Supplementary Exercise on Factory Pattern

(a) Draw a class diagram to illustrate the Factory Method Design Pattern. State and briefly describe the roles of the classes in your class diagram. Show all necessary method(s), association(s) and note(s) for explanation in your class diagram.

[6 marks]

(b) Norman is a junior programmer. He has written the following Java classes for a manufacturing application:

```
public class PadInfo {
  public void showDetailInfo() {
     Pad p = new APad();
     System.out.println("The "+ p.getBrand()+ " pad runs at " +
        p.getMhz() + " MHz");
  }

  public static void main(String[] args) {
    PadInfo p = new PadInfo();
    p.showDetailInfo();
  }

}// end PadInfo class

public abstract class Pad {
  private int mhz;
  private String brand;
  public int getMhz() { return mhz; }
  public void setMhz(int mhz) {this.mhz = mhz;}
  public String getBrand() { return brand; }
  public void setBrand(String brand) { this.brand = brand;}
} // end Pad class

public class APad extends Pad {
  public APad(){
    super.setMhz(500);
    super.setBrand("AnyPad");
  }
} // end APad class
```

The *PadInfo* class is used to display the information about a given *Pad*. Norman has shown his program to his supervisor, Larry. Larry said the manufacturing application should be easily extended to display the information of other subclasses of the *Pad* class in the future. For example, the *NewAPad* has just been introduced to the market. The brand of *NewAPad* is "Samchung". The *NewAPad* runs at 600Mhz.

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The *NewAPad* class is shown below:

```
public class NewAPad extends Pad {
  public NewAPad(int mhz, String brand){
    super.setMhz(mhz);
    super.setBrand(brand);
   }
} // end NewAPad class
```

You are asked to apply the Factory Method Design Pattern to re-design Norman's program so that his program can be easily extended for displaying the information of new subclasses of the *Pad* class.

Draw a class diagram to show your new design of the program. Show all the necessary classes, association(s), inheritance(s), method(s), and dependencies in your class diagram. Show the class for displaying the information of the *APad* object and the class for displaying the information of the *NewAPad* object in your diagram.

[8 marks]

(c) Referring to the class diagram given in your answer to Q4 part (b), write Java codes for implementing the class for displaying the information of the *APad* object and the class for displaying the information of the *NewAPad* object.

[7 marks]

(d) Write down **ONE** difference between the Factory Method Design Pattern and the Abstract Factory Design Pattern. Give a situation in which the Abstract Factory Design Pattern is more suitable than the Factory Method Design Pattern. [4 marks]