OOSE Exam 2012 Answers

1. B

2. C

3.
0
1
2
3
4

4.
```
-0.0 int
-0.5 float
0.0 int
0.5 float
```

5.

Thing is an identifiable thing, concept.

Behavior is what the object can do – defined by its methods, which determin the messages that it can respond to.

State is the set of values stored in the variables or fields or data members inside the object.

Identity: determined by location of object in computer memory. Two objects can have the same state without having the same identity.

6.
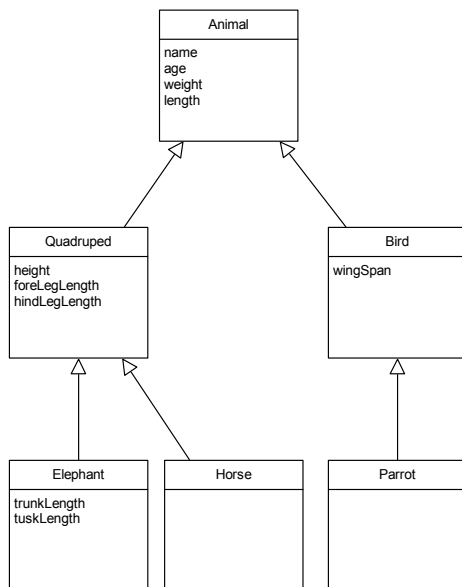
7.

Sketch mode: Description of system for communicating specific information to humans that leaves out many details that are not required.

Blueprint mode: Description of system which is sufficiently detailed for a programmer to be able to implement it.

Programming mode: Actually generating executable code automatically from a UML design.

8.

Used to help with identifying classes when designing in system.

Steps: 1. Take concise description of requirements. 2. Underline all noun phrases. 3. This gives candidate classes. 4. Remove inappropriate classes to get initial class list for system.

9.

a. 1 or more

b. Yes

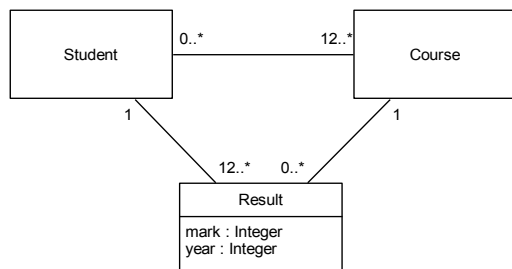c. No books. Only copies of books. Can borrow any number.

d. 0 to 2.

10.

a. An association class to represent that association between the Student class and the Course class.

b. It can't, because there can only be one instance of an association class for any given (Student, Course) pair.

c.

Advantage here is that we can have two or more Result objects associated with the same (Student, Course) pair.

11.

3
4

12.

(0,0)

(0,0,0)

13.

Line 2 should be:

```
public static int add(int x, int y) {
```

14.

```
[0, 1, 2, 0, 1]
[0, 1, 2]
```

15.

a. Synchronous
b. Return value returned by okToBorrow() method.
c. boolean
d. LibraryMember
e. Copy

16.

a. Class
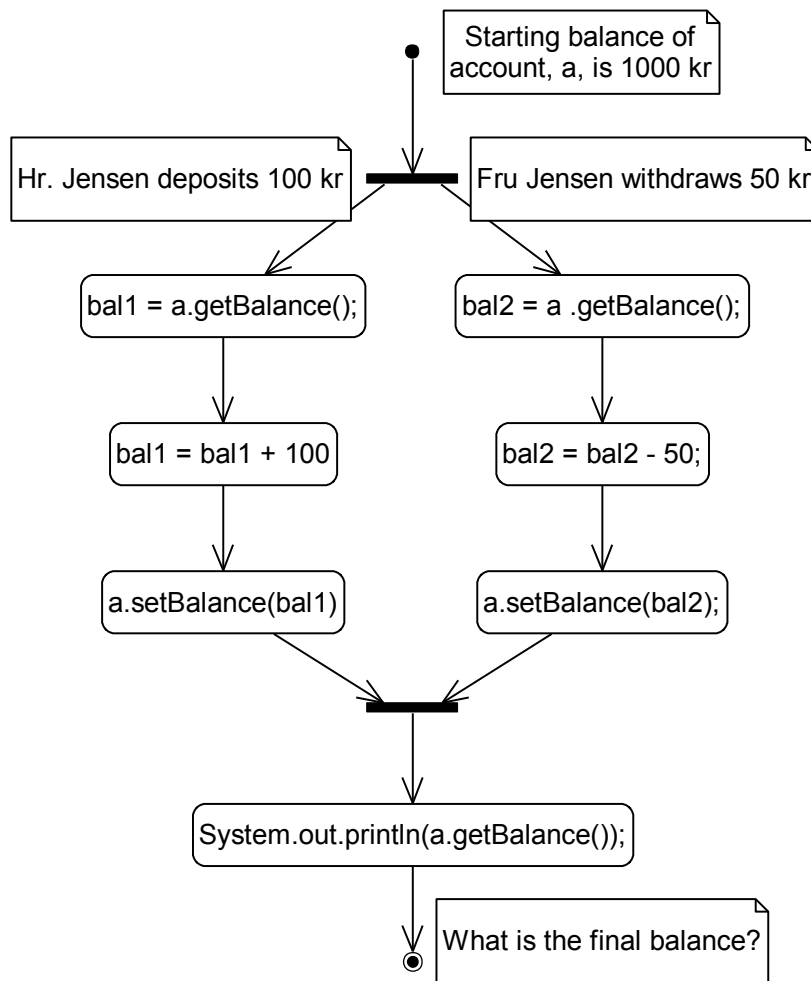b. Asynchronous message
c. Student
d. PersonalTutor
e. Student

17.
a. The wizard transitions to the state "Display new hardware window"
b. The "search" event.
c. If the "Searching" state completes uninterrupted, then it transitions to "Display new hardware window". If the "Searching" state is cancelled, it transitions to "Update hardware window".
d. An (internal) event
e. Events.

18.
a. Activity diagram.
b. Time signal. 2 hours before flight, it sends a token to the "Pack bags" action.
c. Join. When it has received a token from both "Pack bags" and "Taxi arrives", it sends on a token to "Leave for airport".
d. Accept signal. Starts listening at the beginning of the activity. When a taxi arrives, it sends a token on to the join.

19.
Race condition is where interference occurs on a data-object because of two threads accessing it in an interleaved manner. The example they were shown was as follows:

```
                    ┌─────────────────────────┐
                    │ Starting balance of     │
          ●─────────│ account, a, is 1000 kr  │
                    └─────────────────────────┘
┌──────────────────────┐  ▅▅▅▅  ┌──────────────────────────┐
│ Hr. Jensen deposits 100 kr │        │ Fru Jensen withdraws 50 kr │
└──────────────────────┘          └──────────────────────────┘

   ┌──────────────────────┐      ┌──────────────────────┐
   │ bal1 = a.getBalance(); │      │ bal2 = a .getBalance(); │
   └──────────────────────┘      └──────────────────────┘

      ┌──────────────────┐          ┌──────────────────┐
      │ bal1 = bal1 + 100 │          │ bal2 = bal2 - 50; │
      └──────────────────┘          └──────────────────┘

     ┌────────────────────┐        ┌────────────────────┐
     │ a.setBalance(bal1)  │        │ a.setBalance(bal2); │
     └────────────────────┘        └────────────────────┘

                         ▅▅▅▅

          ┌──────────────────────────────────┐
          │ System.out.println(a.getBalance()); │
          └──────────────────────────────────┘

                    ◉    ┌────────────────────────┐
                         │ What is the final balance? │
                         └────────────────────────┘
```

In this situation, the ending balance can be wrong because Fru Jensen and Hr. Jensen access the same bank account in an interleaved manner where the account was not locked for each thread while it was accessing it.

20.

a. Each of the two threads, plus10 and minus5, carries out three steps:

  1. reads balance into variable b

  2. calculates the new balance and stores this in b

  3. writes the new balance from b back into balance

These three steps can be interleaved in various ways because there is no synchronisation. Let A*n* be step *n* for plus10 and B*n* be step *n* for minus5:

What matters is the relative order of A1, A3, B1 and B3. There are therefore 6 possibilities:

A1 A3 B1 B3 = 105
A1 B1 A3 B3 = 95
A1 B1 B3 A3 = 110
B1 A1 A3 B3 = 95
B1 A1 B3 A3 = 110
B1 B3 A1 A3 = 105

There are therefore 3 possible outputs: 95, 110 and 105. (2 marks, 1 if one missing)

b. There are a couple of options. (2 marks for one of the possible answers)

1. swapping line 31 with line 30

2. putting lines 13-18 inside a "synchronized" block with the balance variable locked for those lines.

c. Two threads are being used, but not concurrently, since one blocks until the data becomes available again. In this sense, synchronisation removes concurrency. (1 mark)

21.

TCP is a connection-based protocol that provides a reliable, bi-directional flow of data. TCP guarantees that all data sent will arrive in the right order.

UDP sends independent datagrams and does not guarantee that all the data will arrive at the destination. Also, if the data does arrive, it is not guaranteed to be in the correct order.

UDP is faster than TCP because there is no overhead due to error-checking.

(2 marks)

i. UDP (1); ii. TCP (1); iii. UDP (1)

22.

a. Server

b. Hello

c. Hello to you too!

d. InputStream provides a stream of bytes. InputStreamReader turns a stream of bytes into a stream of characters. BufferedReader supports buffered reading of a character stream, so that, for example, you can read a whole line of characters in an atomic

e. Port number on which Server program listens for incoming connection requests.

23.

Initial threads – running when the program starts, usually only one, the main thread.

Event dispatch thread: Most code that interacts with the Swing framework runs on this thread

Worker threads: Background threads on which time-consuming processes are executed.

24.

a. BorderLayout. Has 5 regions: PAGE_START, PAGE_END, LINE_START, LINE_END, CENTER. A single component can be placed in each region. Addition of a second component to a region that already contains a component causes the first to be replaced by the second. CENTER region expands to fill space available. By default, components added to CENTER.

b. text: JTextField; label: JLabel.

c. The GUI instance that is constructed in line 32.

d. Listens for ActionEvents emitted by the text JTextField component and then runs the actionPerformed() method defined in line 25.

e. pack() formats the JFrame of the application ready for being made visible, determining the size and position of each component in the JFrame main window.