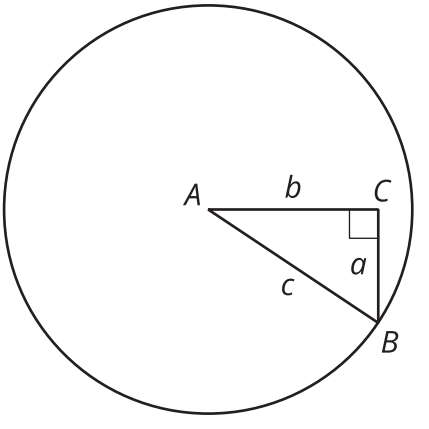
Lesson 2: Revisiting Right Triangles

- Let's recall and use some things we know about right triangles.

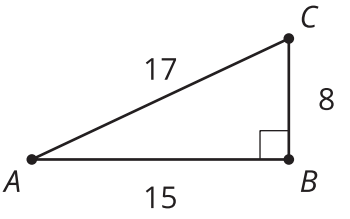
2.1: Notice and Wonder: A Right Triangle

What do you notice? What do you wonder?



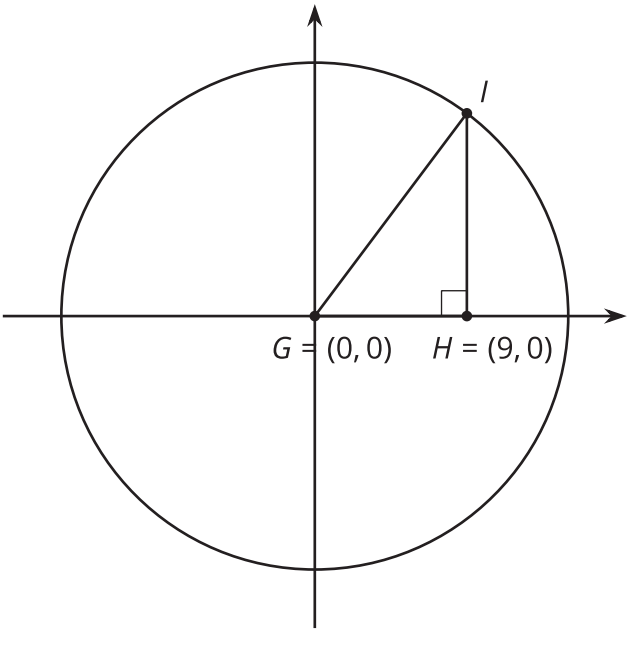
2.2: Recalling Right Triangle Trigonometry

1. Find $\cos(A)$, $\sin(A)$, and $\tan(A)$ for triangle ABC.



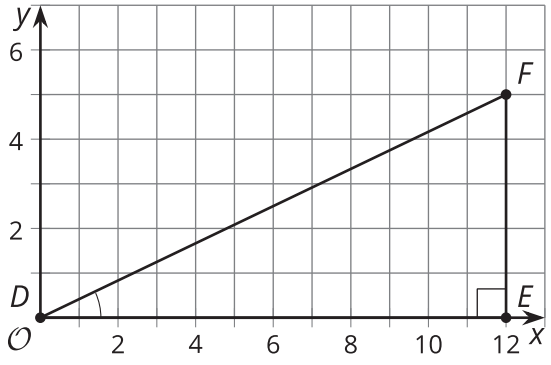
2. Sketch a triangle DEF where $\sin(D) = \cos(D)$ and E is a right angle. What is the value of $\tan(D)$ for this triangle? Explain how you know.

3. If the coordinates of point I are $(9, 12)$, what is the value of $\cos(G)$, $\sin(G)$, and $\tan(G)$ for triangle GHI? Explain or show your reasoning.

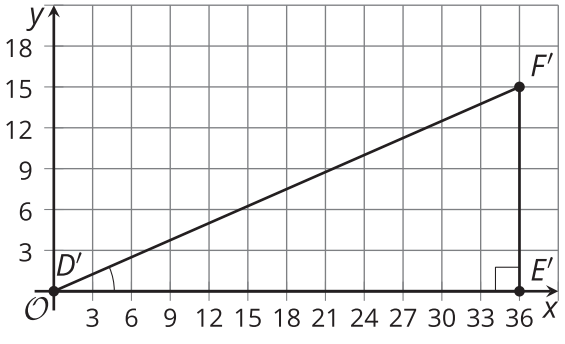


2.3: Shrinking Triangles

1. What are $\cos(D)$, $\sin(D)$, and $\tan(D)$? Explain how you know.



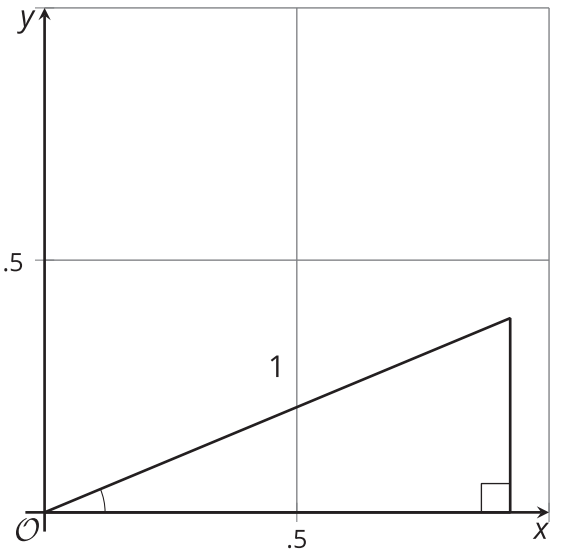
2. Here is a triangle similar to triangle DEF.



a. What is the scale factor from $\triangle DEF$ to $\triangle D'E'F'$? Explain how you know.

b. What are $\cos(D')$, $\sin(D')$, and $\tan(D')$?

3. Here is another triangle similar to triangle DEF.



a. Label the triangle $D''E''F''$.

b. What is the scale factor from triangle DEF to triangle $D''E''F''$?

c. What are the coordinates of F''? Explain how you know.

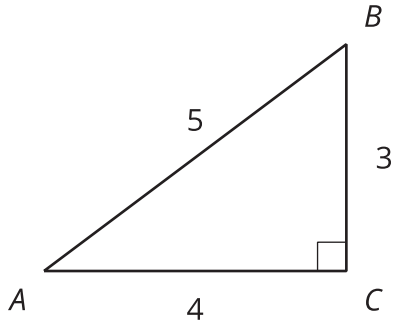
d. What are $\cos(D'')$, $\sin(D'')$, and $\tan(D'')$?

Are you ready for more?

Angles C and C' in triangles ABC and $A'B'C'$ are right angles. If $\sin(A) = \sin(A')$, is that sufficient to show that $\triangle ABC$ is similar to $\triangle A'B'C'$? Explain your reasoning.

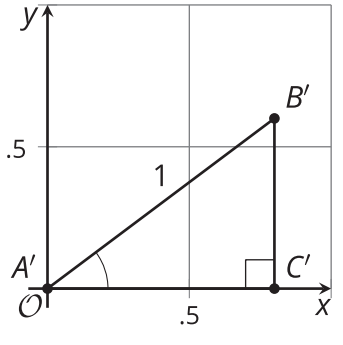
Lesson 2 Summary

In an earlier course, we studied ratios of side lengths in right triangles.



In this triangle, the cosine of angle A is the ratio of the length of the side adjacent to angle A to the length of the hypotenuse—that is $\cos(A) = \frac{4}{5}$. The sine of angle A is the ratio of the length of the side opposite angle A to the length of the hypotenuse—that is $\sin(A) = \frac{3}{5}$. The tangent of angle A is the ratio of the length of the side opposite angle A to the length of the side adjacent to angle A—that is $\tan(A) = \frac{3}{4}$.

Now consider triangle $A'B'C'$, which is similar to triangle ABC with a hypotenuse of length 1 unit. Here is a picture of triangle $A'B'C'$ on a coordinate grid:



Since the two triangles are similar, angle A and A' are congruent. So how do the values of cosine, sine, and tangent of these angles compare to the angles in triangle ABC? It turns out that since all three values are ratios of side lengths, $\cos(A) = \cos(A')$, $\sin(A) = \sin(A')$, and $\tan(A) = \tan(A')$.

Notice that the coordinates of B' are $\left(\frac{4}{5}, \frac{3}{5}\right)$ because segment $A'C'$ has length $\frac{4}{5}$ and segment $B'C'$ has length $\frac{3}{5}$. In other words, the coordinates of B' are $(\cos(A'), \sin(A'))$.