/*
* jmi34P1.pdf
*
* COSC 051 Summer 2016
* Project #1
*
* Due on: JUL 14, 2016
* Author: Jose Maria Iriarte
*
* In accordance with the class policies and Georgetown's
* Honor Code, I certify that, with the exception of the
* class resources and those items noted below, I have neither
* given nor received any assistance on this project.
*
* References not otherwise commented within the program source code.
* Note that you should not mention any help from the Tas, the professor,
* or any code taken from the class textbooks.
*/

START

/*---------- SET UP CONSTANTS ----------*/

// constants (these would be outside of main program and have global scope)

CALCULATE PI = 3.14
CALCULATE COST_OF_RAW_MATERIALS = 4.79
CALCULATE MARKUP = 0.26
CALCULATE MIN_BASE_RADIUS = 4
CALCULATE MAX_BASE_RADIUS = 20
CALCULATE MIN_SHAPE_HEIGHT = 5
CALCULATE MAX_SHAPE_HEIGHT = 25

// store prompts in string constants

CALCULATE WELCOME_MESSAGE = Welcome to the Allegheny International Manufacturing's (AIM) Cone and Frustum Calculation Engine

CALCULATE PROMPT_VALUE_SHAPE = Please enter a shape code (c – cone, f – frustum):
CALCULATE PROMPT_VALUE_COLOR = Please enter a color code (R, O, Y; G, B, I, V):
CALCULATE PROMPT_VALUE_BASE_RADIUS = Please enter the radius of the base (4 inches – 20 inches):
CALCULATE PROMPT_VALUE_TOP_RADIUS = Please enter the radius of the top (one half of the base radius – three fourths of the base radius)
CALCULATE PROMPT_VALUE_SHAPE_HEIGHT = Please enter the shape height (8.64 inches – 25 inches):
CALCULATE PROMPT_VALUE_IS_BASE_OPEN = Should the base be open? (Y/N):
CALCULATE PROMPT_VALUE_IS_TOP_OPEN = Should the top be open? (Y/N):

CALCULATE PROMPT_VALUE_SHAPE_ERROR = The shape code entered is not a valid value. Acceptable values are only (C)one and (F)rustum. Program will now exit. Gooodbye...
CALCULATE PROMPT_VALUE_COLOR_ERROR = The color code entered is not a valid value. Acceptable values should be either (B)lue, (G)reen, (Y)ellow, (R)ed, (O)range, (I)ndigo, (V)iolet. Program will now exit. Gooodbye...
CALCULATE PROMPT_VALUE_BASE_RADIUS_ERROR = The radius of the base value entered is not a valid value. Values must range between 4 and 20 inches. Program will now exit. Gooodbye...
CALCULATE PROMPT_VALUE_TOP_RADIUS_ERROR = The radius of the top value entered is not a

valid value. Values must range between 0.5 t
imes the base radius and 0.75 times the base
radius. Program will now exit. Gooodbye...

CALCULATE PROMPT_VALUE_SHAPE_HEIGHT_ERROR = The shape height value entered is not a valid value. Height must be at least five inches and at minimum equal to the base radius, and no more than 20 inches. Program will now exit. Gooodbye...

CALCULATE PROMPT_VALUE_IS_BASE_OPEN_ERROR = Please answer only typing Y or N (yes or no) to indicate whether the base should be closed.

CALCULATE PROMPT_VALUE_IS_TOP_OPEN_ERROR = Please answer only typing Y or N (yes or no) to indicate whether the top should be closed.

CALCULATE THANK_YOU_MESSAGE = Thank you for using AIM Software. We hope you enjoyed using our software.

```
/*-------------------------------------------------------------------------------------------------------
---------------------------------- SET UP VARIABLES ------------------------------------------
-------------------------------------------------------------------------------------------------------*/

CALCULATE  shapeType              = ?
CALCULATE  colorCode              = ?
CALCULATE  radiusTop              = 0.0
CALCULATE  radiusBase             = 0.0
CALCULATE  heightGF               = 0.0
CALCULATE  heightGC               = 0.0
CALCULATE  height                 = 0.0
CALCULATE  baseOpen               = ?
CALCULATE  topOpen                = ?
CALCULATE  baseSurfaceArea        = 0.0
CALCULATE  topSurfaceArea         = 0.0
CALCULATE  lateralSurfaceArea     = 0.0
CALCULATE  minBaseRadiusFrustum   = 0.0
CALCULATE  maxBaseRadiusFrustum   = 0.0
CALCULATE  theta                  = 0.0

/*-------------------------------------------------------------------------------------------------------
---------RUN PROMPTS, REQUIRE INPUTS, CALCULATE WHAT IS REQUIRED---------
-------------------------------------------------------------------------------------------------------*/

// print welcome message

OUTPUT WELCOME_MESSAGE

// is shape cone or frustum?

OUTPUT PROMPT_VALUE_SHAPE
INPUT  shapeType
IF shapeType value does not start with character C,c,F or f   THEN
BEGIN
        OUTPUT PROMPT_VALUE_SHAPE_ERROR
        STOP
END

// what color will the product be?

OUTPUT PROMPT_VALUE_COLOR
INPUT colorCode
IF colorCode does not start with character that is either R,r,O,o,Y,y,G,g,B,b,I,i,V or v   THEN
BEGIN
        OUTPUT PROMPT_VALUE_COLOR_ERROR
```

```
        STOP
END

// what will the base radius be?

OUTPUT PROMPT_VALUE_BASE_RADIUS
INPUT radiusBase
IF radiusBase < MIN_BASE_RADIUS or > MAX_BASE_RADIUS THEN
BEGIN
        OUTPUT PROMPT_VALUE_BASE_RADIUS_ERROR
        STOP
END

// now that we know radiusBase, we can set up variables for the min and max radii

// now that we know radii values we can calculate variables with min and max radius for frustum
// we need to calculate them here as these will be used in later prompts to the user and before general calculations

CALCULATE   minBaseRadiusFrustum = 0.5*radiusBase
CALCULATE   maxBaseRadiusFrustum = 0.75*radiusBase

// if shape is frustum what will top radius be?

IF shapeType value starts with F or f THEN
BEGIN
        OUTPUT PROMPT_VALUE_TOP_RADIUS
        INPUT radiusTop
        IF radiusTop < MIN_TOP_RADIUS or < minBaseRadiusFrustum or >   maxBaseRadiusFrusutum   THEN
        BEGIN
                OUTPUT PROMPT_VALUE_TOP_RADIUS_ERROR
                STOP
        END

END


// if shape is frustum what will the height be?

IF shapeType value starts with F or f THEN
BEGIN
        OUTPUT PROMPT_VALUE_SHAPE_HEIGHT
        INPUT height
        IF height < than MIN_SHAPE_HEIGHT or < than radiusBase or > than MAX_SHAPE_HEIGHT   THEN
        BEGIN
                OUTPUT PROMPT_VALUE_SHAPE_HEIGHT_ERROR
                STOP
        END
        OTHERWISE
        BEGIN
                CALCULATE   heightGC = √( ((radiusTop*height) /(radiusBase-radiusTop) )^2 + radiusTop^2 )
                CALCULATE   heightGF = √( ((radiusTop*height) /(radiusBase-radiusTop) )^2 + radiusTop^2 ) +
                                        √(height^2 +(radiusBase-radiusTop) ^2)
        END
END

// if shape is cone what will the height be?

IF shapeType value starts with C or c THEN
BEGIN
        OUTPUT PROMPT_VALUE_SHAPE_HEIGHT
        INPUT height
        IF height < MIN_SHAPE_HEIGHT or < than radiusBase or > MAX_SHAPE_HEIGHT   THEN
```

```
        BEGIN
                OUTPUT PROMPT_VALUE_SHAPE_HEIGHT_ERROR
                STOP
        END
        OTHERWISE
                CALCULATE   heightGF = √( ((radiusTop*height) /(radiusBase-radiusTop) )² + radiusTop² ) +
                                                √(height² +(radiusBase-radiusTop) ²)
END


OUTPUT PROMPT_VALUE_IS_BASE_OPEN
INPUT baseOpen
IF baseOpen value is neither Y, y, N or n THEN
BEGIN
        OUTPUT PROMPT_VALUE_IS_BASE_OPEN_ERROR
        STOP
END
OTHERWISE
        CALCULATE   baseOpen = to value they entered
        // values in code are set in this variable at time of input without the need for an else statement

IF shapeType value is F or f THEN
BEGIN
        OUTPUT PROMPT_VALUE_IS_TOP_OPEN
        INPUT topOpen
        IF topOpen value entered is neither Y , y , N or n   THEN
        BEGIN
                OUTPUT PROMPT_VALUE_IS_TOP_OPEN_ERROR
                STOP
        END
END

/*-----------------------------------------------------------------------------------------------------------
------------------------------PERFORM GENERAL CALCULATIONS----------------------------
-----------------------------------------------------------------------------------------------------------*/

CALCULATE   baseSurfaceArea = PI*radiusBase²


IF shapeType value starts with F or f THEN
BEGIN
        CALCULATE   lateralSurfaceArea = PI*(radiusTop+radiusBase)*√(height²+(radiusBase – radiusTop)²)

        IF topOpen value entered is N or n THEN
                CALCULATE topSurfaceArea = PI*radiusTop²
        OTHERWISE
                CALCULATE topSurfaceArea = 0

        IF baseOpen value entered is N or n THEN
                CALCULATE baseSurfaceArea =   PI*radiusBase²
        OTHERWISE
                CALCULATE baseSurfaceArea = 0
END
OTHERWISE // if the shape is a cone perform corresponding calculations
BEGIN
        CALCULATE   lateralSurfaceArea = PI*radiusBase*√(radiusBase²+height²)
        CALCULATE   topSurfaceArea = 0

        IF baseOpen value entered is N or n THEN
                CALCULATE baseSurfaceArea = PI*radiusBase²
        OTHERWISE
```

```
            CALCULATE baseSurfaceArea = 0

END

CALCULATE   totalSurfaceArea = lateralSurfaceArea + topSurfaceArea + baseSurfaceArea// in square feet
            /* the calculation above is flexible, depending on user choices in algorithms previously specified,
            lateral surface area for example will differ if the shape is frustum or a cone, and top and base surface
            areas will be 0 whenever user chooses to leave them open. Top surface area is set to 0 in previous
            algorithms for cones */
CALCULATE   costOfRawMaterials = totalSurfaceArea * COST_OF_RAW_MATERIALS// in dollars per square feet
CALCULATE   salesPrice = costOfRawMaterials + costOfRawMaterials * MARKUP
CALCULATE   theta = 180*( (2*radiusBase - 2*radiusTop) / (heightGF - heightGC) )


/*-----------------------------------------------------------------------------------------------------
----------OUTPUT DATA ENTERED AND CALCULATED VALUES----------
-----------------------------------------------------------------------------------------------------*/

// output data entered by user

OUTPUT      Data Entered

OUTPUT      shapeType – shape code
OUTPUT      colorCode – color code
OUTPUT      radiusBase – base radius
OUTPUT      baseOpen – is base open
OUTPUT       height – height specified by user (inches)

IF shapeType values starts with F or f THEN
BEGIN
        OUTPUT      topOpen – is top open
        OUTPUT      radiusTop – top radius
END

// output calculated values

OUTPUT      Calculated Values

OUTPUT      baseSurfaceArea – base surface area
OUTPUT      lateralSurfaceArea – lateral surface area
OUTPUT      totalSurfaceArea – total surface area
OUTPUT      costOfRawMaterials – raw material cost at $4.79/ square feet for sheet metal
OUTPUT      salesPrice – sales price with 26% markup
OUTPUT      theta – cone angle

IF shapeType values starts with F or f THEN
BEGIN
        OUTPUT      Frusutm Specific Data

        OUTPUT      minBaseRadiusFrustum – minimum base radius allowed for frustum according to user specified
                    radius
        OUTPUT      maxBaseRadiusFrustum – maximum base radius allowed for frustum according to user specified
                    radius
        OUTPUT      topSurfaceArea – top surface area (0 if user chose to leave it open)

END

OUTPUT      THANK_YOU_MESSAGE

STOP
```