PMA Exam 2023 Answers

Question 1
a) False
b) True
c) False
d) True
e) False
f) True
g) True
h) False
i) True
j) True

[1 mark for each correct part]

Question 2
```
dd bb
[10 marks]
```

Question 3
a) The borrow(j: Journal) method defined in MemberOfStaff overloads the borrow(c: Copy) method defined in LibraryMember. return and reserve are also overloaded in MemberOfStaff.
b) The numItemsOnLoan() method in MemberOfStaff overrides the numItemsOnLoan() method in LibraryMember.
c) 1
d) 2
e) Only if they are MemberOfStaff objects.

[2 marks for each correct part]

Question 4
```
2 4 YesYes
6 8 NoNo 10 MaybeMaybe
```
One mark for each of the 11 items (up to a maximum of 10), provided they are in the right order relative to the other items. Full marks only for a complete correct answer.
[10 marks]

Question 5
a) Any one instance of the following:
   - toString definitions in lines 9 and 16 override definition of toString in Object class
   - toString definitions in lines 37 and 47 override definition in Shape class in line 16
   - equals definition in line 26 overrides equals definition inherited from Object class
   Note that the definition of compareTo in line 17 implements an abstract method declared in an *interface*, so it is not a valid answer because the question states that the overridden method must be in a *superclass*. Note that getArea is **not** a valid

answer, as it **implements** an abstract method **declared** in the superclass Shape, whereas the question calls for a method that **overrides** a method **defined** in a superclass. In the case of getArea, there is no definition being overridden because no implementation is provided in Shape.
b) The toString method definitions in lines 37 and 47 call the method implementation from the superclass that these definitions override using the super reference.
c) The Shape class implements the Comparable interface.
d) Rectangle and Circle extend the abstract class Shape.
e) The getArea() method declared in line 14 is implemented in lines 36 and 46 in the Circle and Rectangle classes, respectively.

[2 marks for each correct part]

Question 6

a) The variable s in line 57, the variable shape in line 17, the variable obj in line 26.
b) Rectangle in line 53 has area 3
   Rectangle in line 54 has area 1
   Circle in line 55 has area 3
   Circle in line 56 has area 12
c)
```
Rectangle: (1.0,3.0), 3.0
Rectangle: (2.0,1.0), 1.0
Circle: (1.0,3.0), 3.0
Circle: (1.0,3.0), 12.0
```
d) The Rectangle in line 53 is equal to the Circle in line 55.
e)
```
Rectangle: (1.0,3.0), 3.0
Circle: (1.0,3.0), 12.0
Rectangle: (2.0,1.0), 1.0
```

[2 marks for each correct part]

Question 7

Two sequences of integers, starting with 6 and ending either with "10 Red thread won!" or "0 Green thread won!". Each number must be one different from the previous one.
There is a small probability that the sequence starts with a 4, but this only happens if GREEN_LIGHT is made true by the green thread before the red thread first checks whether the GREEN_LIGHT is false, which will not happen under normal circumstances.
Here are some example outputs:

```
6 7 6 7 6 5 6 5 4 3 2 3 2 1 0 Green thread won!

6 5 6 7 8 7 8 7 6 7 6 7 6 7 6 5 6 5 4 5 4 3 2 3 4 3 4 3 4 5 4 3 4 5 6 5 4 5 4 5 6
5 4 5 6 5 6 5 6 5 6 7 6 7 8 7 8 7 8 7 8 7 8 9 8 7 8 7 8 9 8 9 10 Red thread won!
6 5 6 7 6 5 6 5 6 7 6 7 6 7 8 9 8 7 8 9 8 9 8 9 10 Red thread won!
6 5 6 5 6 5 6 5 6 5 4 5 6 5 4 5 4 5 4 5 6 5 6 7 6 7 6 7 8 9 8 9 8 9 10 Red thread
won!
6 7 6 7 6 7 6 7 6 5 6 5 6 7 8 7 8 7 8 7 6 7 8 7 8 7 8 7 8 7 6 5 6 5 4 5 4 5 6 5 4
5 4 3 4 5 4 3 4 5 4 5 4 3 4 5 4 5 4 5 4 3 4 3 2 3 2 3 2 3 2 3 2 3 2 1 2 3 2 1 0 Green
thread won!
```
[10 marks for two correct sequences]

Question 8

a) Because the GUI needs to be run on the event dispatch thread. This is because the Swing framework code is not thread-safe. invokeLater runs the GUI asynchronously.

b) It causes the label to be placed into the LINE_START region of the border layout, which is to the left of the center region. If it were not present, then the label would be placed in the center region by default.

c)

When the button is pressed, Bing changes to Bang. If the label is already showing "Bang", then it changes back to "Bing".

d) pack computes the positions and sizes of all the elements in the content pane in preparation for rendering the GUI on the screen.

e) If line 22 were deleted, pressing the button would cease to have any effect.

[2 marks for each correct part]

Question 9

a) onPause, onResume, onCreate. [2 marks]

b) Streaming sensor because the sensor delay is set to normal (SensorManager.SENSOR_DELAY_NORMAL). If sensor has a non-zero delay, then it is a streaming sensor. [2 marks]

c) It unregisters the light sensor so that it stops sending signals when the Activity is in the paused state. This saves resources and also makes sure that resources are freed up if the Activity is killed while it is in the paused state. [3 marks]

d) "this" SensorActivity object serves as the SensorEventListener. The onSensorChanged callback runs when a sensor event is emitted. If the accuracy of the sensor is changed, then the onAccuracyChanged callback is run. [3 marks]

Question 10

a) line 24, implicit [1 mark]

b) onCreate [1 mark]

c) It is used to identify the intent received by onActivityResult as being in response to the call to startActivityForResult in line 26. [2 marks]

d) i. The Button object. [1 mark];
   ii. It defines the resource id of the button which is stored in the R.java file. The "@id/" component defines the value to be an id and the "+" indicates that this is the first time that the id is defined and that it should therefore be added to the R.java file. [2 marks]

e) A Bundle is an associative array used to store arbitrary data as key—value pairs. The key is a string and the value is always a byte array. The Bundle object is used in lines 32-33 of onActivityResult to store the bitmap returned by the camera in the Intent. [2 marks]

f) Because the lhs variable has type Bitmap and the get method returns a raw byte array. [1 mark]