

Investigating months in the calendar with the FX82AU+

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Numerical and algebraic patterns can be found in many places. On your calculator you can generate sequences of numbers based on the operations $+$, $-$, \times and \div .

Examples

The sequence $\langle 1, 3, 5, 7, \dots \rangle$ can be generated by entering 1 then pressing [EXE] then [$+$] 2 then follow with repeated [EXE], [EXE], [EXE], ...

The sequence $\langle 10, 7, 4, 1, \dots \rangle$ can be generated by entering 10 then pressing [EXE] then [$-$] 3 then follow with repeated [EXE], [EXE], [EXE], ...

The sequence $\langle 2, 4, 8, 16, \dots \rangle$ can be generated by entering 2 then pressing [EXE] then [\times] 2 then follow with repeated [EXE], [EXE], [EXE], ...

The sequence $\langle 100, 50, 25, 12.5, \dots \rangle$ can be generated by entering 100 then pressing [EXE] then [\div] 2 then then follow with repeated [EXE], [EXE], [EXE], ...

Activity

Generate the following sequences on your calculator and find the 10th and 15th term for each.

- $\langle 7, 11, 15, 19, \dots \rangle$
- $\langle 72, 61, 50, 39, \dots \rangle$
- $\langle 3, 9, 27, 81, \dots \rangle$
- $\langle 1000, 500, 250, 125, \dots \rangle$

Calendar calculations

The Calendar can also be another interesting source to see patterns. There are only two things that can make one **calendar** different from another:

- the day of the week on which January 1 falls
- whether it is a leap **year** or not.

Following is the Calendar for June 2012.

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					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						

This year, June had 5 Fridays, 5 Saturdays and 5 Sundays. Any month with 31 days has four days of the week appearing four times (in each of the four whole weeks of the month) and three days that appear five times (in each of the four weeks and also as one of the 'extra' 3 days that make up a 31 day month).

Investigate

When was the last time 5 Fridays, 5 Saturdays and 5 Sundays happened? When will it happen again?

Activity

Take any '2x2 block' of dates in a calendar month. There must be 4 dates for example, in the June 2012 month the 2x2 blocks in red are not allowed but the one 2x2 blocks in green are allowed.

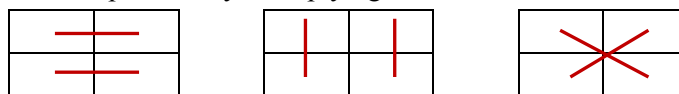
Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

What do you notice? Can you see any patterns?

For example:

- add pairs horizontally and compare the sums.
- add pairs vertically and compare the sums.
- add pairs diagonally and compare the sums.

What about patterns by multiplying:



- pairs horizontally and compare the products.
- pairs vertically and compare the products.

3. pairs diagonally and compare the products.

Extension Activity

1. Take any '2×3 block' of dates in a calendar month. There must be 6 dates for example, in the June 2012 month the 2×3 blocks in red are not allowed but the one 2×3 blocks in green are allowed. What do you notice? Can you see any patterns?

Sun Mon Tue Wed Thu Fri Sat

					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						

2. Take any '3×2 block' of dates in a calendar month. There must be 6 dates for example, in the June 2012 month the 3×2 blocks in red are not allowed but the one 3×2 blocks in green are allowed. What do you notice? Can you see any patterns?
3. Take any '3×3 block' or '3×4 block' or '4×3 block' or '4×4 block' of dates in a calendar month. There must be 9 dates enclosed. What do you notice? Can you see any patterns?
4. Can there be a '5×5 block' on any calendar month? Justify your decision.

Birthday calculations

Often you will need to read and use charts and tables to collect and analyse information. Use the following three tables to find what day people were born on.

Table 1: Month code number

0	1	2	3	4	5	6
January (leap year)	January		February (leap year)	February		
				March		
April		May			June	
July			August			September
	October			November		December

For any given year, the calendar will be identical every 5, 6 or 11 years. This year's calendar [2011] repeats identically in 2022 (not once, coincidentally, last year's calendar [2011], is an exact duplicate of 2005. Notice a pattern of multiples of 7?

Table 2: Year code number

0	1	2	3	4	5	6
	1940	1941	1942	1943		1944
1945	1946	1947		1948	1949	1950
1951		1952	1953	1954	1955	
1956	1957	1958	1959		1960	1961
1962	1963		1964	1965	1966	1967
	1968	1968	1970	1971		1972
1973	1974	1975		1976	1977	1978
1979		1980	1981	1982	1983	
1984	1985	1986	1987		1988	1989
1990	1991		1992	1993	1994	1995
	1996	1997	1998	1999		2000
2001	2002	2003		2004	2005	2006
2007		2008	2009	2010	2011	
2012	2013	2014	2015		2016	2017
2018	2019		2020	2021	2022	2023
	2024	2025	2026	2027		2028
2029	2030	2031		2032	2033	2034
2035		2036	2037	2038	2039	

Table 3: Remainder code number

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

Activity

- What code number is for the month of March?
- What is the code number for year 1999?
- If the remainder is 4, what is the day of the week?
- Suppose Hone's birthday was on 25th June 1986. Complete the following:
 - Write the day date of their birthday.
 - Use table 1 to find the code number for the month.
 - Use table 2 to find the code number for the year.
 - Add these three numbers together.
 - Divide this total by 7 to get a remainder.
 - Use this remainder in table 3 to find the code number for the day of the week.
 - Hone was born on _____