

**HISTORY**

**WEEK**

A  
Cross-curriculum

Project

Bridging

History and Mathematics

## Part 1 : Historical Research

The history teacher gives his class seven pictures of landmark events in the 20th Century.

The students must research (by any means they wish):

A. What the event is, and

B. The date on which it occurs

Some representative choices follow.





Man lands  
on the  
moon.



Man lands  
on the  
moon.

July 20,  
1969





Titanic  
sinks.





Titanic  
sinks.

April 15,  
1912





# Lindbergh Lands in Paris



# Lindbergh Lands in Paris

May 21,  
1927





Challenger  
explodes.



Challenger  
explodes.

January  
28, 1986







# Beatles arrive in New York



Beatles  
arrive in  
New  
York

February  
7, 1964





# Three Mile Island Crisis



# Three Mile Island Crisis

March  
28,  
1979





Alex  
Hahn is  
born.



Alex  
Hahn is  
born.

September 9,  
19??



In history class, the events are identified  
and the dates checked,  
The students' next assignment  
(unknown to them)  
will be to line up the pictures by day of the week.  
(Each event occurred on a different weekday.)

They must construct this history week montage  
without using a computer  
or any reference material.

In their following math class,  
students are introduced to  
**The Doomsday Formula,**

which can identify the weekday  
of any date in the 20th Century  
(and some other centuries, as well).

The Doomsday Formula is an early taste of modular arithmetic for the class.

The names for the days of the week move in a wheel.

The occurrence of leap years is a different type of wheel.

The Doomsday Formula  
(invented by John Conway  
– a non-dead mathematician)  
easily allows one wheel to  
move within the other,  
using math familiar to  
junior high students.

Usually a date advances  
by one weekday each year.

If my birthday is on a Monday this year,  
it's on Tuesday next year.  $1 \pmod{7}$

Leap years disrupt this pattern.  $2 \pmod{7}$

Usually leap years occur every four years.  
But Century Years (XX00) can disrupt this.

Combining both cycles,  
we notice that every 12 years  
any given date advances  
by one weekday  
(if we avoid the effect  
of some Century Years).

Each century has a Century Day,  
the day of the week when  
the last day of February  
- Doomsday –  
occurs in the year XX00.

In 1900 Doomsday came on a Wednesday.

We give this a value of 3, based on this  
assignment :

|    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|
| Su | Mo | Tu | We | Th | Fr | Sa |
| 0  | 1  | 2  | 3  | 4  | 5  | 6  |

To find the Doomsday value for any 20th Century year, we need:

- the Doomsday value for 1900 :

(already identified as 3)

- the number of years passed since 1900 :

(In 19YY, it's YY.)

- the number of leap years since last cycle :

$\lfloor \text{YY}/4 \rfloor$

rounded to the lowest whole number

The Doomsday value,  $d$ , is calculated by :

$$d = [ 3 + \text{YY} + \lfloor \text{YY}/4 \rfloor ] \pmod{7}$$



The Lunar Landing took place on  
July 20, 1969.

Let's find the Doomsday value  
for the year 1969.

$$d = [ 3 + 69 + \lfloor \_69/4\_ \rfloor ] \pmod{7}$$

$$d = [ 3 + 69 + 17 ] \pmod{7}$$

$$d = 89 \pmod{7} = 5$$

So, Doomsday (February 28) occurred on a  
Friday (5) in 1969.

So what? What about July 20?

Fortunately, there is a handy mnemonic device.

Dates in January through March can be counted directly from d.

In even months,

4/4, 6/6, ..., 12/12 occur on the same weekday as Doomsday.

In odd months after March, remember

“I work 9-5 at the 7-11.”

5/9, 9/5, 7/11, 11/7 occur on the same weekday as Doomsday.

So, in 1969, Doomsday has a d-value of 5, and so does July 11.

$$\begin{aligned} & [5 + (20-11)] \pmod{7} = \\ & [5 + 9] \pmod{7} = 14 \pmod{7} = 0 \end{aligned}$$

It was one small step for a man on Sunday ( $d = 0$ ), July 20, 1969.

We close with a scholarly poem.

*The last of Feb., or of Jan. will do  
(Except that in Leap Years it's Jan. 32)  
Then for even months use the month's own day,  
And for odd ones add 4, or take it away\**

*\*According to length or simply remember,  
you only subtract for September, or November.*

*Now to work out your doomsday the orthodox  
way*

*Three things you should add to the century day*

***Dozens, remainder, and fours in the latter,***

*(If you alter by sevens of course it won't matter)*

*In Julian times, lackaday, lackaday*

*Zero was Sunday, centuries fell back a day*

*But Gregorian 4 hundreds are always Tues.*

*And now centuries extra take us back twos.*

Project Group :

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