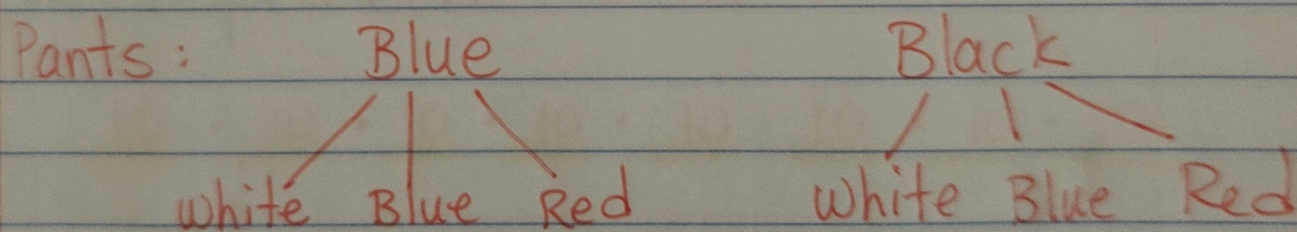


Section 10-2 Fundamental Counting Principle and Permutations

The Fundamental Counting Principle:
The number of ways in which a series of successive events can occur is found by multiplying the number of ways in which each event can occur.

ex 1 On a trip, you pack 3 shirts and 2 pairs of pants. How many outfits are possible?



There are 6 possible outfits.

Fund Counting Princ: $2 \cdot 3 = \boxed{6}$

ex 2 HW #6

How many different ID cards can be made if there are 8 digits on a card and no digit can be used more than once?

Digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9
total of 10 digits

2/6

10 · 9 · 8 · 7 · 6 · 5 · 4 · 3

10 digits
to choose
from

this goes down to 9 choices
bc "no digit can be used
more than once."

Use calc.

1,814,400

ex 3 Rework ex 2 but digits CAN
be repeated.

HW
#6

10 · 10 · 10 · 10 · 10 · 10 · 10 · 10

$$= 10^8 = 100,000,000$$

Factorial !

$$5! = 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 120$$

5 factorial

Math → PRB

↓
4!

$$4! = 4 \cdot 3 \cdot 2 \cdot 1 = 24$$

$$3! = 3 \cdot 2 \cdot 1 = 6$$

$$2! = 2 \cdot 1 = 2$$

$$1! = 1$$

$$0! = 1 \quad \text{Definition}$$

ex 4 Simplify HW #1-5

a) $\frac{10!}{5!}$ In calc $10! / 5! = \boxed{30,240}$

b) $\frac{15!}{3! \cdot 12!}$ In calc $15! / (3! \cdot 12!) = \boxed{455}$

c) $\frac{10!}{(10-3)!}$ In calc $10! / (10-3)! = \boxed{720}$

d) $\frac{100!}{98!} = \frac{100 \cdot 99 \cdot \cancel{98 \cdot 97 \dots}}{\cancel{98 \cdot 97 \dots}} = \boxed{9900}$

A permutation is an ordered arrangement where:

1. no item is repeated
2. the order of the items is important

ex 5 HW #7

✓ no repetition

A professor has 8 different tasks to assign, one to each of her 8 teaching assistants.

In how many different ways can she make the assignments?

$$8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1$$

$$= 8! = \boxed{40,320}$$

$$\text{or } {}^8P_8 = {}^nP_r \text{ with } n=r=8 \\ = 40,320$$

The permutations of n total objects grouped r at a time are:

$${}_nP_r = \frac{n!}{(n-r)!}$$

↑ we won't use this
we will just use
 ${}_nP_r$ on the calc

6/6

Permutations of Duplicate Items

The number of permutations of n total items where p_1 are identical, p_2 are identical, etc is:

$$\frac{n!}{p_1! \cdot p_2! \cdot p_3! \cdot \dots}$$

ex 7 HW #15 In how many ways can we rearrange the letters in ILLINOIS

if we use all the letters each time?

$n = \text{total \# letters} = 8$

repeats $\left\{ \begin{array}{l} I = 3 \\ L = 2 \end{array} \right.$

$$\frac{8!}{3! \cdot 2!}$$

this will change with each problem

$$= 8! / (3! \times 2!)$$

$$= \boxed{3360}$$