Goodhand's Trapezium

I've noticed a trend that on the back of funeral service sheets a piece of creative drawing or similar by the deceased may be printed. I'd like this please :-

Suppose I have a tetrahedral die – 4 sides marked '1', '2', '3' and '4'.

I write	'1'	'2'	'3'	'4'	Total
	1	1	1	1	4

so the probability of a total of say '2' in one throw is $^1/_4$. Not impressed?
Well write another row below adding up the four numbers above

°	°	1	1	1	1	°	°	Total
1	2	3	4	3	2	1		16

and add a row above showing the possible totals of two dice

	'2'	'3'	'4'	'5'	'6'	'7'	'8'	Total
°	°	1	1	1	1	°	°	4
	1	2	3	4	3	2	1	16

so the probability of a total '4' in two throws is $^3/_{16}$. More impressed?

For three dice add another row, adding the 4 numbers above with a new header row.

'3'	'4'	'5'	'6'	'7'	'8'	'9'	'10'	'11'	'12'	Total
°	°	°	1	1	1	1	°	°	°	4
	1	2	3	4	3	2	1			16
1	3	6	10	12	12	10	6	3	1	64

so the probability of a total '6' in three throws is $^{10}/_{36}$.

Now you're impressed? Throwing 4 dice gives

'4'	'5'	'6'	'7'	'8'	'9'	'10'	'11'	'12'	'13'	'14'	'15'	'16'	Total
°	°	°	°	1	1	1	1	°	°	°	°		4
			1	2	3	4	3	2	1				16
		1	3	6	10	12	12	10	6	3	1		64
1	4	10	20	31	40	44	40	31	20	10	4	1	256

so the probability of a total say '7' when throwing four dice is $^{20}/_{256}$.

Now you're really impressed. There are other patterns in these numbers – can you spot them? I would have liked to have shown you this table for a 6 sided die but this service sheet is too small to contain it#.

These tables took me about 4 years on and off to discover and came about after a lesson on dice throwing with a "bottom" set in Maths. There's always something new to discover in Maths.

Robert Goodhand

 # acknowledgments to Fermat