TUTORIAL 1

Object Oriented Concepts & Basic Java

Q1

- Based on your understanding, identify, with reasons, whether the following are mostly considered as Class, Object, Attribute (properties) or Behaviour ?
  - note : all words are deliberately capitalized

Student	NTU	Book	MichaelJackson	Age
Color	Work	Person	Person1	Result
Transformer	Engine	Liquid	Force	Shoot

Review of Concepts

- Objects
  - An entity that contains both the attributes that describe the state of a real-world object and the actions that are associated with the real-world objects
- Classes
  - A template for objects which consists of methods and state descriptions that objects belong to
- Attributes
  - The data or variables that characterize the state of an object
- Behaviour
  - What object can do, actions associated with an object. What operations can be performed upon an object.

Hints and Ideas

- Class and attribute mostly use Noun and should have that abstract ‘feel’
- A class usually should have at least 2 or more attributes to be considered as a reasonable Class
- Behaviour – use verb to indicate actions.

Answer

- Student
  - Class
- NTU
  - Object (a specific university)
- Book
  - Class
- MichaelJackson
  - Object

Answer

- Age
  - Attribute
- Color
  - Attribute
- Work
  - Behavior (action)
  - Class (a piece of work)
- Person
  - Class

Answer

- Person1
  - Object
- Result
  - Attribute
  - Class (a result details)
- Transformer
  - Class (Transformer – MegaTron)
- Engine
  - Class

Answer

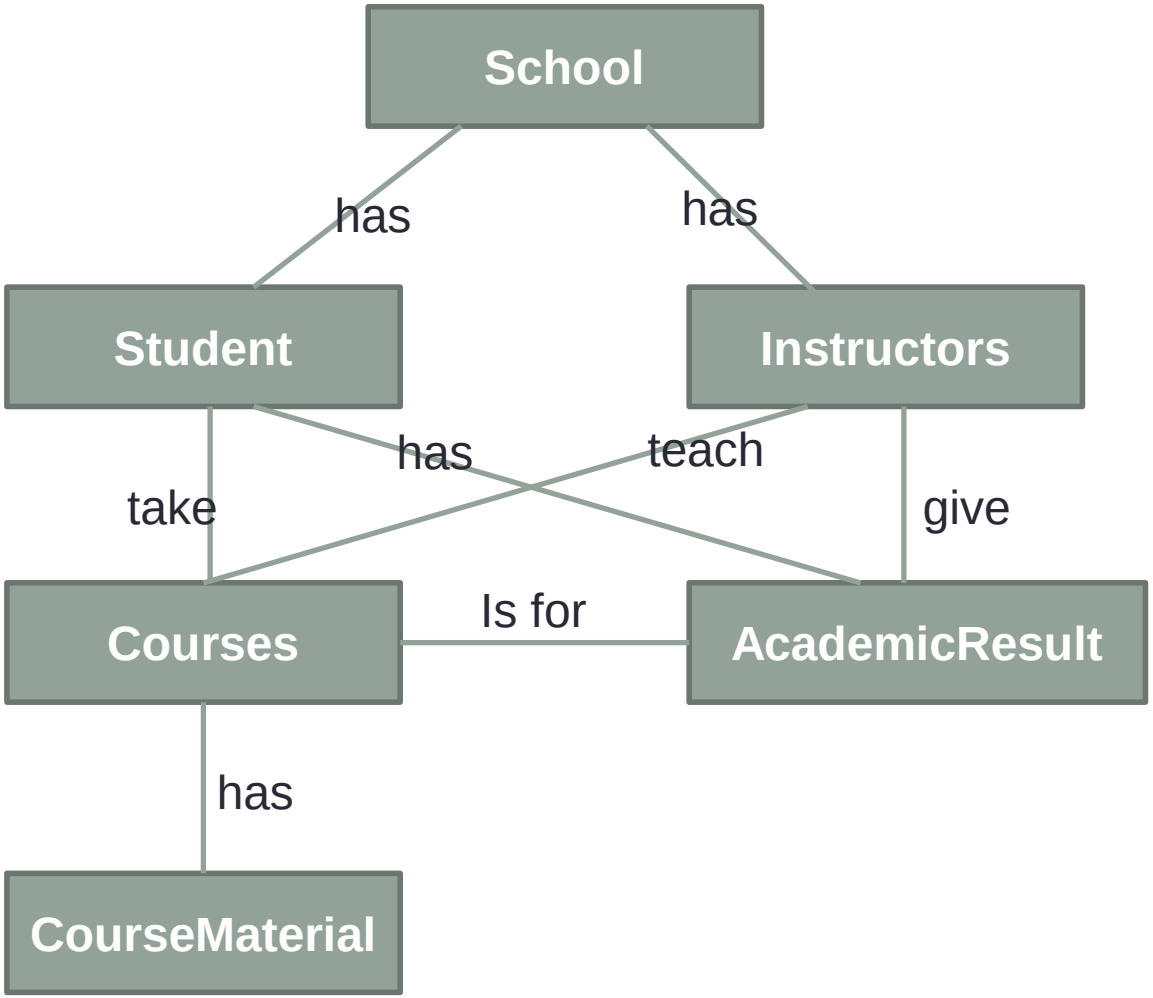
- Liquid
  - Class
- Force
  - Behaviour
  - Class (as a vector – magnitude, direction, eg)
- Shoot
  - Behaviour

Q2

- Considering School as a Class and taking an example of our school SCE, identify as many classes (at least 5) as possible relating to the School class. Show the attributes and behaviours of each class. You may draw out a hierarchy of classes.

Answer

- Student
  - student ID, name, year, courses taken, grade, program
  - register course, do assignments, attend classes
- Course
  - course code, title, instructor(s), course materials
  - add course, drop course,
- CourseMaterial
  - type (slides, video, etc.), content
  - create material, change material
- Instructors
  - staff ID, name, academic background, courses currently teaching
  - give lectures, mark exams
- AcademicResult
  - student, course, course components, grade for each component
  - check result, change result


School
has
has
Student
Instructors
has
teach
take
give
Courses
Is for
AcademicResult
has
CourseMaterial

Q3

- Convert the following Bubble sort program in C language code to Java language code by :
  - Identify the line number of the code to be changed
  - Replace with the Java language syntax.
  - Suggest any improvement to be made to the program

```c
#include<stdio.h>

void bubble(int a[],int n)
{
       int i,j,t;
    for(i=n-2;i>=0;i--)
       {
       for(j=0;j<=i;j++)
          {
            if(a[j]>a[j+1])
                     {
               t=a[j];
               a[j]=a[j+1];
               a[j+1]=t;
            }
        }
     }
  }//end function.

 int main()
  {
      int a[100],n,i;

      printf("\n\n Enter number of Integer elements to be sorted: ");
      scanf("%d",&n);

      for( i=0;i<=n-1;i++)
      {
          printf("\n\n Enter integer value for element no.%d : ",i+1);
          scanf("%d",&a[i]);
      }

      bubble(a,n);

      printf("\n\n Finally sorted array is: ");
      for( i=0;i<=n-1;i++)
            printf("%d  ",a[i]);
  } //end program.
```

```c
#include<stdio.h>

void bubble(int a[],int n)
{
       int i,j,t;
    for(i=n-2;i>=0;i--)
       {
       for(j=0;j<=i;j++)
          {
            if(a[j]>a[j+1])
                     {
               t=a[j];
               a[j]=a[j+1];
               a[j+1]=t;
            }
        }
     }
  }//end function.

 void main()
  {
      int a[100],n,i;

      printf("\n\n Enter number of Integer elements to be sorted: ");
      scanf("%d",&n);

      for( i=0;i<=n-1;i++)
      {
          printf("\n\n Enter integer value for element no.%d : ",i+1);
          scanf("%d",&a[i]);
      }

      bubble(a,n);

      printf("\n\n Finally sorted array is: ");
      for( i=0;i<=n-1;i++)
            printf("%d  ",a[i]);
  } //end program.
```

```
import java.util.Scanner;

class BubbleSort {

        public static void bubble(int a[],int n)
        {
                int i,j,t;
                for(i=n-2;i>=0;i--)
                {
                   for(j=0;j<=i;j++)
                   {
                              if(a[j]>a[j+1])
                              {
                                 t=a[j];
                                 a[j]=a[j+1];
                                 a[j+1]=t;
                              }
                         }
                  }
          }//end function.

    public static void main(String args[])
    {
          int n,i;
          int a[] = new int[100];

        System.out.print("\n\n Enter number of Integer elements to be sorted: ");
        Scanner in = new Scanner(System.in);
        n = in.nextInt();
        for( i=0;i<=n-1;i++)
        {
         System.out.print("\n\n Enter integer value for element no. " + (i+1) + " :
" );
                         a[i] = in.nextInt();
        }
            bubble(a,n);

           System.out.print("\n\n Final sorted array is : ");
                for( i=0;i<=n-1;i++)
                      System.out.print(a[i] + "    " );

                System.out.println() ; // optional
          } //end program.
}
```

A3

- One improvement is to create the array only after user enter the size – save on memory usage.