Name ____ Period__________

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 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.
}
```

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(a) Write the 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)
```

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(b) Write the 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 nth 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 the 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.

```
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)
```

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2. This question involves the implementation of a fitness tracking system that is represented by the `StepTracker` class. A `StepTracker` object is created with a parameter that defines the minimum number of steps that must be taken for a day to be considered active. The `StepTracker` class provides a constructor and the following methods.

- `addDailySteps`, which accumulates information about steps, in readings taken once per day
- `activeDays`, which returns the number of active days
- `averageSteps`, which returns the average number of steps per day, calculated by dividing the total number of steps taken by the number of days tracked The following table contains a sample code execution sequence and the corresponding results

Statements and Expressions	Value Returned (blank if no value)	Comment
`StepTracker tr = new StepTracker(10000);`		Days with at least 10,000 steps are considered active. Assume that the parameter is positive.
`tr.activeDays();`	`0`	No data have been recorded yet.
`tr.averageSteps();`	`0.0`	When no step data have been recorded, the `averageSteps` method returns `0.0`.
`tr.addDailySteps(9000);`		This is too few steps for the day to be considered active.
`tr.addDailySteps(5000);`		This is too few steps for the day to be considered active.
`tr.activeDays();`	`0`	No day had at least 10,000 steps.
`tr.averageSteps();`	`7000.0`	The average number of steps per day is (14000 / 2).
`tr.addDailySteps(13000);`		This represents an active day.
`tr.activeDays();`	`1`	Of the three days for which step data were entered, one day had at least 10,000 steps.
`tr.averageSteps();`	`9000.0`	The average number of steps per day is (27000 / 3).
`tr.addDailySteps(23000);`		This represents an active day.
`tr.addDailySteps(1111);`		This is too few steps for the day to be considered active.
`tr.activeDays();`	`2`	Of the five days for which step data were entered, two days had at least 10,000 steps.
`tr.averageSteps();`	`10222.2`	The average number of steps per day is (51111 / 5).

Score __________/18

Write the complete `StepTracker` class, including the constructor and any required instance variables and methods. Your implementation must meet all specifications and conform to the example.

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Score __________/18