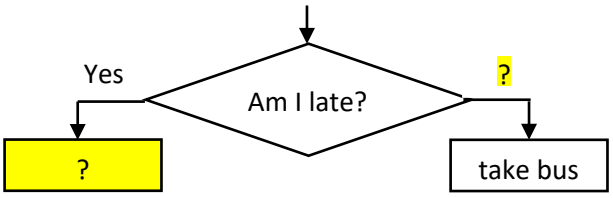
Guide to Exercise 4: Selection Constructs

1. Draw flowchart for the following code segments:

```
if ( I am late )
        I will take a cab.
 else
        I will take a bus.
```



2. What is wrong (if anything) with the following code?

```
x=80;
```

data type missing

Corrected code: ____?____ x=80;

```
if (x = 100);
 cout <<"Excellent";
```

1. **Wrong equality operator**. The current code assigns 100 to x, does not compare the value of x with 100.
2. The **;** immediately after condition is an **empty statement**, no operation will be performed even if the condition is true. No matter what the condition is, "Excellent" will always be printed, as statement *cout <<"Excellent";* is not part of the if block.

Corrected code: if (x __?__ 100) cout<<"Excellent";

3. Determine the errors in the following program.

```
int main(){
  double a=5.0, b=10.0;
    ?    c;     //declare all the variables before being used
  int operation; //refer to switch block below, what's the best data type for operation?
```

Corrected code: ___?___ operation;

```
  cout<<"Enter the peration [+, -, * or ]:);
  /* quotation mark comes in pairs, round brackets are used in pairs */
```

Corrected code: cout<<"Enter the operation [+, -, * or /]: ? ;

```
  cin >> operation ;
  switch(operation) ?  /*check the switch – case construct, what is missing and causes
                       logic error? what is not required and causes syntax error? */
     case = '+' :    c = a+b; // is variable c declared?
     case = '-' :    c = a-b;
    case = '*' :    c = a*b;
     case = '/' :    c =  a/b; // what's the best data type for variable c ?
  }; // where is the matching open bracket?
  cout << a << operation << b <<  "=" << c;
  return 0;
}
```

4. Write a program that calculates the equivalent resistance of two resistors connected either in series or parallel. The user will be prompted to enter his choice of calculation and then the values of the two resistors. A sample run of the code is shown below:

Program to calculate equivalent resistance.

1. Series connection
2. Parallel connection

Enter your choice: 2

Enter the value of the first resistor in units of ohms: 5

Enter the value of the second resistor in units of ohms: 20

The equivalent resistance is 4 ohms.

(The program must be tested with choice 1 and choice 2.)

Solution Guides:

```
//complete the underlines_____________________

# include _________________    //pre-processor directive

using _____________________ ;

int main() //c++ entry function, the starting point to run the program
{
   int choice;  //declare all the variables needed with proper data type and meaningful name
   _________ r1, r2, rEq;

   cout <<_____________________________________; //prompt message for program purpose
   cout << "\n 1. Series connection";
   cout << "\n 2. Parallel connection"<<endl;
   ______ "\nEnter your choice: ";
   cin >> choice; //reads input into variable choice
   _____________________________________; //prompt user to enter first resistance
   cin _______; //reads input into variable r1
   cout <<"Enter the value of the second resistor in units of ohms: ";
   _______ r2; //reads input into variable r2
   if (choice ==1)
     rEq=_____________; //calculate equivalent resistance of two resistors connected in series
   else
     _________________: //calculate equivalent resistance of two resistors connected in parallel
   cout << "\nThe equivalent resistance is " << rEq << " ohms.";
   return 0; //return from main function
} //close main function block
```

5. Write a menu driven program that calculates the voltage, current or resistance using the Ohm's Law (V = IR).

The program first displays a menu prompting the user to enter the choice of calculation. If he chooses voltage calculation, he will then be asked to enter the value of current and resistance. If he chooses current, he will then be prompted to enter voltage and resistance and so on. A sample run of the program is given below:

Ohms Law

1. **Voltage Calculation.**
2. **Current Calculation.**
3. **Resistance Calculation.**

Enter your choice : 3

Resistance Calculation

==========

Enter voltage(volts) : 12

Enter current(amps) : 1.5

The resistance is 8 ohms

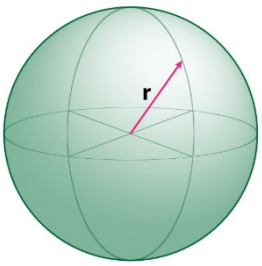
(Use a **switch** statement for selection construct)

Solution Guides: //complete the underlines_____

```
_____  //pre-processor directive
using namespace std;

_____ //c++ entry function, the starting point to run the program
{
        double v, i, r;
        _____ choice; //declare all the variables needed with proper data type and meaningful name
        cout << "Ohms Law"<<endl; //prompt clear message and instruction for the program
        cout << "\n1. Voltage Calculation.";
        cout << _____;
        cout << "\n3. Resistance Calculation."<<endl;
        cout << "\nEnter your choice: ";
        _____ //reads input into variable choice
        switch _____ //switch takes int type variable or value
        {
                case 1:         cout << "\nVoltage Calculation"<<endl;
                                cout << "==================="<<endl;
                                cout << "Enter Current(amps): "; //prompt user to enter value for i
```

```
            cin >> i; //reads input into variable i
            _____; //prompt user to enter value for r
            _____  //reads input into variable r
            v=i*r; //calculate v
            cout << "\nThe voltage is " << v << " volts"<<endl; //print output v's value
            break; //end here for case 1, jump out of switch-case block

    _____:  cout << "\nCurrent Calculation"<<endl;   //case 2 for current calculation
            cout << "==================="<<endl;
            _____;//prompt user to enter value for v
            cin >> v; //reads input into variable v
            _____; //prompt user to enter value for r
            _____  //reads input into variable r
            _____ //calculate i
            cout << "\nThe current is " << i << " amps"<<endl; //print output i's value
            _____; //end here for case 2, jump out of switch-case block

    case 3: cout << "\nResistance Calculation"<<endl;//case 3 for r calculation

            cout << "======================"<<endl;
            _____;//prompt user to enter value for v
            _____ //reads input into variable v
            _____ //prompt user to enter value for i
            _____ //reads input into variable i
            _____ //calculate r
            _____//print output r's value
            _____; //end here for case 3, jump out of switch-case block

    default: cout << "No such choice!"<<endl; // handling other input value for choice
}
    _____  //return from main function

} //close main function block
```

6. (Optional) Mini-challenge



Problem statement:

To calculate the surface area or volume of a sphere.

Surface area = $4\pi r^2$

Volume = $\frac{4}{3}\pi r^3$

Sample run:

- Enter choice as either upper case 'S' or lower case 's'

```
'S' or 's' for Sphere Surface Area Calculation
'V' or 'v' for Sphere Volume Calculation
Enter your choice: s

Sphere Surface Area Calculation
===================
Enter radius in meter: 4.3

The surface ares of the sphere with radius 4.3 meter is 232.234 m2.
```

- Enter choice as either upper case ‘V’ or lower case ‘v’

```
'S' or 's' for Sphere Surface Area Calculation
'V' or 'v' for Sphere Volume Calculation
Enter your choice: V

Volume Calculation
==================
Enter radius in meter: 1.2

The volume of the sphere with radius 1.2 meter is 7.23456 m3.
```

- Enter invalid choice(not ‘V’, not ‘v’, not ‘S’, not ‘s’)

```
'S' or 's' for Sphere Surface Area Calculation
'V' or 'v' for Sphere Volume Calculation
Enter your choice: A
No such choice!
```

- Enter invalid radius (<0)

```
'S' or 's' for Sphere Surface Area Calculation
'V' or 'v' for Sphere Volume Calculation
Enter your choice: S

Sphere Surface Area Calculation
===================
Enter radius in meter: -0.3

Invalid radius value, should not be negative value.
```

Suggestion:

- Use cmath library
- Use constant
- Use switch – case and if - else