

6. A 45-45-90 triangle has legs of 7. Its hypotenuse is:

A. $7\sqrt{2}$

B. 14

C. $7\sqrt{3}$

D. 49

7. The circumference of a circle with diameter 20 is:

A. 10π

B. 100π

C. 20π

D. 40π

8. Two angles of a triangle are 50° and 70°. The third angle is:

A. 40°

B. 60°

C. 80°

D. 90°

9. The equation of a circle centered at the origin with radius 5 is:

A. $x + y = 5$

B. $x^2 - y^2 = 5$

C. $x^2 + y^2 = 5$

D. $x^2 + y^2 = 25$

10. An equilateral triangle has all sides equal and all angles equal to:

A. 60°

B. 45°

C. 90°

D. 120°

11. The slope of the line through (0, 0) and (4, 8) is:

A. 4

B. 1/2

C. 1

D. 2

12. A right triangle has legs of 8 and 15. Its hypotenuse is:

A. 17

B. 19

C. 20

D. 23

13. The distance between (−3, 1) and (1, 4) is:

A. 3

B. 4

C. 5

D. 7

14. An isosceles triangle has two sides equal and two angles:

A. equal to 90°

B. equal to each other

C. both acute only

D. summing to 180°

15. A circle has area 49π. Its radius is:

A. 7

B. 14

C. 25

D. 49

16. In a triangle with sides 6, 8, and 10, the triangle is:

A. equilateral

B. obtuse

C. isosceles

D. right

17. The y-coordinate of the midpoint of (2, 4) and (8, 16) is:

A. 8

B. 10

C. 12

D. 20

18. A circle has circumference 10π. Its radius is:

A. 10

B. 100

C. 20

D. 5

19. The slope of a line perpendicular to $y = 2x + 1$ is:

A. $-1/2$

B. 2

C. $1/2$

D. -2

20. A 45-45-90 triangle has legs of 5. Its hypotenuse is:

A. 5

B. 10

C. $5\sqrt{2}$

D. $5\sqrt{3}$

21. The equation of a circle with center (2, 3) and radius 4 is:

A. $(x - 2)^2 + (y - 3)^2 = 16$

B. $(x + 2)^2 + (y + 3)^2 = 16$

C. $(x - 2)^2 + (y - 3)^2 = 4$

D. $(x + 2)^2 + (y - 3)^2 = 16$

22. The distance between (0, 0) and (5, 12) is:

A. 7

B. 10

C. 13

D. 17

23. A triangle has interior angles that sum to:

A. 90°

B. 120°

C. 150°

D. 180°

24. A circle has diameter 6. Its area is:

A. 6π

B. 9π

C. 36π

D. 12π

25. The midpoint of $(-4, 2)$ and $(6, 8)$ is:

A. $(1, 5)$

B. $(2, 5)$

C. $(1, 4)$

D. $(2, 4)$

26. A right triangle has one leg of 7 and hypotenuse 25. The other leg is:

A. 12

B. 18

C. 20

D. 24

27. A 30-60-90 triangle has hypotenuse 8. The side opposite $60°$ is:

A. 4

B. 8

C. $4\sqrt{3}$

D. $8\sqrt{3}$

28. A line passes through (0, 5) and (3, 8). Its slope is:

A. 1/3

B. 1

C. 3

D. 2

29. A circle has radius 10. Its circumference is:

A. 20π

B. 10π

C. 100π

D. 30π

30. A triangle's base is 16 and its height is 6. Its area is:

A. 22

B. 96

C. 32

D. 48

31. The distance between (2, 5) and (2, 9) is:

A. 2

B. 3

C. 4

D. 7

32. A circle is centered at (0, 0) with radius 3. A point on the circle could be:

A. (0, 3)

B. (3, 3)

C. (−4, 0)

D. (1, 1)

33. A right triangle with legs 9 and 40 has hypotenuse:

A. 31

B. 37

C. 39

D. 41

34. In a 30-60-90 triangle, the sides are in the ratio:

A. $1 : 1 : \sqrt{2}$

B. $1 : \sqrt{3} : 2$

C. 1 : 2 : 3

D. 1 : 3 : 5

35. A circle has area 100π. Its diameter is:

A. 5

B. 10

C. 100

D. 20

36. The midpoint of (0, 0) and (10, 10) is:

A. (5, 5)

B. (10, 0)

C. (0, 10)

D. (5, 0)

37. A right triangle has legs of 20 and 21. Its hypotenuse is:

A. 22

B. 27

C. 29

D. 31

38. Two parallel lines never:

A. have positive slope

B. have negative slope

C. are vertical

D. intersect

39. A circle has radius 6. Its area is:

A. 12π

B. 36π

C. 6π

D. 18π

40. The slope of a horizontal line is:

A. 0

B. 1

C. undefined

D. negative

41. A triangle with three equal angles of 60° each is:

A. scalene

B. equilateral

C. obtuse

D. right

42. The distance between (−2, −3) and (1, 1) is:

A. 3

B. 4

C. 7

D. 5

43. A 45-45-90 triangle has legs of 10. Its hypotenuse is:

A. $10\sqrt{2}$

B. 20

C. $10\sqrt{3}$

D. 100

44. In any triangle, the sum of any two sides must be:

A. equal to the third side

B. less than the third side

C. greater than the third side

D. equal to 180

45. A circle has radius 2. Its circumference is:

A. 2π

B. 4

C. 8π

D. 4π

46. The slope between (2, 3) and (5, 9) is:

A. 2

B. 3

C. 4

D. 1

47. A right triangle has hypotenuse 13 and one leg 5. The other leg is:

A. 8

B. 10

C. 12

D. 15

48. A scalene triangle has:

A. all sides equal

B. no sides equal

C. two sides equal

D. one right angle

49. The midpoint of (1, 1) and (9, 11) is:

A. (4, 5)

B. (5, 5)

C. (4, 6)

D. (5, 6)

50. A 30-60-90 triangle has hypotenuse 20. The side opposite 30° is:

A. 10

B. 5

C. $10\sqrt{3}$

D. $20\sqrt{3}$

PRACTICE SET 7: ANSWER KEY AND EXPLANATIONS

1. B — 15. Applying the Pythagorean theorem, $9^2 + 12^2 = 81 + 144 = 225$, and $\sqrt{225} = 15$. This is the 3-4-5 Pythagorean triple scaled by 3, producing the 9-12-15 triangle.
2. D — 5. Using the distance formula, $d = \sqrt{[(4-1)^2 + (6-2)^2]} = \sqrt{[9 + 16]} = \sqrt{25} = 5$. The distance formula applies the Pythagorean theorem to coordinate differences.
3. A — 64π. The circle area formula $A = \pi r^2$ gives $A = \pi(8^2) = 64\pi$. Squaring the radius before multiplying by π is essential.
4. C — 6. In a 30-60-90 triangle, the side opposite the 30° angle is half the hypotenuse. Half of 12 is 6.
5. D — (5, 7). The midpoint formula averages the coordinates: ((2+8)/2, (4+10)/2) = (5, 7). Midpoints always find the average of corresponding coordinates.
6. A — $7\sqrt{2}$. In a 45-45-90 triangle, the hypotenuse equals a leg times $\sqrt{2}$. With legs of 7, the hypotenuse is $7\sqrt{2}$.
7. C — 20π. The circumference formula $C = \pi d$ gives $C = \pi(20) = 20\pi$. Using diameter directly is faster than converting to radius.
8. B — 60°. Triangle angles sum to 180°, so the third angle is $180 - 50 - 70 = 60°$.
9. D — $x^2 + y^2 = 25$. The standard form of a circle centered at the origin with radius r is $x^2 + y^2 = r^2$, so with $r = 5$, the equation is $x^2 + y^2 = 25$.
10. A — 60°. An equilateral triangle has three equal angles, and since they must sum to 180°, each angle measures 60°.
11. D — 2. The slope formula $(y_2 - y_1)/(x_2 - x_1)$ gives $(8-0)/(4-0) = 8/4 = 2$.
12. A — 17. Applying the Pythagorean theorem, $8^2 + 15^2 = 64 + 225 = 289$, and $\sqrt{289} = 17$. The 8-15-17 triangle is a standard Pythagorean triple.
13. C — 5. Using the distance formula, $d = \sqrt{[(1-(-3))^2 + (4-1)^2]} = \sqrt{[16 + 9]} = \sqrt{25} = 5$.
14. B — equal to each other. An isosceles triangle has two equal sides, and the angles opposite those sides are also equal. This property defines the isosceles triangle.
15. A — 7. The area formula $A = \pi r^2$ gives $49\pi = \pi r^2$, so $r^2 = 49$ and $r = 7$.

16. D — right. Testing $6^2 + 8^2 = 36 + 64 = 100 = 10^2$ confirms the Pythagorean relationship, making this a right triangle. The 6-8-10 triangle is the 3-4-5 triple doubled.

17. B — 10. The y-coordinate of the midpoint is $(4 + 16)/2 = 10$. Midpoint calculations average each coordinate separately.

18. D — 5. The circumference formula $C = 2\pi r$ gives $10\pi = 2\pi r$, so $r = 5$.

19. A — $-1/2$. Perpendicular slopes are negative reciprocals, so the slope perpendicular to 2 is $-1/2$.

20. C — $5\sqrt{2}$. The 45-45-90 triangle ratio is $1 : 1 : \sqrt{2}$, so with legs of 5, the hypotenuse is $5\sqrt{2}$.

21. A — $(x - 2)^2 + (y - 3)^2 = 16$. The standard circle form $(x - h)^2 + (y - k)^2 = r^2$ with center (2, 3) and radius 4 gives $(x - 2)^2 + (y - 3)^2 = 16$.

22. C — 13. Using the distance formula, $d = \sqrt{[25 + 144]} = \sqrt{169} = 13$. This is the 5-12-13 Pythagorean triple applied to coordinates.

23. D — 180°. The Triangle Angle Sum Theorem states that interior angles of any triangle always total 180°.

24. B — 9π. A diameter of 6 means radius 3, and $A = \pi(3^2) = 9\pi$.

25. A — (1, 5). The midpoint is $((-4 + 6)/2, (2 + 8)/2) = (1, 5)$.

26. D — 24. Using the Pythagorean theorem, $7^2 + b^2 = 25^2$, so $b^2 = 625 - 49 = 576$, and $b = 24$. The 7-24-25 triangle is a standard Pythagorean triple.

27. C — $4\sqrt{3}$. In a 30-60-90 triangle, the side opposite 60° is (hypotenuse/2) × $\sqrt{3}$. Half of 8 is 4, multiplied by $\sqrt{3}$ gives $4\sqrt{3}$.

28. B — 1. The slope between (0, 5) and (3, 8) is $(8 - 5)/(3 - 0) = 3/3 = 1$.

29. A — 20π. The circumference formula $C = 2\pi r$ gives $2\pi(10) = 20\pi$.

30. D — 48. The triangle area formula $A = \frac{1}{2}bh$ gives $\frac{1}{2}(16)(6) = 48$.

31. C — 4. Points with the same x-coordinate lie on a vertical line, so the distance is just the difference in y-values: $9 - 5 = 4$.

32. A — (0, 3). A point on a circle of radius 3 centered at the origin must satisfy $x^2 + y^2 = 9$. The point (0, 3) gives $0 + 9 = 9$ ✓.

33. D — 41. Using the Pythagorean theorem, $9^2 + 40^2 = 81 + 1{,}600 = 1{,}681$, and $\sqrt{1{,}681} = 41$. The 9-40-41 triangle is another standard Pythagorean triple.

34. B — $1 : \sqrt{3} : 2$. The 30-60-90 triangle has sides in the ratio 1 (opposite 30°) : $\sqrt{3}$ (opposite 60°) : 2 (opposite 90°, the hypotenuse).

35. D — 20. The area formula gives $100\pi = \pi r^2$, so $r^2 = 100$ and $r = 10$. The diameter is twice the radius, or 20.

36. A — (5, 5). The midpoint of (0, 0) and (10, 10) is ((0+10)/2, (0+10)/2) = (5, 5).

37. C — 29. Applying the Pythagorean theorem, $20^2 + 21^2 = 400 + 441 = 841$, and $\sqrt{841} = 29$. The 20-21-29 triangle is a less common but valid Pythagorean triple.

38. D — intersect. Parallel lines have equal slopes and run in the same direction without ever crossing, which is the defining property of parallelism.

39. B — 36π. The area formula $A = \pi r^2$ gives $\pi(36) = 36\pi$.

40. A — 0. A horizontal line has no vertical change, so the slope is 0/run = 0.

41. B — equilateral. A triangle with three equal 60° angles also has three equal sides, which defines an equilateral triangle.

42. D — 5. Using the distance formula, $d = \sqrt{[(1-(-2))^2 + (1-(-3))^2]} = \sqrt{[9 + 16]} = \sqrt{25} = 5$. This is a 3-4-5 triple.

43. A — $10\sqrt{2}$. With legs of 10 in a 45-45-90 triangle, the hypotenuse is $10\sqrt{2}$ based on the $1 : 1 : \sqrt{2}$ ratio.

44. C — greater than the third side. The Triangle Inequality Theorem states that the sum of any two sides must exceed the third side for a triangle to exist.

45. D — 4π. The circumference formula $C = 2\pi r$ gives $2\pi(2) = 4\pi$.

46. A — 2. The slope is $(9 - 3)/(5 - 2) = 6/3 = 2$.

47. C — 12. Using the Pythagorean theorem, $5^2 + b^2 = 13^2$, so $b^2 = 169 - 25 = 144$, and $b = 12$. The 5-12-13 triangle is one of the most common triples.

48. B — no sides equal. A scalene triangle has three sides of different lengths and, correspondingly, three different angle measures.

49. D — (5, 6). The midpoint is ((1+9)/2, (1+11)/2) = (5, 6).

50. A — 10. In a 30-60-90 triangle, the side opposite 30° is half the hypotenuse, so half of 20 is 10.