Accomack County Public Schools

High School Math
Learning Plans

These plans are also available on our website:

www.accomack.k12.va.us

Please note: The online portion of these plans is optional.

High School Learning Plans

Trigonometry/Probability Statistics

Activities to Support Instruction During Extended School Closures

The purpose of this document is to provide an overview of suggested activities available to ACPS students. These suggestions can be used by families to support the continuity of education. The learning experiences developed and provided will give students opportunities to go deeper into concepts, ideas, and skills independently. These activities do not require copies or additional supplies.

Skills:

- I can find and explain the exact value of trigonometric functions using special right triangles and unit circle.

Online:

One of the best ways to increase mastery of a topic is to teach and explain it to someone else. This process inherently demands that you rehearse and articulate the thought process to someone else. It reinforces understanding and often provides opportunities to gain new insights as you review the skill with the hindsight of having progressed onto other topics. Upon completion of your task, you are challenged to master and explain:

- How to convert between degrees and radians?
- How does our SOH-CAH-TOA understanding relate to y/r, x/r, y/x?
- What are the reciprocal functions of sin x, cos x, and tan x?
- How do we rationalize denominators?
- How the values of each trigonometric function vary from positive to negative for each quadrant?
- How to find the exact values of all six trigonometric functions of special right triangles and quadrantal angles?

Project Based Learning:

- You will create a lesson and review product to help your peers to improve their understanding and mastery of trigonometric functions. Your project may take many forms including these options:
    - presentation in Google Slides or Powerpoint
    - a video
    - a game on an online platform such as Kahoot, Gimkit, Quizizz, etc.
- Your lesson should include how to find the exact values of quadrantal and special angles. Your project should connect diagrams of special right triangles with sides and angles marked. You may consider to include some helpful “tricks” that may be employed in finding exact values. For example, a quick way to find the reference angle (if given radian measure) is to focus on the number in the denominator.

Reflection:

- Choose at least three of the questions above and write a paragraph explanation.

Offline:

Warm Up:

- Ask 4 people to pick five different numbers between 1 and 360.
- Convert those (degree) measures to radians in simplified form.
- On a sheet of paper, write in your own words to describe the process of converting degrees to radians and vice versa.

Project Based Learning:

- Create an activity (for example, flash cards, memory match, board game) that will help you and your peers to find the trigonometric and circular function values for the quadrantal and special angles on the unit circle.
    - Be sure to include the angle measures in degrees and radians and to include the coordinates on the unit circle.
- In addition, you will create a review sheet with at least 15 questions that not only include the sine and cosine functions, but also the tangent, cotangent, secant, and cosecant function values of those quadrant and special angles.

- Be sure to create an answer key for the review sheet.

Skills:

- I can identify the connections between sides and angles of special right triangles, the unit circle, and the coordinate plane.

Online:

Upon completion of the following activities, you are challenged to master and explain:

- How does our SOH-CAH-TOA understanding relate to y/r, x/r, y/x?
- What are the reciprocal functions of sin x, cos x, and tan x?
- How do we rationalize denominators?
- How the values of each trigonometric function vary from positive to negative for each quadrant?
- What are reference angles?
- How do special right triangles relate to the unit circle?
- How to find the coordinates on the unit circle?

Focused Instruction:

- Unit Circle Desmos Activity Retrieved from DESMOS
- Unit Circle Angles in Quadrant 1 Retrieved from YouTube
- I Forgot the Unit Circle Song Retrieved from YouTube
- The Unit Circle Coordinate Song Retrieved from YouTube
- Unit Circle Coordinates Game Retrieved from Purpose Games
- Unit Circle Coordinates Game Part 2 Retrieved from Purpose Games

Reflection:

- Choose at least three of the questions above and write a paragraph explanation.

Offline:

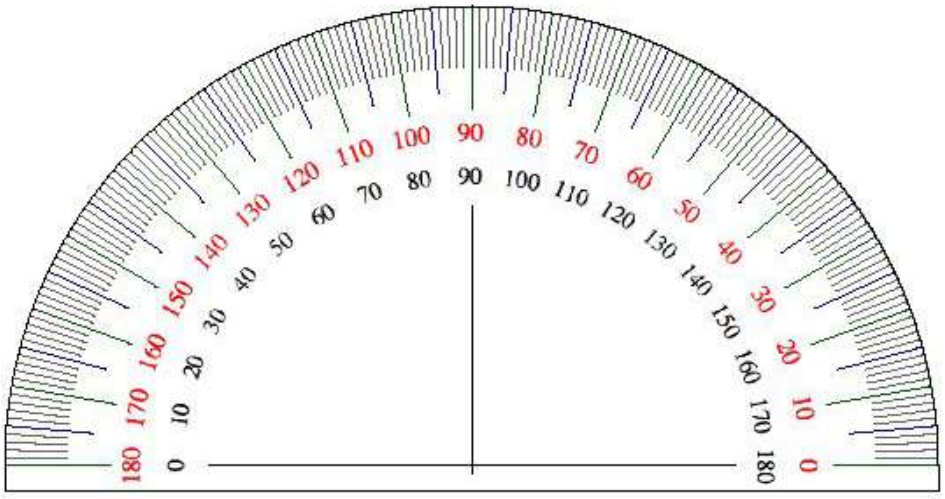
Paper Plate Unit Circle Activity - Modified Activity from Activity by Kacie Travis to reinforce the unit circle - TeachersPayTeachers Freebie per website March 2020

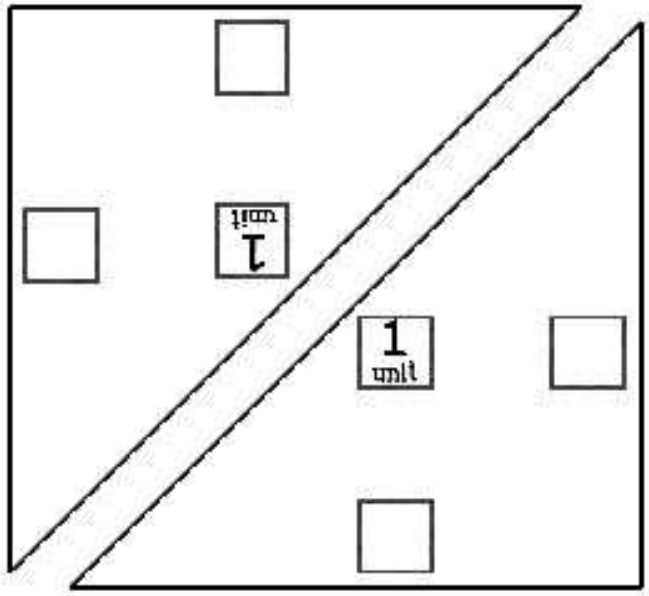
Materials:

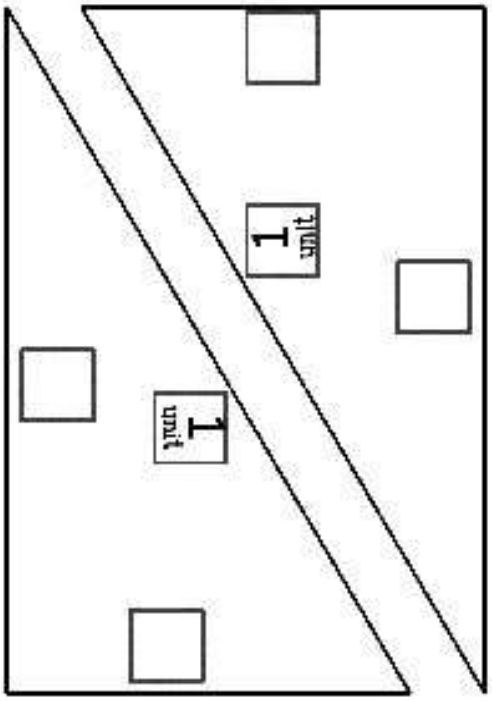
- A paper plate with a radius of 8 cm (or a plain sheet of circular paper with a radius of 8 cm), black sharpie (optional), highlighters/colored markers/pencils, scissors, protractor, and the instructions included below.

Warm Up:

- Review the relationship between the angle measures and side lengths for the special right triangles (45-45-90 and 30-60-90). Color one of the 45-45-90 triangles with one color (pink), one of the 30-60-90-A triangle with another color (yellow), and one of the 30-60-90-B triangles with a third color (blue).

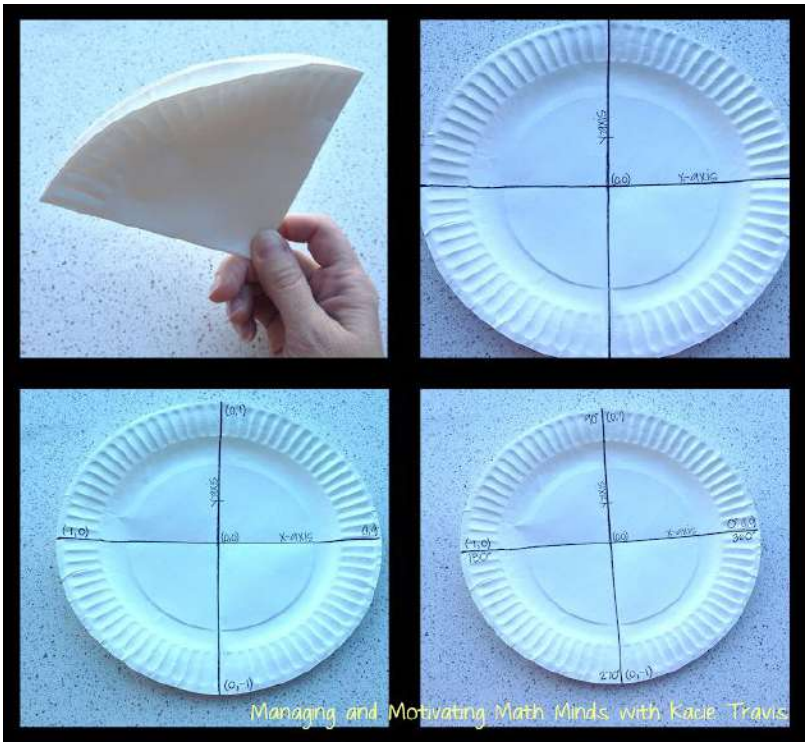




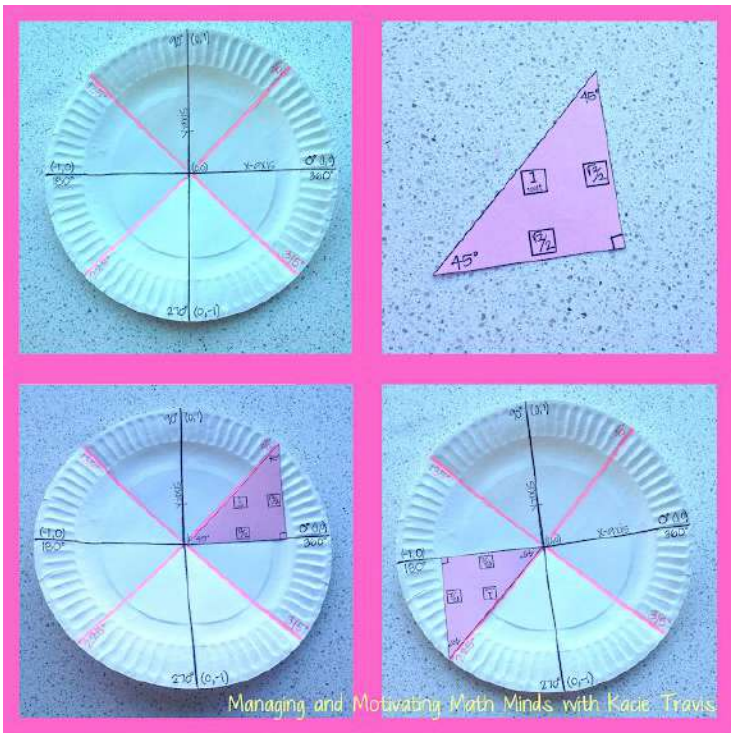


Set-up, Degrees, and Coordinates

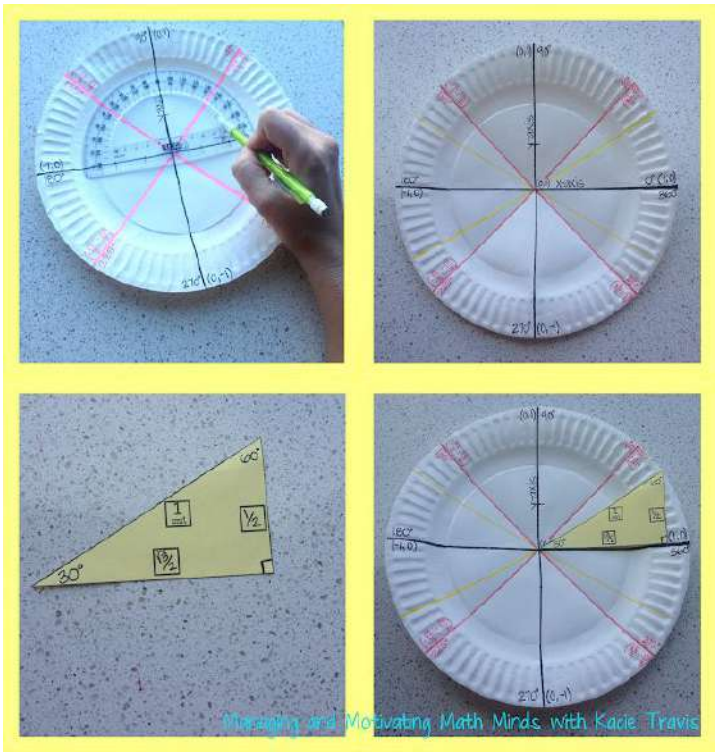
1. Fold the paper plate in half and in half again. These creases represent the x- and y-axes.
2. With a black sharpie, trace the folds. Label one x-axis and the other y-axis. Label the origin (0,0).
3. For the sake of this activity, the paper plate has a radius of one unit (i.e., the scale factor is 8 cm = 1 unit). Label (1,0), (0,1), (-1,0), and (0,-1).
4. Remember, the total degrees in a circle is 360° and a semicircle is 180°. With or without use of a protractor, label all degrees: 0°, 90°, 180°, 270°, and 360° for each of the coordinate points.



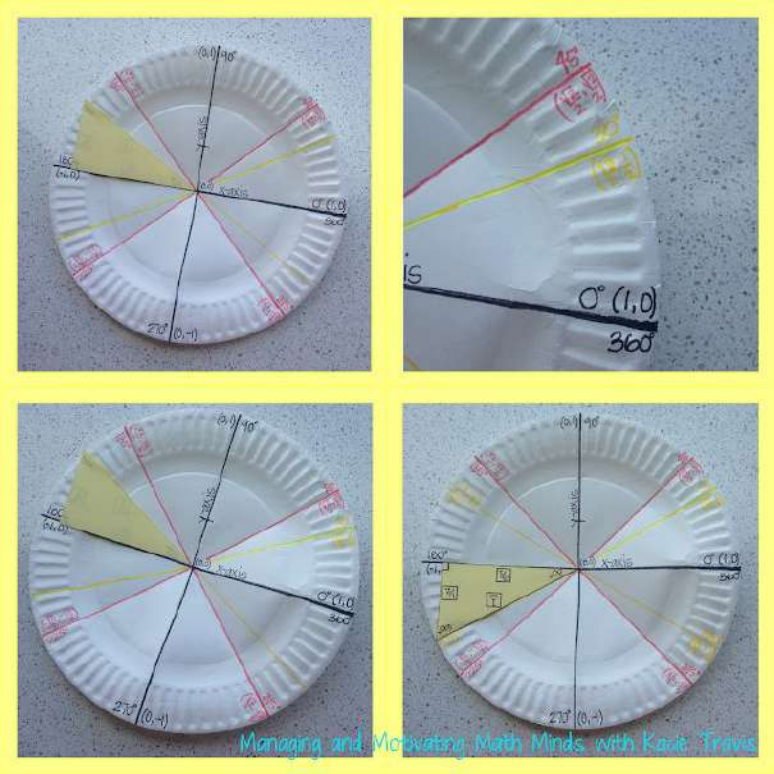
5. Fold the plate along the diagonal so that the 0° line touches the 90° and 180° line touches 270°. Then, fold along the opposite diagonal so the 90° line touches 180° and 0° touches 270°. Make creases. Trace these creases with the same color as the 45-45-90 triangle. Label each accordingly: 45°, 135°, 225°, 315.
6. Cut out the colored 45-45-90 triangle. Label the right angle and the 45° angles. Using the hypotenuse length of one unit, determine the leg lengths and label the lengths in the boxes. Use the side lengths of the 45-45-90 triangle to investigate the coordinate points of the intersection of the lines that were just made with the paper plate. Find and label the coordinate points of all the new colored lines for the 45°, 135°, 225°, 315°. Do not forget the signs of the x-values and the y values in different quadrants. Before moving onto the next step, review the definition of reference angles and the mnemonics (such as A Smart Trig. Class or All Students Take Calculus) for the signs of trigonometric functions in each quadrant of the plane.



7. Use a protractor to measure the 30° angle and make a tiny mark. Do the same for 210° (use the 30° from the 180° line for help). Make a fold on those marks. Label 30° and 210°. Use the protractor to make marks at 150° and 330°. Make a fold on those marks. Label 150° and 330°. Trace these creases with the same color used for the 30-60-90-A triangle.



8. Cut out the colored 30-60-90-A triangle. Label the 30°, the 60°, and 90° angles. Using the hypotenuse length of one unit, determine the leg lengths and label the lengths in the boxes. Use the side lengths of the 30-60-90 triangle to investigate the coordinate points of the intersection of the lines that were just made with the paper plate. Find the coordinate points of all the new colored lines for the 30°, 150°, 210°, 330°. Do not forget the signs of the x-values and the y-values in different quadrants. Once again, review the definition of reference angles and the mnemonics (such as A Smart Trig. Class or All Students Take Calculus) for the signs of trigonometric functions in each quadrant of the plane.



9. Use a protractor to measure the 60° angle and make a tiny mark. Do the same for 240° (use the 60° from the 180° line for help). Make a fold on those marks. Label 60° and 240°. Use the protractor to make marks at 120° and 300°. Make a fold on those marks. Label 120° and 300°. Trace these creases with the same color used for the 30-60-90-B triangle.
10. Cut out the colored 30-60-90-B triangle. Label the 30°, the 60°, and 90° angles. Using the hypotenuse length of one unit, determine the leg lengths and label the lengths in the boxes. Use the side lengths of the 30-60-90 triangle to investigate the coordinate points of the intersection of the lines that were just made with the paper plate. Find the coordinate points of all the new colored lines for the 60°, 120°, 240°, 300°. Do not forget the signs of the x-values and the y-values in different quadrants. Now, think and answer the following two questions:
    a. What are reference angles?
    b. Why are reference angles important?

Extension Activity – Radians

1. What is the formula for the circumference of a circle? If the radius is 1 unit, how far have we traveled after one full trip around the circle?
2. Answer the following questions and label the angles using radians.
    a. At 0°, how many radians have we traveled?
    b. How far is halfway around the circle?
    c. How many radians have you traveled to the 90° line

3. Label as many angles on the paper plate in radians as you can.