Data Types II Programming Example

Problem Description:
A company manufactures traffic cones. The company is preparing a bid on a project that will require it to paint its cones in three different colors. The estimate for the total cost of the cones is dependent on the surface area that is to be painted. Write a program that will compute the surface area of a cone and the cost of painting the cone. The inputs to the program will be the cone radius, the cone height and the cost per square foot of the three colors of paint.

The program is to output the surface area of the cone in square feet and the cost of painting the cone in each of the three colors. All values are to have 2 digits of precision.

All cone measurements of the cones are in inches, and the cones have a base diameter of 8 inches and a height of 30 inches. The cost of the paint is as follows:
- Red: $0.10 per square foot
- Blue: $0.15 per square foot
- Green: $0.18 per square foot

Discussion:
The surface area of a cone is given by the equation: $\pi r \sqrt{r^2 + h^2}$. Cone measurements are in inches, so they must first be converted to feet to determine the surface area in square feet.

Functional Decomposition:

Paint a cone
  Define Constants
    CONE_HEIGHT = 30.0
    CONE_DIAM = 8.0
    INCHES_PER_FT = 12.0
    RED_PRICE = 0.10
    BLUE_PRICE = 0.15
    GREEN_PRICE = 0.16
    PI = 3.14159
  Convert Dimensions to feet
    coneHeightFeet = CONE_HEIGHT/INCHES_PER_FT
    coneRadiusFeet = CONE_DIAM/2.0/INCHES_PER_FT
  Compute Surface area
    surfaceArea = PI*coneRadiusFeet*sqrt(coneRadiusFeet^2+coneHeightFeet^2)
  Compute cost for each color
    redCost = RED_PRICE*surfaceArea
    blueCost = BLUE_PRICE*surfaceArea
    greenCost = GREEN_PRICE*surfaceArea

Print Results
  Print surface area
  Print cost of painting the cone red
  Print the cost of painting the cone blue
  Print the cost of painting the cone green

In the above functional decomposition, you could indicate the data type of each variable/constant above. In this case all constants and variables are floats.