

**Q1. Scala Basics [5 points]**

```
object Q1{
  def findValue(input: List[String]): String = {
    var found: String = ""
    for(word <- input){
      if(word.length > found.length){
        found = word
      }
    }
    found
  }

  def main(args: Array[String]): Unit = {
    val words: List[String] = List("line", "convey", "ten")
    val result = findValue(words)
    println(result)
  }
}
```

What is printed to screen when this program executes?

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**Q2. Scala Basics [5 points]**

```
object Q2 {
  def checkNumbers(input: List[Int]): Int = {
    var challenge = 0
    for (value <- input) {
      challenge += testNumber(value)
    }
    challenge
  }

  def testNumber(input: Int): Int = {
    if (input > 200) {
      1000 + input
    } else {
      20
    }
  }

  def main(args: Array[String]): Unit = {
    val numbers: List[Int] = List(500, 100, 2)
    val result: Int = checkNumbers(numbers)
    println(result)
  }
}
```

What is printed to screen when this program executes?

### Q3. Objects and References [5 points]

```
class Score(var points: Int) {}

class Team(val score: Score) {
    def goal(): Unit = {
        score.points += 1
    }
}

object Q3 {
    def main(args: Array[String]): Unit = {
        val team1: Team = new Team(new Score(0))
        val team2: Team = new Team(new Score(0))
        val team3: Team = team2

        team1.goal()
        team2.goal()
        team3.goal()

        println(team2.score.points)
    }
}
```

What is printed to screen when this program executes?

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### Q4. Objects and References [5 points]

```
class Score(var points: Int) {}

class Team(val score: Score) {
    def goal(): Unit = {
        score.points += 1
    }
}

object Q4 {
    def main(args: Array[String]): Unit = {
        val score: Score = new Score(10)
        val team1: Team = new Team(score)
        var team2: Team = team1

        team1.goal()
        team2.goal()

        team2 = new Team(score)

        team2.goal()
        team2.goal()

        println(team1.score.points)
    }
}
```

What is printed to screen when this program executes?

## Q5. Memory [15 points]

```
class Wallet(val money: Stash) {  
    def spendMoney(): Unit = {  
        money.dollars -= 20  
    }  
}  
  
class Stash(var dollars: Int) {}  
  
object Q5 {  
    def main(args: Array[String]): Unit = {  
        val initialCash: Int = 100  
        val wallet: Wallet = new Wallet(new Stash(initialCash))  
        wallet.spendMoney()  
        wallet.spendMoney()  
        println(wallet.money.dollars) // highlighted line  
    }  
}
```

Draw the memory stack and heap immediately before the highlighted line is executed. Be sure to indicate the beginning of each stack frame and code block.

### Stack

args = {}

### Heap

Memory Address @453
Memory Address @580
Memory Address @989

## Q6. Memory [15 points]

```
object Q6 {  
  
  def checkPlayers(levels: List[Int]): Int = {  
    val criteria: Int = 60  
    var totalLevels: Int = 0  
    for (level <- levels) {  
      if (level > criteria) {  
        totalLevels += accept(level)  
      }  
    }  
    totalLevels  
  }  
  
  def accept(level: Int): Int = {  
    val nextLevel: Int = level + 1  
    nextLevel //highlighted line  
  }  
  
  def main(args: Array[String]): Unit = {  
    val playerLevels: List[Int] = List(30, 85, 65)  
    val playerCount: Int = checkPlayers(playerLevels)  
    println(playerCount)  
  }  
}
```

Draw the memory stack and heap immediately before the highlighted line is executed for the first time. Be sure to indicate the beginning of each stack frame and code block.

### Stack

args = {}

### Heap

Memory Address @453
Memory Address @580
Memory Address @989