## TUTORIAL-15

- 1) a) function
  - b) virtual
  - c) base class
  - d) 0
  - e) derived class
  - f) base
  - g) abstract
  - h) pure virtual function
  - i) override
  - j) inherited
- 2) Output: In Derived
  In Derived

The pointer has been class type but points to derived class object.

3) The virtual mechanisms works only when we have a blo base class pointer to a derived class object. In C++, the Constructor Cannot be virtual, because when a Constructor of a class is executed there is no virtual table in the memory, nyeans no virtual pointer defined yet. So, the Constructor should always be non-virtual

```
the code will not compare.
4) Virtual functions are envoked when you have a pointer,
    reference to an instance of a class. Static functions aren't
  tied to a particular enstance, they're tried to a class. so no
   Itatic functions can't be virtual this code won't compôle.
 5) # include < iostream>
    using hamespace std;
  class Animal
                                 I stated the total of the state of
  Tublic!
   virtual void display ()
   cout <<" I am a Animal" << end 1;
                                          d toll for it
 class Mammal: public Animal
 Public:
   virtual void alsplay ()
                                         I am a Republic
  cout << " I am a Mammal " << end 1;
                                      Mildel a mo I
"class Reptile: public Animal
                                     Industry to me to
 Public :
                                  VIB - HOOD SOM + VAHOLUA
 · { virtual void display ()
 cout <<" I am a Reptile" << end 1;
```

```
}. I see that the second secon
          · Same that the same still be sometimed to the same of
       int main ()
          { off file property and action with the free and the
      Animal *a z new Reptile;
  Ausmal * b = new Mammal;
Animal * C = new Animal;
      Reptile * d = new Reptile;
      Mammal * e = new Mammal;
                                                                                                                                                                   これのようなも おうかい
                a -> duplay ();
                                                                                                                 it has >s "tom laft nous"
                 b-> display ();
                C -> display ();
                 d-> display ();
                e -> display ();
                                                                                                                                            forming sublic surface
Output -
                                                                                                                                                         ( ) unlaid & Blow to
                   I am a Reptile
                                                                                                                                    " formand a mo I " . It
                   I am a Mammal
                   I am a Animal
                  I am a Reptile
                   I am a Mammal.
```

```
6) # include ziostream?
                           using namespace std;
             template < typerame T>
                          void sorting (TaI), int n)
                                                                                                                                          THE STATE OF STATE OF
                       unt l, i;
                        Cout << " In Before sorting: " << end 1;
               for ( 1=0; 12n; 1++)
                       cout 22 a [i] <2" 1';
             for (120; 1<n-1; i++)
                           2 for (j=0; j<n-1-1:j++)
                 if (acj) > a (j+1))
                            t=a[j];
                     a[j]=a[j+1];
                     a[j+1] = +;
                 cout << "In After sorting: " < Lend 1',
                                              for (i=0; i < n; i++)
                                             cout & La[i] < <" ".
                                                                                                 FAST PROBLEM - THE - DIVING CARELA S
```

```
(nt main ()
 (no all = {5,2,4,1,8};
 float b[]= {2.2, 4.8, 1.6, 3.7, 5.2 };
  charc[] = {'a', 'B', 'b', 'd', 'e'};
  Sorting (a,s);
  Sorting (b,5);
   sorting (c,5);
 output.
 Before sorting:
 52413
 After sorting:
 12345
 Before sorting:
 2.2 4.8 1.6 3.7 5.2
 After Sortely:
 1.6 2.2 3.7 4.8 5.2
Sefore sorting!
 aebdc
After Sorting!
 abede
```

```
8) functions overloading à used whon mutiple functions do
    similar operations, templetes are used when meutiple an functions do identical operations templates provide an
    advantage when you want to perform the same action on types that can be different.
 9) to rinclude < iostream >
       Using namespace Std;
  template < type name T>
                                                                                                                                                           tova (and il the
    class Nector
     T* Ptr;
     int size, capacity;
       Public: vector();
      void push - back (T val);
            void print ();
                                                                                                                             ( C) to very ) " and " " " and to wa
     template < typename T>
        vector < T>:: vector ()
        E The second of the second
         Ptr = new T[10];
      Capacity = 10;
        size = 0;
 template < typename, T>
      void vector 4T>:: push_back (T vai)
         I could have the training out of electronic and there are the countries i the
                   if (capacity < 2512e)
                                                         white the "someth house the bring of the property of the prope
```

```
Capacity #= 2;
                           the artists in its dispersion.
T * P = ptr;
                            Billy gode to Person to be some in
Ptr= new T [capacity];
for (1=0; 12 size; 14+)
 Ptr [i] = P[i];
 Ptr [size] = val;
 size ++;
                                        interpretation
template < typerame T> Void vector <T>:: prin()
                                  ( lov T) Blood - dung 1
 int i;
 for (1=0; iz size; 1++)
cout << " " << " (ptr+i);
  cout << end 1;
 i'nt mais ()
    int i, v, c = 1;
  vector < int > a [5];
  while (c==1) (a) I and I wang : 57 2 worder
   { cout <<" enter vector to add element to "<< end1;
   cix >>i;
  cout << " enter value to push " << end 1;
```

```
as >>v;
Court << " Enter 1 to add more elements" < end 1;
 cin >>c;
   a [1-1]. push -back (v); }
   for (1=0;1<5;1++)
   a[i]. print();
                                   Etyporto a more to be a cole a which
 3
Cutbut -
ANISHAs - Mac Book - Air: - anishasaxena $ / users / anisha
  saxena / Desktop/arrayvector
 enter vector to add element to
                                  the vectory to each cleaner to
enter palie to push
 12
Enter 1 to add more elements
 2
Enter vector to add element to
enter value to push
 13
Enter 1 to add more elements
                                  the odd more every every
 enter vector to add element to
enter value to push
 14
 Enter 1 to add move elements
                                        Ham kho of 1 19610
 1
 Enter vector to add element to
```

```
2
enter value to push
Enter 1 to add more elements
 enter vector to add element to
 enter value to push
16
Enter 1 to add more elements
 enter vector to add element to
 17
Choler 1
enter value to push
Enter 1 to add more elements
                               tioners honor which
 Enter vector to add element to
3
enter value to push
                              et in isto man this of
18
Goter 1 to add more elements.
enter vector to add to elements to
2
enter value to push
 13
Enter 1 to add more elements
enter vector to add element to
 4
 enter value to push
20
 Enter 1 to add more elements
 O sale tand the sale of
 12
```

```
13
      12
          18
16
14
  # Include < iostream>
 cusing namespace std;
  template < typename T>
  class vector
   T* ptr;
  int size, capacity;
  Public: vector ();
  Void push - back (Tval);
  void print ();
   void modify (int P, TV);
   Void scalar (Ts);
 template < typename T>
 Vector < T> :: vector ()
    ptr = new T[10];
   Capacity = 10;
     Size 20;
  template < typename T>
void vector <T>:: push -back (T val)
  fant i:
    if (capacity <= size)
   capacity * = 2;
```

```
T*p=ptr;
 Ptr=new T[capacity];
 for (i=0; i<size; i++)
   ptr [i] = p[i];
     P.
    Ptr [size] = val;
     size++;
  template < typename T>
  void vector <T>:: print ()
   int i;
   for (i=0; i<5ize; i++)
   cout << " " << * ( ptr+1);
   cout << end 1;
template < typename T>
void vector <T>:: modify (int p, TV)
    * (ptr+p)=V;
  template < typename T>
  void vector <T>:: scalar (TS)
```

```
unt i:
for (i=0; i' \ Size; i++)
 * (ptv+i) * = s;
ent main ()
 unt i, v, c = 1;
                             The state of the state of the
 Vector < int > a;
 while (c = = 1)
 cout << " Enter value to push" < cend 1;
cin >> V;
 cout << " Enter I to add more elements " << end 1;
   a. push - back (v); }
cout « original vector: "kend2;
 a. print();
 cout << " Enter position to modify "<< end 1;
  cinz>i;
  cout <<" enter value topush" << end 1;
  cin >> V;
  a modify (i, v);
                                        dung at such
```

```
Cout << " vector After modify:" < 2 end 1;
 a. print ();
 coest << "Enter scalar" << end 1;
 Cin >> v;
 a. Scalar (V);
  Cout <<" Vector After Scalar multiplication:" <<end 1;
 a. print ();
output -
Enter I to add more elements
L
Enter value do purh
 Enter I to add more elements
enter value to push
15
Enter 1 to add more elements
                     more to prome the party of the
 1
enter value to push
 16
Enter 1-to add more elements
 1
enter value to push some many many many many many many
Enter 1 to add more elements
 1
enter value to push
```

```
Enter I to add more elemente
enter value to push
                         State of Engineers of the
Enter I to add more elements
enter value to push
 20
Enter 1 to add more elements
                    one of the scalar party pulcarians and
 enter value to push
  22
 Enter 1 to add more elements
 1
enter value to push
 22
Enter 1 to add more elements
enter value to push
 23
Enter 1 to add more elements
 1
enter value to push
 24
Enter 1 to add more elements
  1
enter value to push
 25
Enter I to add more relements
  0
 original vector:
 12 13 14 15 16 17 18 19 20 21 22 23 24 25
```

Enter position to modify en west around been be enter value to push 12 13 14 15 16 17 18 19 20 21 22 23 24 25 stractices among below on Enter Scalar Vector After Scalar multiplication! 60 65 70 75 80 85 90 95 180 105 110 115 120 125 prismais sions bobb as is etromoro promi bod at

strong to many him of

A Hug of an

the could be a secured to be a second to be a secon