

Honors Precalculus  
Double-angle and Half-angle Identities  
Cofunction Identities

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Tell whether each of the following statements is true or false.

1.  $\cos 2(20^\circ) = 2\cos^2 40^\circ - 1$

5.  $\cos 70^\circ = \cos^2 35^\circ - \sin^2 35^\circ$

2.  $\cos 2(25^\circ) = 1 - 2\sin^2 25^\circ$

6.  $\cos 40^\circ = 2\cos^2 40^\circ - 1$

3.  $\sin(-50^\circ) = 2\sin(-25^\circ)\cos(-25^\circ)$

7.  $\tan 2(45^\circ) = \frac{2\tan 45^\circ}{1-\tan^2 45^\circ}$

4.  $\sin 2(42^\circ) = 2\sin 84^\circ\cos 84^\circ$

8.  $\tan(-70^\circ) = \frac{2(\tan 35^\circ)}{1-\tan^2(-35^\circ)}$

Write each expression in terms of a trigonometric function of one angle.

9.  $2\sin 35^\circ\cos 35^\circ$

11.  $\frac{2\tan 22.5^\circ}{1-\tan^2 22.5^\circ}$

10.  $1 - 2\sin^2 40^\circ$

12.  $2\sin 67.5^\circ\cos 67.5^\circ$

Use the double-angle identities to find the exact value of each trigonometric function.

13. If  $\tan \alpha = \frac{4}{5}$  and  $0^\circ < \alpha < 90^\circ$ , find  $\tan 2\alpha$ .

16. If  $\cos \lambda = \frac{4}{5}$  and  $0^\circ < \lambda < 90^\circ$ , find  $\tan 2\lambda$ .

14. If  $\cos \alpha = \frac{4}{5}$  and  $270^\circ < \alpha < 360^\circ$ , find  $\sin 2\alpha$ .

17. If  $\tan \beta = -\frac{4}{3}$  and  $90^\circ < \beta < 180^\circ$ , find  $\cos 2\beta$

15. If  $\sin \theta = \frac{3}{5}$  and  $90^\circ < \theta < 180^\circ$ , find  $\cos 2\theta$ .

Use the half-angle identities to find the exact value of each function.

18.  $\sin 22.5^\circ$

20.  $\cos 105^\circ$

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

21.  $\tan \frac{\pi}{12}$

Find the exact value of each trigonometric function. Assume  $0^\circ < \theta < 360^\circ$ .

22.  $\cos \frac{\theta}{2}$  if  $\cos \theta = \frac{4}{5}$  and  $\theta$  lies in Q1.

23.  $\tan \frac{\theta}{2}$  if  $\tan \theta = -2$  and  $\theta$  lies in Q2.

24.  $\sin \theta$  if  $\cos 2\theta = \frac{5}{13}$  and  $\theta$  lies in Q1.

Tell whether each statement is true or false.

25.  $\cos 10^\circ = \sqrt{\frac{1+\sin 5^\circ}{2}}$

29.  $\tan 15^\circ = \sqrt{\frac{1-\cos 30^\circ}{1+\cos 30^\circ}}$

26.  $\sin 20^\circ = \sqrt{\frac{1-\cos 40^\circ}{2}}$

30.  $\tan 100^\circ = -\sqrt{\frac{\sin 50^\circ}{1+\cos 50^\circ}}$

27.  $\tan 200^\circ = \sqrt{\frac{\sin 100^\circ}{1+\cos 100^\circ}}$

31.  $\sin 60^\circ = \sqrt{\frac{1+\cos 120^\circ}{2}}$

28.  $\tan 10^\circ = \sqrt{\frac{1-\cos 20^\circ}{\sin 20^\circ}}$

32.  $\cos 40^\circ = -\sqrt{\frac{1+\cos 40^\circ}{2}}$

Complete the following using cofunctions of complementary angles theorem.

33.  $\cos 34^\circ = \sin$  \_\_\_\_\_

37.  $\tan \frac{7\pi}{60} = \cot$  \_\_\_\_\_

41.  $\cot \frac{16\pi}{45} = \tan$  \_\_\_\_\_

34.  $\cot \frac{7\pi}{30} = \tan$  \_\_\_\_\_

38.  $\cos 75^\circ = \sin$  \_\_\_\_\_

42.  $\tan 80^\circ = \cot$  \_\_\_\_\_

35.  $\sec \frac{11\pi}{36} = \csc$  \_\_\_\_\_

39.  $\sin 41^\circ = \cos$  \_\_\_\_\_

43.  $\csc \frac{2\pi}{5} = \sec$  \_\_\_\_\_

36.  $\sin 67^\circ = \cos$  \_\_\_\_\_

40.  $\csc \frac{\pi}{2} = \sec$  \_\_\_\_\_

44.  $\sec 22^\circ = \csc$  \_\_\_\_\_

