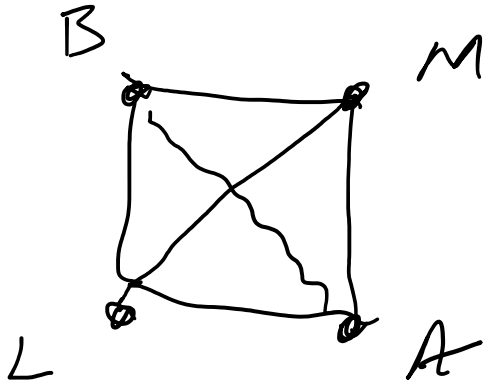


Mar 1/5

Egyptian ^{or} Pascal's Multiplication ^{Book}



There are six total friendships possible

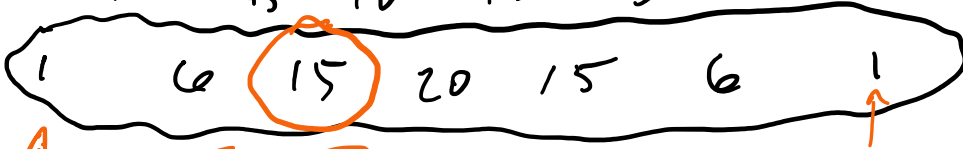
$$\frac{n(n-1)}{2} - \text{A triangular number}$$

n - # of people

$$n=4 \rightarrow \frac{4(4-1)}{2} = 6 \text{ friendships possible}$$

			1			
		1	1			
	1	2	1			
	1	3	3	1		
	1	4	6	4	1	
1	5	10	10	5	1	

The ^{6th} row of Pascal's triangle tells us what to expect



↑
sad anti-social graph

↑ one
↑ two friendships in 15 different ways

↑ complete - everyone's connected - everyone's friends w/ everyone else - just one of those.

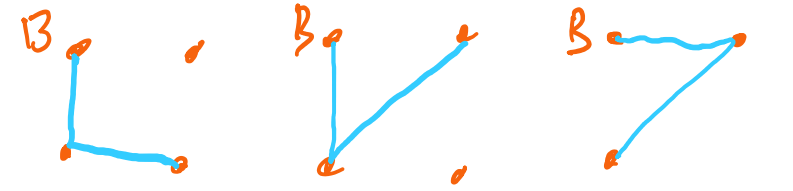
no friendships - just one of those.

B has 3 other friends

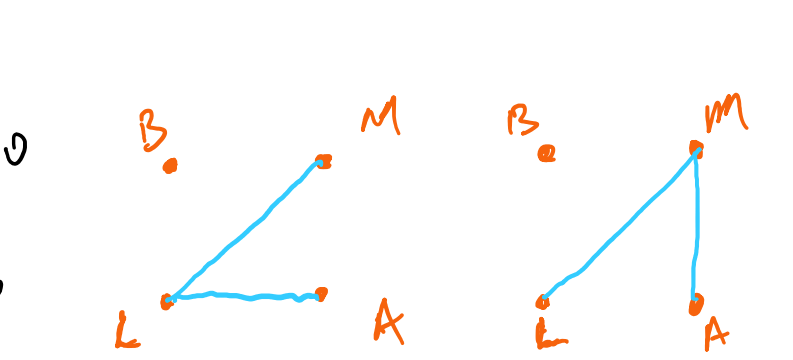


So there should be 15 different Face books.
Focus on B first!

B has 2 other friends



B has 1 other friend



That's all folks!

- a) $13 * 34$
- b) $23 * 79$
- c) $81 * 123$
- d) $255 * 756$

1	34	*	
2	68		272
4	136	*	+ 136
8	272	*	34
16	two big!		<u>442</u>

Build 13 on the left

$$13 = 8 + 4 + 1$$

(using Frandini)

$$34 * 13 = 442$$

b) $23 * 79 = ?$

build 23
 $23 = 16 + 4 + 2 + 1$
 using Fermat's!

1	79	*
2	158	*
4	316	+
8	632	
16	1264	*
32	too big!	

Build the answer from the corresponding doubles!

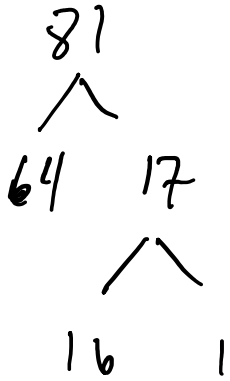
$$\begin{array}{r}
 22 \\
 21 \\
 20 \\
 19 \\
 18 \\
 17 \\
 16 \\
 15 \\
 14 \\
 13 \\
 12 \\
 11 \\
 10 \\
 9 \\
 8 \\
 7 \\
 6 \\
 5 \\
 4 \\
 3 \\
 2 \\
 1 \\
 0 \\
 \hline
 23 \\
 * 79 \\
 \hline
 1817
 \end{array}$$

check:

$$\begin{array}{r}
 79 \\
 * 23 \\
 \hline
 237 \\
 1580 \\
 \hline
 1817 \\
 \checkmark
 \end{array}$$

$23 * 79 = 1817$

c) $81 * 123 = ?$



1	123	*
2	246	
4	492	
8	974	
16	1968	*
32	3936	
64	7872	*
128	no b's!	

? = 7872
 1968
 + 123

 9963

Check:

123
 81

 123
 9840

 9963 ✓

$81 * 123 = 9963$

d) $255 * 256 = ?$

How it pays to double 255! Why?

Because 256 is a power of 2!

There will be no adding after the

doubling: $255 * 256 = 255 * 2^8$

$= 255 * 2 * 2 * 2 * 2 * 2 * 2 * 2 * 2!$

Build a
256:
256 = 256,
It's already
a power of
two.

1	255
2	510
4	1020
8	2040
16	4080
32	8160
64	16320
128	32640
256	65280

$$256 * 255 = 65280$$

Check:

$$\begin{array}{r}
 256 \\
 255 \\
 \hline
 1280 \\
 12800 \\
 51200 \\
 \hline
 65280 \checkmark
 \end{array}$$

only
one row
needed.

No addition after
the doubling.