

## Module 2 Quiz

Quiz, 11 questions

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1.

Consider the following example algorithm, taken from the lecture video:

```
1 Thread 1 {  
2     MYBAL = MYBAL - 100  
3     FAMILY(W1) = FAMILY(R1) + 100  
4 }  
5  
6 Thread 2 {  
7     FAMILY(W2) = FAMILY(R2) - 100  
8     DBAL = DBAL + 100  
9 }
```

We denote the read and write for FAMILY in thread 1 as R1 and W1, and the read and write for FAMILY in thread 2 as R2 and W2. Which of the following is **not** a possible ordering of reads and writes for the family's account balance (FAMILY)?

- ☐ A. R1, W1, R2, W2
- ☐ B. R1, R2, W2, W1
- ☒ C. R2, W1, R1, W2
- ☐ D. R1, R2, W1 W2
- ☐ E. R2, W2, R1, W1

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1  
point

2.

Consider the following example algorithm, taken from the lecture video:

## Module 2 Quiz

Quiz, 11 questions

```
Thread 1 {  
2   MYBAL = MYBAL - 100  
3   FAMILY(W1) = FAMILY(R1) + 100  
4 }  
5  
6 Thread 2 {  
7   FAMILY(W2) = FAMILY(R2) - 100  
8   DBAL = DBAL + 100  
9 }
```

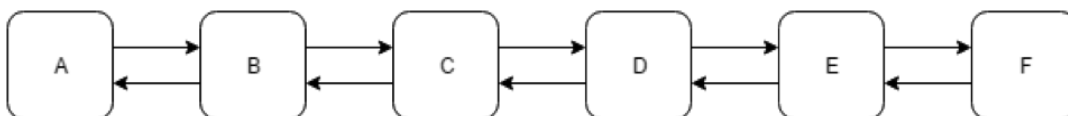
The beginning balance of the FAMILY account is 1000. We denote the read and write for FAMILY in thread 1 as R1 and W1, and the read and write for FAMILY in thread 2 as R2 and W2. Which of the following is **not** a possible value that the family account can end up with?

- ☒ A. 800
- ☐ B. 900
- ☐ C. 1000
- ☐ D. 1100

1  
point

3.

Assume we have the doubly-linked list shown below. Using object-based isolation, which sets of object deletions can occur simultaneously?



Please choose all options that are correct.

- ☒ A. (A, D)
- ☐ B. (A, C, F)
- ☐ C. (B, C, F)
- ☒ D. (B, E)

1  
point

## Module 2 Quiz

Quiz, 11 questions

4.

Assume we are using the provided bank transaction code. We have six accounts: A, B, C, D, E, F. We make eight transfers, all asynchronously:

1. \$100 from A to B
2. \$50 from B to C
3. \$30 from B to C
4. \$20 from B to A
5. \$70 from D to A
6. \$40 from B to D
7. \$30 from E to D
8. \$20 from D to F

Each transaction requires one computation step worth of time, but multiple transactions can run in parallel in the same computation step. Given enough processors, what is the minimum number of computation steps needed to run these eight transactions without causing a data race?

*Please enter an integer for your response.*

1  
point

5.

Consider the following pseudocode snippet for computing the spanning tree in parallel.

## Module 2 Quiz

Quiz, 11 questions

```
1 compute(v) {  
2   for each neighbor n of v {  
3     if makeParent(v, n) {  
4       async compute(n)  
5     }  
6   }  
7 }  
8  
9 boolean makeParent(v, c) {  
10  isolated(c) {  
11    if c.parent == null {  
12      doWork(1)  
13      c.parent = v  
14      return true  
15    } else {  
16      return false  
17    }  
18  }  
19 }  
20  
21 finish {  
22   root.parent = root;  
23   root.compute();  
24 }
```

For a complete graph with 4 vertices, what is the WORK of this algorithm?

- ☒ A. 3
  - ☐ B. 4
  - ☐ C. It depends on the order the node neighbors are selected.
  - ☐ D. It depends on what gets executed in parallel.
- 

1  
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6.

If we re-run the algorithm from Question 5 on the spanning tree (which is also a graph) that is produced in Question 5, what will be the total WORK of the algorithm?

- ☒ A. 3
  - ☐ B. 4
  - ☐ C. It depends on which vertex is selected to start the tree.
  - ☐ D. It depends on what gets executed in parallel.
- 

1  
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7.

Consider the following pseudocode snippet:

## Module 2 Quiz

Quiz, 11 questions

```
1 finish {  
2   AtomicReference r = new AtomicReference()  
3   async {  
4     println(r.get())  
5   }  
6   forall i in 0..1000 {  
7     r.compareAndSet(null, i)  
8   }  
9 }
```

What is most accurate statement regarding the value of `r.get()` printed by the `async`?

- ☐ A. The string is null
  - ☐ B. Any value between 0 and 1000.
  - ☒ C. The string is null or any value between 0 and 1000.
- 

1  
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8.

Now, consider the following pseudocode snippet:

```
1 finish {  
2   AtomicReference r = new AtomicReference()  
3   forall i in 0..1000 {  
4     r.compareAndSet(null, i)  
5   }  
6   async {  
7     println(r.get())  
8   }  
9 }
```

What is most accurate statement regarding the value of `r.get()` printed by the `async`?

- ☐ A. The string null
  - ☒ B. Any value between 0 and 1000.
  - ☐ C. The string is null or any value between 0 and 1000.
- 

1  
point

9.

Assume we have defined objects x and y. The following pseudo-code uses **object isolation** on three blocks of code, A, B, and C.

## Module 2 Quiz

Quiz, 11 questions

```
1  async {
2    isolated (x)  A
3  }
4  async {
5    isolated (x)  B
6  }
7  async {
8    isolated (y)  C
9  }
```

Which code blocks can run simultaneously?

*Please choose all options that are correct.*

- ☐ A. A and B, but not also C
  - ☒ B. A and C, but not also B
  - ☒ C. B and C, but not also A
  - ☐ D. A, B, and C
- 

1  
point

10.

Assume we have defined object y. The following pseudo-code uses object isolation on three blocks of code, D, E, and F.

```
1  async {
2    isolated (read(y))  D
3  }
4  async {
5    isolated (read(y))  E
6  }
7  async {
8    isolated (y)  F
9  }
```

Which code blocks can run simultaneously?

- ☒ A. D and E, but not also F
  - ☐ B. D and F, but not also E
  - ☐ C. E and F, but not also D
  - ☐ D. D, E, and F
-