

Unit 3-Review

Multiple Choice: Select the best answer for each of the following

1. $\sin(50^\circ) \cos(30^\circ) + \cos(50^\circ) \sin(30^\circ)$ is equivalent to : _____

- a. $\sin 80^\circ$ b. $\cos 80^\circ$ c. $\sin 20^\circ$ d. $\cos 20^\circ$

2. $\frac{\tan\left(\frac{5\pi}{9}\right) - \tan\left(\frac{\pi}{6}\right)}{1 + \tan\left(\frac{5\pi}{9}\right) \tan\left(\frac{\pi}{6}\right)}$ is equivalent to : _____

- a. $\tan\left(\frac{13\pi}{18}\right)$ b. $\tan\left(\frac{\pi}{6}\right)$ c. $\tan\left(\frac{7\pi}{18}\right)$ d. $\tan\left(\frac{\pi}{6}\right)$ _____

3. The exact value of $\tan\left(\frac{\pi}{12}\right)$ is :

- a. $2 - \sqrt{3}$ b. $2 + \sqrt{3}$ c. $3 - \sqrt{3}$ d. $3 + \sqrt{3}$

4. Given $\sin(\theta) = \frac{4}{5}$ and terminates in the second quadrant, the value of $\cos(2\theta)$ is _____

- a. $-\frac{24}{25}$ b. $-\frac{7}{25}$ c. $-\frac{16}{25}$ d. $-\frac{3}{25}$

5. Given $\sin(\theta) = \frac{\sqrt{3}}{2}$ and terminates in quadrant one, the value of $\sin 2\theta$ is : _____

- a. $\sqrt{3}$ b. $\frac{\sqrt{3}}{2}$ c. $\frac{\sqrt{3}}{4}$ d. $\frac{\sqrt{3}}{8}$

6. $\sin(-\theta)$ is equivalent to : _____

- a. $-\sin(\theta)$ b. $\sin(\theta)$ c. $\cos(\theta)$ d. $-\cos(\theta)$

7. The exact value of $\sin\left(\frac{5\pi}{12}\right)$ is : _____

- a. $\frac{\sqrt{6} + \sqrt{2}}{4}$ b. $\frac{\sqrt{6} + \sqrt{2}}{2}$ c. $\frac{\sqrt{6} - \sqrt{2}}{4}$ d. $\frac{\sqrt{6} - \sqrt{2}}{2}$

8. The expression $\cos(70^\circ)$ is equivalent to : _____

- a. $\sin(70^\circ)$ b. $\cos(20^\circ)$ c. $\sec(20^\circ)$ d. $\sin(20^\circ)$

9. The expression $\sin\left(\frac{2\pi}{3}\right)\cos\left(\frac{5\pi}{18}\right) - \sin\left(\frac{5\pi}{18}\right)\cos\left(\frac{2\pi}{3}\right)$ is equal to : _____

- a. $\cos\left(\frac{7\pi}{18}\right)$ b. $\cos(\pi)$ c. $\sin\left(-\frac{7\pi}{18}\right)$ d. $\sin\left(\frac{7\pi}{18}\right)$

10. The expression $\frac{2\tan\left(\frac{\pi}{3}\right)}{1 - \tan^2\left(\frac{\pi}{3}\right)}$ is equal to : _____

- a. 1 b. $\sqrt{3}$ c. $-\sqrt{3}$ d. -1

11. The expression $\cot(A+B)$ is equivalent to : _____

- a. $\cot(A) + \cot(B)$ b. $\cot(A) - \cot(B)$
 c. $\frac{1 - \tan(A)\tan(B)}{\tan(A) + \tan(B)}$ d. $\frac{\cot(A) + \cot(B)}{1 - \cot(A)\cot(B)}$

12. The expression $\cos\left(\frac{\pi}{12}\right)$ is equal to : _____

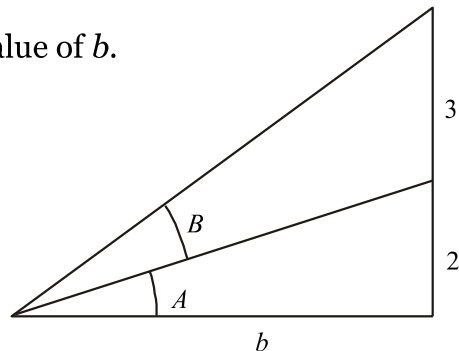
- a. $\frac{\sqrt{3}-1}{2\sqrt{2}}$ b. $\frac{\sqrt{3}+1}{-2\sqrt{2}}$ c. $\frac{\sqrt{3}-1}{-2\sqrt{2}}$
 d. $\frac{\sqrt{3}+1}{2\sqrt{2}}$

13. The expression $\cos(A+B) - \cos(A-B)$ is equivalent to : _____

- a. $2\cos(A)\cos(B)$ b. $-2\sin(A)\sin(B)$ c. $2\sin(A)\sin(B)$ d. 0

Full Solution

1. In the given diagram $\angle A = \angle B$, find the exact value of b .



2. Express $12\cos\theta + 5\sin\theta = R\cos(\theta - \alpha)$, where $R > 0$ and α is acute.
3. Jimmy is flying his kite at the end of a 50 m string. The string makes an angle of $\frac{\pi}{3}$ with the ground. The wind increases, and the kite flies higher until the string makes an angle of $\frac{\pi}{4}$ with the ground. Determine the **vertical displacement** of the kite as an **exact** value.
4. Fill in the blanks.
 - a) Evaluate the exact value of $\cot\left(\frac{3\pi}{2}\right)$ _____
 - b) Evaluate $\csc\left(\frac{\pi}{5}\right)$ to 4 decimal places _____
 - c) Evaluate the exact value of $\sec\left(\frac{7\pi}{6}\right)$ _____
5. Evaluate the exact value of the following expressions:
 - a) $\cos\left(\frac{7\pi}{12}\right)$.
 - b) $\cos\left(\frac{5\pi}{12}\right) + \cos\left(\frac{\pi}{12}\right)$
6. If $\cos\theta = -\frac{3}{8}$, $\pi \leq \theta \leq 3\pi$, determine the exact value of $\cos\left(\frac{\theta}{2}\right)$.
7. Prove that
$$\frac{\sin(\pi - x)\cos(\pi + x)\tan(2\pi - x)}{\sec\left(\frac{\pi}{2} + x\right)\csc\left(\frac{3\pi}{2} - x\right)\cot\left(\frac{3\pi}{2} + x\right)} = \sin^4(x) - \sin^2(x).$$
8. Prove the identity
 - a) $\csc^4(x) - \cot^4(x) = \frac{1 + \cos^2(x)}{1 - \cos^2(x)}$.
 - b) $\sin^4(x) + \cos^4(x) = \frac{3}{4} + \frac{1}{4}\cos(4x)$
10. If $\tan(2x) = -\frac{b}{a}$, $\frac{\pi}{2} \leq 2x \leq \pi$, then determine an expression for $\sin x \cos x$ in terms of a and b .
11. A cable car rises 762 m as it moves a horizontal distance of 628 m.
 - a) How long is the ride?
 - b) What is the angle of inclination of the cable to the nearest degree?
12. An arc of a circle, centre O, subtends an angle of 1.5 radians at the centre. Determine the ratio of the length of arc AB to the length of line segment AB.

13. A skateboard ramp is built with an incline angle of $\frac{\pi}{12}$. If the base of the ramp is 1m in length, determine the exact height of the ramp.
14. A 150-cm tall person stands on the bank of a narrow river and observes a flagpole on the opposite bank. If the angle of elevation to the top of the flagpole is 0.25 and the angle of depression to the bottom of the flagpole is 0.09, determine the flagpole's height, in metres, to two decimal places.
15. If $\cos(x) + \sin(x) = k$, for what value(s) of k does $\sin(x)\cos(x) = \frac{1}{2}$?