OOP TEST 4

Question 1

Tell the three differences between virtual function and pure virtual function in C++.

Question 2

```cpp
#include <iostream>

struct Beverage {
  Beverage() { std::cout << "Make new beverage.\n"; }
  Beverage(const Beverage &b) { std::cout << "Copy beverage.\n"; }
};
struct Coffee: public Beverage {
  Coffee() { std::cout << "Make new coffee.\n"; }
  Coffee(const Coffee &c) { std::cout << "Copy coffee.\n"; }
};
struct Cappuchino: public Coffee {
  Cappuchino() { std::cout << "Make new cappuchino.\n"; }
};

int main() {
  Cappuchino c1;
  Cappuchino c2(c1);
}
```

a. What are printed to the screen when compiling and executing the above program?
b. Explain the order of execution of the program.

Question 3

Class PrimeList is used to generate and contain a list of prime numbers which are smaller than an upper bound integer. By using only raw pointer and memory allocation in C++, implement class PrimeList for the following main function to run correctly (without memory leak or semantic error):

```cpp
int main() {
  PrimeList list1(100);   // Construct prime list to upper bound 100.
  std::cout << list1;     // Print all primes in list.
  list1.generate(500);    // Re-construct list to new upper bound 500.

  PrimeList list2;    // Construct empty list.
  list2 = list1;          // Copy list.
  std::cout << list2[list2.count() - 1]; // Print the last prime in list.
}
```

Question 4

A web crawler is a program which automatically crawl data from specific online sources. You are joining a project to write a web crawler for iPhone prices from a website in C++. Given code fragment from the main function showing how to use the crawler:

```
1  // Code fragment from the main function...
2  const char *url = "mobiles.com/iphone";
3  Crawler *task = new Crawler(url);
4  std::vector<Mobile *> items = task->execute();
5
6  std::cout << "Crawled " << items.size() << " phones from " << url << "\n";
7
8  for (Mobile *mobile: items) {
9    mobile->print();
10   std::cout << "\n";
11 }
```

Sample output:

```
Crawled 4 phones from mobiles.com/iphone
iPhone 11 64GB - 8950000
iPhone 12 128GB - 12500000
iPhone 13 Pro Max 256 GB - 18990000
iPhone 14 Pro 512GB - 23790000
```

You are asked to do the followings:

a. Draw class diagram to describe the classes in the code fragment.

b. Implement (write code) class Mobile from the code fragment.

c. Design and draw class diagram (no code) for the solution of supporting different types of currency formats when printing the output.

Sample output with vi-VN format	**Sample output with en-US format**
Crawled 4 phones from mobiles.com/iphone	Crawled 4 phones from mobiles.com/iphone
iPhone 11 64GB - 8.950.000 đ	iPhone 11 64GB - VND 8,950,000
iPhone 12 128GB - 12.500.000 đ	iPhone 12 128GB - VND 12,500,000
iPhone 13 Pro Max 256 GB - 18.990.000 đ	iPhone 13 Pro Max 256 GB - VND 18,990,000
iPhone 14 Pro 512GB - 23.790.000 đ	iPhone 14 Pro 512GB - VND 23,790,000

d. Design and draw class diagram (no code) for the solution of supporting different ways of layouts when printing the output.

Sample output with simple layout and vi-VN format
Crawled 4 phones from mobiles.com/iphone

Sample output with simple layout and vi-VN format
iPhone 11 64GB - 8.950.000 đ
iPhone 12 128GB - 12.500.000 đ
iPhone 13 Pro Max 256 GB - 18.990.000 đ
iPhone 14 Pro 512GB - 23.790.000 đ

Sample output with table layout and en-US format

Crawled 4 phones from mobiles.com/iphone

```
Crawled 4 phones from mobiles.com/iphone
|Name                     |Price         |
|-------------------------------------|
|iPhone 11 64GB           |VND 8,950,000 |
|iPhone 12 128GB          |VND 12,500,000|
|iPhone 13 Pro Max 256 GB |VND 18,990,000|
|iPhone 14 Pro 512GB      |VND 23,790,000|
```