# **Analyze the Problem:**

We need to convert latitude and longitude coordinates from the Degrees-Minutes-Seconds (DMS) format to the Decimal-Degrees (DD) format. To do this we need to input the latitude degrees, minutes, seconds separately from each other, do the same for the longitude, apply the mathematical formula to convert minutes (minutes/60) and seconds (seconds/3600) to decimals and then add it back to the original degrees (converted min + converted seconds + degrees) to get the DD value for latitude and longitude. After this then we can print and output the DD values for the user. During the conversion we would have to make sure that negative values stay negative and positive value stay positive. To do this we can remove the negative sign from the value before adding the converted minutes and seconds values and then add it back before outputting the final value for DD.

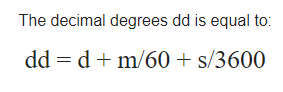


Figure 1: Formula for converting DMS to DD (Screenshot taken from:<https://www.rapidtables.com/convert/number/degrees-minutes-seconds-to-degrees.html>)

# **Design a Solution:**

Pseudocode:

# Input the values for the latitudinal coordinates  
Input latitude degrees  
Input latitude minutes  
Input latitude seconds

# Input the value for the longitudinal coordinates  
Input longitude degrees  
Input longitude minutes  
Input longitude seconds

# Convert Latitudinal minutes to decimals  
Latitude minutes / 60

# Convert Latitudinal seconds to decimals  
Latitude seconds / 3600

# Convert longitudinal minutes   
longitude minutes / 60

# Convert Longitudinal seconds to decimals  
longitude seconds / 3600

# Add latitudinal decimal values to latitudinal degrees  
If latitude degrees is negative:

Then remove the negative  
positive latitude degrees + latitude minutes decimal + latitude seconds decimal  
add the negative back

Else:

latitude degrees + latitude minutes decimal + latitude seconds decimal

# Add longitudinal decimal values to longitudinal degrees  
If longitude degrees is negative:

Then remove the negative  
positive longitude degrees + longitude minutes decimal + longitude seconds decimal  
add the negative back

Else:

longitude degrees + longitude minutes decimal + longitude seconds decimal

# Output the new coordinates  
Print latitudinal DD value  
Print longitudinal DD value

# **Test and Debug:**

I tested and verified my code by using an input I already knew the output to. I used a converter I found online (<https://www.rapidtables.com/convert/number/degrees-minutes-seconds-to-degrees.html>) and entered in a DMS coordinate, noted the DD it got converted too and used that as a reference when testing my code. I ran into a few bugs along the way while coding the calculator. The first was figuring out how to handle negative DMS values. In DMS coordinates only the first number is negative. If I converted the minutes and seconds values as positive numbers and tried to add them to a negative value, the math doesn’t work out. Another problem I had was making sure I had the right syntax for printing the output statements. I wanted to add some text before the value appeared and had to change the data type of the variables that stored the final values to a string so it would work with the print statement. If someone enters text in my program, then it would not run as the code for converting DMS to DD values requires integer values. I solve this by adding a print statement before asking for input of values specifying that the user just need to enter in the values of the coordinates that they have and to ignore and apostrophes or degree symbols and that minutes and seconds should not have negative values.

Like I mentioned above dealing with negative values was an issue. I overcame this problem by using an if-else statement. Basically, if the degree value of a coordinate was less than 0, then we would remove the negative, do the proper addition, and then add the negative back to the value to make sure the math works out right. If the degree value was positive, then there would be no issue. There is no need to worry about if a user gives minutes and degrees negative signs as there is a statement before asking for the first input to not give minutes and seconds negative signs, also the DMS format implies minutes and seconds are also negative anyway.