

# Common Confusion 03

## Modulus / Remainder Operator

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The modulus operator is an important tool to know how to use. It is needed to complete many of the tasks in the mastery assignments and is frequently seen on the exams. There are two functions in MATLAB that calculate the modulus of two numbers. These are the 'mod' and 'rem' functions, which are similar, but have some small differences.

The modulus operator returns the remainder of the division of two numbers. For example, the modulus of '7 / 3' is '1'. Another example would be the modulus of '20 / 5', which is '0' since there is no remainder.

The first function in MATLAB that allows you to calculate the modulus of two numbers is 'mod'. The 'mod' function follows the following format in MATLAB:

$$B = \text{mod}(A, M)$$

Where 'B' is the result, 'A' is the dividend (the number being divided), and 'M' is the divisor (the number doing the dividing). This function can be described mathematically as:

$$B = A - M \cdot \text{floor}(A ./ M)$$

This mathematical function is what actually calculates the modulus value in the 'mod' function in MATLAB. It is not necessary to understand this formula, but it can help you understand the 'mod' function better.

In the event that 'M', the divisor, equals '0', the 'mod' function will return 'A'. This is the main difference between the 'mod' and 'rem' function, which will be seen below.

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The second function in MATLAB that allows you to calculate the modulus of two numbers is 'rem'. The 'rem' function follows the following format in MATLAB:

$$R = \text{mod}(A, B)$$

Where 'R' is the result, 'A' is the dividend (the number being divided), and 'B' is the divisor (the number doing the dividing). This function can be described mathematically as:

$$R = A - B \cdot \text{fix}(A ./ B)$$

This mathematical function is what actually calculates the modulus value in the 'rem' function in MATLAB. It is not necessary to understand this formula, but it can help you understand the 'rem' function better.

In the event that 'B', the divisor, equals '0', the 'rem' function will return 'NaN'. This stands for "Not a Number" and essentially means the result is undefined or unrepresentable. The reason for this result is that the 'rem' function, unlike the 'mod' function, does not have a representation for a calculation with '0' as the divisor.

In this class, you usually cannot go wrong with either function. Both the 'mod' and 'rem' functions are perfectly fine to use *unless* specified or needed to account for division by '0'. However, these cases rarely occur, so you can usually use whichever function you prefer.