



*Eighth Edition*

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

Chapter 6: Annotated Solutions  
to Past Free-Response Questions

**2019**

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[www.skylit.com/beprepared/x2019all.zip](http://www.skylit.com/beprepared/x2019all.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 static int numberOfLeapYears(int year1, int year2)
{
    int count = 0;

    for (int year = year1; year <= year2; year++)
        if (isLeapYear(year)) 1
            count++;

    return count;
}
```

### Notes:

1. You will not receive full credit if you code your own `isLeapYear` rather than calling the provided private helper method.

### Part (b)

```
public static int dayOfWeek(int month, int day, int year)
{
    return (firstDayOfYear(year) +
            dayOfYear(month, day, year) - 1) % 7; 1
}
```

### Notes:

1. Same here: must call the provided helper methods.

## Question 2

```
public class StepTracker
{
    private int minSteps, totalSteps; 1
    private int totalDays, actDays;

    public StepTracker(int goal)
    {
        minSteps = goal;
        totalSteps = 0; 2
        totalDays = 0;
        actDays = 0;
    }

    public void addDailySteps(int steps)
    {
        totalSteps += steps;
        totalDays++;
        if (steps >= minSteps)
            actDays++;
    }

    public int activeDays()
    {
        return actDays;
    }

    public double averageSteps()
    {
        if (totalDays == 0) 3
            return 0.0;
        else
            return (double)totalSteps / totalDays; 4
    }
}
```

### Notes:

1. Don't be tempted to introduce an array or an `ArrayList` in this question; just keep track of the numbers. Arrays and/or `ArrayList` will be tested in Question 3.
2. This and the next two statements are optional, because instance variables are automatically initialized to default values: 0 for ints, 0.0 for doubles, false for booleans, null for objects. It is helpful to remember that elements of an array created using the `new` operator are also automatically initialized to default values. But you must explicitly initialize local variables before they are used — they do not get default values.
3. A special case: avoid division by 0.
4. Need a cast to `double` before division. Alternatively, declare `totalSteps` a `double`.

### Question 3

#### Part (a)

```
public ArrayList<String> getDelimitersList(String[] tokens)
{
    ArrayList<String> dels = new ArrayList<String>();

    for (String t : tokens)
        if (t.equals(openDel) || t.equals(closeDel)) 1
            dels.add(t);

    return dels;
}
```

#### Notes:

1. Always use equals when comparing strings, not ==.

#### Part (b)

```
public boolean isBalanced(ArrayList<String> delimiters)
{
    int count = 0; 1

    for (String del : delimiters)
    {
        if (del.equals(openDel))
            count++;
        else
        {
            count--;
            if (count < 0)
                return false; 2
        }
    }
    return count == 0; 3
}
```

#### Notes:

1. No need for two separate counts.
2. You cannot add

```
        else
            return true;
```

here, of course.

3. Recall that you can return the value of a Boolean expression. This is better than more verbose

```
        if <condition>
            return true;
        else
            return false;
```

## Question 4

### Part (a)

```
public LightBoard(int numRows, int numCols)
{
    lights = new boolean[numRows][numCols];

    for (int r = 0; r < numRows; r++)
        for (int c = 0; c < numCols; c++)
            lights[r][c] = Math.random() < 0.4; 1, 2
}
```

### Notes:

1. You can assign the value of a Boolean expression to a Boolean variable. This is a bit shorter than

```
if (Math.random() < 0.4)
    lights[r][c] = true;
else
    lights[r][c] = false;
```

2. Or `<= 0.4`

### Part (b)

```
public boolean evaluateLight(int row, int col)
{
    int count = 0;

    for (int r = 0; r < lights.length; r++) 1
        if (lights[r][col])
            count++;

    if (lights[row][col] && count % 2 == 0)
        return false; 2

    if (!lights[row][col] && count % 3 == 0)
        return true;

    return lights[row][col];
}
```

### Notes:

1. First compute the number of lights that are "on" in the column, then decide what to do with it.

- 2.

```
else
    return true;
```

here would be a mistake.