Object-Oriented Programming (OOP) comes with many principles.

Choose only FOUR (4) of them and briefly describe the key concept of each principle with an appropriate example.

Answers:

An ellipse can be represented by its centre point *(x, y)*, horizontal radius, *rx* and vertical radius, *ry* as shown in the figure below.

Diagram, venn diagram

Description automatically generated

A circle is a special type of an ellipse in which *rx* and *ry* are the same length.

Given the definition of a class representing an ellipse in the programbelow.

class Ellipse

{

private:

int x, y;

int rx, ry;

public:

Ellipse() {x=y=rx=ry=0;}

Ellipse(int r) { x=y=0; rx=ry=r;}

Ellipse(int \_rx, int \_ry) {x=y=0; rx=\_rx; ry=\_ry;}

Ellipse(int \_x, int \_y, int r ) {x=\_x; y=\_y; rx=ry=r;}

Ellipse(int \_x, int \_y, int \_rx, int \_ry) { x=\_x; y=\_y; rx=\_rx; ry=\_ry;}

void setRadius(int \_rx, int \_ry){rx=\_rx; ry=\_ry;}

};

Questions:

1. In general, what is the purpose of having several constructors in a class?
2. Write five different code in which each code will be creating a circle with the centre at the origin (0,0) and the radius of 10 unit from the class *Ellipse*.
3. What if the class *Ellipse* is added with another constructor as given below?

*Ellipse(int \_x, int \_y) {x=\_x; y=\_y; rx=ry=0;}*

Justify your answer.

Answers:

Consider the class *Data* and functions *increaseDataValue* and *decreaseDataValue* in the program below.

#include<iostream>

using namespace std;

class Data

{

private:

int value;

int \*link;

public:

Data( int \_value, int \* \_link)

{

value = \_value;

link = \_link;

}

Data(const Data &data)

{

value = data.value;

link = data.link;

}

~Data()

{

cout << "Data with value " << value << " is being destroyed" << endl;

}

int getValue() const { return value;}

void setValue(int \_value) { value =\_value;}

void setLinkContent(int number) { \*link = number;}

void print() const

{

cout << "value contains "<< value <<endl;

cout << "link points to "<< \*link <<endl<< endl;

}

};

void increaseDataValue(Data data)

{

int val = data.getValue();

val = val + 10;

data.setValue(val);

}

void decreaseDataValue(Data& data)

{

data.setValue(data.getValue() - 5);

}

Questions:

1. Assume the main function of the program is as below.

What is the output of the program as printed by each of the following lines?

|  |  |  |
| --- | --- | --- |
| Lines | Output | |
| data1.print(); | 1 |  |
| data2.print(); | 2 |  |
| data1.print(); | 3 |  |
| data2.print(); | 4 |  |

int main()

{

int number = 5;

Data data1(100, &number);

data1.print(); **//Output 1**

Data data2 = data1;

data2.print(); **//Output 2**

data1.setLinkContent(9);

data2.setLinkContent(11);

data2.setValue(88);

data1.print(); **//Output 3**

data2.print(); **//Output 4**

return 0;

}

1. If the main function is changed to as follows, determine the value of variables *a*, *b*, and *c*.

|  |  |
| --- | --- |
| Variables | Output |
| a |  |
| b |  |
| c |  |

int main()

{

int a, b, c;

Data data(100, NULL);

a = data.getValue();

increaseDataValue(data);

b = data.getValue();

decreaseDataValue(data);

c = data.getValue();

return 0;

}

1. If the main function is changed to as follows, determine the sequence of the destruction of the objects by writing the output printed from the destructor in order.

int main()

{

int x = 777;

Data \*ptrData;

Data data(1, &x);

ptrData = new Data(7, &x);

if (ptrData->getValue() > data.getValue())

{

Data subData(11, &x);

}

delete ptrData;

return 0;

}

Answer:

Given the program below which is intended to read a list of cars from a binary file and calculate the total price of all the cars.

#include <iostream>

#include <cstdlib>

#include <fstream>

using namespace std;

class Car

{

private:

int year;

double price;

public:

Car(int year=0, double price=0.0)

{

this->year = year;

this->price = price;

}

double getPrice() const{ return price; }

static void fileCheck(\_\_\_(a)\_\_\_)

{

if (\_\_\_(b)\_\_\_)

{

cout << "Error! File not found..";

exit(1);

}

}

};

int main()

{

Car cars[100]; // To store the list of cars read from the file

fstream fin;

string fileName;

int fileSize; // The size of file (number of bytes)

int objectSize; // The size of each Car object (in number of bytes)

int nCars; // The number of Car objects in the file.

cout << "Enter the input file's name => ";

cin >> fileName;

\_\_\_(c)\_\_\_

\_\_\_\_\_\_\_\_\_

\_\_\_(d)\_\_\_

\_\_\_(e)\_\_\_

\_\_\_(f)\_\_\_

\_\_\_\_\_\_\_\_\_

\_\_\_(g)\_\_\_

\_\_\_(h)\_\_\_

\_\_\_(i)\_\_\_

\_\_\_\_\_\_\_\_\_

fin.close();

double totalPrice = 0;

\_\_\_(j)\_\_\_

\_\_\_\_\_\_\_\_\_

cout << "Total car price: " << totalPrice << endl;

return 0;

}

Questions:

The user will need to enter the file’s name that contains the list of cars.

Write the correct C++ code to perform the following tasks.

1. Specify an appropriate parameter for the method *fileCheck*.

This method will take a file as its parameter.

1. Write the condition to check whether the file is opened successfully.
2. The file’s name used in your computer system is in small letters.

However, the user might be entering the name in capital letters or mixed cases.

Thus, convert the file’s name to small letters.

1. Open the file as a binary input file.
2. Invoke the method *fileCheck* to check the input file has been opened successfully.
3. Determine the size of the input file in bytes.
4. Determine the size of each *Car* object.
5. Determine how many cars in the input file.
6. Read all the *Car* objects from the input file into the array *cars*.
7. Calculate the total price.

Answers:

The program below is meant for converting money from a foreign currency (USD, GBP, CNY, or SGD) to Malaysian Ringgit (MYR).

#include <iostream>

#include <string>

#include <cctype>

#include <cstdlib>

using namespace std;

int main()

{

string money;

string currency;

string value;

double moneyValue, myrValue;

cout<<"Enter the money with currency (e.g. USD 10.50) => ";

getline(cin, money);

currency = money.substr(0,3);

value = money.substr(4,money.length()-4);

moneyValue = atof(value.c\_str());

for (int i=0; i<currency.length(); i++)

currency[i] = toupper(currency[i]);

if (currency=="USD") myrValue = moneyValue \* 4.18;

else if (currency=="GBP") myrValue = moneyValue \* 5.44;

else if (currency=="CNY") myrValue = moneyValue \* 0.61;

else if (currency=="SGD") myrValue = moneyValue \* 3.05;

cout << money << " is equivalent to " << "MYR " << myrValue << endl;

return 0;

}

The user might enter the foreign currency in small or capital letters or combination of them.

Based on the program, state what each code segment (1) to (3) below is doing and give the reason why it is necessary to do so.

Answers:

|  |  |  |
| --- | --- | --- |
| code segment | what this code segment is doing | why it is necessary to do |
| currency = money.substr(0,3);  value = money.substr(4,money.length()-4); |  |  |
| moneyValue = atof(value.c\_str()); |  |  |
| for (int i=0; i<currency.length(); i++)  currency[i] = toupper(currency[i]); |  |  |