

POW #2 – Happy Birthday!**Section E, Aces****Caroline Walczak, Danny Harn, Adam Yanco, Ila Chakravarthy****Problem Statement**

Using the calendar for October and the days in each month, write an algorithm that finds the day of the week a person was born

Process

- We started by finding what January 1st 2024 was
- Current day: October 2nd, Wednesday
 - There are 29 days left in October after the 2nd
 - There are 2 months left in the year, November and December, so we added the days for those (30 and 31, respectively)

$$29 + 30 + 31 = 90 \text{ days till December } 31^{\text{st}}$$

- So, January 1st 2025 is 91 days away
 - $91 \bmod 7 = 0$, so January 1st 2025 is a Wednesday
- January 1st 2024 is 366 days before that
 - $366 \bmod 7 = 2$, so 2 days before Wednesday
 - January 1st 2024 is a Monday

To find the day of the birthday in 2024, we found the days between the birthday and January 1st, accounting for the leap year in February if they were born after it.

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
0	31	60	91	121	152	182	213	244	274	305	335

- We then made this chart containing the days until the beginning of that month. Mod7 was taken of all the chart values to get the chart seen in the solution.
- After adding the day of the month (of the birthday), the day of the birthday could be found based upon January 1st being a Wednesday using mod7 again. Negatives were used in some cases because they'd normally be 6, but for ease of use the negative was better.
- To find the day of the week someone was born, we found (accounting for the number of leap years) the shift of weekdays between the 2024 birthday and original birthday.

Solution**Part 1: Find the day of the birthday this year:**

Use the chart below to find the corresponding value for the month of your birthday.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	3	4	0	2	5	0	3	-1	1	4	-1

For example, if your birthday is March 17, you would start with the number **4**.

Then, add that number to the day of your birthday date.

For example, if your birthday was March 17, you would add that **4** to **17** to get **21**.

Then, keep subtracting 7 from your result until you get a number less than 7, and plug your number into this table:

0	1	2	3	4	5	6
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday

That result is the day of the week of your birthday in 2024!

Part 2: Find the day of your original birthday:

First, subtract your birth year from 2024. Call this number D.

Then, divide D by 4 and ignore the remainder (cut off the decimal). **If your birthday is after February 29th and not on a leap year, add 1.** This is the number of leap years that have passed since you were born. Call this number L.

Take L and add it to D. Keep subtracting 7 from this number until you get a number less than 7.

Subtract this number of days from the day you found in part 1.

That's the day of the week you were born on!

Extension

A java program that allows the user to input their birthday and get back the day of the week they were born. It will use the process above so will do all the math so the user doesn't have to.

Program:

```
import java.util.Scanner;

public class birthdayPow {
    // info on arrays found on https://stackoverflow.com/questions/1200621/how-do-i-declare-and-initialize-an-array-in-java
    static int[] monthLookup = {
        0, // Jan
        3, // Feb
        4, // Mar
        0, // Apr
        2, // Mar
        5, // Jun
        0, // Jul
        3, // Aug
        -1, // Sep
        1, // Oct
        4, // Nov
        -1, // Dec
    };

    static String[] dayOfWeek = {
        "Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday"};

    public static void main(String[] args) {
        Scanner steve = new Scanner(System.in);

        System.out.println("Please enter your month number: ");
        int month = steve.nextInt();
        if (month < 1 || month > 12) {
            System.out.println("Month number should be between 1 and 12");
        }

        System.out.println("Please enter the day of the month your birthday is: ");
        int day = steve.nextInt();
        if (day < 1 || day > 31) {
```

```
        System.out.println("Day of month should be between 1 and 31");
    }

    System.out.println("Please enter the year you were born: ");
    int year = steve.nextInt();
    if (year < 1900) {
        System.out.println("Year should be past the 1900s");
    }

    int D = 2024 - year;
    int L = (int) Math.floor( D / 4);
    if (month > 2 || (month == 2 && day > 29)) {
        L++;
    }

    int num = D + L;
    int r = num % 7;

    int dayIn2024 = monthLookup[month-1] + day;
    dayIn2024 = dayIn2024%7;

    int finalDay = dayIn2024 - r;
    if (finalDay < 0) {
        finalDay = finalDay + 7;
    }
    else if (finalDay > 7) {
        finalDay = finalDay - 7;
    }
    System.out.println("Your birthday weekday is: " + dayOfWeek[finalDay]);

    steve.close();
}
}
```

Testing:

```
birthdayPow.java X
1 package exercises;
2 import java.util.Scanner;
3
4 public class birthdayPow {
5     // info on arrays found on https://stackoverflow.com/questions/1208621/how-do-i-declare-and-initialize-an-array-in-java
6     static int[] monthLookup = {
7         0, // Jan
8         3, // Feb
9         4, // Mar
10        0, // Apr
11        2, // May
12        5, // Jun
13        0, // Jul
14        3, // Aug
15        -1, // Sep
16        1, // Oct
17        4, // Nov
18        -1, // Dec
19    };
20
21    static String[] dayOfWeek = {
22        "Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday"};
23
24
25
26    public static void main(String[] args) {
27        Scanner steve = new Scanner(System.in);
28
29        System.out.println("Please enter your month number: ");
30        int month = steve.nextInt();
31        if (month < 1 || month > 12) {
32            System.out.println("Month number should be between 1 and 12");
33        }
34
35        System.out.println("Please enter the day of the month your birthday is: ");
36        int day = steve.nextInt();
37        if (day < 1 || day > 31) {
38            System.out.println("Day of month should be between 1 and 31");
39        }
40
41
42        System.out.println("Please enter the year you were born: ");
43        int year = steve.nextInt();
44        if (year < 1980) {
45            System.out.println("Year should be past the 1980s");
46        }
47
48
49        int D = 2024 - year;
50        int L = (int) Math.floor(D / 4);
51        if (month > 2 || (month == 2 && day > 29)) {
52            L++;
53        }
54
55        int num = D + L;
56        int r = num % 7;
57
58        int dayIn2024 = monthLookup[month-1] + day;
59        dayIn2024 = dayIn2024 % 7;
60
61        int finalDay = dayIn2024 - r;
62        if (finalDay < 0) {
63            finalDay = finalDay + 7;
64        }
65        else if (finalDay > 7) {
66            finalDay = finalDay - 7;
67        }
68        System.out.println("Your birthday weekday is: " + dayOfWeek[finalDay]);
69
70    }
71}
```

Problems Javadoc Declaration Console X

<terminated> birthdayPow [Java Application] /Library/Java/JavaVirtualMachines/jdk-1.8.jdk/Contents/Home/bin/java (Oct 6, 2024)

Please enter your month number:
1
Please enter the day of the month your birthday is:
2
Please enter the year you were born:
1971
Your birthday weekday is: Saturday