Everyone can participate in these puzzles, compare notes, and share solutions. ***Enjoy!***

It's Just a Matter of Time

Explore the math behind the way time is divided into years, months, and days. Keep in mind that leap years change the patterns. Have a calendar handy for reference.

From Year to Year

In general, New Year's Day is one day later in the week than it was in the year before. Sometimes, it is two days later.

1. Why does this happen? Think about the following:
   - the number of days in a week
   - the number of days in a year
   - the number of days in a leap year
2. People say that a year is made of 52 weeks. Is that precise?
3. How do you know if a year is a leap year?

Year	New Year's Day
2010	Friday
2011	Saturday
2012	Sunday
2013	Tuesday
2014	Wednesday
2015	Thursday
2016	Friday
2017	Sunday
2018	Monday
2019	Tuesday
2020	Wednesday

From Month to Month

Complete the table with the total number of days in each month for the year 2018.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

1. How many months have 31 days?
2. How many months have a total of 30 days?
3. How many months have a total of 28 days?
4. Why is it necessary to clarify the question for 30 and 28 days?

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5. From a previous Family Math Activity, you may remember that January and February were added to the beginning of the calendar when people changed from the Roman calendar to the Julian calendar, and later to the Gregorian calendar in an effort to have the calendar more closely match the seasons.

If you disregard January and February in your table, do you see a pattern in the number of days in a month for the remaining 10 months? How would you describe it?

MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

From Day to Day

Dividing time into weeks and months makes it easy to keep track of special days during the year. Imagine if you had to remember that spring begins on day 80, summer begins on day 172, autumn begins on day 266, and winter begins on day 355. You would also need to remember that if it is a leap year, the seasons start on days 81, 173, 267, and 356.

On which day of the year do some of the special days in your life occur?

These tables can help you answer the question. The numbers indicate how many days of the year have passed before the month starts. Add the number given for the month and the date in the month of the event.

Non-leap year:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0 + date	31 + date	59 + date	90 + date	120 + date	151 + date	181 + date	212 + date	243 + date	273 + date	304 + date	334 + date

Leap year:

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
0 + date	31 + date	60 + date	91 + date	121 + date	152 + date	182 + date	213 + date	244 + date	274 + date	305 + date	335 + date

Examples:

- Valentine's Day (Feb 14) is the 45th day of the year, whether or not it is a leap year. (31 + 14 = 45)
- Independence Day is either the 185th or the 186th day of the year, depending on whether it is a leap year. (181 + 4 = 185 or 182 + 4 = 186)

A Perpetual Calendar

Months may start on different days of the week, but there is a fixed pattern in the way the days of the month appear in the columns of a calendar. The 8th day of the month is always the same day of the week as the 1st, the 9th is always the same day of the week as the 2nd, and so on.

You can create a perpetual calendar—one that can be used with any month in any year.

This layout will work for any month when used with the frame or overlays below.

*	*	*	*	*	*	1	2	3	4	5	6	7
2	3	4	5	6	7	8	9	10	11	12	13	14
9	10	11	12	13	14	15	16	17	18	19	20	21
16	17	18	19	20	21	22	23	24	25	26	27	28
23/30	24/31	25	26	27	28	29	30	31	*	*	*	*

These covers can be folded and used at each end of the table to cover the extra days.

*	*	*	*	*	*
*	*	*	*	*	*
*	*	*	*	*	*
*	*	*	*	*	*
*	*	*	*	*	*

*	*	*	*	*	*
*	*	*	*	*	*
*	*	*	*	*	*
*	*	*	*	*	*
*	*	*	*	*	*

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This frame, created by cutting out the center portion, can be used to outline the appropriate layout for the month.

*	SUN	MON	TUE	WED	THU	FRI	SAT	*
*								*
*								*
*								*
*								*
*								*
*	*	*	*	*	*	*	*	*

The month names can be cut out and put at the beginning or end of the month. They are helpful in hiding the extra days at the end of the month when they are not needed.

JANUARY	JULY
FEBRUARY	AUGUST
MARCH	SEPTEMBER
APRIL	OCTOBER
MAY	NOVEMBER
JUNE	DECEMBER

Sample Calendars

*	*	*	*	*	*	1	2	3	*	*	*	*
*	*	4	5	6	7	8	9	10	*	*	*	*
*	*	11	12	13	14	15	16	17	*	*	*	*
*	*	18	19	20	21	22	23	24	*	*	*	*
*	*	25	26	27	28	29	FEBRUARY			*	*	*

*	SUN	MON	TUE	WED	THU	FRI	SAT	*				
*	*	*	*	*	*	1	2	*	4	5	6	7
*	3	4	5	6	7	8	9	*	11	12	13	14
*	10	11	12	13	14	15	16	*	18	19	20	21
*	17	18	19	20	21	22	23	*	25	26	27	28
*	24/31	25	26	27	28	29	30	*	*	*	*	*
*	*	*	JUNE			*	*	*				

*	*	*	AUGUST			1	2	3	4	*	*	*
*	*	*	5	6	7	8	9	10	11	*	*	*
*	*	*	12	13	14	15	16	17	18	*	*	*
*	*	*	19	20	21	22	23	24	25	*	*	*
*	*	*	26	27	28	29	30	31	*	*	*	*

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