GreatHearts Irving

Remote Learning Packet

Please submit scans of written work in Google Classroom at the end of the week.

Week 8: May 18-22, 2020

Course: 11 Precalculus

Teacher(s): Mr. Simmons

Weekly Plan:

Monday, May 18

☐ Complete problems 1-7 from "The Unit Circle."

Tuesday, May 19

☐ Start the trigonometry review

Wednesday, May 20

☐ Finish the trigonometry review

Thursday, May 21

☐ Take the trigonometry assessment

Friday, May 22

☐ Attend office hours

☐ Catch up or review the week's work

Statement of Academic Honesty

I affirm that the work completed from the packet is mine and that I completed it independently.

_____

Student Signature

I affirm that, to the best of my knowledge, my child completed this work independently

_____

Parent Signature

Monday, May 18

1. Happy Monday! If technologically feasible, please let me know how you're doing. Tell me a story from your life. Your summer plans. Your hopes and dreams. Your daily frustrations. Your hobbies. Looking forward to hearing from you!
2. Complete problems from the section entitled "The Unit Circle," which you read last week.

At the end of this week, we will be having an assessment on trigonometry. Everything on the assessment will be reviewed in the next two days.

Tuesday, May 19

1. Start the review. If you want to finish it today, go ahead, but I encourage you not to work more than 40 minutes.

Wednesday, May 20

1. Finish the review.
2. Please let me know what questions you have before tomorrow's assessment!

Thursday, May 21

1. On this day, I will post an assessment on Google Classroom. You will be able to complete it completely on the computer. The practice problems from this week and the past three weeks fully represent the kinds of questions that will be on this assessment.

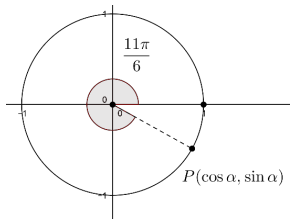


Figure 84

Again, use your Polar Plane to help you find $\frac{11\pi}{6}$. However, you'll want to have a very firm grasp of radians so don't completely rely on you Polar Plane.

Again, we now create a right triangle using the x-axis as our base. We get the special right triangle shown in Figure 85.

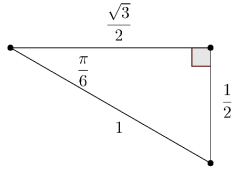


Figure 85

Then we just substitute, knowing what ratio we get with the Cosine function. Hence

$$\cos\frac{11\pi}{6} = \frac{1}{2}.$$

This, also, should be positive, since we went to the right to get to P.

Be patient and resilient as you learn the unit circle. Mastery will come, but only with practice and perseverance. Once you master the unit circle, Trigonometry becomes your plaything.

§3 Exercises

1.) Plot the following points on the Polar Plane, then create a right triangle where the x-axis serves as the base.
   (A) $A(2,135°)$
   (B) $B(3,300°)$
   (C) $C\left(2,\frac{2\pi}{3}\right)$
   (D) $D\left(3,\frac{\pi}{6}\right)$
   (E) $E\left(1,\frac{5\pi}{4}\right)$
   (F) $F\left(4,\frac{\pi}{3}\right)$

2.) Determine whether the result of the following expressions will be positive or negative.
   (A) $\sin 45°$
   (B) $\cos\frac{2\pi}{3}$
   (C) $\sin\frac{5\pi}{6}$
   (D) $\cos\frac{11\pi}{6}$
   (E) $\tan\frac{\pi}{3}$
   (F) $\sin 190°$
   (G) $\cos 299°$
   (H) $\tan\frac{4\pi}{3}$

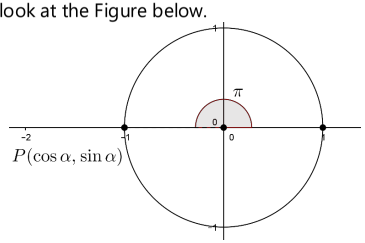
3.) It might be helpful to list out which Quadrants produce which sign for each Trig function.
   (A) Which Quadrants is Sine positive? Negative?
   (B) Which Quadrants is Cosine positive? Negative?
   (C) Which Quadrants is Tangent positive? Negative?
   (D) True or False: If Sine is positive, then its reciprocal, Cosecant, must also be positive.
   (E) List out which sign the reciprocal Trig functions use for each Quadrant.
   (F) Go online and see if you can't find a convenient mnemonic device to help to you remember.

4.) Convert the following Polar points into rectangular points.
   (A) $A(2, 330°)$
   (B) $B(2, 210°)$
   (C) $C\left(2,\frac{7\pi}{6}\right)$
   (D) $D\left(3,\frac{4\pi}{3}\right)$

5.) Let us now use the unit circle. First, let's practice finding the coordinates of a point P that's on the unit circle. In the following problems, use the given angle of rotation to list the coordinates of the point on the unit circle.
   (A) $120°$
   (B) $\frac{3\pi}{4}$
   (C) $\frac{7\pi}{6}$
   (D) $225°$
   (E) $\frac{4\pi}{3}$
   (F) $300°$
   (G) $\frac{7\pi}{4}$
   (H) $330°$

6.) Now let's put the unit circle to use and evaluate some Trig expressions.
   (A) $\sin 120°$
   (B) $\cos\frac{7\pi}{4}$
   (C) $\sin\frac{5\pi}{6}$
   (D) $\cos 210°$
   (E) $\sin\frac{3\pi}{4}$
   (F) $\cos\frac{11\pi}{6}$
   (G) $\tan\frac{3\pi}{4}$
   (H) $\tan\frac{4\pi}{3}$

7.) One thing we've not covered is points on the unit circle that are also on one of the axes. For example, look at the Figure below.



The coordinates of P are quite trivial, are they not? They are $P(-1,0)$. More importantly, however, this does allow us to input angles such as π, $\frac{2\pi}{3}$, and 2π.

(A) Evaluate the Sine function when the input is π, $\frac{3\pi}{2}$, and 2π.

(B) Evaluate the Sine function when the input is π, $\frac{3\pi}{2}$, and 2π.

(C) Evaluate the Sine function when the input is π, $\frac{3\pi}{2}$, and 2π.

8.) In the previous Unit, we learned that $\sin^2\alpha + \cos^2\alpha = 1$ for all α. Let us now prove that this is so.

(A) Write out the equation of a circle centered at $(0,0)$ with radius 1 in terms of x and y.

(B) What is the name of the circle whose equation you wrote in (A)?

(C) What are the coordinates of a point on that unit circle? (Maybe write out the equality first)

(D) Now write a formal proof of why $\sin^2\alpha + \cos^2\alpha = 1$.

9.) Now create a table of values for Sine, Cosine, and Tangent. Start with 0, then $\frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}, \frac{2\pi}{3}$, and so on. There should be 16 inputs for each function.

10.) It might be helpful to identify some decimal approximations with their exact counterpart. List the decimal approximations (to the nearest thousandth) of $\frac{\sqrt{2}}{2}$ and $\frac{\sqrt{3}}{2}$.

11.) Given some circle with $P(-3,4)$, list the six Trig ratios.

12.) Find the exact value of each of the remaining six Trig functions of α in the given Quadrant. (Hint: Draw a picture!)

(A) $\sin\alpha = \frac{3}{5}$, Quadrant II

(B) $\cos\alpha = \frac{12}{13}$, Quadrant IV

(C) $\sin\alpha = -\frac{7}{25}$, Quadrant III

(D) $\cos\alpha = -\frac{11}{61}$, Quadrant II

(E) $\sin\alpha = \frac{5}{13}$, Quadrant I

(F) $\cos\alpha = -\frac{40}{41}$, Quadrant III

(G) $\tan\alpha = \frac{4}{3}$, Quadrant III

(H) $\tan\alpha = -\frac{12}{5}$, Quadrant II

Trigonometry Review

Precalculus
Mr. Simmons

Conceptual Questions

Answer the following questions in your own words. Write in full, complete, grammatical sentences. Answer these questions as if you're teaching these concepts to someone who's never heard of them before. That might mean giving examples, counterexamples, or analogies, for example. If you use any notation, it means explaining that notation. (This is the most important part of the review.)

1. What is an angle?
2. What is the measure of an angle? What is a radian? How is it different from a degree?
3. What is a triangle? (Notice the etymology: "tri" means "three": "angle" means... I'll let you figure it out.)
4. State the right-triangle trigonometry definitions of the functions sine, cosine, and tangent.
5. Explain polar coordinates.
6. State the unit-circle definitions of the functions sine, cosine, and tangent.
7. For a circle on which is drawn a central angle subtended by an arc, how does the angle's measure relate to the arc's length?
8. For a rolling wheel, how does the angle measure of the rotation of the wheel relate to the distance it has traveled?

Practice Problems

(See following pages.)

CHAPTER 5 REVIEW EXERCISES

ANGLES

For the following exercises, convert the angle measures to degrees.

1. $\frac{\pi}{4}$

2. $-\frac{5\pi}{3}$

For the following exercises, convert the angle measures to radians.

3. $-210°$

4. $180°$

5. Find the length of an arc in a circle of radius 7 meters subtended by the central angle of 85°.

6. Find the area of the sector of a circle with diameter 32 feet and an angle of $\frac{3\pi}{5}$ radians.

For the following exercises, find the angle between 0° and 360° that is coterminal with the given angle.

7. $420°$

8. $-80°$

For the following exercises, find the angle between 0 and 2π in radians that is coterminal with the given angle.

9. $-\frac{20\pi}{11}$

10. $\frac{14\pi}{5}$

For the following exercises, draw the angle provided in standard position on the Cartesian plane.

11. $-210°$

12. $75°$

13. $\frac{5\pi}{4}$

14. $-\frac{\pi}{3}$

15. Find the linear speed of a point on the equator of the earth if the earth has a radius of 3,960 miles and the earth rotates on its axis every 24 hours. Express answer in miles per hour.

16. A car wheel with a diameter of 18 inches spins at the rate of 10 revolutions per second. What is the car's speed in miles per hour?

UNIT CIRCLE: SINE AND COSINE FUNCTIONS

17. Find the exact value of $\sin\frac{\pi}{3}$.

18. Find the exact value of $\cos\frac{\pi}{4}$.

19. Find the exact value of $\cos\pi$.

20. State the reference angle for 300°.

21. State the reference angle for $\frac{3\pi}{4}$.

22. Compute cosine of 330°.

23. Compute sine of $\frac{5\pi}{4}$.

24. State the domain of the sine and cosine functions.

25. State the range of the sine and cosine functions.

THE OTHER TRIGONOMETRIC FUNCTIONS

For the following exercises, find the exact value of the given expression.

26. $\cos\frac{\pi}{6}$

27. $\tan\frac{\pi}{4}$

28. $\csc\frac{\pi}{3}$

29. $\sec\frac{\pi}{4}$

For the following exercises, use reference angles to evaluate the given expression.

30. $\sec\frac{11\pi}{3}$

31. $\sec 315°$

32. If $\sec(t) = -2.5$, what is the $\sec(-t)$?

33. If $\tan(t) = -0.6$, what is the $\tan(-t)$?

34. If $\tan(t) = \frac{1}{3}$, find $\tan(t - \pi)$.

35. If $\cos(t) = \frac{\sqrt{2}}{2}$, find $\sin(t + 2\pi)$.

36. Which trigonometric functions are even?

37. Which trigonometric functions are odd?

RIGHT TRIANGLE TRIGONOMETRY

For the following exercises, use side lengths to evaluate.

38. $\cos\frac{\pi}{4}$

39. $\cot\frac{\pi}{3}$

40. $\tan\frac{\pi}{6}$

41. $\cos\left(\frac{\pi}{2}\right) = \sin(\_\_\_\_\_°)$

42. $\csc(18°) = \sec(\_\_\_\_\_°)$

For the following exercises, use the given information to find the lengths of the other two sides of the right triangle.

43. $\cos B = \frac{3}{5}, a = 6$

44. $\tan A = \frac{5}{9}, b = 6$

For the following exercises, use **Figure 1** to evaluate each trigonometric function.

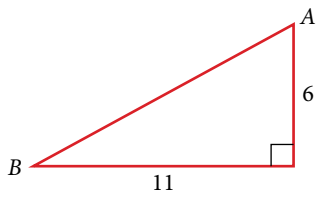


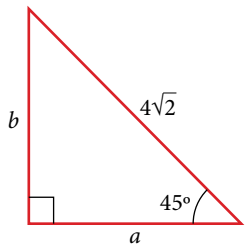
Figure 1

45. $\sin A$

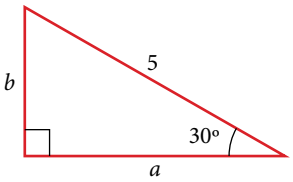
46. $\tan B$

For the following exercises, solve for the unknown sides of the given triangle.

47.



48.



49. A 15-ft ladder leans against a building so that the angle between the ground and the ladder is 70°. How high does the ladder reach up the side of the building?

50. The angle of elevation to the top of a building in Baltimore is found to be 4 degrees from the ground at a distance of 1 mile from the base of the building. Using this information, find the height of the building.