PRACTICE SET 8: TRIGONOMETRY

1. In a right triangle, sin θ is defined as:

A. adjacent/hypotenuse

B. opposite/adjacent

C. opposite/hypotenuse

D. hypotenuse/opposite

2. What is sin(30°)?

A. 1/2

B. √2/2

C. √3/2

D. 1

3. In a right triangle, cos θ is defined as:

A. opposite/adjacent

B. hypotenuse/adjacent

C. opposite/hypotenuse

D. adjacent/hypotenuse

4. What is $\cos(60°)$?

A. $\sqrt{3}/2$

B. $1/2$

C. $\sqrt{2}/2$

D. 1

5. What is $\tan(45°)$?

A. 1

B. $\sqrt{2}/2$

C. $\sqrt{3}$

D. $1/2$

6. The Pythagorean identity is:

A. $\sin^2\theta - \cos^2\theta = 1$

B. $\sin\theta + \cos\theta = 1$

C. $\tan^2\theta + 1 = \sec^2\theta$

D. $\sin^2\theta + \cos^2\theta = 1$

7. What is $\sin(90°)$?

A. 0

B. $1/2$

C. 1

D. $\sqrt{3}/2$

8. What is cos(0°)?

A. 0

B. 1

C. 1/2

D. √2/2

9. In a right triangle, tan θ equals:

A. sin θ × cos θ

B. 1/sin θ

C. cos θ/sin θ

D. sin θ/cos θ

10. If sin θ = 3/5, then cos θ is (for acute θ):

A. 4/5

B. 5/3

C. 3/4

D. 5/4

11. What is sin(60°)?

A. 1/2

B. 1

C. √2/2

D. √3/2

12. What is cos(30°)?

A. 1/2

B. √3/2

C. √2/2

D. 1

13. The reciprocal of sin is:

A. csc

B. sec

C. cot

D. tan

14. If tan θ = 1, then θ (in degrees, for acute angles) is:

A. 30°

B. 60°

C. 90°

D. 45°

15. What is sin(0°)?

A. 1

B. 1/2

C. 0

D. √2/2

16. In a right triangle with a 30° angle, the opposite side is 5. The hypotenuse is:

A. 10

B. $5\sqrt{2}$

C. $5\sqrt{3}$

D. 15

17. The reciprocal of $\cos \theta$ is:

A. $\cot \theta$

B. $\csc \theta$

C. $\tan \theta$

D. $\sec \theta$

18. What is $\tan(30°)$?

A. $\sqrt{3}$

B. $\sqrt{3}/3$

C. 1

D. 1/2

19. If $\cos \theta = 0$, then θ is:

A. 0°

B. 30°

C. 90°

D. 180°

20. The sine of 45° equals:

A. √2/2

B. 1/2

C. 1

D. √3/2

21. In a right triangle, if the opposite side is 6 and hypotenuse is 10, sin θ is:

A. 3/5

B. 5/3

C. 4/5

D. 3/4

22. The tangent of 60° is:

A. 1/√3

B. 1/2

C. √3/2

D. √3

23. The sine and cosine of complementary angles are:

A. always equal

B. equal to each other

C. always reciprocal

D. always 1

24. The Law of Sines states:

A. $a^2 + b^2 = c^2$

B. $\sin A + \sin B = \sin C$

C. $a/\sin A = b/\sin B = c/\sin C$

D. $a \times \sin A = b \times \sin B$

25. In a right triangle, if the legs are 3 and 4, then $\sin \theta$ (opposite 3) equals:

A. 3/5

B. 4/5

C. 3/4

D. 4/3

26. The cosine of 90° equals:

A. 1

B. 1/2

C. $\sqrt{2}/2$

D. 0

27. If $\sin \theta = 1/2$, θ (acute angle in degrees) is:

A. 45°

B. 30°

C. 60°

D. 90°

28. The reciprocal of tan θ is:

A. sec θ

B. csc θ

C. cot θ

D. sin θ

29. In a 45-45-90 triangle, sin(45°) equals:

A. √2/2

B. 1

C. √3/2

D. 1/2

30. The Law of Cosines states:

A. $a^2 + b^2 = c^2$

B. a/sin A = b/sin B

C. sin A = cos B

D. $c^2 = a^2 + b^2 - 2ab \cos C$

31. If cos θ = 1/2, then θ (acute) is:

A. 30°

B. 45°

C. 90°

D. 60°

32. Which is equivalent to $\sin(90° - \theta)$?

A. $\sin \theta$

B. $\cos \theta$

C. $\tan \theta$

D. $\cot \theta$

33. The sin of a 60° angle equals:

A. $\sqrt{3}/2$

B. $1/2$

C. 1

D. $\sqrt{2}/2$

34. If $\tan \theta = \sqrt{3}$, then θ (acute) is:

A. 30°

B. 45°

C. 90°

D. 60°

35. In a right triangle, $\sec \theta$ equals:

A. $1/\sin \theta$

B. $1/\tan \theta$

C. $1/\cos \theta$

D. $\sin \theta/\cos \theta$

36. The tangent of 0° equals:

A. 0

B. 1

C. undefined

D. √2/2

37. In a right triangle with hypotenuse 10 and one leg 6, the sin of the angle opposite the missing leg is:

A. 6/10

B. 10/6

C. 6/8

D. 8/10

38. The csc of 30° equals:

A. 1

B. 2

C. √3

D. 1/2

39. In a right triangle, cos θ = adjacent/hypotenuse. If adjacent = 8 and hypotenuse = 17, cos θ is:

A. 17/8

B. 15/17

C. 8/15

D. 8/17

40. If $\sin^2\theta + \cos^2\theta = 1$ and $\sin\theta = 1/2$, then $\cos^2\theta$ is:

A. 3/4

B. 1/2

C. 1/4

D. 1

41. The reciprocal of tan 45° is:

A. 0

B. √2

C. 1

D. √3

42. In a right triangle, if opposite = 5 and adjacent = 12, tan θ is:

A. 5/12

B. 12/5

C. 5/13

D. 13/5

43. The cot of 45° is:

A. 0

B. √2

C. √3

D. 1

44. The sec of 0° is:

A. 0

B. 1

C. undefined

D. 2

45. In a right triangle with hypotenuse 25 and opposite 7, sin θ is:

A. 7/24

B. 24/7

C. 25/7

D. 7/25

46. The cos of 45° equals:

A. √2/2

B. 1/2

C. √3/2

D. 1

47. If sin θ = 0.8 and θ is acute, cos θ is approximately:

A. 0.2

B. 1.25

C. 0.6

D. 0.8

48. In a 30-60-90 triangle, tan(60°) equals:

A. 1

B. √3

C. 1/2

D. √3/3

49. In a right triangle, if sin θ = 12/13, then cos θ is:

A. 12/5

B. 13/12

C. 5/12

D. 5/13

50. The sine of an acute angle is always:

A. between 0 and 1

B. greater than 1

C. negative

D. undefined

PRACTICE SET 8: ANSWER KEY AND EXPLANATIONS

1. C — opposite/hypotenuse. The sine of an angle in a right triangle is the ratio of the length of the opposite side to the length of the hypotenuse. This definition forms the basis of the SOH-CAH-TOA memory device (SOH stands for Sine = Opposite/Hypotenuse).

2. A — 1/2. The sine of 30° is one of the fundamental values worth memorizing: $\sin(30°) = 1/2$. This comes from the 30-60-90 special triangle with sides in the ratio $1 : \sqrt{3} : 2$.

3. D — adjacent/hypotenuse. Cosine is defined as the adjacent side divided by the hypotenuse. This is the CAH portion of the SOH-CAH-TOA mnemonic.

4. B — 1/2. The cosine of 60° equals 1/2, which comes from the 30-60-90 triangle. Note that $\cos(60°) = \sin(30°)$, demonstrating the cofunction relationship.

5. A — 1. The tangent of 45° is 1 because in a 45-45-90 triangle the legs are equal, making the ratio opposite/adjacent equal to 1.

6. D — $\sin^2\theta + \cos^2\theta = 1$. This is the fundamental Pythagorean identity, which holds for every angle θ. It is derived from the Pythagorean theorem applied to the unit circle and is the most important trigonometric identity.

7. C — 1. The sine of 90° equals 1, the maximum value sine can take. This corresponds to the point (0, 1) on the unit circle.

8. B — 1. The cosine of 0° equals 1, the maximum value cosine can take. This corresponds to the point (1, 0) on the unit circle.

9. D — $\sin\theta/\cos\theta$. Tangent is defined as sine divided by cosine. This identity follows directly from the SOH-CAH-TOA definitions when expressed as a ratio.

10. A — 4/5. Using the Pythagorean identity, $\cos^2\theta = 1 - (3/5)^2 = 1 - 9/25 = 16/25$, so $\cos\theta = 4/5$. This comes from the 3-4-5 right triangle.

11. D — $\sqrt{3}/2$. The sine of 60° equals $\sqrt{3}/2$, derived from the 30-60-90 triangle.

12. B — $\sqrt{3}/2$. The cosine of 30° equals $\sqrt{3}/2$, which is the same as $\sin(60°)$ due to the cofunction relationship.

13. A — csc. The cosecant (csc) function is defined as the reciprocal of sine: $\csc\theta = 1/\sin\theta$.

14. D — 45°. The tangent equals 1 at 45° because in a 45-45-90 triangle, the legs are equal, making the opposite/adjacent ratio equal to 1.

15. C — 0. The sine of 0° equals 0, corresponding to the point (1, 0) on the unit circle where the y-coordinate (representing sine) is zero.

16. A — 10. In a 30-60-90 triangle, the side opposite the 30° angle is half the hypotenuse. If the opposite side is 5, the hypotenuse is 10.

17. D — sec θ. The secant (sec) function is defined as the reciprocal of cosine: $\sec \theta = 1/\cos \theta$.

18. B — $\sqrt{3}/3$. The tangent of 30° equals $1/\sqrt{3}$, which rationalizes to $\sqrt{3}/3$. This is a standard value worth memorizing.

19. C — 90°. The cosine of 90° equals 0, corresponding to the point (0, 1) on the unit circle where the x-coordinate is zero.

20. A — $\sqrt{2}/2$. The sine of 45° equals $\sqrt{2}/2$, which comes from the 45-45-90 triangle where both legs are equal to 1 and the hypotenuse is $\sqrt{2}$.

21. A — 3/5. Using SOH, $\sin \theta$ = opposite/hypotenuse = 6/10, which simplifies to 3/5.

22. D — $\sqrt{3}$. The tangent of 60° equals $\sqrt{3}$ because in a 30-60-90 triangle the side opposite 60° is $\sqrt{3}$ times the side opposite 30°.

23. B — equal to each other. Sine and cosine of complementary angles (angles that sum to 90°) are equal. For example, $\sin(30°) = \cos(60°)$. This is called the cofunction identity.

24. C — $a/\sin A = b/\sin B = c/\sin C$. The Law of Sines states that the ratio of a side to the sine of its opposite angle is constant in any triangle.

25. A — 3/5. Using the Pythagorean theorem, the hypotenuse is $\sqrt{(9 + 16)} = 5$. Then $\sin \theta$ opposite the leg of length 3 is 3/5.

26. D — 0. The cosine of 90° equals 0, corresponding to the point (0, 1) on the unit circle.

27. B — 30°. Since $\sin(30°) = 1/2$, the acute angle with sine equal to 1/2 is 30°.

28. C — cot θ. Cotangent is the reciprocal of tangent: $\cot \theta = 1/\tan \theta = \cos \theta/\sin \theta$.

29. A — $\sqrt{2}/2$. In a 45-45-90 triangle, the legs are equal. If each leg is 1, the hypotenuse is $\sqrt{2}$, making $\sin(45°) = 1/\sqrt{2} = \sqrt{2}/2$.

30. D — $c^2 = a^2 + b^2 - 2ab \cos C$. The Law of Cosines generalizes the Pythagorean theorem to non-right triangles by including a correction term based on the cosine of the included angle.

31. D — 60°. Since $\cos(60°) = 1/2$, the acute angle with cosine equal to 1/2 is 60°.

32. B — $\cos \theta$. The cofunction identity states that $\sin(90° - \theta) = \cos \theta$, meaning sine and cosine are complementary trigonometric functions.

33. A — $\sqrt{3}/2$. The sine of 60° equals $\sqrt{3}/2$, one of the standard values derived from the 30-60-90 triangle.

34. D — 60°. Since $\tan(60°) = \sqrt{3}$, the acute angle with tangent equal to $\sqrt{3}$ is 60°.

35. C — $1/\cos \theta$. Secant is defined as the reciprocal of cosine: $\sec \theta = 1/\cos \theta$.

36. A — 0. The tangent of 0° equals 0 because $\sin(0°) = 0$ and tangent is sine divided by cosine: $0/1 = 0$.

37. D — 8/10. The missing leg, found by Pythagoras, is $\sqrt{(100 - 36)} = 8$. The sine of the angle opposite that leg is 8/10.

38. B — 2. The cosecant of 30° is the reciprocal of $\sin(30°) = 1/2$, which is 2.

39. D — 8/17. By CAH, $\cos \theta$ = adjacent/hypotenuse = 8/17.

40. A — 3/4. Using $\sin^2\theta + \cos^2\theta = 1$ with $\sin \theta = 1/2$, we get $\cos^2\theta = 1 - 1/4 = 3/4$.

41. C — 1. The reciprocal of $\tan(45°) = 1$ is $1/1 = 1$.

42. A — 5/12. By TOA, $\tan \theta$ = opposite/adjacent = 5/12.

43. D — 1. The cotangent of 45° is the reciprocal of $\tan(45°) = 1$, which is 1.

44. B — 1. The secant of 0° is the reciprocal of $\cos(0°) = 1$, which is 1.

45. D — 7/25. By SOH, $\sin \theta$ = opposite/hypotenuse = 7/25.

46. A — $\sqrt{2}/2$. The cosine of 45° equals $\sqrt{2}/2$, the same as $\sin(45°)$ due to the cofunction relationship.

47. C — 0.6. Using $\sin^2\theta + \cos^2\theta = 1$, $\cos^2\theta = 1 - 0.64 = 0.36$, so $\cos \theta = 0.6$.

48. B — $\sqrt{3}$. The tangent of 60° equals $\sqrt{3}$, derived from the 30-60-90 triangle ratios.

49. D — 5/13. Using the Pythagorean identity, $\cos^2\theta = 1 - (144/169) = 25/169$, so $\cos \theta = 5/13$. This comes from the 5-12-13 Pythagorean triple.

50. A — between 0 and 1. The sine of any acute angle (between 0° and 90°) falls strictly between 0 and 1 because both sine endpoints ($\sin 0° = 0$ and $\sin 90° = 1$) mark the boundaries.