

Illustrative Mathematics

F-TF Trig Functions and the Unit Circle

Alignments to Content Standards

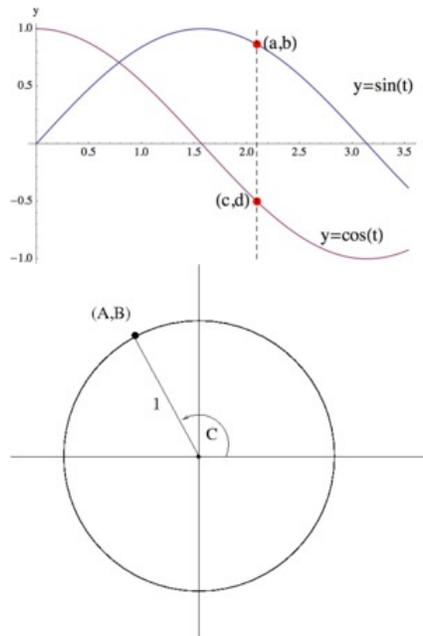
- [Alignment: HSF-TF.A.2](#)

Tags

- *This task is not yet tagged.*

The points on the graphs and the unit circle below were chosen so that there is a relationship between them.

Explain the relationship between the coordinates a , b , c , and d marked on the graph of $y = \sin t$ and $y = \cos t$ and the quantities A , B , and C marked in the diagram of the unit circle below.



Commentary

The purpose of this task is to help students make the connection between the graphs of $\sin t$ and $\cos t$ and the x and y coordinates of points moving around the unit circle. Students have to match coordinates of points on the graph with coordinates and angles in the diagram of the unit circle.

A slight variation of this task would be to ask the students to draw in line segments in both diagrams that correspond to the indicated quantities. So for example, C would be the line segment along the t axis of the graph from $(0, 0)$ to $(0, a)$.

In this task students practice SMP 7 - Look for and Make Use of Structure. A firm understanding of the connections between the unit circle and the graphs of sine and cosine build a solid foundation for future work in trigonometry.

Solutions

Solution: 1

On the graph, a and c are the input value of the sine and cosine function, respectively, that give the output values $b = \sin(a)$ and $d = \cos(c)$.

On the unit circle, we know that $A = \cos(C)$ and $B = \sin(C)$.

We can estimate that $a = c \approx 2.1$. We can also estimate that C is an angle close to $\pi/3 \approx 2.1$. We are given that the points on the graph and the unit circle correspond to each other, and therefore we can conclude that $a = c = C$.

Putting everything together we get $b = \sin(a) = \sin(C) = B$ and $d = \cos(c) = \cos(C) = A$.



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