Math 182: Trigonometry

Practice Quiz 1

This practice quiz will give you an idea of the format and difficulty level of the actual quiz. Like the actual quiz, it consists of 27 questions drawn from the problem sets and modified slightly (e.g. by changing the numbers). Any problem on the problem sets can appear on the actual quiz; it is not enough just to know how to solve the problems on this practice quiz.

No partial credit will be given for wrong answers. You will be graded on the best 25 of the 27 questions, so you can get up to two answers wrong without penalty. You cannot score more than 100% on the quiz.

Read the instructions carefully and follow them exactly. Your answers on the answer page must exactly match the solutions, or they will be graded as wrong.

If the question asks that you round the answer to a certain number of decimal places, you must do so. Your answer will be considered wrong if it is rounded incorrectly, or to the wrong number of decimal places.

Unless you’re told to round your answer, it should be exact. Some things that can cause you to lose credit for an exact answer are:

- Failure to simplify fractions. \( \frac{15}{20} \) is wrong; \( \frac{3}{4} \) is correct.

- Failure to rationalize denominators. \( \frac{2}{\sqrt{3}} \) is wrong; \( \frac{2\sqrt{3}}{3} \) is correct.

- Failure to simplify radicals. \( \sqrt{18} \) is wrong; \( 3\sqrt{2} \) is correct.

- Using decimal approximations instead of exact answers. 1.0472 is wrong; \( \frac{\pi}{3} \) is correct.

On problems where the answer involves units of measure (e.g. “23 ft”), you won’t lose credit for not including the units. However, it’s a good idea to do so. Your answer must be in the correct units: if, for example, the correct answer is “30°”, then “\(\pi/6\)” will be graded as wrong.

Your answers must appear in the correct format on the answer sheet. If no answer or a wrong answer appears there, the grader will not check the page with the question to see if you’ve answered it correctly there. That means it’s a good idea to double-check at the end of the test and make sure that you’ve copied the answers correctly and in the right places on the answer sheet.
Math 182: Trigonometry
Practice Quiz 1

Name __________________________ Date ______________ Score _____ Grader ________

This quiz consists of 27 multiple-choice and short-answer questions. There will be no partial credit for wrong answers. You will be graded on the best 25 of the 27, so you can get two questions wrong without penalty. You cannot get a higher grade than 100% on this quiz.

Write only your answers in the spaces provided on this page. Circle the correct answers for multiple-choice questions. Do not do your work on this page.

Write your answers in exactly the format that the question asks for. If, for example, you round to the wrong number of decimal places, or fail to rationalize denominators or simplify fractions in exact solutions, your answer will be graded as wrong.

Unless otherwise indicated, your answers should be exact. Rationalize all denominators and simplify all fractions.

Your answer must be in the correct units of measure. If, for example, the problem asks for an angle in degrees, then an answer given in radians would be considered wrong.

Your grade will be based on the answers that you write on this page. If you have a wrong answer or no answer on this page, the grader will not look at the page with the question to see if the correct answer appears there. Illegible or ambiguous answers will be graded as wrong. You are responsible for copying your answers clearly, correctly, and in the appropriate blanks.

You must show your work on the page with the question. Credit will not be given for lucky guesses.

1. b
2. 20°
3. a
4. 17.4 m
5. \( \sqrt{5}/3 \)
6. a
7. \( 4\sqrt{2}/7 \)
8. 5
9. 740 m
10. \( -\sqrt{2}/2 \)
11. \( 3\pi/10 \) rad
12. \( 5/9 \)
13. \( \pi/5 \) rad
14. \( -\sqrt{3}/2 \)
15. e
16. b
17. b
18. f
19. b
20. III
21. -0.3907
22. d
23. 5
24. 25
25. 13.2 ft
26. a
27. d
1. If the angle \( \theta \) is in quadrant II, which of the following is true?
   (a) \( \sin \theta > 0, \cos \theta > 0 \)  
   (b) \( \sin \theta > 0, \cos \theta < 0 \)
   (c) \( \sin \theta < 0, \cos \theta > 0 \)  
   (d) \( \sin \theta < 0, \cos \theta < 0 \)

2. An angle measures \( \pi/9 \) radians. What is its measure in degrees? Your answer should be exact.
   \[
   \frac{\pi \cdot 180}{9} = 20^\circ
   \]

3. Solve for \( x \) in the right triangle:
   (a) \( \sqrt{11} \)  
   (b) 11  
   (c) \( \sqrt{61} \)  
   (d) \( \frac{11}{2} \)  
   (e) 1  
   (f) \( \sqrt{30} \)

   \[x^2 + 5^2 = 6^2\]; so \( x = \sqrt{36 - 25} = \sqrt{11} \). Hence: (a)

4. A pole is supported by a diagonal guy wire. The wire is anchored in the ground 11.4 meters from the base of the pole, and meets the ground at an angle of \( \theta = 49^\circ \). How long is the wire? Round your answer to the nearest tenth of a meter.

   Let \( r \) be the length of the wire. Then \( \frac{11.4}{r} = \cos 49^\circ \); so
   \[
   r = \frac{11.4}{\cos 49^\circ} = 17.4 \text{ m}
   \]
5. In the right triangle ABC, what is \( \sin A \)? Your answer should be exact. Use Pythagoras to determine the third side of the triangle:

\[
a = \sqrt{3^2 - 2^2} = \sqrt{5}.
\]
Then \( \sin A = \frac{\sqrt{5}}{3} \).

6. What function does the graph below show? \( x \) is in degrees.

(a) \( y = 2 \sin (x - 60) - 1 \)
(b) \( y = \sin (3x - 2) + 80 \)
(c) \( y = 2 \sin (3x) + 80 \)
(d) \( y = \sin (x - 80) - 3 \)
(e) \( y = 2 \sin (x - 3) + 60 \)
(f) \( y = \sin (2x + 60) - 3 \)

We need to find a function of the form: \( y = a \sin(bx - c) + d \) that fits this graph.

The graph oscillates between a minimum of -3 and a maximum of 1. The amplitude is half the difference between these: \( a = 2 \). This rules out answers (b), (d), and (f), all of which have amplitude \( a = 1 \).

The midpoint of the graph is halfway between the maximum and minimum, at \( y = -1 \). The sine curve has been translated down by 1 unit; so \( d = -1 \). Only (a) has the correct value of \( a \) and \( d \), so that must be the correct answer.

We’ll check the period and the horizontal translation, just to be sure. The graph rises through the midpoint at (60, -1) and again at (420, -1). Thus the period is 360. In our general equation, the period is \( 360/b \); so \( b = 1 \). That’s consistent with answer (a).

Since the curve rises through the midpoint at (60, -1), it’s translated 60 units to the right. That’s also consistent with (a).
7. In the right triangle ABC, what is \( \tan A \)? Your answer should be exact.

We need to use Pythagoras to find the third side of the triangle:

\[ a = \sqrt{9^2 - 7^2} = \sqrt{32} = 4\sqrt{2} \]

Then \( \tan A = \frac{4\sqrt{2}}{7} \).

8. Find the distance between the points (-1,3) and (2,7). Your answer should be exact.

The distance between points \((x_1, y_1)\) and \((x_2, y_2)\) is:

\[ d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \]

In this problem, it evaluates as:

\[ d = \sqrt{(2 - (-1))^2 + (7 - 3)^2} = \sqrt{9 + 16} = \sqrt{25} = 5 \]

9. You and a friend are trying to find out how high airplanes pass over his house. He calls you when a plane is directly overhead. At that moment, the airplane is at an elevation of \( \theta = 0.58 \) rad, as seen from your house. If your house is 1130 meters from your friend's house, how high is the airplane? Round your answer to the nearest 10 meters.

Let \( h \) be the height of the airplane. Then \( \frac{h}{1130} = \tan(0.58) \); so

\[ h = 1130 \tan(0.58) = 740 \text{ m} \]

10. If \( \theta = 3\pi/4 \) radians, what is \( \cos \theta \)? Your answer should be exact.

\( 3\pi/4 \) is in the second quadrant; so the reference angle is \( \pi - 3\pi/4 = \pi/4 \). \( \cos(\pi/4) = \sqrt{2}/2 \). Since \( \theta \) is in the second quadrant, its cosine is negative; so \( \cos \theta = -\sqrt{2}/2 \).

11. What is the complement of \( \pi/5 \) radians? Your answer should be exact.

\[ \frac{\pi}{2} - \frac{\pi}{5} = \frac{3\pi}{10} \text{ rad.} \]
12. In the right triangle ABC, what is \( \sin A \)? Your answer should be exact.
   You can read this right off the figure: \( \sin A = \frac{5}{9} \)

13. An angle measures 36°. What is its measure in radians? Your answer should be exact.
   \[
   36 \cdot \frac{\pi}{180} = \frac{\pi}{5} \text{ rad.}
   \]

14. If \( \theta = 300^\circ \), what is \( \sin \theta \)? Your answer should be exact.
   300° is in the fourth quadrant; so the reference angle is 360 – 300 = 60°.
   \[
   \sin 60^\circ = \frac{\sqrt{3}}{2}.
   \]
   Since 300° is in the fourth quadrant, \( \sin 300^\circ \) is negative; so \( \sin 300^\circ = -\frac{\sqrt{3}}{2} \)

15. In the right triangle ABC, what is \( \csc A \)?
   (a) \( \frac{4}{3} \)  (b) \( \frac{4}{5} \)  (c) \( \frac{3}{5} \)
   (d) \( \frac{3}{4} \)  (e) \( \frac{5}{4} \)  (f) \( \frac{5}{3} \)
   You can read this directly from the triangle without any calculation:
   \( \csc A = \frac{5}{4} \). The correct answer is (e).

16. What is the measure of the angle \( \theta \)?
   (a) \( \frac{8}{5} \) radians  (b) \( \frac{5}{8} \) radians  (c) \( \sqrt{39} \) radians
   (d) \( \frac{8\pi}{5} \) radians  (e) \( \frac{5\pi}{8} \) radians  (f) \( \frac{\sqrt{39}\pi}{5} \) radians
   The relationship between the central angle \( \theta \), the radius \( r \), and the arc length \( s \) is: \( s = r\theta \). In this case, \( \theta = s/r = \frac{5}{8} \) radians. The correct answer is (b).

17. You are riding on a Ferris wheel. Your height \( z \) in feet above the ground as a function of the time \( t \) in seconds since the wheel started turning is: \( z = 40\sin(9t - 90) + 42 \), where angles are measured in degrees. How long does it take for the wheel to make one complete turn?
   (a) 30 sec  (b) 40 sec  (c) 9 sec
   (d) 4 sec  (e) 20 sec  (f) 90 sec
   The general formula for a modified sine function is: \( z = a\sin(bt - c) + d \). When angles are measured in degrees, the period is \( 360/b \). In this case, it’s \( 360/9 = 40 \) sec. The correct answer is (b).
18. An angle of 92º is
   (a) right (b) lenticular (c) acute
   (d) tenuous (e) straight (f) obtuse
   Obtuse; so the correct answer is (f).

19. What function does the graph below show? x is in degrees.
   (a) \( y = \sin x \) (b) \( y = \cos x \) (c) \( y = \tan x \)
   (b) \( y = \cot x \) (e) \( y = \sec x \) (f) \( y = \csc x \)

   ![Graph](image)

   The function oscillates between -1 and 1. Thus it must be the sine or the cosine. It passes through the point (0,1). This is inconsistent with \( y = \sin x \), since \( \sin(0) = 0 \); it’s consistent with \( y = \cos x \), since \( \cos(0) = 1 \). Hence: (b).

20. In which quadrant would you find the angle \( \theta = 11\pi/9 \) radians? Circle the correct answer on the answer page.
   \( \pi < \frac{11\pi}{9} < \frac{3\pi}{2} \); so \( \theta \) is in quadrant III.

21. The point \((x, y)\) lies on the unit circle at \( \theta = 113^\circ \). Find the value of \( x \). Round your answer to four decimal places.
   \[ x = \cos 113^\circ = -0.3907 \]
22. A disc has a radius of 8 cm. It is spinning at an angular speed of 200 radians/sec. How fast is a point on the edge of the disc moving?

(a) 3200 cm/sec  (b) 50 cm/sec  (c) 0.08 cm/sec
(d) 1600 cm/sec  (e) 25 cm/sec  (e) 0.04 cm/sec

The relationship between the central angle $\theta$, the radius $r$, and the arc length $s$ is: $s = r\theta$.

In this case, 200 radians corresponds to an arc length of $(8)(200) = 1600$ cm. Hence the edge of the disc is moving at 1600 cm/sec, and the correct answer is (d).

23. What is the amplitude of the function: $y = 5 \sin (3x - 60) + 4$? Angles are in degrees.

In the formula $y = a \sin(bx - c) + d$, the amplitude is $a$. In this case, $a = 5$. (The angle measure has nothing to do with the question.)

24. What is the length of the arc $s$ if $\theta = 2.5$ radians? Your answer should be exact.

The relationship between the central angle $\theta$, the radius $r$, and the arc length $s$ is: $s = r\theta$. In this case, $s = (10)(2.5) = 25$.

25. The floor of a rental truck is 2.8 ft above ground level. The truck comes with a 13.5-foot ramp that attaches to the back of the truck and slopes down. How far behind the truck does the ramp touch ground? Round your answer to the nearest 0.1 ft.

Let $x$ be the horizontal distance from the truck to where the ramp touches ground. Then $x^2 + 2.8^2 = 13.5^2$; so $x = 13.2$ ft

26. Suppose $\theta$, measured in degrees, is in quadrant IV. Then $\sin \theta =$?

(a) $-\sin(360^\circ - \theta)$  (b) $\sin(\theta - 180^\circ)$
(c) $\sin(180^\circ + \theta)$  (d) $-\sin(360^\circ + \theta)$

Since $\theta$ is in quadrant IV, the reference angle is $360 - \theta$, and the sine is negative. Hence the correct answer is (a).

27. Solve for $x$ in the right triangle:

(a) $4 + a^2$  (b) $2\sqrt{a}$  (c) $2 + \sqrt{a}$
(d) $\sqrt{16 + a^2}$  (e) $\sqrt{4 + a^2}$  (f) $4 + a$

$4^2 + a^2 = x^2$; so $x = \sqrt{16 + a^2}$. This expression cannot be simplified. Hence: (d).