Object-Oriented Concepts and Programming

Lab 13

Start your program with your information using the following format:

/*

ID:

Name:

Lab No:

Question No:

Date:

*/

1. Write a C++ program to help a teacher to print a list of students and their scores and grades in the class. The id, score and grade need to be stored in the Student class.

    a. The Student class must have the following attributes (variables), the id of type int to store the student id. The score that can be any number type to store student score, and the grade that must be char type. So this class must be template class. The class must also have all setter and getter functions (methods).
    b. You need to use the NumberException to check if a user does not enter only number.
    c. The program must have a function name readAnumber() that asks user to enter number of any type so that this function must be a template function. This function needs to use the NumberException class and try, catch blocks to handle the user error. It must use loop to ask user to enter only number if the user does not have done so. The prototype of the function is as follows:

        template <class T>
        T readANumber(string prompt);

    d. For all of your number input you need to use the readAnumber() function defined in c.
    e. You need to use vector to store students information.
    f. The program calculates grade of each student based on the following condition
        If score >= 90 grade = A
        If score >= 80 grade = B
        If score >= 70 grade = C
        If score >= 60 grade = D
        The score below 60 grade = F

You need to have the following functions

```
void processStudents(int numStudents);
template <class T>
T readANumber(string prompt);
//process vector
template <class T>
void enterStudentsInfo(vector<Student<T>> &students);
template <class T>
void calculateStudentsGrade(vector<Student<T>> &students);
template <class T>
void printStudentsInfo(const vector<Student<T>> &students);
//process each element in the vector
template <class T>
void enterEachStudentInfo(Student<T> *aStudent);
template <class T>
void calculateEachStudentGrade(Student<T> *aStudent);
template <class T>
void printEachStudentInfo(const Student<T> *aStudent);
 void processStudents(int numStudents);
```

where main() function is as follows:

```
int main() {
   int numStudents{};
   string prompt{"Please enter number of students "};
   numStudents = readANumber<int>(prompt);
   processStudents(numStudents);
   return 0;
}
```

The examples output of the program are as follows:

Please enter number of students 6

Student 1

Enter Student ID: 12345

Enter Score: 67

Student 2

Enter Student ID: er

Enter only number

Enter Student ID: 12346

Enter Score: 75

Student 3

Enter Student ID: 12347

Enter Score: ty

Enter only number

Enter Score: 82

Student 4

Enter Student ID: 12348

Enter Score: 94

Student 5

Enter Student ID: 12349

Enter Score: 45

Student 6

Enter Student ID: 12350

Enter Score: 85

Student ID	Student Score	Student Grade
12345	67	D
12346	75	C
12347	82	B
12348	94	A
12349	45	F
12350	85	B