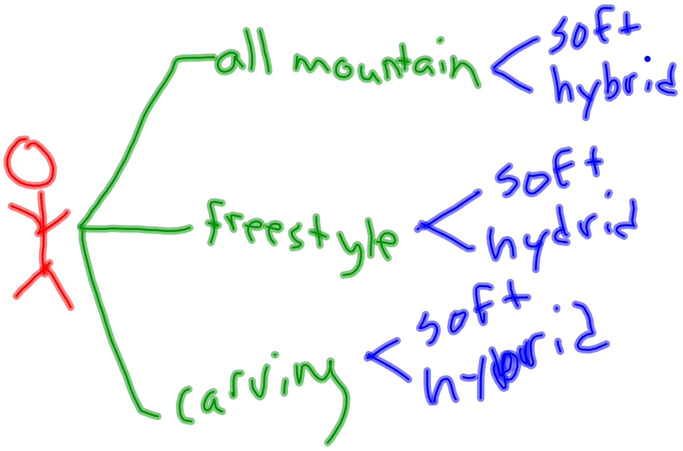
Chapter 10.1: Apply the Counting Principle and Permutations

make use of a tree diagram to help you out.

A sporting goods store offers 3 types of snow boards(all-mountain, freestyle and carving) and 2 types of boots(soft and hybrid). How many choices does the store offer for snow boarding equipment?



Fundamental Counting Principle:

Two Events: If one event can occur in m ways and another event can occur in n ways, then the number of ways both events can occur is mn.

times

This can be extended to more events.

12 - ties
4 - pants
7 - shirts
3 - shoes

$12(4)(7)(3) = 1008$

You are framing a picture. The frames are available in 12 different styles. Each style is available in 55 different colors. You also want blue mat board, which is available in 11 different shades of blue. How many different ways can you frame the picture?

$12(55)(11)$

7,260

The standard for a Texas license plate is 1 letter followed by 2 digits followed by 3 letters. How many different plates are possible if letters and digits can be repeated? What about when they cannot be repeated?

$\underset{L}{\underline{26}} \cdot \underset{D}{\underline{10}} \cdot \underset{D}{\underline{10}} \cdot \underset{L}{\underline{26}} \cdot \underset{L}{\underline{26}} \cdot \underset{L}{\underline{26}}$

45,697,600

$26 \cdot 10 \cdot 9 \cdot 25 \cdot 24 \cdot 23$

32,292,000

Cal.

$\underset{L/D}{\underline{36}}\ \underline{36}\ \underline{36}\ \underline{36}\ \underline{36}\ \underline{36}\ \underline{36}$

2,176,782,336

7.8364164×10^{10}

An ordering of n objects is a permutation of the objects. For example there are 6 permutations of the letters A, B, and C.

ABC CBA BAC
ACB CAB BCA

Factorial $3! = 3 \cdot 2 \cdot 1 = 6$ $0! = 1$

The number of permutations of r objects taken from a group of n distinct objects.

The order matters

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

n# nPr R#

$_4P_{10}$

Ten teams are competing in the final round of the Olympic four-person bobsledding competition. In how many different ways can the bobsledding teams finish the competition (no ties)? How many different ways can 3 of the bobsledding teams finish 1st, 2nd, 3rd.

$${}_{10}P_{10} = \frac{10!}{(10-10)!} = 10! = 3{,}628{,}800$$

$${}_{10}P_{3} = \frac{10!}{(10-3)!} = \frac{10!}{7!} = \frac{10\cdot 9\cdot 8\cdot \cancel{7!}}{\cancel{7!}} = 10\cdot 9\cdot 8 = \boxed{720}$$

10 nPr 3 = 720

Permutations with Repetition:

The number of distinguishable permutations of n objects where one object is repeated s_1 number of times and another object repeated s_2 number of times.

$$\frac{n!}{s_1!\bullet s_2!\bullet s_3!\bullet\ldots\bullet s_k!}$$

Find the number of distinguishable permutations of the letters in MIAMI and TALLAHASSEE

$$\frac{5!}{(2!2!)} = \frac{5!}{4} = 30$$

$$\frac{5 \cdot \cancel{4} \cdot 3 \cdot 2 \cdot 1}{\cancel{4}}$$

$$\frac{11!}{(3!2!2!2!)} = 831,600$$

Homework: Chapter 10.1 pg.686
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