

201x AP[®] COMPUTER SCIENCE A FREE-RESPONSE QUESTIONS

© 201x The College Board.

Visit the College Board on the Web: www.collegeboard.com.

COMPUTER SCIENCE A

SECTION II

Time—~~1 hour and 30 minutes~~

(25 minutes only!)

Directions: SHOW ALL YOUR WORK. REMEMBER THAT PROGRAM SEGMENTS ARE TO BE WRITTEN IN JAVA.

Notes:

- Assume that the classes listed in the Quick Reference found in the Appendix have been imported where appropriate.
- Unless otherwise noted in the question, assume that parameters in method calls are not null and that methods are called only when their preconditions are satisfied.
- In writing solutions for each question, you ~~may~~ **SHOULD** use any of the accessible methods that are listed in classes defined in that question. Writing ~~significant~~ **ANY** amount of code that can be replaced by a call to one of these methods ~~may not~~ **WILL NOT** receive full credit!

Mr. Lee's additional notes to think about:

**Answer in space provided below or write out answers on UNLINED copy paper – not notebook paper.*

****Why?**

Because your AP exam will not have lined pages and you need practice indenting and writing legibly on blank paper!

*****Remember:**

Grading the free response portion of your AP exam is a “human process” so be sure to write legibly and exhibit good indentation! Teachers are grading your responses – not machines.

******Also Remember:**

- *Maximize your exam results by going after “low hanging fruit” if you find difficulties answering any question.*
- *Circle questions that give you great difficulty and come back to them.*
- *Simply adding a correct “return” statement in an accessor method provides a full point even if you have no idea how to solve the rest.*
- *If a question has parts A, B, and C and you know you’ve blown part A, don’t get discouraged. Treat parts B and C as if part A is correct and move on.*
- *Always “invoke” the method available whether it exists as part of the question or as part of your previous answer. NEVER rewrite code that you’ve already written.*
- *Lastly, if you feel overwhelmed... Close your eyes. Take 3 deep breaths. Begin again. You will do just fine!*

2019 AP[®] COMPUTER SCIENCE A FREE-RESPONSE QUESTIONS

1. The `APCalendar` class contains methods used to calculate information about a calendar. You will write two methods of the class.

```
public class APCalendar
{

    /** Returns true if year is a leap year and false otherwise. */
    private static boolean isLeapYear(int year)
    { /* implementation not shown */ }

    /** Returns the number of leap years between year1 and year2, inclusive.
     * Precondition: 0 <= year1 <= year2
     */
    public static int numberOfLeapYears(int year1, int year2)
    { /* to be implemented in part (a) */ }

    /** Returns the value representing the day of the week for the first day of year,
     * where 0 denotes Sunday, 1 denotes Monday, ..., and 6 denotes Saturday.
     */
    private static int firstDayOfYear(int year)
    { /* implementation not shown */ }

    /** Returns n, where month, day, and year specify the nth day of the year.
     * Returns 1 for January 1 (month = 1, day = 1) of any year.
     * Precondition: The date represented by month, day, year is a valid date.
     */
    private static int dayOfYear(int month, int day, int year)
    { /* implementation not shown */ }

    /** Returns the value representing the day of the week for the given date
     * (month, day, year), where 0 denotes Sunday, 1 denotes Monday, ...,
     * and 6 denotes Saturday.
     * Precondition: The date represented by month, day, year is a valid date.
     */
    public static int dayOfWeek(int month, int day, int year)
    { /* to be implemented in part (b) */ }

    // There may be instance variables, constructors, and other methods not shown.
}
```

2019 AP[®] COMPUTER SCIENCE A FREE-RESPONSE QUESTIONS

- (a) Write the static method `numberOfLeapYears`, which returns the number of leap years between `year1` and `year2`, inclusive.

In order to calculate this value, a helper method is provided for you.

- `isLeapYear(year)` returns `true` if `year` is a leap year and `false` otherwise.

Complete method `numberOfLeapYears` below. You must use `isLeapYear` appropriately to receive full credit.

```
/** Returns the number of leap years between year1 and year2, inclusive.
 * Precondition: 0 <= year1 <= year2
 */
public static int numberOfLeapYears(int year1, int year2)
```

2019 AP[®] COMPUTER SCIENCE A FREE-RESPONSE QUESTIONS

(b) Write the static method `dayOfWeek`, which returns the integer value representing the day of the week for the given date (`month`, `day`, `year`), where 0 denotes Sunday, 1 denotes Monday, ..., and 6 denotes Saturday. For example, 2019 began on a Tuesday, and January 5 is the fifth day of 2019. As a result, January 5, 2019, fell on a Saturday, and the method call `dayOfWeek(1, 5, 2019)` returns 6.

As another example, January 10 is the tenth day of 2019. As a result, January 10, 2019, fell on a Thursday, and the method call `dayOfWeek(1, 10, 2019)` returns 4.

In order to calculate this value, two helper methods are provided for you.

- `firstDayOfYear(year)` returns the integer value representing the day of the week for the first day of year, where 0 denotes Sunday, 1 denotes Monday, ..., and 6 denotes Saturday. For example, since 2019 began on a Tuesday, `firstDayOfYear(2019)` returns 2.
- `dayOfYear(month, day, year)` returns n , where `month`, `day`, and `year` specify the n th day of the year. For the first day of the year, January 1 (`month = 1`, `day = 1`), the value 1 is returned. This method accounts for whether `year` is a leap year. For example, `dayOfYear(3, 1, 2017)` returns 60, since 2017 is not a leap year, while `dayOfYear(3, 1, 2016)` returns 61, since 2016 is a leap year.

Class information for this question

```
public class APCalendar
private static boolean isLeapYear(int year)
public static int numberOfLeapYears(int year1, int year2)
private static int firstDayOfYear(int year)
private static int dayOfYear(int month, int day, int year)
public static int dayOfWeek(int month, int day, int year)
```

2019 AP[®] COMPUTER SCIENCE A FREE-RESPONSE QUESTIONS

Complete method `dayOfWeek` below. You must use `firstDayOfYear` and `dayOfYear` appropriately to receive full credit.

```
/** Returns the value representing the day of the week for the given date
 * (month, day, year), where 0 denotes Sunday, 1 denotes Monday, ...,
 * and 6 denotes Saturday.
 * Precondition: The date represented by month, day, year is a valid date.
 */
public static int dayOfWeek(int month, int day, int year)
```