The most important trig identity, by far, is $\sin ^{2} \theta+\cos ^{2} \theta=1$. The second most important identities are the two angle addition formulas:

$$
\begin{aligned}
& \sin (a+b)=\sin a \cos b+\cos a \sin b, \\
& \cos (a+b)=\cos a \cos b-\sin a \sin b .
\end{aligned}
$$

1. Use the following image of triangles inside the unit circle to explain why the angle addition formula for sine is correct.

(a) The two gray right triangles are similar (they have all the same interior angles, but are different sizes). Can you explain why?
(b) How long are the hypotenuses of the two gray triangles?
(c) Find the base and height for each of the two gray triangles.
(d) Find coordinates of $P$, and use them to explain why the angle addition formulas are correct.
