

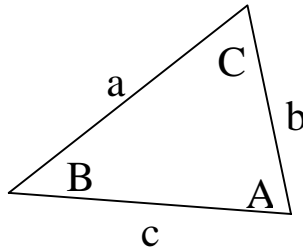
## MATLAB Assignment #2

### Reading Assignment:

Lecture #10 (MATLAB Lecture #1)  
 MATLAB Handout

### MATLAB Assignment:

- Write a MATLAB program to calculate the three angles in a triangle given the three sides using the law of cosines.



#### Law of Cosines

$$a^2 = b^2 + c^2 - 2 \cdot b \cdot c \cdot \cos(A)$$

#### Example :

If  $a = 20$ ,  $b = 15$ ,  $c = 10$ , then

$$20^2 = 15^2 + 10^2 - 2 \cdot (15) \cdot (10) \cdot \cos(A)$$

$$A = \cos^{-1} \left( \frac{15^2 + 10^2 - 20^2}{2 \cdot (15) \cdot (10)} \right)$$

$$A = 104.5^\circ$$

- Include comments in your program, including name, course, filename, description of the assigned problem, and explanations of program features.
- Display a description of the program
- Prompt the user to enter the three sides of the triangle.
- Display the three sides as well as the three angles in degrees (include the unit **degrees**).
- Test the program for the following cases:

| Case | a   | b   | c   |
|------|-----|-----|-----|
| 1    | 20  | 15  | 10  |
| 2    | 5   | 12  | 13  |
| 3    | 200 | 100 | 250 |

- Turn in a printout of the program and a printout of the output for the three cases above.

- Write a MATLAB program to solve N simultaneous equations.

- Include comments in your program, including name, course, filename, description of the assigned problem, and explanations of program features.
- Display a description of the program.
- Display an example so the user will know how to enter the inputs (using brackets, semicolons, etc).
- Prompt the user to input matrices A and b.
- Test the program with the following simultaneous equations:

| Case | Equations   |
|------|---|
| 1    | $x_1 + 4x_2 + 7x_3 = 10$<br>$2x_1 + 9x_2 - x_3 = 15$<br>$12x_2 + 6x_3 = 20$   |
| 2    | $3x_1 + 4x_2 = 52$<br>$2x_1 - 3x_2 = -5$  |
| 3    | $x_1 + 2x_2 + 3x_3 + 4x_4 + 5x_5 = 30$<br>$10x_1 + 11x_2 + 12x_3 = 40$<br>$21x_2 + 22x_3 + 23x_4 = 50$<br>$x_1 - x_2 + x_3 - x_4 + x_5 = 60$<br>$9x_1 + 8x_2 + 7x_3 + 6x_4 + 5x_5 = 70$ |

- Turn in a printout of the program and a printout of the output for the three cases above.

3. Write a MATLAB program to calculate the distance that a mousetrap car will travel. Based on the diagram below, assume that the mousetrap will pull a length of string equal to  $2L$  from the rear axle (axle supports are not shown.)

- Include comments in your program, including name, course, filename, description of the assigned problem, and explanations of program features.
- Display a description of the program.
- Prompt the user to input:
  - a. The length of the arm,  $L$  (in inches)
  - b. The diameter of the axle (in inches)
  - c. The diameter of the rear wheel (in inches)
- Display the three input values (with units) and the distance travelled (in feet).
- Test the program for the following cases:

| Case | $L$ | Axle Diameter | Rear Wheel Diameter |
|------|-----|---------------|---------------------|
| 1    | 12  | .125          | 4.5                 |
| 2    | 8   | .125          | 4.5                 |
| 3    | 8   | .25           | 4.5                 |
| 4    | 8   | .125          | 6                   |

