

SOLUTION TO PROJECT 1 - ANALYSIS PROBLEM

The following documentation provides *one* solution for [analysis Assignment 1](#).

SOLUTION

Note: All *italicized text* below serves only to clarify the documentation for students, but would not actually appear in the real documentation.

PROBLEM STATEMENT

This should define the program's task. The "problem" is not to write the program! It is to do whatever task the problem requires for its solution. This statement must be clear and complete enough for the program to be written entirely from just it and the sample outputs that follow it.

Calculate how much it would cost to carpet a single rectangular room. Prompt for and read from the keyboard the room's length and width in feet (allowing decimal places if necessary) and then calculate the floor area of the room. Ask for the carpet price in units of dollars per square yard and then convert that price to square feet before using it to calculate the cost of the carpet. Display the calculated area and total carpet cost (rounded to cents as shown in the Sample Softcopy below)

DATA DEFINITION

In the sample output below:

- The numerals on the left of the sample output below are there for the analyst's reference only and will not appear on the screen.
- The characters <CR> indicate the presence of a "carriage return" control code, causing the start of a new line of output.
- Items shown in [brackets] indicate values entered by the user (as distinguished from output produced by the program), but the brackets should not actually appear on the screen.
- The values below are examples which are valid for only one of many possible runs of the program.

SAMPLE OUTPUT (Softcopy):

```
1 CARPET COST PROGRAM<CR>
2 by Joe Student - 1 January 2011<CR>
3 <CR>
4 This program will calculate and display how much it would cost to<CR>
5 carpet a single rectangular room. It will request and store the<CR>
6 room's length and width in feet and the carpet price in units of<CR>
7 $/sq.yd., and then calculate the floor area of the room.<CR>
8 <CR>
9 Room's Length (in decimal feet)? [99.9]<CR>
10 Room's Width (in decimal feet)? [99.9]<CR>
11 Carpet Price (in $/sq.yd.)? [99.99]<CR>
12 <CR>
13 The area of that room is 99.99 square feet.<CR>
14 That carpet would cost $999.99 dollars.<CR>
```

SAMPLE OUTPUT (Hardcopy):

(none)

SYMBOLIC CONSTANT LIST:

Symbolic constants are fixed values that may be referenced using a label at many different locations within a program's instructions rather than repeating the value many times. This practice makes it easy to update the program if the value ever needs to be changed.

IDENTIFIER	DESCRIPTION	DATA TYPE	VALUE	USAGE	DESTINATION
SFPERSY	Square Feet per Square Yard	Integer	9	for PSF	---

VARIABLE LIST:

Variables are storage locations that hold values that will be different each time a program is run. Each variable is given a label that can be used by programmers to identify the storage location without having to know its numeric address in computer memory.

IDENTIFIER	DESCRIPTION	DATA TYPE	SOURCE	USAGE	DESTINATION
L	Room Length (in decimal feet)	Floating point	Keyboard	for A	---
W	Room Width (in decimal feet)	Floating point	Keyboard	for A	---
PSY	Carpet Price per Sq.Yd.	Floating point	Keyboard	for PSF	---
PSF	Carpet Price per Sq.Ft.	Floating point	Calculated	for COST	---
A	Room Area (in sq. feet)	Floating point	Calculated	for COST	Screen
COST	Cost of Carpet (in dollars)	Floating point	Calculated	---	Screen

Remember that the description column clearly identifies each piece of data that must be stored including units of measure. The DATA TYPE column indicates the [data type](#) of the variable. The last three columns are used to indicate: (SOURCE) where the data comes from, (USAGE) what happens to it while it is stored, and (DESTINATION) where it will end up (for example, a screen, a printer, or disk storage). Notice that each variable has an entry in the SOURCE column (all data comes from somewhere) and each variable has an entry in one of the other two columns as well. Some variables have an entry in all three columns.

ALGORITHM

A. Start.

B. Output Intro. & Instructions as shown in softcopy.

B1. Program Title on Line 1.

B2. Program Credits (Author and Date) on Line 2.

B3. Blank Line.

B4. Introduction on Lines 4 - 7.

B5. Blank Line.

C. Request and store data as shown in softcopy on lines 9 - 11.

C1. Display prompt for L (w/o carriage return).

C2. Read keyboard entry and store it in L, then display car. return.

C3. Display prompt for W (w/o carriage return).

C4. Read keyboard entry and store it in W, then display car. return.

- C5. Display prompt for PSY (w/o carriage return).
- C6. Read keyboard entry and store it in PSY, then display a car. return.
- D. Calculate and store interim and final answers.
 - D1. Store PSF as PSY divided by SFPERSY.
 - D2. Store A as L times W.
 - D3. Store COST as PSF times A.
- E. Display answers on the screen as shown in the sample softcopy on lines 12 & 13.
 - E1. Blank Line 12.
 - E2. Line 13.
 - E2a. " The area of that room is " (note trailing blank space).
 - E2b. A (rounded to 2 places without carriage return).
 - E2c. " square feet." (note leading space) followed by a carriage return.
 - E3. Line 14.
 - E3a. "That carpet would cost \$" (note trailing dollar sign without carriage return).
 - E3b. COST (rounded to cents without carriage return).
 - E3c. " dollars." (note leading space) followed by a carriage return.
- F. End.

DESK CHECK

This desk check shows some sample input data run through the algorithm.

DATA TRACING CHART USING SAMPLE DATA:

The Data Tracing Chart is used to document what would be happening in the computer's memory during the execution of the steps described in your algorithm. A column is provided for each variable in your analysis with an additional column (#1) to serve as a reference to steps in your algorithm. Note in the chart below that it only relates to steps in the algorithm that effect the memory (ie. steps C & D).

	Input			Calculated		
Step	L	W	PSY	PSF	A	COST
C2	10.0					
C4		9.0				
C6			18.00			
D1				2.00		
D2					90.0	
D3						180.0

TEST OUTPUT (Softcopy):

```
1 CARPET COST PROGRAM<CR>
2 by Joe Student - 1 January 2011<CR>
3 <CR>
4 This program will calculate and display how much it would cost to<CR>
5 carpet a single rectangular room. It will request and store the<CR>
6 room's length and width in feet and the carpet price in units of<CR>
7 $/sq.yd., and then calculate the floor area of the room. <CR>
8 <CR>
9 Room's Length (in decimal feet)? [10.0]<CR>
10 Room's Width (in decimal feet)? [9.0]<CR>
11 Carpet Price (in $/sq.yd.)? [18.00]<CR>
12
13 The area of that room is 90.00 square feet.<CR>
14 That carpet would cost $180.00 dollars.<CR>
```

SOURCE CODE IN C++

Note: Analysis assignments do not require source code. It is included here simply to provide a complete example of a program's development.

```
/******
 * Carpet Cost Program - a1.cpp      *
 * Written by: Joe Student           *
 * Coded by: Randolph Gibson         *
 * Date: January 1, 2011             *
 *****/

#include <iostream> // for cout and cin
using namespace std; // to define context for cin and cout
#include <iomanip> // for setprecision and fixed

#define SFPERSY 9 /* Symbolic constant for quantity of tests */

int main (void)
{
    float L, W; // Length and Width of a Room (in feet)/
    double PSY; // Carpet unit price per sq.yd. (in dollars)
    double PSF; // Carpet unit price per sq.ft. (in dollars)
    float A; // Room Area in sq.ft.
    double COST; // Overall Cost of Carpet (in dollars)

    /* Intro. & Instructions */
    cout << "Carpet Cost Program\n";
    cout << "by Joe Student - 1 January 2004\n\n";
    cout << "This program will calculate and display how much it would cost to\n";
    cout << "carpet a single rectangular room. It will request and store the\n";
    cout << "room's length and width in feet and the carpet price in units of\n";
    cout << "$/sq.yd., and then calculate the floor area of the room.\n\n";

    /* Source code continued on next page */
```

```

/* Data Input Section */
cout << "Room\'s Length (in decimal feet)? ";
cin >> L;
cout << "Room\'s Width (in decimal feet)? ";
cin >> W;
cout << "Carpet Price (in $/sq.yd.)? ";
cin >> PSY;

/* Calculation Section */
PSF = PSY / SFPERSY;
A    = L * W;
COST = PSF * A;

/* Output Section */
cout << endl;
cout << setprecision(2) << fixed;
cout << "The area of that room is " << A << " square feet." << endl;
cout << "That carpet would cost $" << COST << " dollars." << endl;

return 0; /* Send a null error code to the parent process */
}

```

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www.gibsonr.com/classes/cop2000/fall/s1.pdf

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