

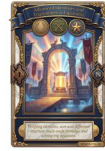
# Advanced Identities and Trigonometric Equations

Verifying identities, sum-and-difference structure, multi-angle formulas, and solving trig equations.

Name \_\_\_\_\_ Date \_\_\_\_\_

32 main 2-up grid 2 pages

## Completion Reward



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### 1. Which formula is correct?

- A.  $\sin(a + b) = \sin(a)\sin(b) + \cos(a)\cos(b)$
- B.  $\sin(a + b) = \sin(a)\cos(b) + \cos(a)\sin(b)$
- C.  $\sin(a + b) = \sin(a)\cos(b) - \cos(a)\sin(b)$
- D.  $\sin(a + b) = \tan(a) + \tan(b)$

### 2. Which formula is correct?

- A.  $\cos(a - b) = \cos(a)\cos(b) - \sin(a)\sin(b)$
- B.  $\cos(a - b) = \sin(a)\cos(b) + \cos(a)\sin(b)$
- C.  $\cos(a - b) = \cos(a)\cos(b) + \sin(a)\sin(b)$
- D.  $\cos(a - b) = \tan(a) - \tan(b)$

### 3. Which expression equals $\sin(2x)$ ?

- A.  $2\sin(x)\cos(x)$
- B.  $\sin^2(x) - \cos^2(x)$
- C.  $2\tan(x)$
- D.  $1 - 2\sin^2(x)$

### 4. Which expression equals $\cos(2x)$ ?

- A.  $2\sin(x)\cos(x)$
- B.  $1 + 2\sin^2(x)$
- C.  $\cos^2(x) - \sin^2(x)$
- D.  $2\tan(x)$

### 5. Which denominator appears in $\tan(a + b)$ ?

- A.  $1 + \tan(a)\tan(b)$
- B.  $\tan(a) + \tan(b)$
- C.  $1 - \tan(a)\tan(b)$
- D.  $\cos(a) + \cos(b)$

### 6. Why might you rewrite $\cos(2x)$ as $1 - 2\sin^2(x)$ when solving an equation?

- A. To replace cosine with an expression in sine only
- B. To turn the equation into one trig function instead of two
- C. To force every solution into Quadrant I
- D. To avoid considering interval restrictions

### 7. Which exact value equals $\sin(75 \text{ degrees})$ ?

- A.  $(\sqrt{6} - \sqrt{2}) / 4$
- B.  $\sqrt{3} / 2$
- C.  $1 / 2$
- D.  $(\sqrt{6} + \sqrt{2}) / 4$

### 8. Which exact value equals $\cos(15 \text{ degrees})$ ?

- A.  $(\sqrt{6} - \sqrt{2}) / 4$
- B.  $\sqrt{3} / 2$
- C.  $(\sqrt{6} + \sqrt{2}) / 4$
- D.  $1 / 2$

### 9. Which expression is another form of $\cos(2x)$ ?

- A.  $1 + 2\sin^2(x)$
- B.  $2\sin(x)\cos(x)$
- C.  $2\cos^2(x) + 1$
- D.  $1 - 2\sin^2(x)$

### 10. If $\sin(x) = -1/2$ , what is the reference angle?

- A.  $\pi / 3$
- B.  $\pi / 6$
- C.  $\pi / 4$
- D.  $2\pi / 3$

### 11. Which expression equals $\sin(105 \text{ degrees})$ ?

- A.  $(\sqrt{6} - \sqrt{2}) / 4$
- B.  $\sqrt{3} / 2$
- C.  $(\sqrt{6} + \sqrt{2}) / 4$
- D.  $1 / 2$

### 12. To verify $\sin(x)\cos(x) = 1/2 \sin(2x)$ , what is the best first step?

- A. Square both sides
- B. Replace  $\sin(2x)$  with  $2\sin(x)\cos(x)$
- C. Divide by  $\tan(x)$
- D. Replace  $\cos(x)$  with  $\sec(x)$

### 13. What is the best setup for finding $\sin(15 \text{ degrees})$ ?

- A. Use  $\cos(45 \text{ degrees} + 30 \text{ degrees})$
- B. Use  $\tan(45 \text{ degrees} - 30 \text{ degrees})$
- C. Use  $\sin(45 \text{ degrees} - 30 \text{ degrees})$
- D. Use a half-angle identity on 15 degrees immediately

### 14. What is the best first step to solve $\cos(2x) = 0$ ?

- A. Divide by  $\cos(x)$
- B. Replace  $\cos(2x)$  with  $\sin(2x)$
- C. Square both sides
- D. Solve  $2x = \pi / 2 + k\pi$

### 15. To verify $(1 - \cos(2x)) / 2 = \sin^2(x)$ , which identity helps most?

- A.  $\sin(2x) = 2\sin(x)\cos(x)$
- B.  $\tan(2x) = 2\tan(x) / (1 - \tan^2(x))$
- C.  $\cos(2x) = 1 - 2\sin^2(x)$
- D.  $\sin^2(x) + \cos^2(x) = 2$

### 16. A student writes $\cos(a + b) = \cos(a)\cos(b) + \sin(a)\sin(b)$ . What is wrong?

- A. The formula should use tangent
- B. The cosine terms should be squared
- C. Nothing is wrong
- D. The sign should be minus, not plus

### 17. A student solves $\cos(x) = 1/2$ on $[0, 2\pi]$ with $x = \pi/3$ and $2\pi/3$ . What is wrong?

- A.  $2\pi/3$  has cosine  $-1/2$ , not  $1/2$
- B.  $\pi/3$  is outside the interval
- C. Cosine can never equal  $1/2$
- D. The student should only give one answer

### 18. A student solving $\tan(x) = 1$ lists $x = \pi/4$ and $9\pi/4$ on $[0, 2\pi]$ . What is the mistake?

- A.  $\pi/4$  is not a tangent solution
- B.  $9\pi/4$  is outside the interval
- C. Tangent has period  $2\pi$
- D. The second solution should be  $3\pi/4$

### 19. Write $\sin(a - b)$ . Answer as an equation.

### 20. Write $\cos(a + b)$ . Answer as an equation.

### 21. Write $\sin(2x)$ . Answer as an equation.

### 22. Write $\cos(2x)$ as a difference of squares. Answer as an equation.

### 23. Write $\tan(2x)$ . Answer as an equation.

### 24. Rewrite $2\sin(x)\cos(x)$ using a double-angle identity. Answer as an expression.

25. Rewrite  $\cos^2(x) - \sin^2(x)$  using a double-angle identity. Answer as an expression.
26. Rewrite  $1 - 2\sin^2(x)$  using a double-angle identity. Answer as an expression.
27. Which solution set on  $[0, 2\pi]$  is correct for  $\sin(x) = 1/2$ ?
- A.  $x = \pi/6$  and  $7\pi/6$   
B.  $x = 5\pi/6$  and  $7\pi/6$   
C.  $x = \pi/6$  and  $5\pi/6$   
D.  $x = 11\pi/6$  only
28. Which solution set on  $[0, 2\pi]$  is correct for  $\cos(x) = -\sqrt{2}/2$ ?
- A.  $x = \pi/4$  and  $7\pi/4$   
B.  $x = \pi/4$  and  $3\pi/4$   
C.  $x = 3\pi/4$  and  $5\pi/4$   
D.  $x = 5\pi/4$  and  $7\pi/4$
29. Which solution set on  $[0, 2\pi]$  is correct for  $\tan(x) = 1$ ?
- A.  $x = \pi/4$  and  $3\pi/4$   
B.  $x = 3\pi/4$  and  $7\pi/4$   
C.  $x = \pi/4$  only  
D.  $x = \pi/4$  and  $5\pi/4$
30. Which solution set on  $[0, 2\pi]$  is correct for  $2\sin(x) = \sqrt{3}$ ?
- A.  $x = \pi/6$  and  $5\pi/6$   
B.  $x = \pi/3$  and  $5\pi/3$   
C.  $x = \pi/3$  and  $2\pi/3$   
D.  $x = 2\pi/3$  and  $4\pi/3$
31. Which solution set on  $[0, 2\pi]$  is correct for  $2\cos(x) = -1$ ?
- A.  $x = 2\pi/3$  and  $4\pi/3$   
B.  $x = \pi/3$  and  $5\pi/3$   
C.  $x = \pi/6$  and  $11\pi/6$   
D.  $x = \pi/3$  and  $2\pi/3$
32. Which solution set on  $[0, 2\pi]$  is correct for  $\tan(x) = -\sqrt{3}$ ?
- A.  $x = \pi/3$  and  $4\pi/3$   
B.  $x = \pi/6$  and  $7\pi/6$   
C.  $x = 2\pi/3$  and  $5\pi/3$   
D.  $x = 5\pi/6$  and  $11\pi/6$