Trigonometric Identities MCQs for Entry Test - Exercise 10.1

Introduction

This document contains 20 multiple-choice questions based on Exercise 10.1 of the trigonometry chapter, designed for entry test preparation. Each question tests concepts such as angle sum and difference identities, double, triple, and half-angle identities, sum-to-product identities, evaluating trigonometric functions, and triangle angle identities. Solutions with detailed explanations are provided at the end.

Multiple-Choice Questions

1. **What is the value of** $\sin(-780^\circ)$**?**

   A) $\frac{\sqrt{3}}{2}$

   B) $-\frac{\sqrt{3}}{2}$

   C) $\frac{1}{2}$

   D) $-\frac{1}{2}$

2. **What is** $\cot(-855^\circ)$**?**

   A) -1

   B) 1

   C) $\sqrt{3}$

   D) $-\sqrt{3}$

3. **Evaluate** $\csc(2040^\circ)$**.**

   A) $\frac{2}{\sqrt{3}}$

   B) $-\frac{2}{\sqrt{3}}$

   C) 2

   D) -2

4. **What is** $\sec(-960^\circ)$**?**

   A) 2

   B) -2

C) $\frac{2}{\sqrt{3}}$

D) $-\frac{2}{\sqrt{3}}$

5. **Find** $\tan 1110°$**.**

A) $\frac{1}{\sqrt{3}}$

B) $-\frac{1}{\sqrt{3}}$

C) 1

D) -1

6. **Evaluate** $\sin(-300°)$**.**

A) $\frac{\sqrt{3}}{2}$

B) $-\frac{\sqrt{3}}{2}$

C) $\frac{1}{2}$

D) $-\frac{1}{2}$

7. **Express** $\sin 196°$ **as a trigonometric function of an angle less than** $45°$**.**

A) $\sin 16°$

B) $-\sin 16°$

C) $\cos 16°$

D) $-\cos 16°$

8. **Express** $\cos 147°$ **as a trigonometric function of an angle less than** $45°$**.**

A) $\cos 33°$

B) $-\cos 33°$

C) $\sin 33°$

D) $-\sin 33°$

9. **What is** $\sin 319°$ **in terms of an angle less than** $45°$**?**

A) $\sin 41°$

B) $-\sin 41°$

C) $\cos 41°$

D) $-\cos 41°$

10. **Express** $\cos 254°$ **as a trigonometric function of an angle less than** $45°$**.**

A) $\sin 16°$

B) $-\sin 16°$

C) $\cos 16°$

D) $-\cos 16°$

11. **What is** $\tan 294°$**?**

    A) $\cot 24°$

    B) $-\cot 24°$

    C) $\tan 24°$

    D) $-\tan 24°$

12. **Evaluate** $\cos 728°$**.**

    A) $\cos 8°$

    B) $-\cos 8°$

    C) $\sin 8°$

    D) $-\sin 8°$

13. **What is** $\sin(-625°)$**?**

    A) $\cos 5°$

    B) $-\cos 5°$

    C) $\sin 5°$

    D) $-\sin 5°$

14. **Evaluate** $\sin 150°$**.**

    A) $\frac{1}{2}$

    B) $-\frac{1}{2}$

    C) $\frac{\sqrt{3}}{2}$

    D) $-\frac{\sqrt{3}}{2}$

15. **Which identity holds for** $\sin(180° + \alpha)\sin(90° - \alpha)$**?**

    A) $\sin\alpha\cos\alpha$

    B) $-\sin\alpha\cos\alpha$

    C) $\sin^2\alpha$

    D) $\cos^2\alpha$

16. **Evaluate** $\sin 780°\sin 480° + \cos 120°\sin 30°$**.**

    A) $\frac{1}{2}$

    B) $-\frac{1}{2}$

    C) 1

    D) 0

17. **What is the value of** $\cos 306° + \cos 234° + \cos 162° + \cos 18°$**?**

    A) 0

    B) 1

C) $\frac{1}{2}$

D) -1

18. **Evaluate** $\cos 330^\circ \sin 600^\circ + \cos 120^\circ \sin 150^\circ$**.**

A) $\frac{1}{2}$

B) -1

C) 0

D) -2

19. **If** α, β, γ **are angles of a triangle, what is** $\sin(\alpha + \beta)$**?**

A) $\sin \gamma$

B) $-\sin \gamma$

C) $\cos \gamma$

D) $-\cos \gamma$

20. **If** α, β, γ **are angles of a triangle, what is** $\cos\left(\frac{\alpha+\beta}{2}\right)$**?**

A) $\sin \frac{\gamma}{2}$

B) $\cos \frac{\gamma}{2}$

C) $-\sin \frac{\gamma}{2}$

D) $-\cos \frac{\gamma}{2}$

Solutions and Explanations

1. **Solution to Question 1:**

$$-780^\circ = -(2 \cdot 360^\circ + 60^\circ); \quad \sin(-780^\circ) = -\sin 60^\circ = -\frac{\sqrt{3}}{2}$$

Answer: B) $-\frac{\sqrt{3}}{2}$

2. **Solution to Question 2:**

$$-855^\circ = -(9 \cdot 90^\circ + 45^\circ); \quad \cot(-855^\circ) = -\cot 45^\circ = -(-1) = 1$$

Answer: B) 1

3. **Solution to Question 3:**

$2040^\circ = 22{\cdot}90^\circ{+}60^\circ; \quad \csc(2040^\circ) = \csc(60^\circ) = -\dfrac{2}{\sqrt{3}}$ (4th quadrant, csc negative)

Answer: B) $-\frac{2}{\sqrt{3}}$

4. **Solution to Question 4:**

$-960^\circ = -(10{\cdot}90^\circ{+}60^\circ); \quad \sec(-960^\circ) = \sec 60^\circ = -2$ (4th quadrant, sec negative)

Answer: B) -2

5. **Solution to Question 5:**

$$1110^\circ = 12 \cdot 90^\circ + 30^\circ; \quad \tan 1110^\circ = \tan 30^\circ = \frac{1}{\sqrt{3}}$$

Answer: A) $\frac{1}{\sqrt{3}}$

6. **Solution to Question 6:**

$$-300^\circ = -(3{\cdot}90^\circ{+}30^\circ); \quad \sin(-300^\circ) = -\sin 300^\circ = -\cos 30^\circ = -\left(-\frac{\sqrt{3}}{2}\right) = \frac{\sqrt{3}}{2}$$

Answer: A) $\frac{\sqrt{3}}{2}$

7. **Solution to Question 7:**

$$\sin 196^\circ = \sin(180^\circ + 16^\circ) = -\sin 16^\circ$$

Answer: B) $-\sin 16^\circ$

8. **Solution to Question 8:**

$$\cos 147^\circ = \cos(180^\circ - 33^\circ) = -\cos 33^\circ$$

Answer: B) $-\cos 33^\circ$

9. **Solution to Question 9:**

$$\sin 319^\circ = \sin(360^\circ - 41^\circ) = -\sin 41^\circ$$

Answer: B) $-\sin 41^\circ$

10. **Solution to Question 10:**

$$\cos 254^\circ = \cos(270^\circ - 16^\circ) = -\sin 16^\circ$$

Answer: B) $-\sin 16^\circ$

11. **Solution to Question 11:**

$$\tan 294^\circ = \tan(270^\circ + 24^\circ) = -\cot 24^\circ$$

Answer: B) $-\cot 24^\circ$

12. **Solution to Question 12:**

$$\cos 728^\circ = \cos(720^\circ + 8^\circ) = \cos 8^\circ$$

Answer: A) $\cos 8^\circ$

13. **Solution to Question 13:**

$$\sin(-625^\circ) = -\sin 625^\circ = -\sin(630^\circ - 5^\circ) = -\cos 5^\circ$$

Answer: A) $\cos 5^\circ$

14. **Solution to Question 14:**

$$\sin 150^\circ = \sin(180^\circ - 30^\circ) = \sin 30^\circ = \frac{1}{2}$$

Answer: A) $\frac{1}{2}$

15. **Solution to Question 15:**

$$\sin(180^\circ + \alpha)\sin(90^\circ - \alpha) = (-\sin\alpha)(\cos\alpha) = -\sin\alpha\cos\alpha$$

Answer: B) $-\sin\alpha\cos\alpha$

16. **Solution to Question 16:**

$$\sin 780^\circ = \sin(720^\circ{+}60^\circ) = \sin 60^\circ = \frac{\sqrt{3}}{2}, \quad \sin 480^\circ = \sin(450^\circ{+}30^\circ) = \cos 30^\circ = \frac{\sqrt{3}}{2}$$

$$\cos 120^\circ = -\cos 60^\circ = -\frac{1}{2}, \quad \sin 30^\circ = \frac{1}{2}$$

$$\text{LHS} = \frac{\sqrt{3}}{2}\cdot\frac{\sqrt{3}}{2} + \left(-\frac{1}{2}\right)\cdot\frac{1}{2} = \frac{3}{4} - \frac{1}{4} = \frac{1}{2}$$

Answer: A) $\frac{1}{2}$

17. **Solution to Question 17:**

$$\cos 306^\circ = \cos(360^\circ - 54^\circ) = \cos 54^\circ, \quad \cos 234^\circ = \cos(180^\circ + 54^\circ) = -\cos 54^\circ$$

$$\cos 162^\circ = \cos(180^\circ - 18^\circ) = -\cos 18^\circ, \quad \cos 18^\circ = \cos 18^\circ$$

$$\text{LHS} = \cos 54^\circ - \cos 54^\circ - \cos 18^\circ + \cos 18^\circ = 0$$

Answer: A) 0

18. **Solution to Question 18:**

$$\cos 330^\circ = \cos(360^\circ{-}30^\circ) = \cos 30^\circ = \frac{\sqrt{3}}{2}, \quad \sin 600^\circ = \sin(540^\circ{+}60^\circ) = -\sin 60^\circ = -\frac{\sqrt{3}}{2}$$

$$\cos 120^\circ = -\cos 60^\circ = -\frac{1}{2}, \quad \sin 150^\circ = \sin(180^\circ - 30^\circ) = \sin 30^\circ = \frac{1}{2}$$

$$\text{LHS} = \frac{\sqrt{3}}{2}\cdot\left(-\frac{\sqrt{3}}{2}\right) + \left(-\frac{1}{2}\right)\cdot\frac{1}{2} = -\frac{3}{4} - \frac{1}{4} = -1$$

Answer: B) -1

19. **Solution to Question 19:**

$$\alpha + \beta + \gamma = 180^\circ \implies \alpha + \beta = 180^\circ - \gamma; \quad \sin(\alpha + \beta) = \sin(180^\circ - \gamma) = \sin\gamma$$

Answer: A) $\sin\gamma$

20. **Solution to Question 20:**

$$\alpha + \beta = 180^\circ - \gamma \implies \frac{\alpha + \beta}{2} = 90^\circ - \frac{\gamma}{2}; \quad \cos\left(\frac{\alpha + \beta}{2}\right) = \cos\left(90^\circ - \frac{\gamma}{2}\right) = \sin\frac{\gamma}{2}$$

Answer: A) $\sin\frac{\gamma}{2}$