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**Project 1: Paint Job Estimator Design**

**Purpose:**

To calculate the total cost of painting a room’s walls and ceiling, assuming that the room is without holes, which would have been for doors and windows. The input will be the cost of the paints and dimensions of the room. The output will be the total cost of painting the room.

**Input:**

The dimensions of the room = length, width and height. Constraint: The dimensions have to be > 0.

The price of the wall paint per gallon in dollars. Constraint: The price has to be > 0.

The price of the ceiling paint per gallon in dollars. Constraint: The price has to be > 0.

Notes:

1. The values for the dimensions should be integers
2. There is no upper bound for any of the input values
3. The values for the input prices for both the paints should be to 2 digits of precision

**Sample Input:**

PAINT JOB ESTIMATOR

Enter the length of the room in feet => 10.

Enter the width of the room in feet => 20.

Enter the ceiling height of the room in feet => 10.

Enter the price of the wall paint => $6.00 per gallon.

Enter the price of the ceiling paint => $5.00 per gallon.

**Output:**

* The number of gallons of wall paint required.
* The cost of the wall paint.
* The hours of labor required for painting the walls.
* The labor charge for painting the walls.
* The total cost of painting the walls.
* The number of gallons of ceiling paint required.
* The cost of the ceiling paint.
* The hours of labor required for painting the ceiling.
* The labor charge for painting the ceiling.
* The total cost of painting the ceiling.
* The total cost of painting both the walls and the ceiling

Notes:

1. We need an integer value of the number of gallons of both types of paints to show as an output, but we also need a value to 2 digits of precision for further calculations.
2. Therefore, we shall obtain the decimal value from calculation and use that for further calculation. As for the output, we shall convert this value to an integer to display to the program user.
3. The number of gallons precise to two digits will be rounded off to the upper bound integer value in the conversion.

**Sample Output:**

PAINT JOB ESTIMATOR

The amount of wall paint required is 6 gallons. Therefore, the cost of the wall paint is $36.00.

The time for labor required for painting the walls is ­­­41.74 hours. Hence the cost of labor for painting the walls is $834.80.

The total cost of painting the walls is $870.80.

The amount of ceiling paint required is 2 gallons. Thus the cost of the ceiling paint is $7.69.

The time for labor required for painting the ceiling is 9.23­­­ hours. So the cost of labor for painting the ceiling is $184.60.

The total cost of painting the ceiling is $192.29.

The total cost of painting the walls and the ceiling is $1063.1.

**Formulae:**

PER\_WALL\_SQUAREFEET = 115

PER\_CEILING\_SQUAREFEET = 130

LABOR\_CHARGE = 20.00

wallPaintAmount1 = 2 \* inputLength \* inputHeight / PER\_WALL\_SQUAREFEET

wallPaintAmount2 = 2 \* inputWidth \* inputHeight / PER\_WALL\_SQUAREFEET

wallPaintTotalAmount = wallPaintAmount1 + wallPaintAmount2

wallPaintTotalCost = wallPaintTotalAmount \* wallPaintInputCost

wallLaborTotalTime = wallLaborHours \* wallPaintTotalAmount

wallLaborTotalCost = wallLaborTotalTime \* laborCharge

wallTotalCost = wallPaintTotalCost + wallLaborTotalCost

ceilingPaintAmount = inputLength \* inputWidth / PER\_CEILING\_SQUAREFEET

ceilingPaintCost = ceilingPaintAmount \* ceilingPaintInputCost

ceilingLaborTotalTime = ceilingLaborHours \* ceilingPaintAmount

ceilingLaborTotalCost = ceilingLaborTotalTime \* laborCharge

ceilingTotalCost = ceilingPaintCost + ceilingLaborTotalCost

totalCost = wallTotalCost + ceilingTotalCost

**Oracle:**

|  |  |  |
| --- | --- | --- |
| **Purpose** | **Input** | **Expected Output** |
| Invalid input – Length < 0 or Width < 0 or Height < 0 | inputLength = -5 ft, or  inputWidth = -5 ft or  inputHeight = -5 ft. | “Input error: The length, width or height of a room can not be negative.” |
| Invalid input – inputWallPaintCost < 0 | wallPaintInputCost = $-10 | “Input error: The cost of paint for the wall can not be negative.” |
| Invalid input –  inputCeilingPaintCost < 0 | ceilingPaintInputCost = $-10 | “Input error: The cost of paint for the ceiling can not be negative.” |
| Valid input – Boundary condition on length, width or height. | inputLength = 1  inputWidth = 1  inputHeight = 1  wallPaintInputCost = $5  ceilingPaintInputCost = $6 | “The amount of wall paint required is 1 gallons. Therefore, the cost of the wall paint is $00.17.  The time for labor required for painting the walls is ­­­0.28 hours. Hence the cost of labor for painting the walls is $5.57.  The total cost of painting the walls is $5.74.  The amount of ceiling paint required is 1 gallons. Thus the cost of the ceiling paint is $0.05.  The time for labor required for painting the ceiling is 0.05­­­ hours. So the cost of labor for painting the ceiling is $1.04.  The total cost of painting the ceiling is $1.09.  The total cost of painting the walls and the ceiling is $6.83. |
| Valid input – Boundary condition on the prices for the wall and ceiling paints | wallPaintInputCost = $0.01  ceilingPaintInputCost = $0.01  inputLength = 5 ft  inputWidth = 5 ft  inputHeight = 5 ft | “The amount of wall paint required is 2 gallons. Therefore, the cost of the wall paint is $0.01.  The time for labor required for painting the walls is ­­­6.96 hours. Hence the cost of labor for painting the walls is $139.13.  The total cost of painting the walls is $129.14.  The amount of ceiling paint required is 1 gallons. Thus the cost of the ceiling paint is $0.01.  The time for labor required for painting the ceiling is 1.30­­­ hours. So the cost of labor for painting the ceiling is $26.09.  The total cost of painting the ceiling is $26.10.  The total cost of painting the walls and the ceiling is $155.24. |

Notes:

Each of the dimensions have been written in one row, and also the prices have been written in one row to avoid too much working and space consumption as the output is lengthy.

The values of the Expected Output are underlined just so it is easy to read. This is not how the result will actually be displayed.

**Pseudocode:**

Display: PAINT JOB ESTIMATOR

/\* Get and validate inputs \*/

Prompt: “Enter the length of the room in feet => “

Read in inputLength.

/\* while the input is not valid \*/

while ( inputLength < 0 )

Display: “Input error: The length, width or height of a room can not be negative.”

Prompt: “Enter the length of the room in feet => “

Read in inputLength.

/\* Post-condition: inputLength is valid \*/

Prompt: “Enter the width of the room in feet => “

Read in inputWidth.

/\* while the input is not valid \*/

while ( inputWidth < 0 )

Display: “Input error: The length, width or height of a room can not be negative.”

Prompt: “Enter the width of the room in feet => “

Read in inputWidth.

/\* Post-condition: inputWidth is valid \*/

Prompt: “Enter the ceiling height of the room in feet => “

Read in inputHeight.

/\*while the input is not valid \*/

while ( inputHeight < 0 )

Display: “Input error: The length, width or height of a room can not be negative.”

Prompt: “Enter the ceiling height of the room in feet => “

Read in inputHeight.

/\* Post-condition: inputHeight is valid \*/

Prompt: “Enter the price of the wall paint => “

Read in wallPaintInputCost.

/\* while the input is not valid \*/

while ( wallPaintInputCost < 0 )

Display: “Input error: The cost of paint for the wall can not be negative.”

Prompt: “Enter the price of the wall paint => “

Read in wallPaintInputCost.

/\* Post-condition: wallPaintInputCost is valid \*/

Prompt: “Enter the price of the ceiling paint => “

Read in ceilingPaintInputCost.

/\* while the input is not valid \*/

while ( ceilingPaintInputCost < 0 )

Display: “Input error: The cost of paint for the ceiling can not be negative.”

Prompt: “Enter the price of the ceiling paint => “

Read in ceilingPaintInputCost.

/\* Post-condition: ceilingPaintInputCost is valid \*/

/\* compute results \*/

wallPaintAmount1 = 2 \* inputLength \* inputHeight / PER\_WALL\_SQUAREFEET

wallPaintAmount2 = 2 \* inputWidth \* inputHeight / PER\_WALL\_SQUAREFEET

wallPaintTotalAmount = wallPaintAmount1 + wallPaintAmount2

wallPaintTotalCost = wallPaintTotalAmount \* wallPaintInputCost

wallLaborTotalTime = wallLaborHours \* wallPaintTotalAmount

wallLaborTotalCost = wallLaborTotalTime \* laborCharge

wallTotalCost = wallPaintTotalCost + wallLaborTotalCost

ceilingPaintAmount = inputLength \* inputWidth / PER\_CEILING\_SQUAREFEET

ceilingPaintCost = ceilingPaintAmount \* ceilingPaintInputCost

ceilingLaborTotalTime = ceilingLaborHours \* ceilingPaintAmount

ceilingLaborTotalCost = ceilingLaborTotalTime \* laborCharge

ceilingTotalCost = ceilingPaintCost + ceilingLaborTotalCost

totalCost = wallTotalCost + ceilingTotalCost

/\* output results \*/

Display: “The amount of wall paint required is < wallPaintTotalAmount > gallons. Therefore, the cost of the wall paint is $< wallPaintTotalCost >.

The time for labor required for painting the walls is < wallLaborTotalTime > hours. Hence the cost of labor for painting the walls is $< wallLaborTotalCost >.

The total cost of painting the walls is $< wallTotalCost >.

The amount of ceiling paint required is < ceilingPaintAmount > gallons. Thus the cost of the ceiling paint is $< ceilingPaintCost >.

The time for labor required for painting the ceiling is < ceilingLaborTotalTime > hours. So the cost of labor for painting the ceiling is $< ceilingLaborTotalCost >.

The total cost of painting the ceiling is $< ceilingTotalCost >.

The total cost of painting the walls and the ceiling is $< totalCost >.”