OOP Assignment 3

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Section: BCS-2D

Question 1:

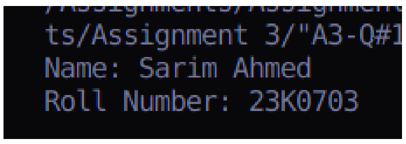
Code:

```
#include <iostream>
#include <chrono>

using namespace std;
using namespace chrono;

class Medicine
{
protected:
string name, formula;
float retailPrice;
int manufactureDate, expirationDate;

public:
Medicine(
string name,
string formula,
float retailPrice,
int manufactureDate,
int expirationDate)
: name(name),
formula(formula),
retailPrice(retailPrice),
manufactureDate(manufactureDate),
expirationDate(expirationDate) {}

string getName()
{
return this->name;
}

void setName(string name)
{
this->name = name;
}

string getFormula()
{
return this->formula;
}

void setFormula(string formula)
{
this->formula = formula;
}

float getRetailPrice()
{
```

```cpp
return this->retailPrice;
}

void setRetailPrice(float retailPrice)
{
this->retailPrice = retailPrice;
}

int getManufactureDate()
{
return this->manufactureDate;
}

void setManufactureDate(int manufactureDate)
{
this->manufactureDate = manufactureDate;
}

int getExpirationDate()
{
return this->expirationDate;
}

void setExpirationDate(int expirationDate)
{
this->expirationDate = expirationDate;
}

virtual void printMedicine() = 0;
};

class Tablet : public Medicine
{
float sucroseLevel;

public:
Tablet(
string name,
string formula,
float retailPrice,
int manufactureDate,
int expirationDate,
float sucroseLevel)
: Medicine(
name,
formula,
retailPrice,
manufactureDate,
expirationDate),
sucroseLevel(sucroseLevel) {}

void printMedicine()
{
cout << "=====Medicine Details=====" << endl;
cout << "name: " << name << endl;
cout << "formula: " << formula << endl;
cout << "retailPrice: " << retailPrice << endl;
cout << "manufactureDate: " << manufactureDate << endl;
cout << "expirationDate: " << expirationDate << endl;
cout << "sucroseLevel: " << sucroseLevel << endl;
}
};

class Capsule : public Medicine
{
float absorptionPercentage;

public:
Capsule(
string name,
string formula,
float retailPrice,
int manufactureDate,
int expirationDate,
float sucroseLevel)
: Medicine(
name,
formula,
retailPrice,
manufactureDate,
expirationDate),
absorptionPercentage(absorptionPercentage) {}

void printMedicine()
{
cout << "=====Medicine Details=====" << endl;
cout << "name: " << name << endl;
cout << "formula: " << formula << endl;
cout << "retailPrice: " << retailPrice << endl;
cout << "manufactureDate: " << manufactureDate << endl;
cout << "expirationDate: " << expirationDate << endl;
cout << "absorptionPercentage: " << absorptionPercentage << endl;
}
};

class Syrup : public Medicine
{
public:
Syrup(
string name,
string formula,
float retailPrice,
int manufactureDate,
int expirationDate,
float sucroseLevel)
: Medicine(
name,
formula,
retailPrice,
manufactureDate,
expirationDate) {}
};

class Pharmacist
```

```
{
public:
void searchMedicine(Medicine *medicineList);
};

class Counter
{
public:
void searchMedicine(Medicine *medicineList);

void updateRevenue(Medicine &medicine);
};

bool operator==(Medicine &med1, Medicine &med2)
{
return med1.getExpirationDate() == med1.getManufactureDate();
}

int main()
{
// Header
cout << "Name: Sarim Ahmed\nRoll Number: 23K0703\n\n";
}
```

Output:
[No Output as per the question requirements of a skeleton class and function headers]



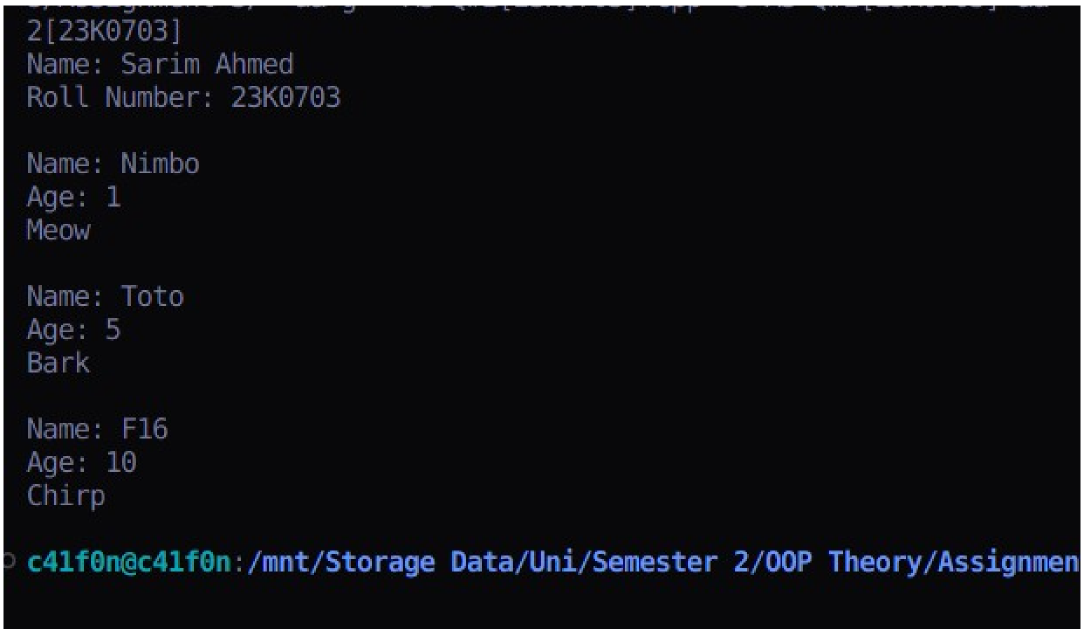
```
/Assignments/Assignment
ts/Assignment 3/"A3-Q#1
Name: Sarim Ahmed
Roll Number: 23K0703
```

Question 2:

Code:
```
#include <iostream>

using namespace std;

template <class T>
class Pet
{
public:
string name;
int age;

Pet(
string name,
int age)
: name(name),
age(age) {}

void virtual makeSound() = 0;
};

class Cat : public Pet<Cat>
```

```
{
public:
Cat(
string name,
int age)
: Pet(
name,
age) {}

void makeSound()
{
cout << "Meow" << endl;
}
};

class Dog : public Pet<Dog>
{
public:
Dog(
string name,
int age)
: Pet(
name,
age) {}

void makeSound()
{
cout << "Bark" << endl;
}
};

class Bird : public Pet<Bird>
{
public:
Bird(
string name,
int age)
: Pet(
name,
age) {}

void makeSound()
{
cout << "Chirp" << endl;
}
};

int main()
{
// Header
cout << "Name: Sarim Ahmed\nRoll Number: 23K0703\n\n";

Cat cat("Nimbo", 1);
Dog dog("Toto", 5);
Bird bird("F16", 10);

cout << "Name: " << cat.name << endl;
cout << "Age: " << cat.age << endl;
cat.makeSound();
cout << endl;

cout << "Name: " << dog.name << endl;
cout << "Age: " << dog.age << endl;
dog.makeSound();
cout << endl;

cout << "Name: " << bird.name << endl;
cout << "Age: " << bird.age << endl;
bird.makeSound();
cout << endl;

return 0;
}
```

Output:



```
2[23K0703]
Name: Sarim Ahmed
Roll Number: 23K0703

Name: Nimbo
Age: 1
Meow

Name: Toto
Age: 5
Bark

Name: F16
Age: 10
Chirp

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```

Question 3

Code:

```
#include <iostream>
#include <vector>

using namespace std;

template <class T>
class Matrix
{
protected:
int rows, cols;
vector<vector<T>> data;

public:
```

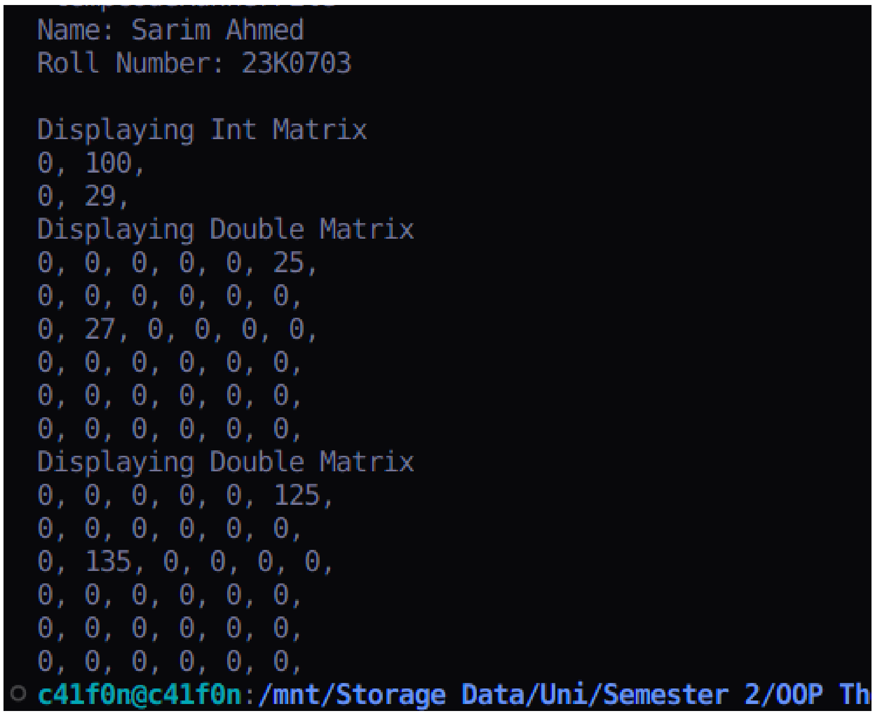
```
Matrix(int rows, int cols) : rows(rows), cols(cols)
{
}

void setElement(int row, int col, T value)
{
data[row][col] = value;
}

T getElement(int row, int col)
{
return data[row][col];
}

void virtual displayMatrix() = 0;
};

class IntMatrix : public Matrix<int>
{
public:
IntMatrix(
int rows,
int cols)
: Matrix(
rows,
cols)
{
for (int i = 0; i < rows; i++)
{
vector<int> thisRow;
for (int j = 0; j < cols; j++)
{
thisRow.push_back(0);
}
data.push_back(thisRow);
}
}

void displayMatrix()
{
cout << "Displaying Int Matrix" << endl;
for (int i = 0; i < rows; i++)
{
for (int j = 0; j < cols; j++)
{
cout << data[i][j] << ", ";
}
cout << "\b\b\n";
}
}

IntMatrix operator+(IntMatrix &mat)
{
int newRow, newCol;
newRow = min(rows, mat.rows);
newCol = min(cols, mat.cols);
```

```
IntMatrix temp(newRow, newCol);

for (int i = 0; i < newRow; i++)
{
for (int j = 0; j < newCol; j++)
{
temp.data[i][j] = data[i][j] + mat.getElement(i, j);
}
}

return temp;
}

IntMatrix operator-(IntMatrix &mat)
{
int newRow, newCol;
newRow = min(rows, mat.rows);
newCol = min(cols, mat.cols);

IntMatrix temp(newRow, newCol);

for (int i = 0; i < newRow; i++)
{
for (int j = 0; j < newCol; j++)
{
temp.data[i][j] = data[i][j] - mat.getElement(i, j);
}
}

return temp;
}

IntMatrix operator*(int x)
{

IntMatrix temp(rows, cols);

for (int i = 0; i < rows; i++)
{
for (int j = 0; j < cols; j++)
{
temp.data[i][j] = data[i][j] * x;
}
}

return temp;
}
};

class DoubleMatrix : public Matrix<double>
{
public:
DoubleMatrix(
int rows,
int cols)
: Matrix(
rows,
cols)
{
for (int i = 0; i < rows; i++)
{
vector<double> thisRow;
for (int j = 0; j < cols; j++)
{
thisRow.push_back(0.0);
}
data.push_back(thisRow);
}
}

void displayMatrix()
{
cout << "Displaying Double Matrix" << endl;
for (int i = 0; i < rows; i++)
{
for (int j = 0; j < cols; j++)
{
cout << data[i][j] << ", ";
}
cout << "\b\b\n";
}
}

DoubleMatrix operator+(DoubleMatrix &mat)
{
int newRow, newCol;
newRow = min(rows, mat.rows);
newCol = min(cols, mat.cols);

DoubleMatrix temp(newRow, newCol);

for (int i = 0; i < newRow; i++)
{
for (int j = 0; j < newCol; j++)
{
temp.data[i][j] = data[i][j] + mat.getElement(i, j);
}
}

return temp;
}

DoubleMatrix operator-(DoubleMatrix &mat)
{
int newRow, newCol;
newRow = min(rows, mat.rows);
newCol = min(cols, mat.cols);

DoubleMatrix temp(newRow, newCol);

for (int i = 0; i < newRow; i++)
{
for (int j = 0; j < newCol; j++)
{
```

```
temp.data[i][j] = data[i][j] - mat.getElement(i, j);
}
}

return temp;
}

DoubleMatrix operator*(int x)
{

DoubleMatrix temp(rows, cols);

for (int i = 0; i < rows; i++)
{
for (int j = 0; j < cols; j++)
{
temp.data[i][j] = data[i][j] * x;
}
}

return temp;
}
};

int main()
{
// Header
cout << "Name: Sarim Ahmed\nRoll Number: 23K0703\n\n";

IntMatrix mat1(2, 3);
IntMatrix mat2(2, 2);

mat1.setElement(0, 1, 50);
mat1.setElement(1, 1, 25);

mat2.setElement(0, 1, 50);
mat2.setElement(1, 1, 4);

IntMatrix mat3 = mat1 + mat2;

mat3.displayMatrix();

DoubleMatrix mat4(6, 6);
DoubleMatrix mat5(6, 6);

mat4.setElement(0, 5, 23);
mat4.setElement(2, 1, 25);

mat5.setElement(0, 5, 2);
mat5.setElement(2, 1, 2);

DoubleMatrix mat6 = mat5 + mat4;

mat6.displayMatrix();

mat6 = mat6 * 5;
```

```
mat6.displayMatrix();

return 0;
}
```

Output:



```
Name: Sarim Ahmed
Roll Number: 23K0703

Displaying Int Matrix
0, 100,
0, 29,
Displaying Double Matrix
0, 0, 0, 0, 0, 25,
0, 0, 0, 0, 0, 0,
0, 27, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0,
Displaying Double Matrix
0, 0, 0, 0, 0, 125,
0, 0, 0, 0, 0, 0,
0, 135, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0,
0, 0, 0, 0, 0, 0,
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```

Question 4

Code:

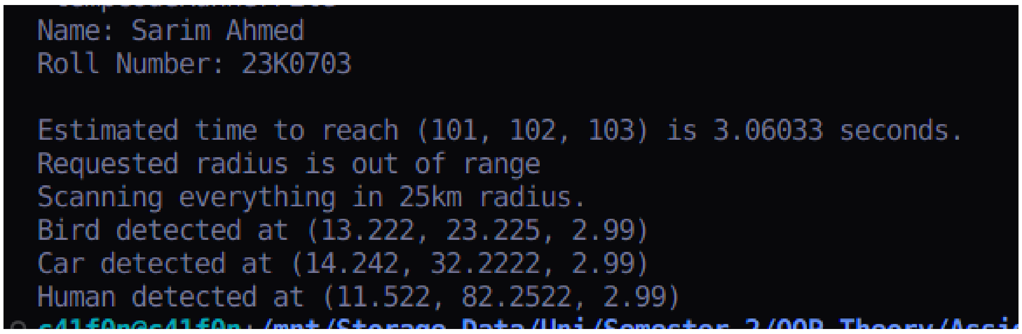
```
#include <iostream>
#include <cmath>

using namespace std;

class Drone
{
protected:
float latitude, longitude, altitude, speed;

public:
Drone(
float latitude,
float longitude,
float altitude,
float speed)
: latitude(latitude),
longitude(longitude),
altitude(altitude),
speed(speed) {}

virtual void adjustAltitude(float altitude)
{
```

```cpp
this->altitude = altitude;
}

virtual void setSpeed(float speed)
{
this->speed = speed;
}
};

class FlyableDrone : virtual public Drone
{
public:
FlyableDrone(
float latitude,
float longitude,
float altitude,
float speed)
: Drone(
latitude,
longitude,
altitude,
speed)
{
}
virtual void takeoff()
{
altitude += 50;
}

virtual void land()
{
altitude = 0;
}

virtual void navigateTo(float latitude, float longitude, float altitude)
{
this->latitude = latitude;
this->longitude = longitude;
this->altitude = altitude;
}
};

class ScannableDrone : virtual public Drone
{
public:
ScannableDrone(
float latitude,
float longitude,
float altitude,
float speed)
: Drone(
latitude,
longitude,
altitude,
speed)
{
}
```

```
virtual void scanArea(int radius)
{
cout << "Scanning everything in " << radius << "km radius." << endl;
}
};

class ReconDrone : public FlyableDrone, public ScannableDrone
{
int cameraResolution;
float maxFlightTime;

public:
ReconDrone(
float latitude,
float longitude,
float altitude,
float speed)
: FlyableDrone(
latitude,
longitude,
altitude,
speed),
ScannableDrone(
latitude,
longitude,
altitude,
speed),
Drone(
latitude,
longitude,
altitude,
speed)
{
}

void navigateTo(float latitude, float longitude, float altitude) override
{

float horizDistance = pow(pow(longitude - this->longitude, 2) + pow(latitude - this->latitude, 2), 0.5);
float verticalDistance = this->altitude - altitude;
float directDistance = pow(pow(verticalDistance, 2) + pow(horizDistance, 2), 0.5);

float estimatedTime = (float)(directDistance / speed);

cout << "Estimated time to reach (" << latitude << ", " << longitude << ", " << altitude << ") is " <<
estimatedTime << " seconds." << endl;

FlyableDrone::navigateTo(latitude, longitude, altitude);
}

void scanArea(int radius) override
{
try
{
if (radius <= 50)
{
```

```
ScannableDrone::scanArea(radius);

// Rnadom objects being detected
cout << "Bird detected at (13.222, 23.225, 2.99)" << endl;
cout << "Car detected at (14.242, 32.2222, 2.99)" << endl;
cout << "Human detected at (11.522, 82.2522, 2.99)" << endl;
}
else
{
throw radius;
}
}
catch (int e)
{
cout << "Requested radius is out of range" << endl;
}
}
};

int main()
{
// Header
cout << "Name: Sarim Ahmed\nRoll Number: 23K0703\n\n";

ReconDrone drone1(0, 0, 0, 50);

drone1.takeoff();
drone1.navigateTo(101, 102, 103);

drone1.scanArea(101);
drone1.scanArea(25);
}
```

Output:



```
Name: Sarim Ahmed
Roll Number: 23K0703

Estimated time to reach (101, 102, 103) is 3.06033 seconds.
Requested radius is out of range
Scanning everything in 25km radius.
Bird detected at (13.222, 23.225, 2.99)
Car detected at (14.242, 32.2222, 2.99)
Human detected at (11.522, 82.2522, 2.99)
s41f0n@s41f0n:/mnt/Storage Data/Uni/Semester 2/OOP Theory/Assi
```