COP3330C Module 5 Practice Exercise

In this practice exercise we will modify the birthday card application by applying the Factory Method pattern in order to delegate the responsibility for instantiating birthday cards to factory subclasses for each age category. We will also implement a lambda expression which allows the factories to send the card.

We will continue using the age categories created in the Module 4 practice exercise, but we no longer need the enumerated type as the individual factories will create the appropriate birthday card.

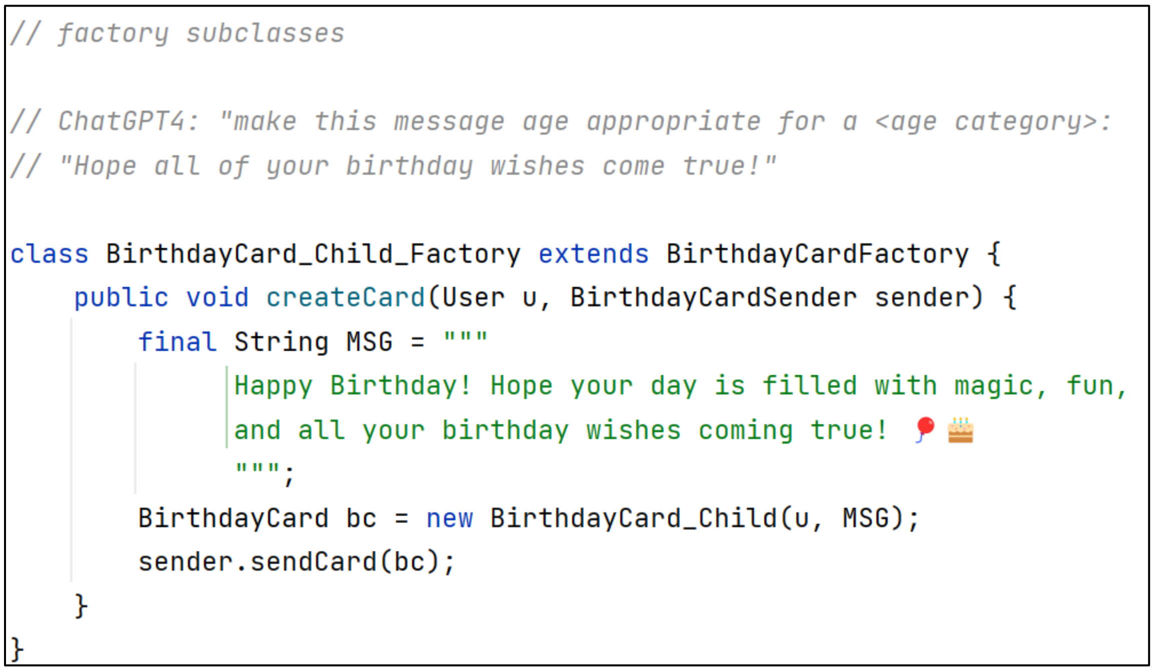
A String parameter has been added to the BirthdayCard constructor to allow the use of a custom message:

```java
public BirthdayCard(User user, String msg) {
    this.user = user;
    System.out.println("building card for " + this.getClass().getSimpleName());
    this.buildCard(user, msg);
}
```

Change the BirthdayCardFactory class to declare it as abstract and provide an abstract method specification as the only method in that class (remove the other code from Module 4 createCard method). The BirthdayCardSender parameter used here is a reference to the BirthdayCardSender interface.

```java
public abstract class BirthdayCardFactory {
    public abstract void createCard(User u,
                                    BirthdayCardSender sender);
}
```

For each age category, create a factory subclass which inherits from BirthdayCardFactory. Here is the subclass for the Child age category (note the use of ChatGPT to generate age-appropriate messages).



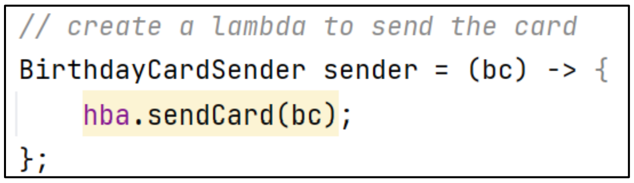
```java
// factory subclasses

// ChatGPT4: "make this message age appropriate for a <age category>:
// "Hope all of your birthday wishes come true!"

class BirthdayCard_Child_Factory extends BirthdayCardFactory {
    public void createCard(User u, BirthdayCardSender sender) {
        final String MSG = """
                Happy Birthday! Hope your day is filled with magic, fun,
                and all your birthday wishes coming true! 🎈🎂
                """;
        BirthdayCard bc = new BirthdayCard_Child(u, MSG);
        sender.sendCard(bc);
    }
}
```

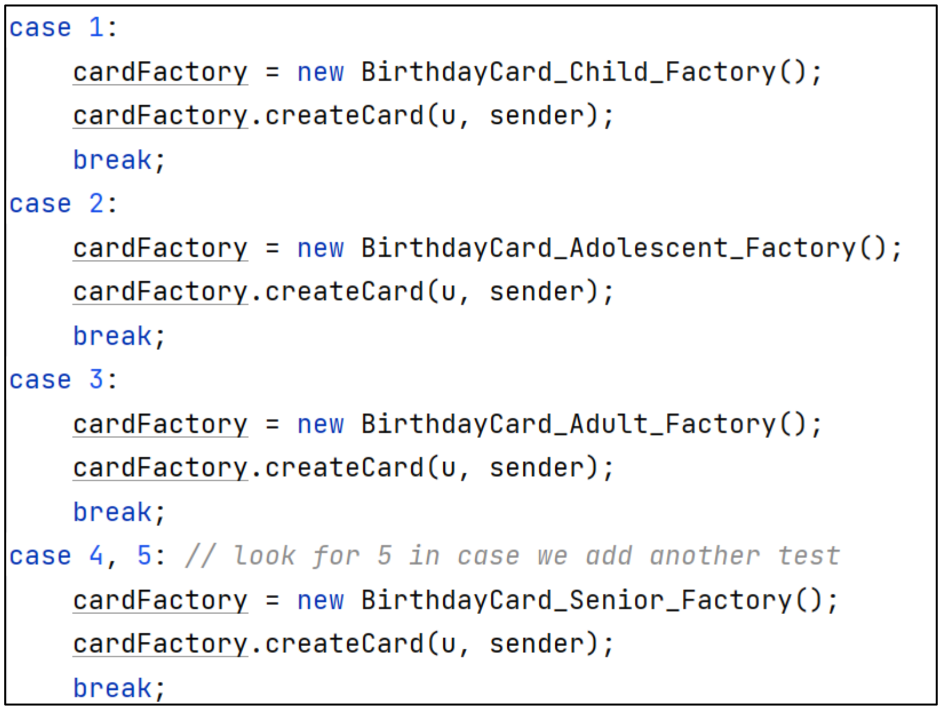
Each factory’s createCard method instantiates and sends a birthday card for the Child category. There are three more of these subclasses implemented in the solution for the remaining age categories.

In the HappyBirthday application’s main method, a lambda expression is created to pass to the createCard method so it can send the card:



```java
// create a lambda to send the card
BirthdayCardSender sender = (bc) -> {
    hba.sendCard(bc);
};
```

We then instantiate a factory subclass object for each birthday card category, then create/send the card.



```
case 1:
    cardFactory = new BirthdayCard_Child_Factory();
    cardFactory.createCard(u, sender);
    break;
case 2:
    cardFactory = new BirthdayCard_Adolescent_Factory();
    cardFactory.createCard(u, sender);
    break;
case 3:
    cardFactory = new BirthdayCard_Adult_Factory();
    cardFactory.createCard(u, sender);
    break;
case 4, 5: // look for 5 in case we add another test
    cardFactory = new BirthdayCard_Senior_Factory();
    cardFactory.createCard(u, sender);
    break;
```

Sample Output (I have added a debugging println in the BirthdayCard constructor to indicate which card subclass being generated).

```
Here are the birthdays:
Miles Bennell:
Sorry, today is not their birthday.

Becky Driscoll:
building card for BirthdayCard_Child
Birthday card for Becky Driscoll
|----------------------------------------------------------|
| Happy Birthday! Hope your day is filled with magic, fun, |
|      and all your birthday wishes coming true! 🎈 🎂       |
|----------------------------------------------------------|

sending email to Becky.Driscoll@email.test

Jack Belicec:
building card for BirthdayCard_Adolescent
Birthday card for Jack Belicec
|--------------------------------------------------------|
| Happy Birthday! Hope your day is as awesome as you are |
|      and all your birthday wishes come true! 🎉 🎈       |
|--------------------------------------------------------|

sending email to Jack.Belicec@email.test
```

```
Theodora Belicec:
building card for BirthdayCard_Adult
Birthday card for Theodora Belicec
|------------------------------------------------------------|
|                       Happy Birthday!                      |
| Here's to a wonderful year ahead, filled with joy, growth, |
|  and every single one of your birthday wishes coming true. |
|                           Cheers!                          |
|------------------------------------------------------------|

sending email to Theodora.Belicec.@email.test

Sally Withers:
building card for BirthdayCard_Senior
Birthday card for Sally Withers
|------------------------------------------------------------|
|                       Happy Birthday!                      |
|   May this special day bring you cherished memories, joy   |
|          in the present, and hopes for the future.         |
|  Wishing all of your birthday dreams and wishes come true! |
|------------------------------------------------------------|

sending email to Sally.Withers@email.test
```