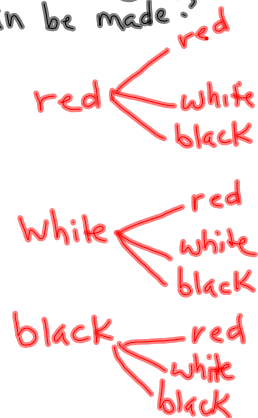


Chapter 2: Counting Methods  
 Sec. 2.1: Counting Principles

Tree Diagram

pg. 68 ex. #1

Soccer uniform has three sweaters: red, white & black  
 Three different shorts: red, white & black.  
 How many variations of the uniform can be made?



9 variations

Fundamental Counting Principle

If there are 'a' ways to perform one task and 'b' ways to perform another, then there are  $a \cdot b$  ways to perform both.

example

Iphone 4, 5 or 6

Cases: rubber or plastic

Colors: red, black, green, purple, blue

Iphone options    cases    color  
 $3 \cdot 2 \cdot 5$

30 variations

## Fundamental Counting Principle with Restrictions.

ex. pg. 69

Lock that opens with the correct 3-digit code. Each wheel has digits 0-9.

a) How many are possible?

$$\frac{10}{\uparrow \text{10 possible digits}} \cdot \frac{10}{\phantom{\uparrow}} \cdot \frac{10}{\phantom{\uparrow}} = 1000 \text{ ways}$$

b) Suppose each digit can only be used once. (no repeating numbers)

$$\frac{10}{\uparrow \text{10 possible numbers}} \cdot \frac{9}{\uparrow \text{only 9 allowed}} \cdot \frac{8}{\phantom{\uparrow}} = 720$$

$$\underline{10} \cdot \underline{10} \cdot \underline{10} \cdot \underline{10}$$

repeat  
allowed

$$\underline{10} \cdot \underline{9} \cdot \underline{8} \cdot \underline{7}$$

not allowed  
to repeat

\* What if the first number  
has to be a 5?

$$\underline{1} \cdot \underline{10} \cdot \underline{10} \cdot \underline{10}$$

repeat allowed

$$\underline{1} \cdot \underline{9} \cdot \underline{8} \cdot \underline{7}$$

no repeating

## ex.2) Postal codes

Letter, number, Letter      number, letter, number

\* # letters in the alphabet  $\Rightarrow 26$   
 # digits 0-9  $\Rightarrow 10$

a) no restrictions

$$\underline{26} \cdot \underline{10} \cdot \underline{26} \cdot \underline{10} \cdot \underline{26} \cdot \underline{10}$$

17,576,000

b) no repeating

$$\underline{26} \cdot \underline{10} \cdot \underline{25} \cdot \underline{9} \cdot \underline{24} \cdot \underline{8}$$

$$= 11,232,000$$

c) No repeating, no zero, no vowels.  
 (a, e, i, o, u)

$$\underline{21} \cdot \underline{9} \cdot \underline{20} \cdot \underline{8} \cdot \underline{19} \cdot \underline{7}$$

$$= 4,021,920$$