1. Find the exact value of the expression
\[ \cos^{-1} \left( \frac{\sqrt{2}}{2} \right) = \square \]
(Type an exact answer, using \( \pi \) as needed.)

Answer: \( \frac{\pi}{4} \)

2. Give the exact value of the expression without using a calculator.

\[ \sin \left( 2 \tan^{-1} \left( \frac{5}{12} \right) \right) \]

\[ \sin \left( 2 \tan^{-1} \left( \frac{5}{12} \right) \right) = \square \]
(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression.)

Answer: \( \frac{120}{169} \)

3. Write the expression as an algebraic expression in \( u \), \( u > 0 \).

\[ \sin \left[ \tan^{-1} \left( \frac{u}{3} \right) \right] \]

\[ \sin \left[ \tan^{-1} \left( \frac{u}{3} \right) \right] = \square \]
(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression. Rationalize all denominators.)

Answer: \( \frac{u \sqrt{u^2 + 9}}{u^2 + 9} \)

4. Find all solutions in the interval \([0, 2\pi)\).

\[ \tan^2 x + 1 = 0 \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

\( \bigcirc \) A. The solution set is \( \{ \square \} \).
(Type an exact answer, using \( \pi \) as needed. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

\( \bigcirc \) B. The solution is the empty set.

Answer: B
5. Solve the equation for exact solutions over the interval \([0, 2\pi]\).

\[ 8 \sin^2 x + 16 \sin x + 8 = 0 \]

Select the correct choice below and, if necessary, fill in the answer box to complete your choice.

○ A. The solution set is \(\{\square\}\).

(Type an exact answer, using \(\pi\) as needed. Type your answer in radians. Use integers or fractions for any numbers in the expression. Use a comma to separate answers as needed.)

○ B. The solution is the empty set.

Answer: A

6. Find the length of side \(a\). Do not use a calculator.

![Diagram of a triangle with sides labeled]

\[ a = \square \]

(Simplify your answer, including any radicals. Use integers or fractions for any numbers in the expression.)

Answer: \(9\sqrt{2}\)

7. Determine the remaining sides and angles of the triangle ABC.

\[ A = 130^\circ 50', C = 30^\circ 10', AB = 9 \]

\[ B = \square^\circ \, \square' \]

\[ BC \approx \square \]

(Do not round until the final answer. Then round to the nearest hundredth as needed.)

\[ AC \approx \square \]

(Do not round until the final answer. Then round to the nearest hundredth as needed.)

Answers: 19
0
13.55
5.83
8. Find the area of the triangle ABC.

\[a = 12.7 \text{ m} \quad b = 5.4 \text{ m} \quad C = 12.9^\circ\]

What is the area of the triangle?
\[\square \text{ m}^2\]
(Simplify your answer. Type an integer or decimal rounded to the nearest tenth as needed.)

Answer: 7.7

9. Determine the number of triangles ABC possible with the given parts.

\[B = 142.08^\circ \quad c = 8.8 \quad b = 14.8\]

How many possible solutions does this triangle have?
\[\square\]

Answer: 1

10. Solve the triangle with the given parts.

\[A = 97.7^\circ, \quad b = 9, \quad c = 5\]

What is the length of side a?
\[\square\]
(Round to four decimal places.)

What is the measure of angle C?
\[\square^\circ\]
(Round to the nearest tenth.)

What is the measure of angle B?
\[\square^\circ\]
(Round to the nearest tenth.)

Answers 10.8655
27.1
55.2
11. To find the distance from the house at A to the house at B, a surveyor measures the angle ACB, which is found to be 10°, and then walks off the distance to each house, 70 feet and 100 feet, respectively. How far apart are the houses?

The houses are [ ] feet apart.
(Round to the nearest hundredth as needed.)

Answer: 33.36

12. For the vectors \( \mathbf{u} \) and \( \mathbf{w} \) with angle \( \theta \) between them sketch the resultant.

\[ |\mathbf{u}| = 29, \ |\mathbf{w}| = 28, \ \theta = 31^\circ \]

Choose the correct sketch of the resultant below.

\[ \text{OA.} \quad \text{OB.} \quad \text{OC.} \]

Answer: B

13. Use the parallelogram rule to find the magnitude of the resultant force for the two forces shown in the figure.

The magnitude of the resultant force is [ ] lb.
(Round to the nearest tenth as needed.)

Answer: 26.6
14. Write the vector \(-9,10\) in the form \(ai + bj\).

\[-9,10] = \boxed{\phantom{0}}i + \boxed{\phantom{0}}j\]

Answers  
\(-9\)
\(10\)

15. For \(u = \langle 2, -1 \rangle\), \(v = \langle 3, 1 \rangle\), and \(w = \langle 1, 3 \rangle\), evaluate the expression.

\((4u) \cdot v\)

\((4u) \cdot v = \boxed{\phantom{0}}\) (Simplify your answer.)

Answer: 20