# Armstrong State University
# Engineering Studies
# MATLAB Marina – If-Else Statements Exercises

1. Write a MATLAB program that will display the smaller of two numbers. The two numbers should be read in from the user and the program should display the value of the smaller number. If the two numbers are equal, either value can be displayed (i.e. don't worry about if the two numbers are equal). How many test cases are needed to verify that program operates correctly? Use these test cases to verify that your program operates correctly.
2. Using the program from exercise 1 as a starting point, write a MATLAB program that will display the smallest of three numbers. The three numbers should be read in from the user and the program should display the value of the smallest number. If the two or three numbers are equal and are the smallest value, either value can be displayed. Hint: one way of solving this problem is to first determine smaller of two of the numbers and then compare that result to the third number. How many test cases are needed to verify that program operates correctly? Use these test cases to verify that your program operates correctly.
3. Write a MATLAB program that will compute the absolute value of a number. The number should be read in from the user. Do not use MATLAB's built in absolute value (`abs`) function. Verify that the program operates correctly. How many test cases are needed to verify that program operates correctly? Use these test cases to verify that your program operates correctly.
4. Write a MATLAB program to compute the solutions x of a second order polynomial equation $ax^2 + bx + c = 0$. The polynomial constants a, b, and c, should be read in from the user and the program should display the two solutions to the equation. How many test cases are needed to verify that program operates correctly? Use these test cases to verify that your program operates correctly. Hint: the solutions of a second order polynomial can be found using the quadratic equation $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$.
5. Modify the program of exercise 4 to include inline error handling. The program should ensure that the solutions of the equation are real. Use the test cases from exercise 4 to verify that your program operates correctly. Hint: the quadratic equation has a real solution when $b^2 - 4ac \geq 0$.
6. Write a MATLAB program that will calculate the appropriate federal tax owed (assuming no income has been withheld) given the user's income and deductions for the previous year. Taxes owed should be calculated according to Table 1. Test your program for the following incomes and deductions:
   Trial 1: income $10000, deductions $0
   Trial 2: income $30000, deductions $2000
   Trial 3: income $80000, deductions $12000
   Trial 4: income $150000, deductions $10000

| **Taxable Income (Income – deductions) in dollars** | **Tax** |
|---|---|
| $0 - $25000 | 15% of taxable income |
| $25001 - $50000 | $3750 + 28% of taxable income greater than $25000 |
| $50001 - $75000 | $10750 + 31% of taxable income greater than $50000 |
| $75001 and up | $18500 + 40% of taxable income greater than $75000 |

Table 1, Tax Table for Exercise 6

7. Write a MATLAB program that will determine if measured velocity is within 5% of the theoretical velocity. The measured and theoretical velocities should be read in from the user and the program should display whether or not the measured velocity is within 5% of the theoretical velocity. How many test cases are needed to verify that program operates correctly? Use these test cases to verify that your program operates correctly.

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