



*Eighth Edition*

Be Prepared  
for the  
**AP**  
Computer Science  
Exam in Java

Chapter 6: Annotated Solutions  
to Past Free-Response Questions

**2024**

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[www.skylit.com/beprepared/x2024all.zip](http://www.skylit.com/beprepared/x2024all.zip) contains complete Java code, including solutions and test programs for runnable projects.

The free-response questions for this exam are posted on [apstudent.collegeboard.org](http://apstudent.collegeboard.org) and, for teachers, on AP Central:

- For students: [apstudents.collegeboard.org](http://apstudents.collegeboard.org)
- For teachers: [apcentral.collegeboard.org](http://apcentral.collegeboard.org)

Scoring guidelines for teachers are usually posted over the summer.

## Question 1

### Part (a)

```
public void simulateOneDay(int numBirds)
{
    boolean bear = Math.random() < 0.05;
    if (!bear)
    {
        int standardFood = 10 + (int)(41*Math.random());1
        currentFood -= numBirds * standardFood;
        if (currentFood < 0)2
        {
            currentFood = 0;
        }
    }
    else
    {
        currentFood = 0;
    }
}
```

### Notes:

1. Recall that `Math.random()` returns a double value greater than or equal to 0.0 and less than 1.0, so `(int)(41*Math.random())` will be from 0 to 40, inclusive of both ends.
2. Don't forget that `currentFood` cannot be negative.

### Part (b)

```
public int simulateManyDays(int numBirds, int numDays)
{
    int days = 0;

    while (currentFood > 0 && days < numDays)
    {
        days++;
        simulateOneDay(numBirds);
    }
    return days;
}1
```

### Notes:

1. This solution counts any day when there was some food in the feeder at the start of the day, even if there was not enough to feed all the birds.

**Question 2**

```
public class Scoreboard
{
    private String team1, team2, activeTeam;
    private int score1, score2;

    public Scoreboard(String name1, String name2) {
        team1 = name1;
        team2 = name2;
        activeTeam = team1;
        score1 = 0;1
        score2 = 0;1
    }

    public void recordPlay(int points)
    {
        if (activeTeam.equals(team1))
        {
            if (points > 0)
                score1 += points;
            else
                activeTeam = team2;
        }
        else
        {
            if (points > 0)
                score2 += points;
            else
                activeTeam = team1;
        }
    }

    public String getScore()
    {
        return score1 + "-" + score2 + "-" + activeTeam;
    }
}2
```

**Notes:**

1. `int` instance variables are initialized to 0 by default, so these statements are optional.
2. The question begs for a solution that uses two-element parallel arrays for the team names and scores, with the active team indicated by the index 0 or 1. Although FRQ #2 doesn't expect the use of arrays, such solutions, if implemented correctly, will receive full credit. For example:

```
public class Scoreboard
{
    private String[] teams = new String[2];
    private int[] scores = new int[2];
    private int activeTeam;

    public Scoreboard(String name1, String name2)
    {
        teams[0] = name1;
        teams[1] = name2;
        activeTeam = 0;
    }

    public void recordPlay(int points)
    {
        if (points == 0)
            activeTeam = 1 - activeTeam; // toggle between 0 and 1
        else
            scores[activeTeam] += points;
    }

    public String getScore()
    {
        return scores[0] + "-" + scores[1] + "-" +
                teams[activeTeam];
    }
}
```

### Question 3

#### Part (a)

```
public boolean isWordChain()
{
    for (int i = 1; i < wordList.size(); i++)
    {
        String currentWord = wordList.get(i);
        String previousWord = wordList.get(i-1);

        if (currentWord.indexOf(previousWord) == -1)
            return false;
    }
    return true;
}
```

#### Part (b)

```
public ArrayList<String> createList(String target)
{
    ArrayList<String> targetList = new ArrayList<String>();

    for (String word : wordList)
    {
        if (word.indexOf(target) == 0)1
        {
            String ending = word.substring(target.length());
            targetList.add(ending);
        }
    }

    return targetList;
}
```

#### Notes:

1. Or: `if (word.startsWith(target))` -- not in the AP subset, but will receive full credit.

## Question 4

### Part (a)

```
public Location getNextLoc(int row, int col)
{
    if (row < grid.length - 1 && col < grid[0].length - 1)
    {
        if (grid[row+1][col] < grid[row][col+1])
            return new Location(row+1, col);
        else
            return new Location(row, col+1);
    }
    else if (row == grid.length - 1)
    {
        return new Location(row, col+1);
    }
    else
    {
        return new Location(row+1, col);
    }
} 1
```

### Notes:

#### 1. Alternative solution:

```
public Location getNextLoc(int row, int col)
{
    if (row == grid.length - 1)
        return new Location(row, col+1);
    else if (col == grid[0].length - 1)
        return new Location(row+1, col);
    else if (grid[row+1][col] < grid[row][col+1])
        return new Location(row+1, col);
    else
        return new Location(row, col+1);
}
```

**Part (b)**

```
public int sumPath(int row, int col)
{
    int sum = 0;

    while (true)
    {
        sum += grid[row][col];
        if (row == grid.length - 1 && col == grid[0].length - 1)
            return sum;

        Location loc = getNextLoc(row, col);
        row = loc.getRow();
        col = loc.getCol();
    }
} 1,2,3
```

**Notes:**

## 1. Alternative solution:

```
public int sumPath(int row, int col)
{
    int sum = 0;

    while (row < grid.length && col < grid[0].length)
    {
        sum += grid[row][col];
        if (row != grid.length || col != grid[0].length)
        {
            Location loc = getNextLoc(row, col);
            row = loc.getRow();
            col = loc.getCol();
        }
    }

    return sum;
}
```

2. Another solution, perhaps more straightforward, proposed by Lisa Ryder from Westlake High School in Westlake Village, CA:

```
public int sumPath(int row, int col)
{
    int sum = grid[row][col];

    while (row < grid.length - 1 || col < grid[0].length - 1)
    {
        Location next = getNextLoc(row, col);
        row = next.getRow();
        col = next.getCol();
        sum += grid[row][col];
    }

    return sum;
}
```

3. Yong Joo from Alameda High School in Alameda, CA suggested that a solution with recursion is called for. Here is our version:

```
public int sumPath(int row, int col)
{
    int sum = grid[row][col];

    if (row < grid.length - 1 || col < grid[0].length - 1)
    {
        Location next = getNextLoc(row, col);
        sum += sumPath(next.getRow(), next.getCol());
    }

    return sum;
}
```

Students are not expected, of course, to write recursive methods on the AP exam, but, if written correctly, a recursive solution will receive full credit.