Discrete Maths

List all the partitions
of $\{1, 2, 3, 4\}$ into two
classes.

$\Rightarrow \{12\} \{34\}$

$\{13\} \{24\}$

$\{14\} \{23\}$

$\{123\} \{4\}$

$\{124\} \{3\}$

$\{134\} \{2\}$

$\{1\} \{234\}$

$\{234\} \{\}$

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Generating function

"one more way of solving problem"

Adding one more or string to your bow

An archer may use next string when previous is broken.

"A generating function is a clothesline on which we hang up a sequence of numbers for display."

"when it works, it is often the simplest.
"For many problems, it is okey to even reach closer to solution!!

n^{th} prime number

i.e.

$n \Rightarrow 3^{rd}$

$$2 \quad 3 \quad 5 \quad 7 \quad \underline{11} \quad 13 \quad \overline{17}$$

$$2x^0 + 3x^1 + 5x^2 + 7x^3 +$$
$$11x^4 + - - - - -$$

clothesline

$$\sum_{i=0}^{\infty} a_i x^i \qquad a_i \; i^{th} \; prime \; number$$

Def:

Given a sequence (set) of co-efficients $(a_0, a_1, a_2, \ldots \ldots a_n)$ a_∞ be a symbolic representation of a sequence of events or let it simply be a sequence.

$$f(x) = a_0 \, u_0(x) + a_1 \, u_1(x) + a_2 \, u_2(x) + \ldots$$

$u_0, u_1, u_2 \ldots$ are called indicators. Mostly we will use

Ex1

Set 1

$(2, 5, 7)$

Find pairs having total 12 one element per set. How many pairs?

Set 2

$(10, 5, 1)$

$$x^2 x^{10} + x^2 x^5 + x^2 x^1$$

$$+ x^5 x^{10} + x^5 x^5 + x^5 x^1$$

$$+ x^7 x^{10} + x^7 x^5 + x^7 x^1$$

$$\Rightarrow x^{12} + x^7 + x^3 + x^{15} + x^{10} + x^6$$

$$+ x^{17} + x^{12} + x^6$$

$$\Rightarrow \boxed{2} \; \boxed{x^{12}} + x^7 + x^3 + x^{15} + x^{17} + x^8$$

possible summation How many ($(2,10)$, $(7,5)$)

17, 15, 12, 10, 8, 7, 6, 3 are various possible summation any two. from different

Ex2. 3 objects to distribute amonst
2 people.

P A   B
$[0, 1, 2, 3]$ $[0, 1, 2, 3]$

$(x^0 + x^1 + x^2 + x^3)$ $(x^0 + x^1 + x^2 + x^3)$

$x^0 x^0 + x^0 x^1 + x^0 x^2 + x^0 x^3$

$+ x^1 x^0 + x^1 x^1 + x^1 x^2 + x^1 x^3$

$+ x^2 x^0 + x^2 x^1 + x^2 x^2 + x^2 x^3$

$+ x^3 x^0 + x^3 x^1 + x^3 x^2 + x^3 x^3$

$x^0 + 2x^1 + 3x^2 + 4x^3 + 3x^4$
$+ 2x^5 + x^6$

$\overset{\text{#objects}}{\underset{\underset{\text{#ways}}{\uparrow}}{4x^3}}$ $\longleftarrow$ indicates 4 ways to distribute 3 objects

$$3, 0$$
$$0, 3$$
$$2, 1$$
$$1, 2$$

$\overset{\text{#objects}}{\underset{\underset{\text{#ways}}{\uparrow}}{3x^2}}$ $\longleftarrow$ indicates 3 ways to distribute 2 objects

$$2, 0$$
$$0, 2$$
$$1, 1$$

$2x^1 \leftarrow$ 2 ways to distribute 1 object

objects

2 x ways

$$1 \quad 0$$
$$0 \quad 1$$

$1x^0 \leq 1$ way to distribute 0 objects

Don't distribute. ??!

P.S. We have only 3 objects in total.

$3x^4$ objects $2x^5$ objects $1x^6$ objects

ways   # ways   4 ways

ways

*

(No understanding of these as of now.

If you want answer for more objects distribution,
you will need to update from beginning.
i.e #obj 5
[0,1,2,3,4,5]   [0,112,3,4,5]   and create
oyf.

Assignment:

① Why
What shall be the value of x in x^2 Indicator

be $|x| < 1$?

② Find out connection between permutation and sorting.

Sorting → Ascending
→ Descending
→ Non —
→ Non —