18. Enum

Enum (Enumeration – 1.5 version) :—

→ If we want represent a group of constants then we should go for enum.

Ex:

```
enum Month
{
  JAN, FEB, MAR, - - - - -, DEC;
}
```

```
enum Beer
{
  KF, KO, RC, FO;
}
```

↳ optional (semicolon)

→ The main purpose of enum is to define our own data types like Enumerated data types.

→ Enum concept introduced in 1.5 version.

→ When compared with old languages enum Java enum is more powerful.

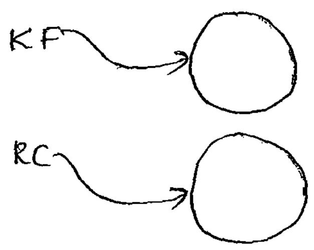
Internal implementation of Java enum :—

→ Every enum internally implemented by using class concept.

→ Every enum constant is always public static final.

→ Every enum constant represents an object of the type enum.

```
enum Beer              →  class Beer
{                         {
  KF, RC;                 →  public static final Beer KF=new Beer();
}                         →  public static final Beer RC=new Beer();
                          }
```



Enum Declaration and Usage :—

→ Every enum constant is always static & hence we can access by using enum name.

Ex:
```
enum Beer
{
  KF, KO, RC, FO;
}
class Test
{
  p s v m(-)
  {
    Beer b=Beer.RC;
    S.o.p(b); => O/P : RC
  }
}
```

Note:- Inside enum toString() method internally implemented to return name of the constant.

→ We can declare enum either outside a class or within the class, but not inside a method.

→ If we are trying to declare enum inside a method then we will get CE.

Ex:
```
enum X          | class X         | class X
{               | {               | {
}               |   enum Y        |  public void m1()
class Y         |   {             |  {
{               |   }             |    enum Y
}               | }               |    {
                |                 |    }
  ✓             |   ✓             |  }
                |                 | }  ✗   CE: enum types must
                |                 |            not be local
```

→ If we declare enum outside the class the applicable modifiers are public, <default> and strictfp.

→ If we declare enum within the class the applicable modifiers are

public + private
<default> + protected
strictfp + static

enum Vs switch statement :—

→ For the switch statement allowed argument types until 1.4 version are byte, short, char and int.

→ But from 1.5 version onwards the corresponding wrapper classes & enum types allowed.

1.4 V	1.5 V	1.7 V
byte short char int	Byte Short Character Integer + enum	String

→ Hence from 1.5 version onwards we can pass enum type also as argument to switch statement.

Ex:
```
enum Beer
{
 KF, KO, RC, FO;
}

class Test
{
 p s v m(-)
 {
  Beer b= Beer. RC;
  switch(b)
  {
   case KF : S.o.p("It is children's brand");
             break;
   case KO : S.o.p(" It is too light");
             break;
   case RC : S.o.p("It is not that much kick");
             break;
   case FO : S.o.p(" Buy one get one free");
             break;
   default : S.o.p("Other brands are not
                                 recommended");
             break;
  }
 }
}
```

o/p : It is not that much kick

→ If we pass enum type as argument to switch statement then every case label should be valid enum constant, o.w. we will get CE.

Ex:
```
switch(b)
{
✓ case KF:
✓ case KO:
✓ case RC:
✓ case FO:
✗ case KALYANI:
}
```
CE: unqualified enumeration constant name required.

enum vs Inheritance :—

1. Every enum in Java is direct child class of java.lang.Enum class. Hence our enum can't extend any other enum.

2. Every enum is always final implicitly & hence we can't create child enum.

→ Becoz of above reasons we can conclude inheritance concept not applicable for enum's explicitly.

→ Hence we can't use extends keyword for enum's.

Ex:
```
enum X
{ }
enum Y extends X
{
}
        ✗
```
```
enum X extends j.l.Enum
{

}
        ✗
```
```
class X
{
}
enum Y extends X
{

}
        ✗
```
```
enum X
{
}
class Y extends X
{
}
```
CE1: cannot inherit from final X
CE2: enum types are not extensible

→ An enum can implement any no. of interfaces simutaneously.

Ex:
```
interface X
{
}
enum Y implements X
{
}
```
✓

java.lang.Enum :—

→ Every enum in Java is the direct child class of j.l.Enum class.

→ Hence this class acts as base class for all Java enums.

→ It is an abstract class and direct child class of Object.

→ It implements Comparable & Serializable interfaces.

values() method :—

→ We can use values() method to list out all values present inside enum.

Ex:
```
Beer[] b=Beer.values();
```

ordinal() method:—

→ Within the enum order of constants is important & we can represent order by using ordinal value.

→ We can find ordinal value of enum constant by using ordinal() method.

```
public final int ordinal();
```

Ex:
```
enum Beer
{
  KF, KO, RC, FO;
}
class Test
{
  p s v m()
  {
    Beer[] b=Beer.values();
    for(Beer b1 : b)
    {
      S.o.p(b1+"..."+b1.ordinal());
    }
  }
}
```

O/P :
```
KF ... 0
KO ... 1
RC ... 2
FO ... 3
```

Note:- ordinal value is zero based.

Speciality of Java enum :—

→ In old languages enum, we can take only constants but in Java enum in addition to constants we can take methods, constructors, normal variables etc.

→ Hence Java enum is more powerful than old languages enum.

→ Inside enum we can take main(–) method & hence we can invoke Enum class directly from command prompt.

Ex:

```
enum Fish
{
   STAR, GUPPY, GOLD;
   p s v m(–)
   {
     S.o.p("Enum main method");
   }
}
```

```
javac Fish.java ↵
java Fish ↵
```

o/p: Enum main method.

→ In addition to constants, if we are taking any extra member like a method then list of constants should be in the first line & should ends with semicolon(;).

Ex:

```
enum Fish
{
  STAR, GUPPY;
  public void m1()
  {
  }
}      Mandatory
```

```
enum Fish
{
  STAR, GUPPY
  public void m1()
  {
  }
}   ✗
```

```
enum Fish
{
  public void m1()
  {
  }
  STAR, GUPPY;
}   ✗
```

→ If we are taking any extra member like a method then first line should contain list of constants atleast semicolon.

Ex:

```
enum Fish
{
  public void m1()
  {
  }
}   ✗
```

```
enum Fish
{
  ;
  public void m1()
  {
  }
}   ✓
```

→ Anyway an empty enum is valid.

Ex:
```
enum Fish
{
} ✓
```

enum Vs constructors :—

→ enum can contain constructors and enum constructors will be executed at the time of enum class loading automatically for every enum constant.

Ex:
```
enum Beer
{
  KF, KO, RC, FO;
  Beer()
  {
    S.o.p("constructor");
  }
}
class Test
{
  p s v m(_)
  {
    Beer b=Beer.KF; ——→ ①
    S.o.p("Hello");
  }
}
```

$$\begin{tikzcd}
 & \text{javac Test.java} \arrow[dl] \arrow[dr] & \\
\text{Beer.class} & & \text{Test.class}
\end{tikzcd}$$

java Test

o/p :
```
constructor
constructor
constructor
constructor
Hello
```

→ If we comment line ① then the o/p is Hello.

→ We can't create enum object explicitly by mistake if we are trying to create then we will get compile time error.

→ Hence we can't invoke enum constructor directly.

Ex: Beer b=new Beer(); ✗

CE: enum types may not be instantiated.

Note:—

```
KF ⇒ p s final Beer KF=new Beer();
KF(100) ⇒ p s final Beer KF=new Beer(100);
```

Ex:

```
enum Beer
{
  KF(100), KO(90), RC(95), FO;
  int price;
  Beer(int price)
  {
    this.price=price;
  }
  Beer()
  {
    this.price=65;
  }
  public int getPrice()
  {
    return price;
  }
}
```

```
class Test
{
  p s v m(-)
  {
    Beer[] b= Beer.values();
    for(Beer b1 : b)
    {
      S.o.p (b1+"..."+b1.getPrice());
    }
  }
}
```

o/p :
```
KF ... 100
KO ... 90
RC ... 95
FO ... 65
```

Note:- Inside enum we can take methods, but should be concrete methods i.e.; we can't take abstract methods inside enum.

Ex(i): Every enum constant represents an object of the type enum. Hence whatever the methods we can call on normal Java objects we can call same methods on enum constants also.

✓1. Beer.KF.equals(Beer.RC)

✓2. Beer.KF == Beer.RC

✓3. Beer.KF.hashCode() > Beer.RC.haseCode()

✗4. Beer.KF > Beer.RC

✓5. Beer.KF.ordinal() > Beer.RC.ordinal()

Case(ii):

```
enum Color
{
  BLUE, RED, GREEN;
  public void info()
  {
    S.o.p("Universal Color");
  }
}
```

```
enum Color
{
  BLUE, RED{
              public void info()
              { S.o.p("Dangerous Color");
              }
            }, GREEN;
```

```
class Test
{
 p s v m(-)
 {
   Color[] c= Color.values();
   for(Color c1 : c)
    {
      c1.info();
    }
  }
}
```

O/p: Universal Color
Universal Color
Universal Color

```
public void info()
 { S.o.p("Universal Color");
 }
}
class Test
{
 p s v m(-)
 {
   Color[] c = Color.values();
   for (Color c1 :c)
    {
      c1.info();
    }
  }
}
```

O/p: Universal Color
Dangerous Color
Universal Color

**
Case(iii): enum Vs Enum Vs Enumeration :-

1) enum:-

→ enum is a keyword in Java which can be used to define a group of named constants.

2) Enum:-

→ It is a class present java.lang package.
→ Every enum in Java should be direct child class of this Enum class.
→ Hence Enum class acts as base class for all Java enums.

3) Enumeration:-

→ It is an interface present in java.util package.
→ We can use Enumeration object to get objects one by one from the Collection.

Case(iv):

Note:- If we want to use class name directly from outside package we have to use normal import.

If we want to access static members directly without class name then we have to use static import.

Ex:

```
package pack1;
public enum Fish
{
  STAR, GUPPY;
}
```

```
package pack2;

class Test1
{
  p s v m(--)
  {
    Fish f = Fish. GUPPY;
    S.o.p(f)
  }
}
```

The required import is

```
import pack1. Fish;
        (or)
import pack1. *;
```

```
package pack3;

class Test2
{
  p s v m(--)
  {
    S.o.p(GUPPY);
  }
}
```

The required import is

```
import static pack1.Fish.GUPPY;
        (or)
import static pack1. Fish.*;
```

```
package pack4;

class Test3
{
  p s v m(--)
  {
    Fish f = Fish. GUPPY;
    S.o.p(STAR);
  }
}
```

```
import static pack1.Fish.STAR;
        (or)
import static pack1.Fish.*;
```

```
import pack1. Fish;
        (or)
import pack1.*;
```