

POW 1 - Birthday

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1. When is your birthday? When most people answer, they can easily come up with the month, the day, and the year. However, few people actually know what day of the week they were born on. In many cultures, the day of the week they were born on influences their personality, name, and upbringing. Utilizing our method, you will be able to find how the day of the week you were born on!
2. We first wanted to find a benchmark date—a date and its day of the week that we could base all of our other calculations off of. Since we were accounting for the years 1901-2099, we found the day on January 1st of 1900, which was the closest year to 1901 that was evenly divisible by four. To find the day of the week, we took MLK's birthday, Tuesday 1/15/1929, and counted back to 1/1/1929, which was a Tuesday. By finding the difference between 1929 and 1900, we got 29 years, including seven leap years. By dividing 365 days in a year by seven and then taking the remainder, we got one. Thus, the day of the week on the same date goes forward by one every year and by two after every leap year. For example, if 7/15/2022 was a Friday, 7/15/2023 would be a Saturday. We used this method and worked back from 1929 eventually finding 1/1/1900 to be a Monday.

To find the number of days between the given date and 1/1/1900, you first must find the number of days between the birth date and the first of the birth month. This is equal to the birth date day minus one. (Example: March 22nd birthday, you do $22 - 1$ (March 1st) and get 21 days in that month).

The next step is to find the number of days between the first of the month and the first of January of that year. You do this by adding the number of days in the

months prior to the date, without including the days in the month that the birthday is in. For example, if you had a March birthday, you would add the number of days in January and February, which would be $31+28=59$. Included below is a table with the expected values for each month.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	31	59	90	120	151	181	212	243	273	304	334

The next step is to find the number of days between January 1 of the birth year and January 1 of 1900. To do this you first have to find the closest leap year before the birth year and subtract 1900. This is so you know that you're getting a consistent number of leap years. Next, multiply this number by $5/4$ because every four years, 5 days of the week pass; if you are on a Tuesday, after the multiplication (four years later on the same date), you will be on a Sunday. You can then take the birth year and subtract the leap year from that. Since one weekday passes every year, this will be the number of weekdays passed since the previous leap year. The aforementioned steps can be summarized with the equation: $R+5(Y-1900-R)/4$ where Y equals the birth year, and $R=\text{The remainder of } (Y-1900)/4$. R can be simplified because the remainder of $(Y-1900)/4 = \text{The remainder of } Y/4$. The equation can be simplified even further to $((5Y-R)/4)-2375$.

When you add the day of the month you were born on, the number of days between the first of the birth month and January 1st, and the number of days between January first of the birth year and 1/1/1900, you get the number of days between the given date and 1/1/1900. This will be the number of days after Monday. To make it simpler, we made it so that you can first not subtract one from the day of the month so you will be able to count after Sunday rather than Monday. For instance, instead of

doing 22-1 for March 22nd, just use the number 22. During our process, we found this to be easier as Monday through Friday ended up matching with one through five after our next step: finding the remainder of this end number when divided by seven. With Sunday being zero, Monday being one, etc., this final number is the day of the week that you were born on.

3. This solution will include the example 9/21/1987.

a. Assume Y =birth year, and D =birth day.

Example: The date of 9/21/1987, has a $Y=1987$ and $D=21$.

b. R = the remainder of $Y/4$

Example: $Y=1987$ so $1987/4 = R$; $R=3$.

c. $A = ((5Y-R)/4)-2375$

Example: $A = ((5*1987-3)/4)-2375$; $A=108$

d. B = The number that corresponds to your birth month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
0	31	59	90	120	151	181	212	243	273	304	334

Example: the 9th month is September, so $B = 243$.

e. $C = A+B+D$

Example: $C = 108+243+21 = 372$.

f. S = the remainder of $C/7$

Example: $C = 372$; $S = \text{remainder of } 372/7$; $S = 1$.

g. The day of the week your date falls on is S days after Sunday, meaning:

Sunday = 0; Monday = 1; Tuesday = 2; Wednesday = 3; Thursday = 4; Friday = 5; Saturday = 6 for value S .

Example: The day of the week 9/21/1987 fell on was **Monday**, because $S=1$.

4. Some next steps could be finding what day of the week dates lie on that aren't between 1900 and 2100. You could find out what day of the week Constantinople fell, but to do this you would have to factor in that not all years that are a multiple of 100 are leap years.

We have also created a java code to extend this project so that the person who wants to solve this problem does not have to do the math. They only have to input the month, day, and year they were born and then the rest is taken care of.

[Date Weekday Calculator](#) - here is the link to test out the code.

Here is the code just in case the link does not work:

```
import java.util.Scanner;

class Main {
    public static void main(String[] args) {
        Scanner scan = new Scanner(System.in);
        System.out.println("Enter Target Year:");
        String yr = scan.next();
        System.out.println("Enter Target Month:");
        String mn = scan.next();
        System.out.println("Enter Target Day:");
        String dy = scan.next();

        int y = Integer.parseInt(yr);
        int d = Integer.parseInt(dy);

        int A = (5*y-(y%4))/4-2375;
        int B;
        switch(mn) {
            case "1":
                B = 0;
                break;
            case "2":
                B = 31;
                break;
            case "3":
                B = 59;
```

```

        break;
case "4":
    B = 90;
    break;
    case "5":
        B = 120;
        break;
    case "6":
        B = 151;
        break;
case "7":
    B = 181;
    break;
    case "8":
        B = 212;
        break;
    case "9":
        B = 243;
        break;
    case "10":
        B = 273;
        break;
    case "11":
        B = 304;
        break;
    case "12":
        B = 334;
        break;
    default:
        System.out.println("Error, reload.");
        B = 0;
}

```

```
int D = (A+B+d)%7;
```

```

switch(D) {
    case 0:
        System.out.println("Sunday");
        break;
    case 1:
        System.out.println("Monday");
        break;
    case 2:
        System.out.println("Tuesday");
        break;
    case 3:
        System.out.println("Wednesday");
        break;
    case 4:
        System.out.println("Thursday");

```

```
        break;
case 5:
    System.out.println("Friday");
    break;
case 6:
    System.out.println("Saturday");
    break;
default:
    System.out.println("Error, reload.");
} }
}
```