Topics: From formula to program, variable & assignment, input & output

Reading: CFile sec 1.2

Example: surface area of a sphere

```matlab
% Example 1_1: Compute surface area of a sphere
% A: surface area of the sphere
% r: radius of the sphere

r= input('Enter the radius: ');
A= 4*3.14159*r*r;
fprintf('Surface area is %7.2f.\n', A);
```

Anatomy of a program

- input
- calculation
- output
- comments

Definitions

- **Algorithm**: a set of procedures for solving a problem
- **Program**: an algorithm implemented in some language
- **Variable**: a named memory space for storing a value
- **Assignment**: the action of putting a value into a variable
- **Expression**: a combination of operators and operands (variables, constants) that evaluate to a value

Variables & assignment

A variable is a named memory space for storing a value. Think about it as a box to hold an item. Valid variable names begin with a letter and can contain digits. Always use *meaningful* variable names!

Assignment is the action of putting a value into a variable. The assignment operator is the symbol `=` but do *not* read this as “equal.” Some example assignment statements are

```matlab
x= 2*3.1416
y= 1+x
z= 4^2 - cos(y)
```

In an assignment, the expression on the right hand side (rhs) is evaluated *before* the assignment operation. Therefore, any variable on the rhs *must be initialized.*
Input & output statements

Input: \( \text{variable} = \text{input}('\text{prompt}') \)
Output: \( \text{disp('words to be displayed')} \)
\( \text{fprintf('Value of x is } \%f, \text{ not } \%d!\backslash n', x, y) \)

Comments

- Use comments for readability!
- Start each program with a **concise** description of what it does
- Define each important variable/constant
- Top a block of code for a specific task with a **concise** comment
- A comment starts with the "\%" symbol and goes to the end of the line

Example: expanding sphere

Modify the previous program to calculate the increase in surface area given an increase in the radius of a sphere. We will call this program **diffArea**—you will use it in the lab later.

```
\% Example 1_2: Explore how the surface area of a sphere
\% changes with an increase in the radius.

r= input('Enter radius r in miles: ');
delta= input('Enter delta r in inches: ');

fprintf('Increase in area (mile^2) is \%f.\backslash n', incr);
```

```