Programming Fundamentals

Exercise No 4

Answer each of the following questions

4.1

a)

Question

All programs can be written in terms of three types of control structures: _____, _____, and _____.

Answer:

Sequence, selection, and repetition.

b)

Question:

The _____ selection statement is used to execute one action when a condition is true or a different action when that condition is false.

Answer:

if...else

c)

Question:

Repeating a set of instructions a specific number of times is called _____ repetition.

Answer:

Counter-controlled (or definite).

d)

Question:

When it isn't known in advance how many times a set of statements will be repeated, a(n) _____ value can be used to terminate the repetition.

Answer:

Sentinel, signal, flag, or dummy.

4.2

Question:

Write four different C++ statements that each add 1 to integer variable x.

Answer:

```
x = x + 1;

x += 1;

++x;

x++;
```

4.3

Question:

Write C++ statements to accomplish each of the following:

a)

Statement:

In one statement, assign the sum of the current value of x and y to z and postincrement the value of x.

Answer:

```
z = x++ + y;
```

b)

Statement:

Determine whether the value of the variable count is greater than 10. If it is, print "Count is greater than 10."

Answer:

```
if (count > 10) cout << "Count is greater than 10" << endl;
```

c)

Statement:

Predecrement the variable x by 1, then subtract it from the variable total.

Answer:

total -= --x;

d)

Statement:

Calculate the remainder after q is divided by divisor and assign the result to q. Write this statement two different ways.

Answer:

q %= divisor; and q = q % divisor;

4.4

Write C++ statements to accomplish each of the following tasks:

a)

Task:

Declare variable sum to be of type unsigned int and initialize it to 0.

Answer:

Unsigned int sum = 0;

b)

Task:

Declare variable x to be of type unsigned int and initialize it to 1.

Answer:

unsigned int x = 1;

c)

Task:

Add variable x to variable sum and assign the result to variable sum.

Answer:

sum += x; (or sum = sum + x;)

d)

Task:

Print "The sum is: " followed by the value of variable sum.

Answer:

cout << "The sum is: " << sum ;

4.5

Question:

Combine the statements that you wrote in Exercise 4.4 into a program that calculates and prints the sum of the integers from 1 to 10. Use the while statement to loop through the calculation and increment statements. The loop should terminate when the value of x becomes 11.

Answer:

```
#include <iostream>

using namespace std;

int main() {

  unsigned int sum = 0;

  unsigned int x = 1;

  while (x <= 10) {

    sum += x;

    ++x;

  }

  cout << "The sum is: " << suml;

}
```

4.6

Question:

State the values of each of these unsigned int variables after the calculation is performed. Assume that, when each statement begins executing, all variables have the integer value 5.

a) Statement: product *= x++;

Answer:

product = 25, x = 6

b) Statement: quotient /= ++x;

Answer:

quotient = 0, x = 6

4.7

Write single C++ statements or portions of statements that do the following:

a) Input unsigned int variable x with cin and >>.

b) Input unsigned int variable y with cin and >>.

c) Declare unsigned int variable i and initialize it to 1.

d) Declare unsigned int variable power and initialize it to 1.

e) Multiply variable power by x and assign the result to power.

f) Preincrement variable i by 1.

g) Determine whether i is less than or equal to y.

h) Output integer variable power with cout and <<.

Answers:

a) cin >> x;

b) cin >> y;

c) unsigned int i = 1;

d) unsigned int power = 1;

e) power *= x;

f) ++i;

g) i <= y

h) cout << power;

4.8

Question:

Write a C++ program that uses the statements in Exercise 4.7 to calculate x raised to the power y.

The program should use a while repetition statement.

Answer:

```
#include <iostream>

using namespace std;
```

```
int main()
{
   unsigned int x, y;
   unsigned int i = 1;
   unsigned int power = 1;
   cout << "Enter base x: ";
   cin >> x;
   cout << "Enter exponent y: ";
   cin >> y;
   while (i <= y)
   {
      power *= x;
      ++i;
   }
   cout << "Result is: " << power << endl;
   return 0;
}
```

4.9

Question :

Identify and correct the errors in each of the following:

a)

```
while ( c <= 5 )
{
   product *= c;
   ++c;
}
```

Correction:

No error (this code is correct).

b)

```
cin << value;
```

Error: Wrong operator used with cin.

Correct statement:

```
cin >> value;
```

c)

```
if ( gender == 1 )
   cout << "Woman" << endl;
else;
   cout << "Man" << endl;
```

Error: Extra semicolon after else.

Correct code:

```
if ( gender == 1 )
   cout << "Woman" << endl;
else
   cout << "Man" << endl;
```

4.10

Question:

What is wrong with the following while repetition statement?

```
while ( z >= 0 )
   sum += z;
```

Answer:

Problem:

The value of z is never changed, so the loop will run forever (infinite loop).

Correct version:

```
while ( z >= 0 )
{
```

```
   sum += z;
   --z;
}
```

4.11

Question:

(Correct the Code Errors) Identify and correct the error(s) in each of the following:

a) Code: if (age >= 65); cout << "Age is greater than or equal to 65" << endl;

Correction:

Remove the semicolon after the if condition.

b) Code: if (age >= 65) cout << ... else; cout << ...

Correction:

Remove the semicolon after else.

c)Code: unsigned int x = 1; unsigned int total; while (x <= 10) { total += x; ++x; }

Correction:

total must be initialized to 0: unsigned int total = 0;.

d) Code: While (x <= 100) total += x; ++x;

Correction:

Change While to lowercase while and wrap the body in braces { } if both statements belong to the loop.

e) Code: while (y > 0) { cout << y << endl; ++y; }

Correction:

This is an infinite loop because y grows away from 0. Change ++y; to --y;.

4.12

Question:

(What Does this Program Do?) What does the following program print?

(The program iterates x from 1 to 10, calculating y = x * x and adding y to total.)

Answer:

1

4

9

16

25

36

49

64

81

100

Total is 385