

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

**Reading:** CFile sec 1.2

## Example: surface area of a sphere

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```
% 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);
```

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## 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

```
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*.

Statements are executed in sequence:

```
x= 2*3.14
y= 1+x
x= 5
% What is y now?
```

## Input & output statements

Input: `variable = input('prompt')`  
Output: `disp('words to be displayed')`  
`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.

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```
% 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);
```

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