**Paint Job Estimator Program**

A painting company has determined that for every 115 square feet of wall space, 1 gallon of paint and 8 hours of labor will be required. For every 130 square feet of ceiling space, 1 gallon of paint and 6 hours of labor will be required. The labor charge is $20.00 per hour.

The user is to enter the dimensions of the room (i.e., length, width, and ceiling height), the price of the wall paint per gallon, and the price of the ceiling paint per gallon.

Assume that the room is a box; do not worry about window or door cutouts.

Since a homeowner might want to consider painting only the walls or the ceiling, the program displays the information about the walls and ceiling separately. It should output:

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

**Input:**

Assumption: the room is a rectangle and is no smaller than 4 x 4 x 6

Room width in feet as an integer; must be >= 4

Room length in feet as an integer; must be >= 4

Wall height in feet as an integer; must be >= 6

Cost of wall paint per gallon as integers in dollars and cents in the format dd.cc dollars > 0 and cents >= 0

Cost of ceiling paint per gallon as integers in dollars and cents in the format dd.cc dollars > 0 and cents >= 0

**Sample Input:**

Enter the room’s width in feet as an integer: 18

Enter the room’s length in feet as an integer: 15

Enter the wall’s height in feet as an integer: 7

Enter the cost of wall paint per gallon in dollars and cents: $25.20

Enter the cost of ceiling paint per gallon in dollars and cents: $18.50

**Output:**

gallonsToPaintWalls - The number of gallons of wall paint required as an integer. So, if 12.2 gallons of paint are needed, this must be rounded up to 13.

hoursToPaintWalls - The hours of labor required for painting the walls; 1 place of precision

costWallsPaint - The cost of the wall paint; dollars and cents

costWallsLabor - The labor charge for painting the walls; dollars and cents

costWallsTotal - The total cost of painting just the walls; dollars and cents

gallonsToPaintCeiling - The number of gallons of ceiling paint required as an integer. So, if 8.7 gallons of paint are needed, this must be rounded up to 9.

hoursToPaintCeiling - The hours of labor required for painting the ceiling; 1 place of precision

costCeilingPaint - The cost of the ceiling paint; dollars and cents

costCeilingLabor - The labor charge for painting the ceiling; dollars and cents

costCeilingTotal -The total cost of painting just the ceiling; dollars and cents

costWallsAndCeilingTotal - The total cost of painting both the walls and the ceiling; dollars and cents

**Sample Output:**

Costs to paint the walls and the ceiling

Number of gallons of wall paint: 4

Hours to paint the walls: 27.3

Cost of wall paint: $30.45

Labor charge for painting the wall: 545.39

Cost to paint the walls (paint + labor): $575.84

Number of gallons of ceiling paint: 2

Hours to paint the ceiling: 8.9

Cost of ceiling paint: $18.55

Labor charge for painting the ceiling: $177.23

Cost to paint the ceiling (paint + labor): $195.78

Total cost for walls and ceiling: $771.62

**Formula:**

*NOTE*: Need to define symbolic constants for the literal integers used here

sqrtFtWalls: 2 \* roomWidth \* roomHeight + 2 \* roomLength \* roomHeight

sqrFtCeiling: roomWidth \* roomLength

hoursToPaintWalls: 8 \* sqrFtWalls / 115

hourstToPaintCeiling: 6 \* sqrFtCeiling / 130

gallonsToPaintWall: sqrFtWall / 115 (rounded up to nearest integer)

gallonsToPaintCeiling: sqrFtCeiling / 130 (rounded up to nearest integer)

costWallsPaint: gallonsToPaintWalls \* cost of wall paint per gallon

costWallsLabor: hoursToPaintWalls \* hourly wage

costWallsTotal: costWallsPaint + costWallsLabor

costCeilingPaint: gallonsToPaintCeiling \* cost of ceiling paint per gallon

costCeilingLabor: hoursToPaintCeiling \* hourly wage

costCeilingTotal: costCeilingPaint + costCeilingLabor

**Oracle:**

**Valid input:** Hours is an integer >= 0; minutes is an integer in range [0 – 59]

**Invalid input**: Hours < 0; minutes < 0 or minutes >= 60:> produce an error message

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| --- | --- | --- |
| **Purpose** | **Inputs** | **Expected Output** |
| Invalid Input – wall width | Width: 3 | “Error: wall width must be >= 4” |
| Invalid Input – wall length | Length: 2 | “Error: wall length must be >= 4” |
| Invalid Input – wall height | Height: 5 | “Error: wall height must be >= 6” |
| Valid Input at boundary – wall width | Width: 4 | No error – input accepted |
| Valid Input at boundary – wall length | Length: 4 | No error – input accepted |
| Valid Input at boundary – wall height | Height: 6 | No error – input accepted |
| Invalid Input – wall paint cost dollars | Dollars: 0  Cents: 0 | “Error: dollars must be > 0 and cents must be >= 0” |
| Invalid Input – wall paint cost cents | Dollars: 5  Cents: -1 | “Error: dollars must be > 0 and cents must be >= 0” |
| Valid Input at boundary – wall paint dollars and cents | Dollars:1  Cents: 0 | No error – input accepted |
| Invalid Input – ceiling paint cost dollars | Dollars: 0  Cents: 0 | “Error: dollars must be > 0 and cents must be >= 0” |
| Invalid Input – ceiling paint cost cents | Dollars: 5  Cents: -1 | “Error: dollars must be > 0 and cents must be >= 0” |
| Valid Input at boundary – ceiling paint dollars and cents | Dollars: 1  Cents: 0 | No error – input accepted |
| Valid inputs | Width: 10  Length: 15  Height: 7  Wall Pt: 30.00  Clng Pt: 18.00 | Gallons wall paint: 4  Hours wall: 24.3  $ wall paint: $120.00  Labor walls: $486.96  Total walls: $606.96  Gallons ceiling paint: 2  Hours ceiling: 6.9  $ ceiling paint: $36.00  Labor ceiling: $138.46  Total ceiling: $174.46  Grand total: $781.42 |

**Pseudocode:**

/\* get the inputs \*/

Prompt: "Enter the room's width in feet as an integer: "

Read in roomWidth

while roomWidth is invalid

Display: “Error: wall width must be >= 4”

Prompt: "Enter the room's width in feet as an integer: "

Read in roomWidth

//Post: roomWidth is valid

Prompt: "Enter the room's length in feet as an integer: "

Read in roomLength

while roomLength is invalid

Display: “Error: wall length must be >= 4”

Prompt: "Enter the room's length in feet as an integer: "

Read in roomLength

//Post: roomLength is valid

Prompt: “Enter the wall height in feet as an integer: “

Read in wallHeight

while wallHeight is invalid

Display: “Error: wall height must be >= 6”

Prompt: "Enter the wall height in feet as an integer: "

Read in wallHeight

//Post: wallHeight is valid

Prompt: “Enter the cost of wall paint per gallon in dollars and cents: $“

Read in dollars and cents

while dollars or cents is invalid

Display: “Error: dollars must be > 0 and cents must be >= 0”

Prompt: “Enter the cost of wall paint per gallon in dollars and cents: “

Read in dollars and cents

// Post: cost of wall paint is valid

Prompt: “Enter the cost of ceiling paint per gallon in dollars and cents: $“

Read in dollars and cents

while dollars or cents is invalid

Display: “Error: dollars must be > 0 and cents must be >= 0:

Prompt: “Enter the cost of ceiling paint per gallon in dollars and cents: “

Read in dollars and cents

// Post: cost of ceiling paint is valid

/\* Do computations \*/

sqrtFtWalls: 2 \* roomWidth \* roomHeight + 2 \* roomLength \* roomHeight

sqrFtCeiling: roomWidth \* roomLength

/\* Determine costs for just the walls \*/

hoursToPaintWalls: 8 \* sqrFtWall / 115

gallonsToPaintWall: sqrFtWall / 115 (rounded up to nearest integer)

costWallsPaint: gallonsToPaintWalls \* cost of wall paint per gallon

costWallsLabor: hoursToPaintWalls \* hourly wage

costWallsTotal: costWallsPaint + costWallsLabor

/\* Determine costs for just the ceilings \*/

hourstToPaintCeiling: 6 \* sqrFtCeiling / 130

gallonsToPaintCeiling: sqrFtCeiling / 130 (rounded up to nearest integer)

costCeilingPaint: gallonsToPaintCeiling \* cost of ceiling paint per gallon

costCeilingLabor: hoursToPaintCeiling \* hourly wage

costCeilingTotal: costCeilingPaint + costCeilingLabor

/\* now compute the grand total \*/

costWallsAndCeilingTotal: costWallsTotal + costCeilingTotal

/\* Output the results \*/

Display: "Costs to paint the walls and the ceiling"

Display: "Number of gallons of wall paint: < gallonsToPaintWall>”

Display: "Hours to paint the walls: < hoursToPaintWalls)>”

Display: "Cost of wall paint: < costWallsPaint>”

Display: "Labor charge for painting the wall: < costWallsLabor>”

Display: "Cost to paint the walls (paint + labor): < costWallsTotal>”

Display: "Number of gallons of ceiling paint: <gallonsToPaintCeiling>”

Display: "Hours to paint the ceiling: < hoursToPaintCeiling>”

Display: "Cost of ceiling paint: costCeilingPaint>”

Display: "Labor charge for painting the ceiling: $< costCeilingLabor>”

Display: "Cost to paint the ceiling (paint + labor): $< costCeilingTotal>”

Display: "Total cost for walls and ceiling: $<costWallsAndCeilingTotal>”