‘It’s About Time’ – Sheet 1

Days of the Week

To calculate the day of the week, we need to count in remainders of 7, more formally called ***arithmetic modulo 7***. We thus give each day of the week an associated ‘remainder value’, as follows:

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

When we calculate the day of the week of a particular day, we need to know **the date, the month and the year**.

The date

This is easy. Just take the date and store it ready to add to other stuff later. If you’re feeling efficient, you can take its remainder when you divide it by 7, as this is all we care about.

The month

We get the value for the month by taking one of the values below. For a leap year, we take the bracketed number for a date in January or February.

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Number	6 (5)	2 (1)	2	5	0	3	5	1	4	6	2	4

The year

The trickiest to get. The easiest way to start off is by looking at the year code of the first year of the century (e.g. 2000), adding on the number which forms the last two digits (so for 2014 we take 14), and then finally adding on the number of leap years since the start of the century, not including the year 2000 (or 1900 – although 1900 wasn’t a leap year – or whatever). Let’s take the example of 1946. 1900 had a year code of 1. 1 + 46 = 47 (= 5 (mod 7)). There were 11 leap years between 1901 and 1946, which we can see by dividing 46 by 4 and rounding down. 5 + 11 = 16 (= 2 (mod 7)) So 1946 had a year code of 2.

Some Examples/Exercises

You may find the following helpful:

Year	1700	1800	1900	2000	2100
Number	5	3	1	0	5

1) If you don’t know it already, calculate the day of the week of your birthday.

2) In 1905, Albert Einstein had his 'Annus Mirabilis'. His birthday was 14 March. What day did his birthday fall on in his Annus Mirabilis?
3) What day of the week did the following fall on:
   a) The accession of Queen Victoria on 20 June 1837
   b) The birth of Carl Friedrich Gauss on 30 April 1777
   c) The outbreak of World War Two on 1 September 1939
   d) The creation of the office of UK Prime Minister on 4 April 1721
4) Marty McFly, having grown up with the film of the same name and being terrified by it, hates Friday the 13th, and likes to avoid years where the maximum possible number of Friday the 13ths can occur (3), by using Doc Brown's DeLorean to travel a year forwards in time. If Marty was born in 1968 and gains control of the DeLorean at the end of 1985, and lives for 100 years, in what year does he die?
5) At the beginning of the 22nd century, the Dalek Empire threatens to invade Earth. Intergalatic diplomats conclude that the Daleks will only invade another planet on the Festival Day of the Kaled God of War. This festival day occurs once every 364 days on Earth, due to the length of the year on Skaro (the Dalek home world) being slightly shorter, however there is a leap day in the Skaro calendar, meaning that once every ten years the Festival falls 365 days after the last one. If the Daleks want to invade at the earliest possible opportunity, and can only conquer Earth if they do it on a Sunday, in what year should they invade if the Festival Day falls on Monday 3 January 2100, and 2100 exactly corresponds to the leap year on Skaro?
6) And when did the Doctor eventually turn up to help out?
7) In the future, the Prime Minister announces that the calendar is to be changed so that leap years fall every four years, but are missed out every 128 years, with 2048 the first year to be missed out in this way (so it is a common year). If this calendar subsequently remains unchanged, what day of the week is 29th March 3014?

The Julian Calendar

Month	Number of Days
January	31
February	28 (29 every fourth year)
March	31
April	30
May	31
June	30
July	31
August	31
September	30
October	31
November	30
December	31