

**GUIDED PRACTICE** for Examples 5, 6, and 7

Verify the identity.

11. $\sin 3x = 3 \sin x - 4 \sin^3 x$

12. $1 + \cos 10x = 2 \cos^2 5x$

Solve the equation.

13. $\tan 2x + \tan x = 0$ for $0 \leq x < 2\pi$

14. $2 \cos \frac{x}{2} + 1 = 0$

14.7 EXERCISES**HOMEWORK KEY** = **WORKED-OUT SOLUTIONS** on p. WS1 for Exs. 7, 13, and 53 = **TAKS PRACTICE AND REASONING** Exs. 11, 27, 54, 55, 57, and 58**SKILL PRACTICE**

- VOCABULARY** Copy and complete: $\sin 2a = 2 \sin a \cos a$ is called the ? formula for sine.
- WRITING** Explain how to determine the sign of the answer when evaluating a half-angle formula for sine or cosine.

EXAMPLE 1on p. 955
for Exs. 3–11**EVALUATING EXPRESSIONS** Find the exact value of the expression.

3. $\sin 105^\circ$

4. $\tan 112.5^\circ$

5. $\tan (-165^\circ)$

6. $\cos (-75^\circ)$

7. $\cos \frac{\pi}{8}$

8. $\sin \frac{5\pi}{12}$

9. $\tan \left(-\frac{5\pi}{8}\right)$

10. $\sin \left(-\frac{11\pi}{12}\right)$

- 11.
-
- TAKS REASONING**
- What is the exact value of
- $\tan 15^\circ$
- ?

A $-\sqrt{3}$

B $2 - \sqrt{3}$

C $\sqrt{3}$

D $2 + \sqrt{3}$

EXAMPLE 2on p. 956
for Exs. 12–20**HALF-ANGLE FORMULAS** Find the exact values of $\sin \frac{a}{2}$, $\cos \frac{a}{2}$, and $\tan \frac{a}{2}$.

12. $\cos a = \frac{4}{5}$, $0 < a < \frac{\pi}{2}$

13. $\cos a = \frac{1}{3}$, $\frac{3\pi}{2} < a < 2\pi$

14. $\sin a = \frac{12}{13}$, $\frac{\pi}{2} < a < \pi$

15. $\sin a = -\frac{3}{5}$, $\pi < a < \frac{3\pi}{2}$

- 16.
- ERROR ANALYSIS**
- Describe and correct the error in finding the exact value of
- $\sin \frac{a}{2}$
- given that
- $\cos a = -\frac{3}{5}$
- with
- $\frac{\pi}{2} < a < \pi$
- .

$$\sin \frac{a}{2} = -\sqrt{\frac{1 - \cos a}{2}} = -\sqrt{\frac{1 + \frac{3}{5}}{2}} = -\sqrt{\frac{4}{5}} = -\frac{2\sqrt{5}}{5} \quad \times$$

DOUBLE-ANGLE FORMULAS Find the exact values of $\sin 2a$, $\cos 2a$, and $\tan 2a$.

17. $\tan a = 2$, $\pi < a < \frac{3\pi}{2}$

18. $\tan a = -\sqrt{3}$, $\frac{\pi}{2} < a < \pi$

19. $\sin a = -\frac{2}{3}$, $\pi < a < \frac{3\pi}{2}$

20. $\cos a = \frac{2}{5}$, $-\frac{\pi}{2} < a < 0$