**ECE 103 Engineering Programming**

Expanded Homework B

**Sawtooth Star Quilt Program Design Report**

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**Jane Doe**

[**janedoe@pdx.edu**](mailto:janedoe@pdx.edu)

**Problem Description**

A quilt is made of many of these blocks sewn together to make a square or a rectangle shape. Task is to write a program to help a quilter make a Sawtooth Star quilt.

The program will prompt the user to enter the finished length in inches of one square (side), dimensions of the finished quilt (length and width). The program will determine how many quilt squares can fit in the finished quilt dimensions and length of border and dimension of each piece.

**Design Approach**

*Inputs & Outputs*

· The five inputs are finished length of one quilt square, dimension of one side and other side of quilt, number of colors (2 or 3) and name of colors.

· The seven outputs are dimension of whole square, length of border, dimensions of four pieces A, B, C and D, yards required of each color

*Assumptions*

· Error checking is needed for the entered dimensions side, length, width and numOfColors (don’t accept negative values).

· The user's option to quit will be a single character, either 'y' for yes or 'n' for no.

*Method*

· Take inputs from user by calling takeInput () function, which will also validate all entered values, it will retake values until user enter valid values.

· All the dimensions taken by user are stored in floating point variable type float to calculate exact lengths.

· Then by calling function calculation (), get the length of side of square pieces (sqrA and sqrD) by using side and required dimensions (altitude, base and hypothesis) of triangle pieces triB and triC.

· Find total dimension of quilt square of fabrics by calling function gettingTotal () within calculation ().

· Find dimension of border by using length and width and side of quilt.

· Print the output on the console by calling printResult () function. It will output on console dimensions of all four pieces (two triangle pieces and two square pieces), dimensions of border and length in Yard of each color.

· Loop the program to do calculation again and again if user enter y or Y (proceed again) do calculation again and if user enter n or N (not to proceed more).

**Logic Flow (pseudocode)**

PROGRAM

WHILE USER ENTER CHOICE ‘Y’ or ‘y’

CALL FUNCTION TAKEINPUT ( )

CALL FUNCTION CALCULATE ( )

CALL FUNCTION PRINTRESULTS ( )

DISPLAY message asking for choice Y or N

GET choice

ENDWHILE

**END** PROGRAM

START FUNCTION TAKEINPUT ( )

WHILE SIDE IS NOTVALID

DISPLAY message asking for finished side length in inches of one quilt square

GET side

ENDWHILE

WHILE LENGTH IS NOTVALID

DISPLAY message asking for finished dimensions in inches of one side of the quilt.

GET length

ENDWHILE

WHILE WIDTH IS NOTVALID

DISPLAY message asking for finished dimensions in inches of the other side of the quilt.

GET width

ENDWHILE

WHILE NUMOFCOLORS != 2 or NUMOFCOLORS != 3

DISPLAY message asking for number of colors.

GET NUMOFCOLORS

ENDWHILE

DISPLAY message to enter Color

GET color[0]

DISPLAY message to enter second Color

GET color[1]

IF NUMOFCOLORS == 3

DISPLAY message to enter Color

GET color[0]

ENDIF

END FUNCTION TAKEINPUT ( )

START GETTINGTOTAL ( )

SET total = (numSquare[0] \* numSquare[1] \* sqrA \* sqrA

ADD total = total + (numSquare[0] \* numSquare[1] \* triB \* triB \* 4)

SET total = total / 45

SET total = total / 36;

RETURN total;

END FUNCTION GETTINGTOTAL ( )

START FUNCTION CALCULATE ( )

SET numSquare[0] = length / side;

         SET numSquare[1] = width / side;

         SET sqrA =  ((float)side / 2) + (seam \* 2)

         SET triB  =  ((float)side / 4) + (seam \* 2) + 0.354

         SET Bhyp =   SQAURROOT (2 \* POWER (triB, 2))-0.01

         SET triC  =  ((float) side / 4) + (seam \* 2) + (2 \* 0.6) + 0.394

         SET Cbase = ((float)side / 4) + (seam \* 2) + (2 \* 0.6) + 0.394

         SET Chyp  =  SQAURROOT (2 \* POWER(triC, 2))

         SET sqrD  =  (float)side / 4) + (seam \* 2)

         SET total = gettingTotal ( )

         SET whole = (CONVERT TO INT) total

         SET b = (length \* width) - (side \* side \* numSquare[0] \* numSquare[1])

         SET b /= 45;

         SET b /= 36;

         SET b \*= 8;

         SET b = GET CEILING (b) + 1

END FUNCTION CALCULATE ( )

START FUNCTION PRINTRESULT ( )

DISPLAY message and values of  numSquare[0]  numSquare[1]

DISPLAY message for Border dimension and (length % side) / 2, (width % side) / 2

DISPLAY message for dimension of Piece A and sqrA

DISPLAY message for dimension of Piece B  and triB, triB, Bhyp

DISPLAY message for dimension of Piece C  and triC, triC, Chyp

DISPLAY message for dimension of Piece D  and sqrD

IF NUMOFCOLORS == 2

DISPLAY message YARDS of color and total, whole, color[0]

DISPLAY message YARDS of color and total, whole, color[1]

ENDIF

ELSE IF NUMOFCOLORS == 3

            DISPLAY message YARDS of color and total, whole, color[0]

DISPLAY message YARDS of color and total, whole, color[1]

DISPLAY message YARDS of color and total, whole, color[2]

END ELSE

DISPLAY message and border in YARDS b

END FUNCTION PRINTRESULT