

## Triangular Numbers and Combinations

First order triangular numbers are familiar to most students.

First order triangular numbers represent units in a 2-D triangle.

*but did you know*

Second order triangular numbers represent units in a 3-D tetrahedron.

Triangular numbers correlate with Combinations

As the formula for permutations are readily generated, the formula for triangular numbers are easily deduced.

Algebraic series can often be reduced to the sum of two or more triangular series.

Successive orders of triangular numbers appear on the diagonals of Pascal's Triangle.

Cardinal	1	2	3	4	5	6	7	8
1st order	$1T1 = 1 = 2C2$	$1T2 = 3 = 3C2$	$1T3 = 6 = 4C2$	$1T4 = 10 = 5C2$	$1T5 = 15 = 6C2$	$1T6 = 21 = 7C2$	$1T7 = 28 = 8C2$	$1T8 = 36 = 9C2$
2nd order	$2T1 = 1 = 3C3$	$2T2 = 4 = 4C3$	$2T3 = 10 = 5C3$	$2T4 = 20 = 6C3$	$2T5 = 35 = 7C3$	$2T6 = 56 = 8C3$	$2T7 = 84 = 9C3$	$2T8 = 120 = 10C3$
3rd order	$3T1 = 1 = 4C4$	$3T2 = 5 = 5C4$	$3T3 = 15 = 6C4$	$3T4 = 35 = 7C4$	$3T5 = 70 = 8C4$	$3T6 = 126 = 9C4$	$3T7 = 210 = 10C4$	$3T8 = 330 = 11C4$
4th order	$4T1 = 1 = 5C5$	$4T2 = 6 = 6C5$	$4T3 = 21 = 7C5$	$4T4 = 56 = 8C5$	$4T5 = 126 = 9C5$	$4T6 = 252 = 10C5$	$4T7 = 462 = 11C5$	$4T8 = 792 = 12C5$

and in general  $(r-1)T(n-r+1) = nCr$

✕RG triangular02/00