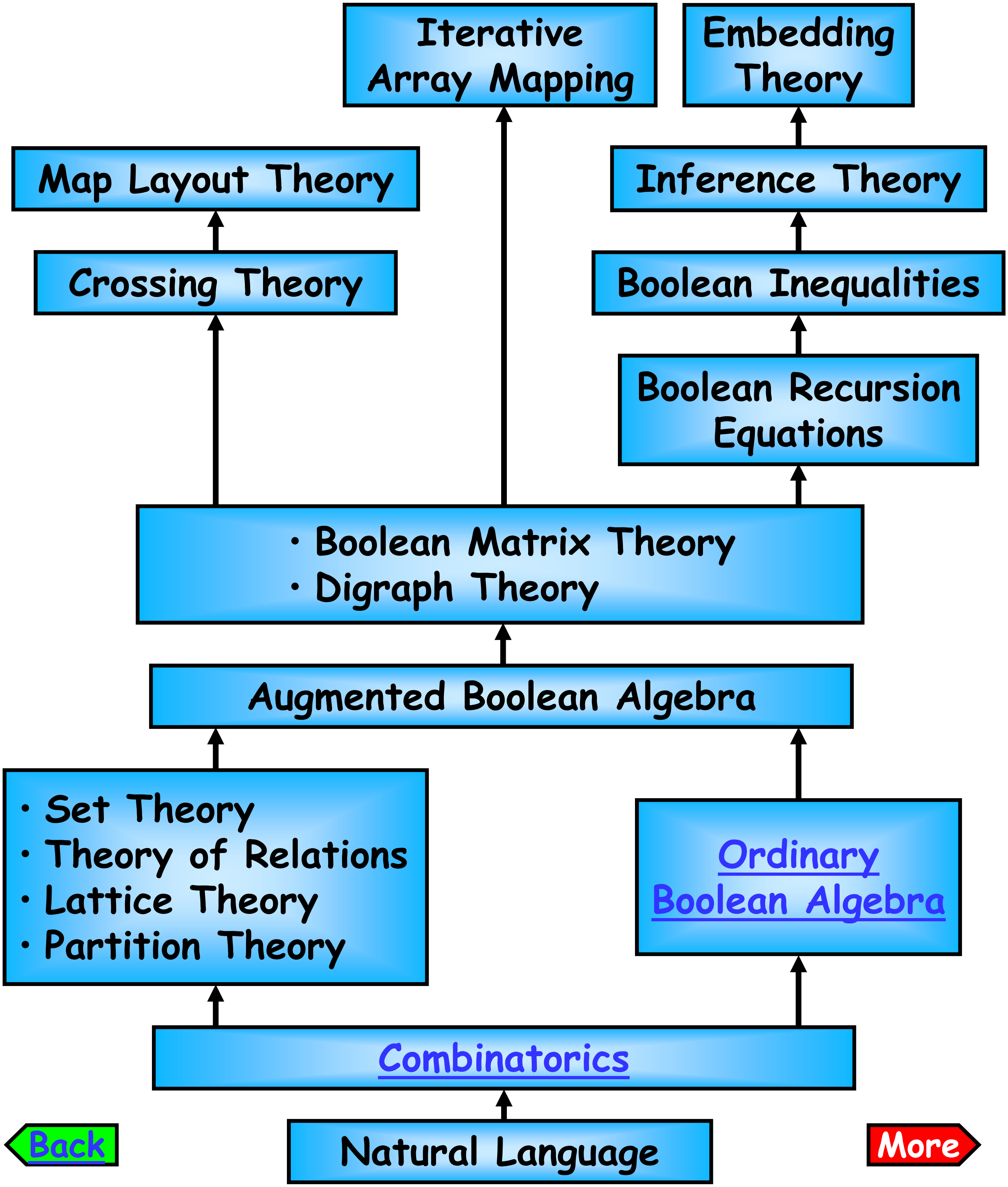
Warfield, Dependency Sequence – Mathematics of Modeling

(Lower elements contribute to higher elements)



Warfield, Dependency Sequence

[Lower elements contribute to higher elements]

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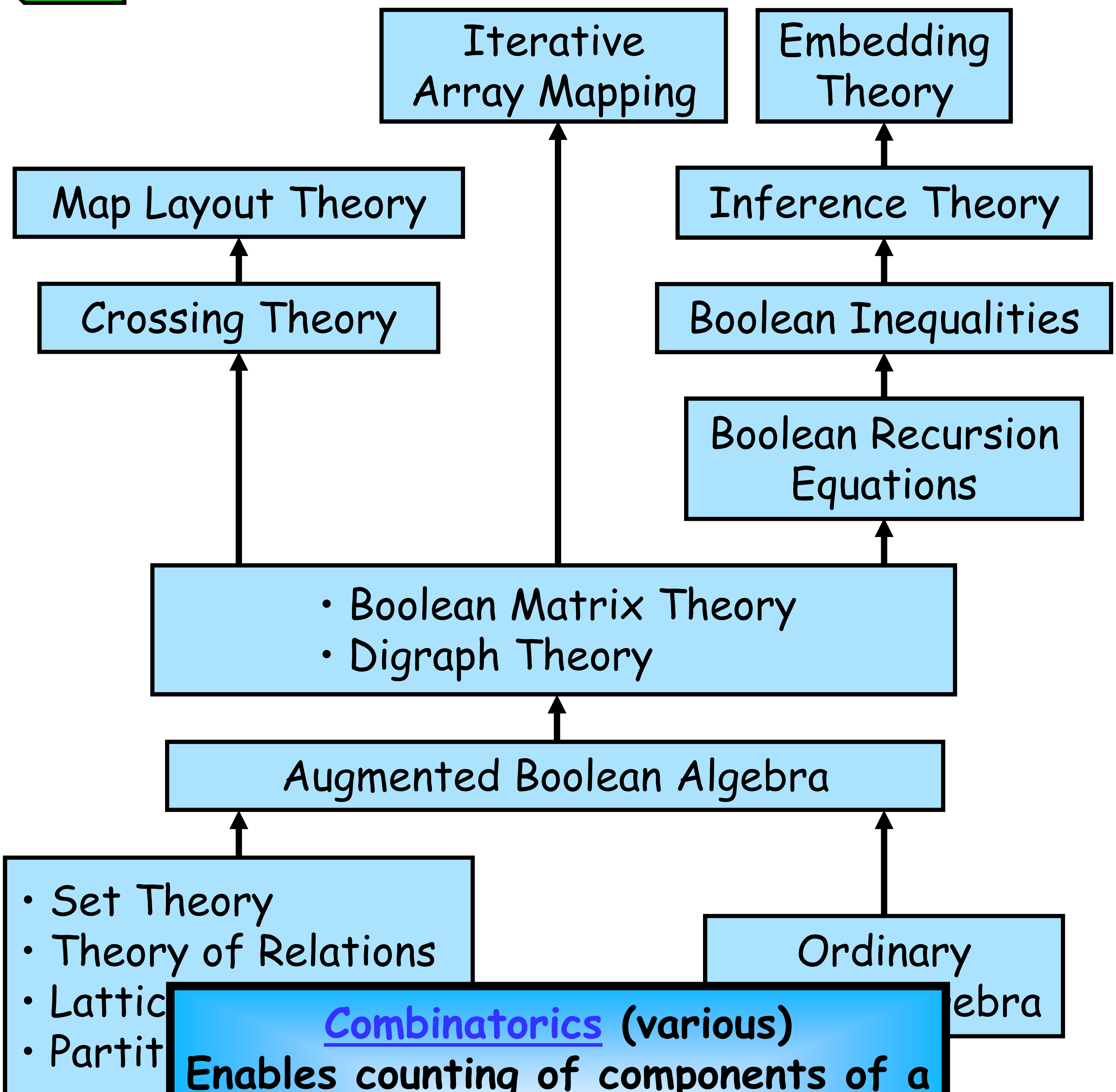

Combinatorics (various)
Enables counting of components of a Problematic Situation, leading to strategic insights concerning the development of linkages between human beings and logic

Combinatorics

[Three formulas are especially important]

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For purposes of structuring complexity, combinatorics is mainly of interest for its power in counting.

- The number of combinations of **n** things, taken **k** at a time is found from the formula

  $n!/(n-k)!k!$

- The number of permutations of **n** things, taken **k** at a time is found from

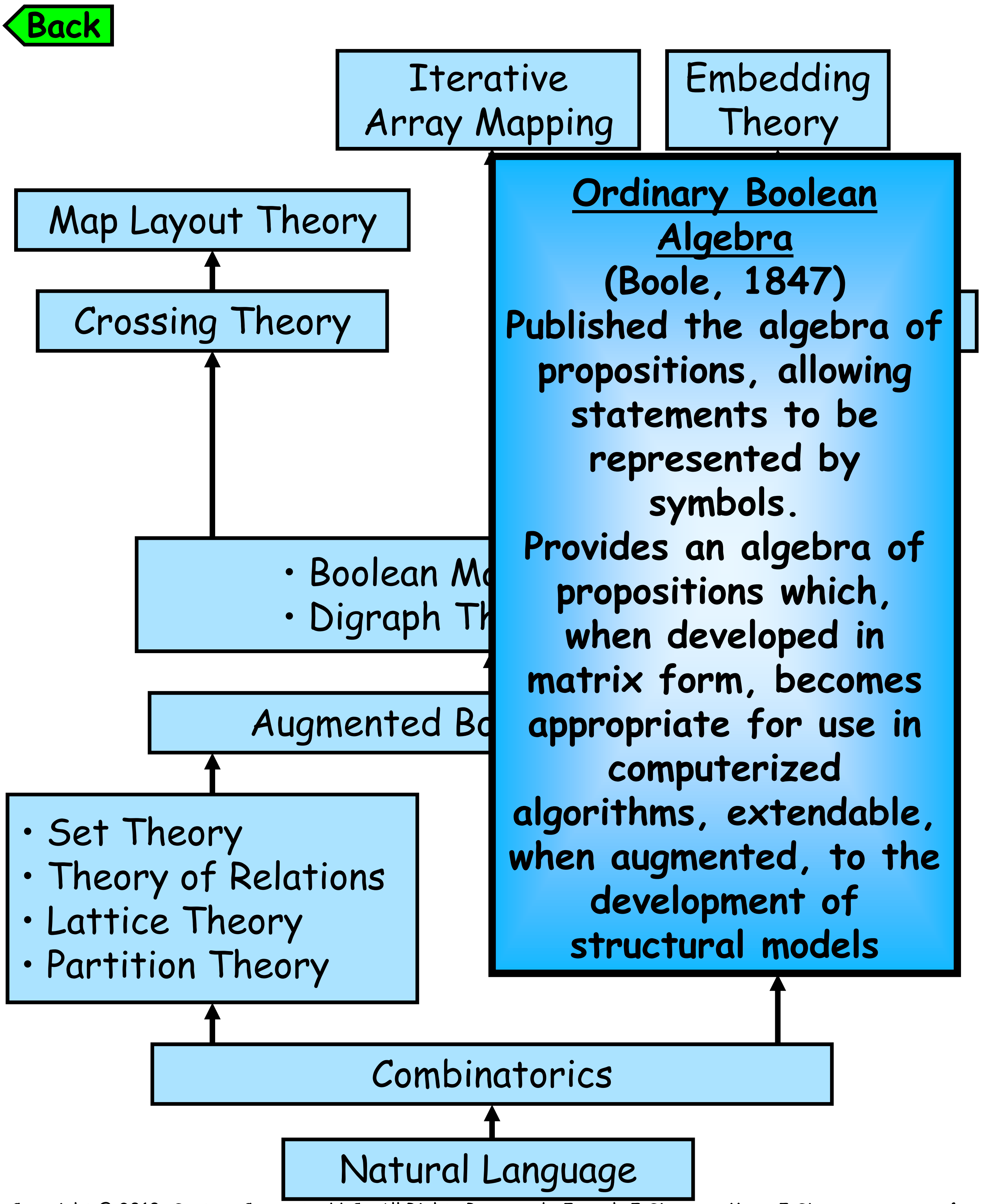
  $n!/(n-k)!$

- The total number of combinations of **n** things (summed from k = 0 to k = n), is

  2^n

Warfield, Dependency Sequence

[Lower elements contribute to higher elements]



Warfield, Dependency Sequence – Mathematics of Modeling

Additional Components: Mathematics of Structure

- Constraint Theory
- Geodetic Cycles
- Graph Theory
- Implication Matrix
- Interpretive Structural Modeling
- Matrix Interconnection Theory
- Matrix Theory
- Model Exchange Theory
- Reachability Matrix

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Warfield, Dependency Sequence – Mathematics of Modeling

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Additional Components: Mathematics of Structure

Constraint Theory
(Friedman, 1967)
Provides algorithms for determining consistency of large models, pinpointing sources of inconsistency, and determining allowability of requested computations

Inter… …deling

Matrix Interconnection Theory

Matrix Theory

Model Exchange Theory

Reachability Matrix

 Joseph J Simpson, Mary J Simpson

Warfield, Dependency Sequence – Mathematics of Modeling

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Additional Components: Mathematics of Structure

Constraint Theory

Geodetic Cycles
(Warfield, 1976)
Algorithm shows how to compute the number of geodetic cycles contained in a large cycle, and how to form a hierarchy of geodetic cycles as a strategy to facilitate interpretation of the large cycle

Int… …ling

M… …ry

Matrix Theory

Model Exchange Theory

Reachability Matrix

Cycles

And their relationship to syllogisms

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Warfield used Aristotle's work on syllogisms (a formalizing inference, requiring 3 statements) and set theory to develop a formula for computing the number of syllogisms in a cycle.

- A cycle is a set of mutually (symmetrically) related elements.
- Three elements are required to create a syllogism, so there will not be any syllogisms in a cycle that doesn't have at least 3 elements.
- A(n) represents the number of syllogisms in a structure having n members. For a cycle,

  $A(0) = A(1) = A(2) = 0$

- A(n) = P(n,3) = the number of permutations of n things taken 3 at a time, or

  $P(n,k) = n!/(n-k)! \quad \rightarrow \quad P(3,3) = 6$

- For n greater than 3, the following recursion equation was developed to compute the number of syllogisms contained in cyclic structures:

  $A(n) = P(n,3) = n/(n-3) \times P(n-1,3)$

n	A(n)	n	A(n)
3	6	7	210
4	24	8	336
5	60	9	504
6	120	10	720