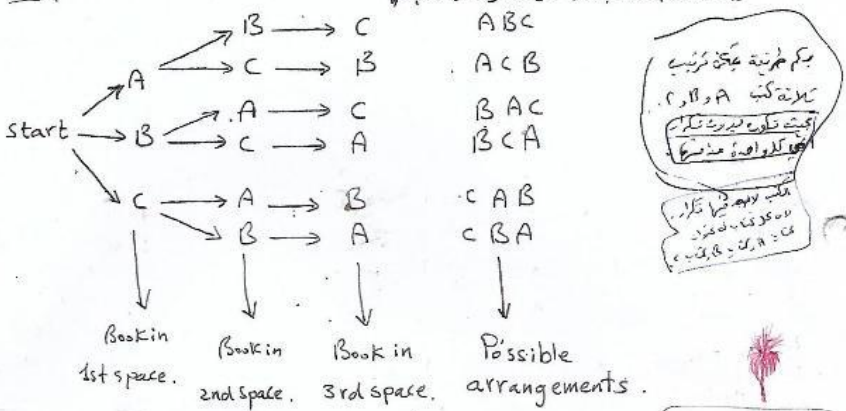
Tree Diagrams

ex.24. In How many ways can three books denoted by A, B and C be arranged in order on aself?

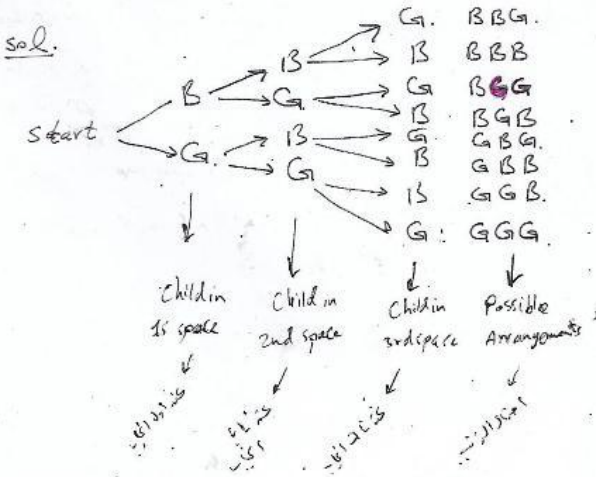
Sol.



عدد الطرق = 6

ex.25. Suppose that the Cuple is planning to have three children. In how many ways can this happen?

Sol.



عدد الطرق = 8

Ex.27 How many 4 digits numbers can be formed from the digit numbers 1, 2, 3, 4 ?. repition is not allowed.

1st method.

4	3	2	1

$4 \times 3 \times 2 \times 1 = 24$

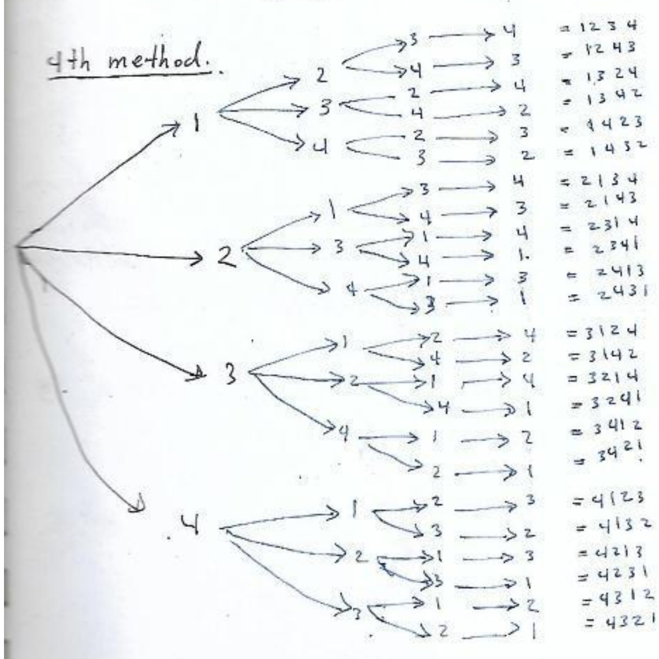
2nd method.

$n! = 4! = 4 \times 3 \times 2 \times 1 = \boxed{24}$

3rd method.

$$P^n_r = P^4_4 = \frac{4!}{(4-4)!} = \frac{4!}{0!} = \frac{4!}{1} = 4 \times 3 \times 2 \times 1 = \boxed{24}$$

4th method.



with replacement.? (How)

ex.28) How many arrangements can be made of the letters of the word (Mississippi), taken all together?

sol/ since ther are. $m = 1$, $i = 4$, $s = 4$, $p = 2$

and the total of letters is 11, then.

$$\frac{n!}{n_1!\, n_2!\, n_3! \dots n_k!} = \frac{11!}{1!\, 4!\, 4!\, 2!} = \boxed{34650}$$

How many arrangment. can be made of the letters of the words statistics taken all together

statistics / عدد الترتيب المختلفة التي يمكن تكوينها من حروف كلمة statistics اذا اخذت جميعاً.

الكلمة تحتوي على. $s = 3$, $t = 3$, $i = 2$, $a = 1$, $c = 1$ وبذلك فان $K = 5$ و $n_1 = 3$, $n_2 = 3$, $n_3 = 2$, $n_4 = 1$, $n_5 = 1$

$$n_1 + n_2 + n_3 + n_4 + n_5 = 3 + 3 + 2 + 1 + 1 = \boxed{10}$$

وعلى هذا الاساس فان عدد الترتيب

$$\frac{n!}{n_1!\, n_2!\, n_3!\, n_4!\, n_5!} = \frac{10!}{3!\, 3!\, 2!\, 1!\, 1!} = \frac{10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4 \times 3!}{3! \times 3! \times 2 \times 1 \times 1} = \boxed{50400}$$

عدد الترتيب او الطرق.

ex. use world · Baghdad.

Ex

In How many ways can three Books denoted by, A, B and C

(i) be arranged in order on a shelf ?

(ii) be arranged only 2 letters ?

(iii) with replecment. for (i)

with respect 2 only letters with replecment.

(i) ① arranged. method

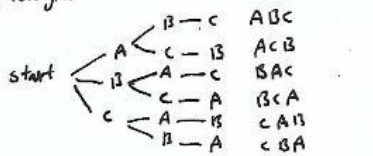
1	2	3
3	2	1

$3 * 2 * 1 = \boxed{6}$ ways.

② $P^{n.}_{n} = P^{3}_{3} = 3! = 3 * 2 * 1 = \boxed{6}$ ways

or $P^{n}_{n} = n! = 3! = \boxed{6}$

③ Tree Diagram.



عدد الطرق = 6

(ii) ① Arrangement method.

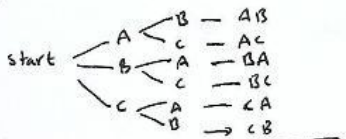
1	2
3	2

$3 * 2 = \boxed{6 \text{ ways}}$

② permutation

$$P^{n}_{r} = \frac{n!}{(n-r)!} \Rightarrow P^{3}_{2} = \frac{3!}{(3-2)!} = \frac{3!}{1!} = 3 * 2 * 1 = 6 \boxed{\text{ways}}$$

③ Tree Diagram



عدد الطرق = 6

(iii) With replecment.

① $P \Rightarrow n^r = 3^3 = \boxed{27}$ ways

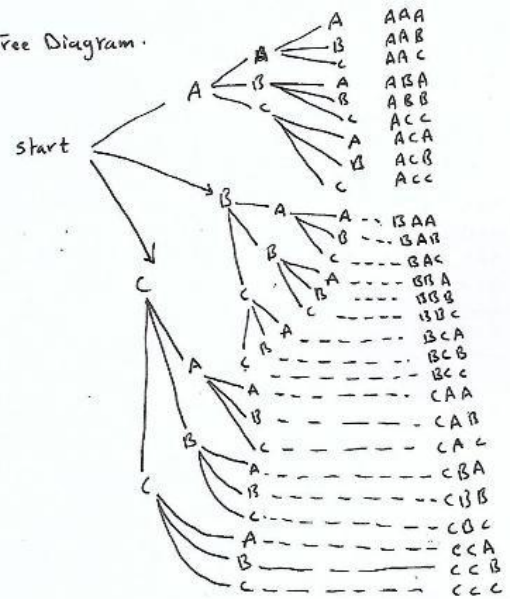
or ① $P^n_r + P^n_{n-1} = P^n_{r+n-1} = P^3_{2+3-1} = 6+$

② Arrangment method.

1	2	3
3	3	3

$3 \times 3 \times 3 = 3^3 = \boxed{27}$ ways.

③ Tree Diagram.



27 ways

iv) 2 only letters with replacement.

① Arrangment method.

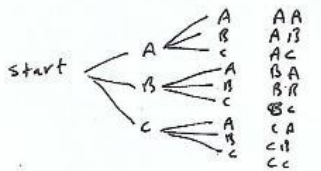
1	2
3	3

$3 * 3 = \boxed{9}$ ways.

② permutation

$n^r = 3^2 = \boxed{9}$ ways.

③ Tree Diagrams



9 = عدد الطرق

How many 2-digit numbers can be formed from the digits (2, 4, 5, 7)

if (i) Repetation are not allowed. (ii) with replacement.

(iii) 4-digit only. without replacement.

(iv) with replacement.

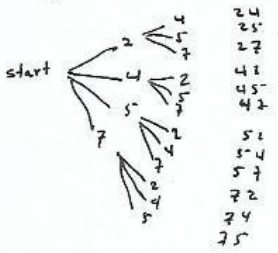
(i)

① | 4 | 3 |

$4 \times 3 = 12$ ways

② $P_r^n = P_2^4 = \frac{4!}{(4-2)!} = \frac{4!}{2!} = 4 \times 3 = 12$ ways.

③



24
25
27
42
45
42
52
54
57
72
74
75

= 12 ways

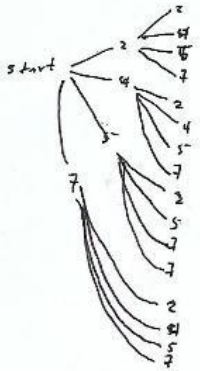
(ii) with replacement.

① | 4 | 4 |

$4 \times 4 = 16$ ways

② $n^r = 4^2 = 4 \times 4 = 16$ ways.

③



= 16 ways