



## Break It Down!

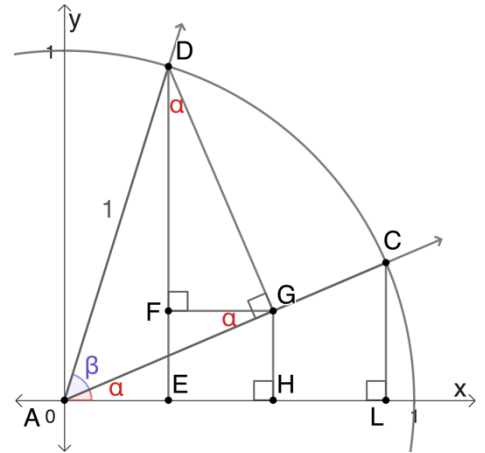


Angle  $DAH$  is composed of two smaller angles  $\alpha$  and  $\beta$ . Today we'll use a diagram with multiple right triangles to explore how the sine and cosine of angle  $DAH$  is related to the sine and cosine of  $\alpha$  and  $\beta$ .

1. Which segment in the diagram represents  $\sin(\alpha + \beta)$ ?

Which two smaller segments make up  $\sin(\alpha + \beta)$ ?

2. For  $\alpha$  and  $\beta$  in the first quadrant, is  $\sin(\alpha + \beta)$  greater than, less than, or equal to  $\sin \alpha + \sin \beta$ ? How do you know?



3. Let's explore this further. Write a ratio for each of the following using the segments in the diagram.

a. In  $\triangle GHA$ ,  $\sin \alpha = \underline{\hspace{2cm}}$

b. In  $\triangle DGF$ ,  $\cos \alpha = \underline{\hspace{2cm}}$

c. In  $\triangle DGA$ ,  $\sin \beta = \underline{\hspace{2cm}}$

d. In  $\triangle DGA$ ,  $\cos \beta = \underline{\hspace{2cm}}$

4. How can you combine your ratios in question 3 to get an expression for  $DF$ ?

5. What other segment length is equal to  $FE$ ?

$$FE =$$

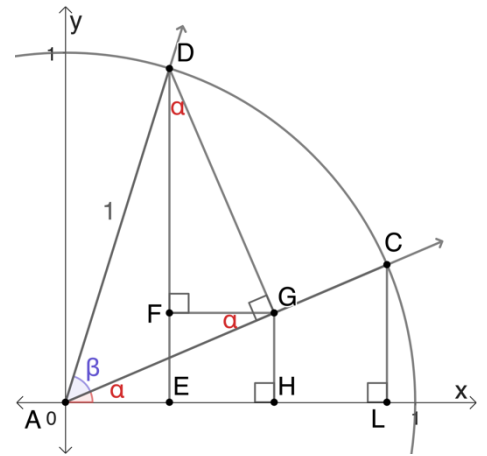
6. How can you combine your ratios in question 3 to get an expression for  $FE$ ?

7. Write an expression for  $\sin(\alpha + \beta)$  using the sine and cosine of  $\alpha$  and  $\beta$ .

8. Which segment in the diagram represents  $\cos(\alpha + \beta)$ ?

Complete the statement:  $\cos(\alpha + \beta) = HA - \underline{\hspace{2cm}}$

9. For  $\alpha$  and  $\beta$  in the first quadrant, is  $\cos(\alpha + \beta)$  greater than, less than, or equal to  $\cos \alpha + \cos \beta$ ? How do you know?



10. Write a ratio for each of the following using the segments in the diagram.

a. In  $\triangle DGF$ ,  $\sin \alpha = \underline{\hspace{2cm}}$

b. In  $\triangle GHA$ ,  $\cos \alpha = \underline{\hspace{2cm}}$

c. In  $\triangle DGA$ ,  $\sin \beta = \underline{\hspace{2cm}}$

d. In  $\triangle DGA$ ,  $\cos \beta = \underline{\hspace{2cm}}$

11. How can you combine your ratios in question 10 to get an expression for  $AH$ ?

12. What other segment length is equal to  $AH$ ?

$AH =$

13. How can you combine your ratios in question 11 to get an expression for  $AH$ ?

14. Write an expression for  $\cos(\alpha + \beta)$  using the sine and cosine of  $\alpha$  and  $\beta$ .

## Lesson 7.6 – Angle Sum Identities

QuickNotes

### Check Your Understanding

1. Find an exact value for  $\sin 75^\circ$ . (Hint: Can you write  $75^\circ$  as a sum or difference of two known angles on the unit circle?)
2. Find an exact value for  $\cos 255^\circ$ .
3. Let's see if we can come up with a pattern for evaluating sine and cosine for angles that are double a given angle, like  $\sin(2\theta)$ .
  - a. Can you rewrite the double angle  $2\theta$  as the sum of two angles?
  - b. Write an equivalent expression for  $\sin(2\theta)$  using  $\sin \theta$  and  $\cos \theta$ .
4. Solve the equation  $\sin(2x) - \sin x = 0$  for  $0 \leq x \leq 2\pi$ .