Practice Questions:

1 Write a program that will search a file of numbers of type int and write the largest and the smallest numbers to the screen. The file contains nothing but numbers of type int separated by blanks or line breaks.

2 Write a program that takes its input from a file of numbers of type double. The program outputs to the screen the average and standard deviation of the numbers in the file. The file contains nothing but numbers of type double separated by blanks and/or line breaks. The standard deviation of a list of numbers n1, n2, n3, and so forth is defined as the square root of the average of the following numbers:

(n1 – a)2, (n2 – a)2, (n3 – a)2, and so forth

The number a is the average of the numbers n1, n2, n3, and so forth.

3 Write a program to compute numeric grades for a course. The course records are in a file that will serve as the input file. The input file is in exactly the following format: Each line contains a student's last name, then one space, then the student's first name, then one space, then ten quiz scores all on one line. The quiz scores are whole numbers and are separated by one space. Your program will take its input from this file and send its output to a second file.

The data in the output file will be the same as the data in the input file except that there will be one additional number (of type double) at the end of each line. This number will be the average of the student's ten quiz scores.

4 Write a program that converts dates from numerical month/day format to alphabetic month/day (for example, 1/31 or 01/31 corresponds to January 31). You will define two exception classes, one called MonthError and another called DayError. If the user enters anything other than a legal month number (integers from 1 to 12), then your program will throw and catch a MonthError. Similarly, if the user enters anything other than a valid day number (integers from 1 to either 29, 30, or 31, depending on the month), then your program will throw and catch a DayError. To keep things simple, always allow 29 days for February.

5 Create a base class called Vehicle that has the manufacturer's name (type string), number of cylinders in the engine (type int).Then create a class called Truck that is derived from Vehicle and has additional properties: the load capacity in tons (type double since it may contain a fractional part) and towing capacity in pounds (type int). Be sure your classes have a reasonable complement of constructors, accessor, and mutator member functions, an overloaded assignment operator, and a copy constructor. Write a driver program that tests all your member functions.

6 Create a template class Searcher that contains function for searching a given element from N items in an array. The type of array needs to be generic (int, float and double only) while the array size can be different for each object.

7 Write a function template for a function that has parameters for a partially filled array and for a value of the base type of the array. If the value is in the partially filled array, then the function returns the index of the first indexed variable that contains the value. If the value is not in the array, the function returns −1. The base type of the array is a type parameter. Notice that you need two parameters to give the partially filled array: one for the array and one for the number of indexed variables used. Also, write a suitable test program to test this function template.

8 BlueTech Technologies is an appliances company that makes Tracking devices, LED TVs, Mobile phones and Tablets. Apart from these, the company also makes Smart Ring that is a device capable of communication like Mobile phones as well as being able to serve as a Tracking device. The LED TVs have a screen size, model#, year of manufacture and number of supported apps as attributes, each Mobile phone has a model#, year of manufacture and camera resolution, Tablets have model#, year of manufacture and screen size as attributes, while Tracking devices have year of manufacture and accuracy (in continuous range 0-1) as attributes. There are no specialized attributes in Smart Ring.

 1. Read the scenario and create all the classes with their attributes

 2. Identify if Diamond Problem can occur in the classes you created. If yes, what will be the reason and can it be resolved?

 3. Create a single global function item_sort that sorts items based on year of manufacture. The function must receive three instances of the same type as parameters. All the parameters need to be of same type, but it can be instances of any of the classes.

 4. There is another company RedTech. This company keeps check and balance on the Tracking devices made by BlueTech, since they have a collaboration on inventing this product. For the purpose, RedTech requires direct access to all the features of tracking devices made by BlueTech.

 5. Create a function checker in RedTech. The function should receive a tracking device as input and throw a user-defined exception if year of manufacture is earlier than 2010.

9 Using dynamic arrays, implement a polynomial class with polynomial addition, subtraction, and multiplication.

Think about the polynomial

x*x*x + x + 1

One simple way to implement the polynomial class is to use an array of doubles to store the coefficients. The index of the array is the exponent of the corresponding term. Where is the term in x*x in the previous example? If a term is missing, then it simply has a zero coefficient.

Provide a default constructor, a copy constructor, and a parameterized constructor that enable an arbitrary polynomial to be constructed. Also supply an overloaded operator = and a destructor.

Provide these operations:

■ polynomial + polynomial

■ constant + polynomial

■ polynomial + constant

■ polynomial - polynomial

■ constant - polynomial

■ polynomial - constant

■ polynomial * polynomial

■ constant * polynomial

■ polynomial * constant

Supply functions to assign and extract coefficients, indexed by exponent.

Supply a function to evaluate the polynomial at a value of type double.

You should decide whether to implement these functions as members, friends, or stand-alone functions.

10. To combat election fraud, your city is instituting a new voting procedure. The ballot has a letter associated with every selection a voter may make.

A sample ballot is shown.

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1. VOTE FOR MAYOR
    A.  Pincher, Penny        ☐
    B.  Dover, Skip           ☐
    C.  Perman, Sue           ☐

2. PROPOSITION 17
    D.  YES                   ☐
    E.  NO                    ☐

3. MEASURE 1
    F.  YES                   ☐
    G.  NO                    ☐

4. MEASURE 2
    H.  YES                   ☐
    I.  NO                    ☐
```

After submitting the ballot, every voter receives a receipt that has a unique ID number and a record of the voting selections. For example, a voter who submits a ballot for Sue Perman, Yes on Proposition 17, No on Measure 1, and Yes on Measure 2 might receive a receipt with

ID 4925 : CDGH

The next day the city posts all votes on its Web page sorted by ID number.This allows a voter to confirm their submission and allows anyone to count the vote totals for themselves. A sample list for the sample ballot is shown.

ID	VOTES
4925	CDGH
4926	AEGH
4927	CDGI
4928	BEGI
4929	ADFH

Write a program that reads the posted voting list from a file and outputs the percent of votes cast for each ballot item. You may assume that the file does not have any header lines. The first line will contain a voter ID and a string representing votes. Define a class named Voter that stores an individual's voting record. The class should have a constructor that takes as input a string of votes (for example, "CDGH"), a voter ID, and accessor function(s) that return the person's ID and vote for a specific question.

Store each Voter instance in an array or vector. Your program should iterate over the array to compute and output the percent of votes cast for each candidate, proposition, and measure. It should then prompt the user to enter a voter ID, iterate over the list again to find the object with that ID, and print his or her votes.