Topics: From formula to program, variable & assignment, input & output
Reading: CFile sec 1.2

Example: surface area of a sphere

\[
\begin{align*}
\text{Example 1.1: Compute surface area of a sphere} \\
\text{A: surface area of the sphere} \\
\text{r: radius of the sphere} \\
\text{r= input('Enter the radius: ')}; \\
\text{A= 4*3.14159*r*r}; \\
\text{fprintf('Surface area is %7.2f\n', A)};
\end{align*}
\]

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

\[
\begin{align*}
x &= 2*3.1416 \\
y &= 1+x \\
z &= 4^2 - \cos(y)
\end{align*}
\]

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.

Statements are executed in sequence:

\[
\begin{align*}
x &= 2*3.14 \\
y &= 1+x \\
x &= 5 \\
\% What is y now?
\end{align*}
\]
Input & output statements

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

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.

```matlab
% 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.\n', incr);
```