EVERY TIME A NEW SITUATION COMES AND THEN WE FIGURE OUT HOW TO COUNT THEM.

NOW COMES THE VARIATION IN GROUPING!

I AM GIVING YOU A SITUATION

AND IT IS

YOU HAVE 3 BOXES. AND YOU HAVE TO DISTRIBUTE 10 BALLS IN THE RATIO OF 5:3:2

HEY I THINK YOU DIDN'T MENTION WHETHER THE BOXES ARE IDENTICAL OR DISTINCT AND THE BALLS ARE IDENTICAL OR DISTINCT

WHY NOT? LET'S EXPLORE ALL THE POSSIBILITIES:

(#1) BALLS ARE DISTINCT, BOXES ARE DISTINCT

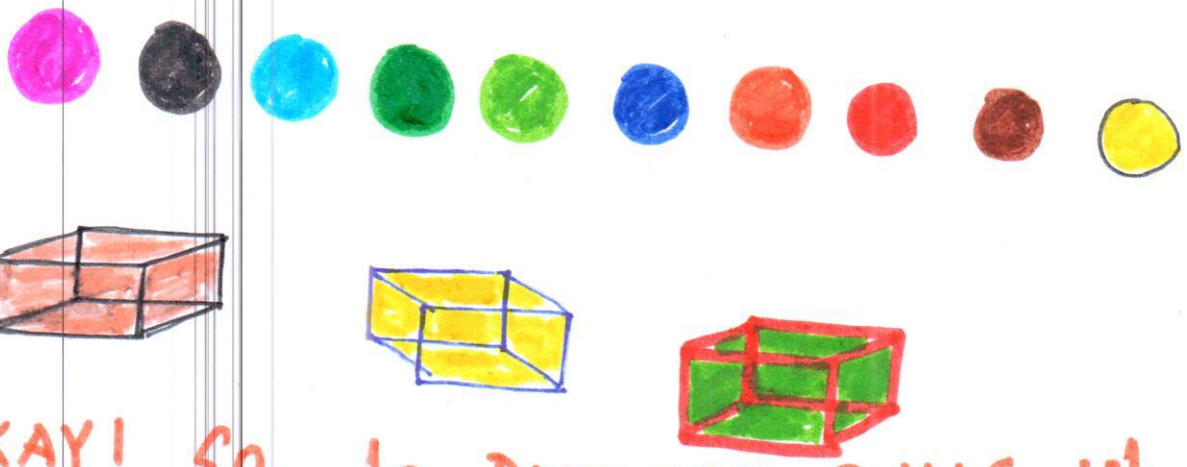
(#2) BALLS IDENTICAL, BOXES DISTINCT

(#3) BALLS IDENTICAL, BOXES IDENTICAL

(#4) BALLS DISTINCT, BOXES IDENTICAL

HEY WAIT! YOU'VE GIVEN TOO MUCH TO COUNT! LET'S LOOK AT EACH CASE INDIVIDUALLY!

#1 BALLS DISTINCT, BOXES DISTINCT



OKAY! SO 10 DISTINCT BALLS IN 3 DISTINCT BOXES IN 5:3:2 ratio.

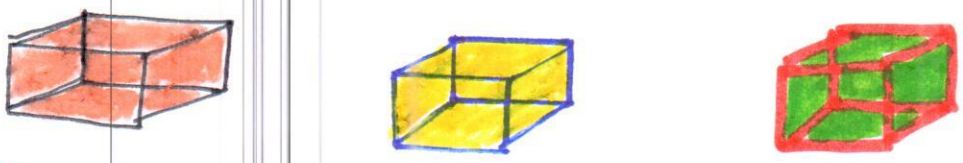
LET'S SELECT 5 AND 3 AND 2 BALLS

WELL THIS IS EASY $^{10}C_5 \times {}^5C_3 \times {}^2C_2$

NOW ANY BOX CAN HAVE 5/3/2. SO LET'S SHUFFLE

$^{10}C_5 \times {}^5C_3 \times {}^2C_2 \times 3!$

#2 BALLS IDENTICAL, BOX DISTINCT



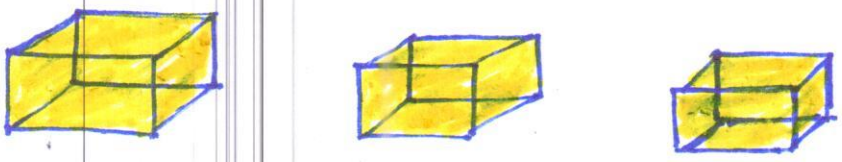
OKAY! SINCE ALL BALLS ARE IDENTICAL

WE CAN 5 AND 3 AND 2 BALLS IN $1 \times 1 \times 1$ WAY

NOW ANY BOX CAN HAVE 5/3/2.
AND SINCE BOXES ARE DISTINCT
WE CAN SHUFFLE IN 3!

$1 \times 1 \times 1 \times 3!$

#3 BALLS IDENTICAL, BOXES IDENTICAL



Hmmm!

SELECTING 5 AND 3 AND 2 IN

1 x 1 x 1

NOW SINCE ALL BOXES ARE IDENTICAL IT DOESN'T MATTER WHICH WILL HAVE 5/3/2.

HENCE, 1 x 1 x 1 x 1

#4 BALLS DISTINCT, BOXES IDENTICAL

NOW BALLS CAN BE SELECTED

$$^{10}C_5 \times {}^{5}C_3 \times {}^{2}C_2$$

SINCE BOXES ARE IDENTICAL SHUFFLING WILL RESULT IN SAME PATTERN EVERY TIME

$$^{10}C_5 \times {}^{5}C_3 \times {}^{2}C_2 \times 1$$

NOW REPEAT ABOVE THINGS FOR RATIO 6 : 2 : 2

#1 BALLS DISTINCT, BOXES DISTINCT

$$^{10}C_6 \times {}^{4}C_2 \times {}^{2}C_2 \times \frac{3!}{2!}$$

CAN YOU TELL ME WHY?
WELL LET ME SHOW YOU