CSC126 Fundamentals of Algorithms & Computer Problem Solving

INDIVIDUAL ASSESSMENT

Title: *3D Geometry Calculator*

Group: *CS1101G*

Student ID:	2022478924
Name:	MUHAMMAD AIDIEL BIN MOHAMAD HUSSIN

Date Submitted:	0	6	0	1	2	0	2	3

Given the following 3D Geometry Formulas below.

Table 1: 3D Geometry Formula

CODE	3D GEOMETRY	OPTIONS	FORMULA	DESCRIPTION
A	CUBE	1. Volume	s^3	s = side
		2. Surface	$6s^2$	
B	RECTANGLE SOLID	1. Volume	lwh	l = length w = width h = height
		2. Surface	$2lw + 2lh + 2wh$	
C	SPHERE	1. Volume	$\frac{4}{3}\pi r^2$	r = radius
		2. Surface	$4\pi r^2$	
D	RIGHT CIRCULAR CYLINDER	1. Volume	$\pi r^2 h$	r = radius
		2. Surface	$2\pi rh + 2\pi r^2$	h = height
E	RIGHT CIRCULAR CONE	1. Volume	$\frac{1}{3}\pi r^2 h$	r = radius h = height
		2. Surface	$\pi r\sqrt{r^2+h^2} + \pi r^2$	
F	SQUARE PYRAMID	1. Volume	$\frac{1}{3}s^2 h$	s = side h = height
		2. Surface	$s(s + \sqrt{s^2 + 4h^2})$	
G	REGULAR TETRAHEDRON	1. Volume	$\frac{1}{12}\sqrt{2}s^3$	s = side
		2. Surface	$\sqrt{3}s^2$	

TASK 1
Based on the Table 1 above, you are required to create a 3D Geometry Calculator that will calculate the volume and surface respectively based on user's selection.
The following are the requirements for the 3D Geometry Calculator.
  A. First user must enter a username and a password. If the username and password are not matched, then ask the user to reenter the username and password again. Only three attempts are allowed, otherwise terminate the program.
  B. If the username and the password are matched, then the user may proceed to use the calculator.
  C. The calculator should display the lists of all 3D Geometry as in shown in Table 1.
  D. The user should select the desired 3D Geometry based on the Code. If the user enters a wrong input, the program should ask the user to enter again until it gets a valid input.
  E. Then the user should choose one of the two options (1 for calculate volume, 2 for calculate surface area). If the user enters a wrong input, the program should ask the user to enter again until it gets a valid input.
  F. The program will display the volume, or the surface area based on the user's selections.
  G. After the above processes are completed, the program will ask the user whether to continue the process or to terminate the program.

TASK 2
1. Draw the flow chart of your program above.

ANSWER TASK 1

Username: AidielHussin

Password: 12345

```cpp
#include <iostream>

#include <math.h>

#include <unistd.h>

#include <Windows.h>

#include <iomanip>

using namespace std;


int main(){

     //declaration

     char reload = 'Y', option;

     float formula, side, length, width, height, radius;

     string geometry, detail, user, codes, unit;

     int pass, attempt = 3, status = 1;


     cout << "3D GEOMETRY SYSTEM" <<endl;

     //process

     while (toupper(reload) == 'Y') //system will repeat if reload == 'Y'

     {

          while ((user !="AidielHussin" || pass !=12345) && attempt > 0)

          {

               cout << "\nEnter username: ";   //user enter username

               cin >> user;

               cout << "Enter password: ";            //user enter password

               cin >> pass;

               cout << endl;


               if (user !="AidielHussin" || pass !=12345)  //system
checking if username & password match or not

                {

                     cout << "Invalid username or password, please try
again!" <<endl <<endl;

                     attempt = attempt - 1;   //attempt decrease
```

```cpp
                        if (attempt <1)

                        status = 0;

            }


                else

                {

                        status = 1;

                }

        }

        system("cls");


        if (status == 0)

        {

                //output

                cout << "You are not allowed to access THIS SYSTEM!!";
//system will end

                break;

        }


        else if (status == 1)

        {

                //system will display 3D geometry formula table

                cout << "Welcome to 3D Geometry System!";

                cout << "\n\n              3D GEOMETRY FORMULA
" <<endl;

                cout <<
"======================================================" <<endl;

                cout << "| CODES |        3D GEOMETRY       |     OPTION
|"  <<endl;

                cout <<
"======================================================" <<endl;

                cout << "|    A    |            CUBE            | 1. VOLUME
|" <<endl;

                cout << "|    B    |      RECTANGLE SOLID      | 2.
SURFACE  |" <<endl;

                cout << "|    C    |           SPHERE          |
|" <<endl;

                cout << "|    D    | RIGHT CIRCULAR SYLINDER  |
|" <<endl;
```

```cpp
                  cout << "|    E     |     RIGHT CIRCULAR CONE      |
|" <<endl;

                  cout << "|    F     |       SQUARE PYRAMID        |
|" <<endl;

                  cout << "|    G     |     REGULAR TETRAHEDRON     |
|" <<endl;

                  cout <<
"=======================================================" <<endl <<endl;


                  while (codes != "A" && codes != "a" && codes != "B" && codes
!= "b" && codes != "C" && codes != "c" && codes != "D" && codes != "d" && codes
!= "E" && codes != "e" && codes != "F" && codes != "f" && codes != "G" && codes
!= "g")
                  {
                  //input
                  cout << "Please enter codes: ";        //user enter
input codes
                  cin >> codes;


                  if (codes == "A"||codes == "a")
                  {
                       while (option !='1' && option !='2')
                       {
                            //input
                            cout << "Please enter an option: ";
    //user enter input option
                            cin >> option;


                                 if (option == '1')
                                 {
                                      geometry = "CUBE";
                                      detail = "Volume";
                                      unit = "cm^3";
                                      //input
                                      cout << "\nEnter side (cm):
";    //user enter input side
                                      cin >> side;
                                      formula = pow(side,3);
                                  }
```

```cpp
                                        else if (option == '2')
                                        {
                                                geometry = "CUBE";
                                                detail = "Surface";
                                                unit = "unit";
                                                //input
                                                cout << "\nEnter side (cm): ";     //user enter input side
                                                cin >> side;
                                                formula = (6*pow(side,2));
                                        }

                                        else
                                        //output
                                                cout << "\nInvalid option, try again" <<endl; //system will repeat until user enter correct input option

                                }
                        }

                        else if (codes == "B" || codes == "b")
                        {
                                while (option !='1' && option !='2')
                                {

                                //input
                                cout << "Please enter option: ";     //user enter input option
                                cin >> option;

                                        if (option == '1')
                                        {
                                                geometry = "RECTANGLE SOLID";
                                                detail = "Volume";
                                                unit = "cm^3";
                                                //input
                                                cout << "\nEnter lenght (cm): ";     //user enter input length
```

6

```cpp
                                            cin >> length;

                                            cout << "Enter width (cm): ";
        //user enter input width

                                            cin >> width;

                                            cout << "Enter height (cm): ";
        //user enter input height

                                            cin >> height;

                                            formula = length * width * height;

                                    }

                                    else if (option == '2')
                                    {

                                            geometry = "RECTANGLE SOLID";

                                            detail = "Surface";

                                            unit = "unit";

                                            //input

                                            cout << "\nEnter lenght (cm): ";
        //user enter input lenght

                                            cin >> length;

                                            cout << "Enter width (cm): ";
        //user enter input width

                                            cin >> width;

                                            cout << "Enter height (cm): ";
        //user enter input height

                                            cin >> height;

                                            formula = (2 * length * width) +
(2 * length * height) + (2 * width * height);

                                    }

                                    else

                                            //output

                                            cout << "\nInvalid option, try
again" <<endl; //system will repeat until user enter correct input option

                                    }

                            }

                            else if (codes == "C" || codes == "c")
                            {

                                    while (option !='1' && option !='2')
```

```cpp
{
    //input
    cout << "Please enter option: ";
    //user enter input option
    cin >> option;

    if (option == '1')
    {
        geometry = "SPHERE";
        detail = "Volume";
        unit = "cm^3";
        //input
        cout << "\nEnter radius (cm): ";
        //user enter input radius
        cin >> radius;
        formula = ((4* 3.142 *
(pow(radius,2)))/3);
    }

    else if (option == '2')
    {
        geometry = "SPHERE";
        detail = "Surface";
        unit = "unit";
        //input
        cout << "\nEnter radius (cm): ";
        //user enter input radius
        cin >> radius;
        formula = (4 * 3.142 *
(pow(radius,2)));
    }

    else
        //output
        cout << "\nInvalid option, try
again" <<endl; //system will repeat until user enter correct input option
    }
}
```

```cpp
else if (codes == "D" || codes == "d")
{
    while (option !='1' && option !='2')
    {
    //input
    cout << "Please enter option: ";
    //user enter input option
    cin >> option;

        if (option == '1')
        {
            geometry = "RIGHT CIRCULAR
CYLINDER";
            detail = "Volume";
            unit = "cm^3";
            //input
            cout << "\nEnter radius (cm): ";
//user enter input radius
            cin >> radius;
            cout << "Enter height (cm): ";
//user enter input height
            cin >> height;
            formula = 3.142 * pow(radius,2) *
height;
        }

        else if (option == '2')
        {
            geometry = "RIGHT CIRCULAR
CYLINDER";
            detail = "Surface";
            unit = "unit";
            //input
            cout << "\nEnter radius (cm): ";
//user enter input side
            cin >> radius;
            cout << "Enter height (cm): ";
//user enter input side
            cin >> height;
```

```cpp
                                                formula = (2 * 3.142 * radius *
height) + (2 * 3.142 * pow(radius,2));
                                        }

                                else
                                        //output
                                        cout << "\nInvalid option, try
again" <<endl; //system will repeat until user enter correct input option
                                }
                        }

                else if (codes == "E" || codes == "e")
                {
                        while (option !='1' && option !='2')
                        {
                        //input
                        cout << "Please enter option: ";
        //user enter input option
                        cin >> option;

                                if (option == '1')
                                {
                                        geometry = "RIGHT CIRCULAR CONE";
                                        detail = "Volume";
                                        unit = "cm^3";
                                        //input
                                        cout << "\nEnter radius (cm): ";
                //user enter input radius
                                        cin >> radius;
                                        cout << "Enter height (cm): ";
        //user enter input height
                                        cin >> height;
                                        formula = ((1 * 3.142 *
(pow(radius,2) * height))/3);
                                }

                                else if (option == '2')
                                {
                                        geometry = "RIGHT CIRCULAR CONE";
```

```cpp
                                        detail = "Surface";

                                        unit = "unit";

                                        //input

                                        cout << "\nEnter radius (cm): ";
        //user enter input radius

                                        cin >> radius;

                                        cout << "Enter height (cm): ";
    //user enter input height

                                        cin >> height;

                                        formula = ((3.142 * radius) *
(sqrt((pow(radius,2)) + pow(height,2))) + (3.142 * pow(radius,2)));
                            }


                        else
                                //output

                                cout << "\nInvalid option, try
again" <<endl; //system will repeat until user enter correct input option
                        }
                }


                else if (codes == "F" || codes == "f")
                {
                        while (option !='1' && option !='2')
                        {
                        //input
                        cout << "Please enter option: ";
    //user enter input option
                        cin >> option;


                                if (option == '1')
                                {
                                        geometry = "SQUARE PYRAMID";
                                        detail = "Volume";
                                        unit = "cm^3";
                                        //input
                                        cout << "\nEnter side (cm): ";
    //user enter input side
                                        cin >> side;
```

```cpp
                                                cout << "Enter height (cm): ";
        //user enter input height
                                                cin >> height;
                                                formula = ((1 * pow(side,2) *
height)/3);
                                    }

                                    else if (option == '2')
                                    {
                                            geometry = "SQUARE PYRAMID";
                                            detail = "Surface";
                                            unit = "unit";
                                            //input
                                            cout << "\nEnter side (cm): ";
          //user enter input side
                                            cin >> side;
                                            cout << "Enter height (cm): ";
        //user enter input height
                                            cin >> height;
                                            formula = (side * (side +
sqrt((pow(side,2))+(4*pow(height,2))))));
                                    }

                            else
                                    //output
                                    cout << "\nInvalid option, try
again" <<endl;    //system will repeat until user enter correct input option
                            }
                    }

                    else if (codes == "G" || codes == "g")
                    {
                            while (option !='1' && option !='2')
                            {
                            //input
                            cout << "Please enter option: ";
      //user enter input option
                            cin >> option;
```

12

```cpp
if (option == '1')
{
    geometry = "REGULAR TETRAHEDRON";
    detail = "Volume";
    unit = "cm^3";
    //input
    cout << "\nEnter side (cm): ";    //user enter input side
    cin >> side;
    formula = ((1 * sqrt(2) * pow(side,3))/12);
}

else if (option == '2')
{
    geometry = "REGULAR TETRAHEDRON";
    detail = "Surface";
    unit = "unit";
    //input
    cout << "\nEnter side (cm): ";    //user enter input side
    cin >> side;
    formula = (sqrt(3) * pow(side,2));
}

else
    //output
    cout << "\nInvalid option, try again" <<endl; //system will repeat until user enter correct input option
        }
    }

    else
        //output
        cout << "\nInvalid codes, try again" <<endl; //system will repeat until user enter correct input codes
}
```

13

```cpp
                //output
                cout << "\n3D GEOMETRY: " <<geometry <<endl;
        //system display geometry from option user choose
                cout << "Option: " <<detail <<endl;         //system
display option from option user choose
                cout << "Total: " <<setiosflags(ios::fixed)
<<setprecision(2) <<formula << " " << unit <<endl;        //system display
formula from option user choose
                cout << "\n\nDo you want coutinue the process?"
<<endl;
                cout << "Press Y to continue OR press any key to end
session: ";         //system will ask if user want to repeat this system
                cin >> reload;


                //set the data into null (prevent data to be return)
                option = '0';
                codes = "0000";


                while (toupper(reload) != 'Y')
                {
                        //output
                        cout << "\nThank You for using this system!";
                        sleep(3);
                        break;  //system end
                }
        }
        system("cls");
    }
return 0;
}
```

ANSWER TASK 2

A flowchart with the following elements:

BEGIN

char reload = 'Y', option
float formula, side, length, width, height, radius
string geometry, detail, user, codes, unit
int pass, attempt = 3, status = 1

while (toupper(reload) == 'Y')

True

while ((user !="AidielHussin" || pass !=12345) && attempt >0)

True

INPUT user, pass

IF (user !="AidielHussin" || pass !=12345)

True → DISPLAY "Invalid username or password, please try again!"

attempt = attempt - 1

IF (attempt < 1)

False

True

status = 0

False → status = 1

B

E

B

if (status == 0) — True → DISPLAY "You are not allowed to access THIS SYSTEM!!"

False

else if (status ==1)

True

while (codes != "A" && codes != "a" && codes != "B" && codes != "b" && codes != "C" && codes != "c" && codes != "D" && codes != "d" && codes != "E" && codes != "e" && codes != "F" && codes != "f" && codes != "G" && codes != "g")

True

INPUT codes

if (codes == "A" || codes == "a") — True → while (option !='1' && option !='2')

False

True

INPUT option

if (option == '1') — True → INPUT side

geometry = "CUBE"
detail = "Volume"
unit = "cm^3"
formula = pow(side,3)

False

else if (option == '2') — True → INPUT side

geometry = "CUBE"
detail = "Surface"
unit = "unit"
formula = (6*pow(side,2))

False

DISPLAY "Invalid option, try again"

A

B

C   D   E

E

A   B   C D E

if (codes == "B" || codes == "b")

True

while (option !='1' && option !='2')

False

True

INPUT option

if (option == '1')

True

INPUT lenght, widht, height

geometry = "RECTANGLE SOLID"
detail = "Volume"
unit = "cm^3"
formula = length * width * height

False

else if (option == '2')

True

INPUT lenght, widht, height

geometry = "RECTANGLE SOLID"
detail = "Surface"
unit = "unit"
formula = (2 * length * width) + (2 * length * height) + (2 * width * height)

False

DISPLAY "Invalid option, try again"

A   B   C D E

A   B   C   D   E

if (codes == "C" || codes == "c")

True

while (option !='1' && option !='2')

False

True

INPUT option

if (option == '1')

True

INPUT radius

False

geometry = "SPHERE"
detail = "Volume"
unit = "cm^3"
formula = ((4* 3.142 * (pow(radius,2)))/ 3)

else if (option == '2')

True

INPUT radius

False

geometry = "SPHERE"
detail = "Surface"
unit = "unit"
formula = (4 * 3.142 * (pow(radius,2)))

DISPLAY "Invalid option, try again"

A   B   C   D   E

A   B   C   D   E

if (codes == "D" || codes == "d")

True

while (option !='1' && option !='2')

False

True

INPUT option

if (option == '1')

True

INPUT radius, height

False

geometry = "RIGHT CIRCULAR CYLINDER"
detail = "Volume"
unit = "cm^3"
formula = 3.142 * pow(radius,2) * height

else if (option == '2')

True

INPUT radius, height

False

geometry = "RIGHT CIRCULAR CYLINDER"
detail = "Surface"
unit = "unit"
formula = (2 * 3.142 * radius * height) + (2 * 3.142 * pow(radius,2))

DISPLAY "Invalid option, try again"

A   B   C   D   E

A   B   C   D   E

if (codes == "E" || True   while (option !='1' &&
codes == "e")   option !='2')

         False   True

                              INPUT option

                      if (option == '1')   True   INPUT radius
                                                         , height

                              False   geometry = "RIGHT
                                                 CIRCULAR CONE"
                                                 detail = "Volume"
                                                 unit = "cm^3"
                                                 formula = ((1 *
                                                 3.142 *
                                                 (pow(radius,2) *
                                                 height))/3)

                      else if (option == '2')   True   INPUT radius
                                                            , height

                              False   geometry = "RIGHT
                                                 CIRCULAR CONE"
                                                 detail = "Surface"
                                                 unit = "unit"
                                                 formula = ((3.142 *
                                                 radius) *
                                                 (sqrt((pow(radius,2)
) + pow(height,2))) +
                                                 (3.142 *
                                                 pow(radius,2)))

                              DISPLAY "Invalid
                              option, try
                              again"

A   B   C   D   E

A
B

if (codes == "F" || codes == "f")

True

while (option !='1' && option !='2')

False

True

INPUT option

if (option == '1')

True

INPUT side, height

False

geometry = "SQUARE PYRAMID"
detail = "Volume"
unit = "cm^3"
formula = ((1 * pow(side,2) * height)/3)

else if (option == '2')

True

INPUT side, height

False

geometry = "SQUARE PYRAMID"
detail = "Surface"
unit = "unit"
formula = (side * (side + sqrt((pow(side,2))+(4*pow(height,2)))))

DISPLAY "Invalid option, try again"

A

B

C D E

C D E

A   B   C   D   E

if (codes == "G" || codes == "g")

True

if (codes == "G" || codes == "g")

False

True

INPUT option

if (option == '1')

True

INPUT side

False

geometry = "REGULAR TETRAHEDRON"
detail = "Volume"
unit = "cm^3"
formula = ((1 * sqrt(2) * pow(side,3))/12)

else if (option == '2')

True

INPUT side

False

geometry = "REGULAR TETRAHEDRON"
detail = "Surface"
unit = "unit"
formula = (sqrt(3) * pow(side,2))

DISPLAY "Invalid option, try again"

DISPLAY "Invalid option, try again"

C   D   E

C　D　E

DISPLAY geometry,
detail, formula,
unit, reload

SET
option = 0,
code = "0000'

while
(toupper(reload) !=
'Y')

True

False

END