

Med2 PFI Examination 2017

12 June 9.00 – 13.00

Question 1

- (a) A man-month or person-month is the amount of work or effort that can be carried out by one person in one month. [1 mark]
- (b) 2 months (neglecting the effects of extra communication and management). [1 mark]
- (c) If the communication between team members is not restricted and we can assume that the same amount of communication takes place between each pair of team members, then doubling the number of team members theoretically increases the total amount of communication by a factor of $(4n-2)/(n-1)$ when there are initially n members in the team. In other words, for large enough n , the amount of communication increases by approximately 4 times. [2 marks]
- (d) Because the man-month fails to take into account the amount of time spend by team members on communicating with each other and managing the project. [1 mark]

Question 2

- (a) No. [1 mark]
- (b) Yes. [1 mark]
- (c) Circle is a subclass of Shape. [1 mark]
- (d) The `display()` method in Circle overrides the `display()` method in Shape. [1 mark]
- (e) `s` is polymorphic because it refers at objects of various runtime types (Shape, Triangle, Circle, Square) at different instants in time while the program is running. [1 mark]

Question 3

- (a) The output of the program is:

-10 is negative and even
-5 is negative and odd
0 is positive and even
4 is positive and even
9 is positive and odd

[1 mark]

- (b) So that it can be called directly from the static method, main, in line 17. If it were not static, then an instance of the Question3 class would have to be constructed and then the d() method would need to be run on that instance. [1 mark]
- (c) The keyword void indicates that the method does not return a value. [1 mark]
- (d) The main method takes a single argument which must be an array of String objects. If the program is run from the console or command line, any arguments typed on the command line after the program name are stored in this array and made available to the program. [2 marks]

Question 4

- (a) Aggregation. [1 mark]
- (b) 12 or more. [1 mark]
- (c) 1 or more. [1 mark]
- (d) Degree programme is the container object [1 mark].
If a Degree programme object is destroyed, then the Course objects it contains are not destroyed. [1 mark]

Question 5

The output of the program is

```
null  
(3, -1)  
(0, 0)
```

[5 marks]

Question 6

```
38 B[] bList = { objD, objE, objF, objG };  
39 C[] cList = { objD, objE, objF, objG };  
40 D[] dList = { objD, objE, objF, objG };  
41 E[] eList = { objD, objE, objF, objG };  
42 F[] fList = { objD, objE, objF, objG };  
43 G[] gList = { objD, objE, objF, objG };
```

[5 marks, 1 mark if 1 or 2 correct, 2 marks if 3 correct, 3 marks if 4 correct, 4 marks if 5 correct, 5 marks if all correct]

Question 7

Line 11: u is not static, therefore cannot be accessed in a non-static way from the main method

Line 12: as for Line 11, v needs to be declared as static if it is going to be accessed directly from the main method.

Line 13: x is declared as final and initialized in line 5. It therefore cannot be changed in this line.

Line 14: No error in this line.

Line 15: z is not static and therefore cannot be accessed directly from main. Even if it were static, it is declared as final, so its value cannot be changed.

Line 16: No error.

Line 17: No error. (Can access a private field from within the same class.)

Line 18: x is final so its value cannot be changed. Will also get a warning about accessing x in a non-static way through a particular instance of its containing class rather than through the class itself.

Line 19: No error, though will get a warning about accessing q.y in a non-static way.

Line 20: z is final so its value cannot be changed.

[1/2 mark for each line]

Question 8

(a) 2 (one reserving and one borrowing) [1 mark]

(b) The borrow(), return() and reserve() methods overload the methods with the same selector in LibraryMember. The numItemsOnLoad() method in MemberOfStaff overrides the method with the same selector in LibraryMember. [2 marks, ½ mark for each method]

(c) Any number. [1 mark]

(d) Not unless the LibraryMember is a MemberOfStaff. A MemberOfStaff is a special type of LibraryMember that can borrow Journal objects. [1 mark]

Question 9

012341234234344

[5 marks for a correct answer, 0 marks for an incorrect one]

Question 10

4a
1.5
0.5
i11
2.0x

[5 marks, 1 mark for each line in the output]

Question 11

i too low
i too low
i just right
i just right
i too high

[5 marks, 1 for each line, 4 marks for 6 lines where first 5 are as above]

Question 12

- (a) a, b, d [2 marks, 1 if partially correct]
- (b) Line 35 causes the main method to block for approximately half a second after starting thread2. This gives the threads approximately half a second to run before they are interrupted in lines 39 and 40. [1 mark]
- (c) Lines 12, 24, and 35. [2 marks, 1 if partially correct]

Question 13

- (a) The following is written to the console window by the client program:

4
9
16
0

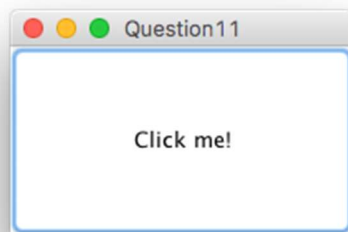
[1 mark]

- (b) Nothing [1 mark]

- (c) The `InputStreamReader` converts a stream of bytes (an `InputStream`) into a stream of characters. [1 mark]
- (d) 50000 is the port number on which the server program is running. [1 mark]
- (e) The `accept` method blocks the current thread until an incoming connection request is received by the server. At that point, the method returns a reference to the remote `Socket` from which the connection request was received. [1 mark]

Question 14

(a)



[1 mark]

- (b) The `actionPerformed()` method is called (defined in line 4). This method changes the text on the button to "You clicked me!". [1 mark]
- (c) The `Question11` object constructed in line 14 serves as an `ActionListener`. [1 mark]
- (d) The `invokeLater()` method schedules the `Runnable` object given to it as an argument to be run on the event dispatch thread. [1 mark]
- (e) In line 7, the `getContentPane()` method returns a reference to the `JFrame`'s content pane, which is where all the GUI components are stored (apart from the menubar). The button object is then added to this content pane. [1 mark]

Question 15

c, d, e, f and h are true

- (a) False (the intent is sent via the OS)
- (b) False (it's the other way around)
- (c) True
- (d) True
- (e) True

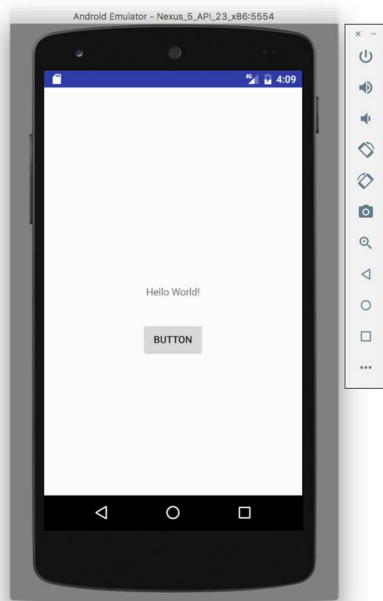
- (f) True
- (g) False (it's a linux-based system)
- (h) True
- (i) False (the process for an app starts whenever a component of the app is started, e.g., as a result of being requested via an intent from another app)
- (j) False (R.java is updated automatically)

[1/2 mark for each one correct]

3 3

Question 16

(a)



[1 mark]

- (b) When the button is clicked, the `buttonPressed` method runs, which changes the text on the button to "Button pressed". [1 mark]
- (c) Line 6, in the call to `setContentView()` [1 mark]
- (d) The view object provided as an argument to the `buttonPressed` click event handler method is type cast to a `Button` object. This is necessary in order to be able to call the `setText` method in the next line. [1 mark]
- (e) In line 26 of `activity_main.xml`, the resource id for the `Button` object is defined. This will be stored in the `R.java` file. The `@id` indicates that the type of the resource is an id; the "+" sign indicates that the id should be added as a new resource (i.e., it has not previously been used). [1 mark]