# 4.1 Counting Principles

Monday, March 11, 2013
9:02 AM

## Fundamental Counting Principle

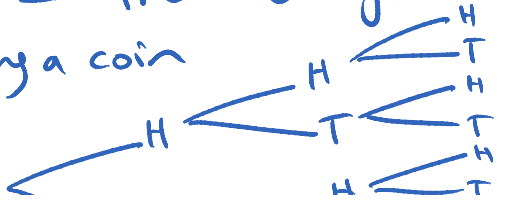
- if one task can be performed in "a" ways and another task can be performed in "b" ways, then both tasks can be performed in (a)(b) ways (multiply)
  - applies when tasks are related by the word "AND"
  - applies to as many task connected by "AND" (a)(b)(c)(...
  - does not apply when tasks connected by "OR" or an "or" situation.
    such as: - disjoint / mutually exclusive sets
    - overlapping sets - careful not to double count
  - can use: - outcome tables

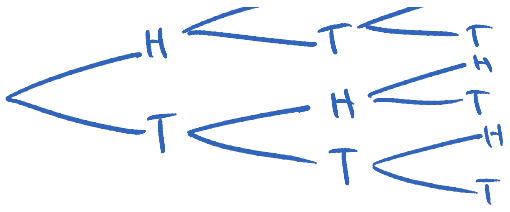
| # on a spinner \ Sun | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |

# rolled on a dice

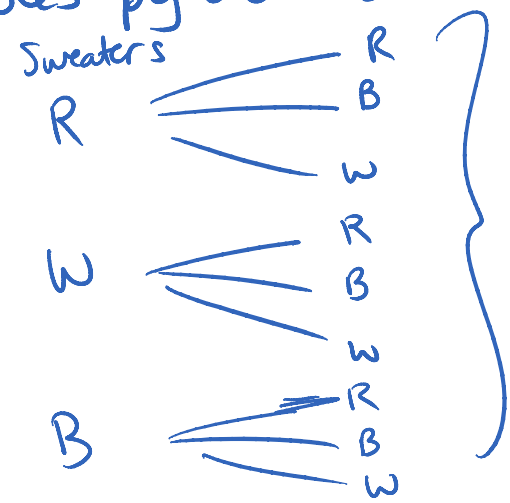
- organized list
- tree diagram

flipping a coin






examples pg 230-32




9 possible combinations of sweaters + shorts

OR

Fund. count. princ.

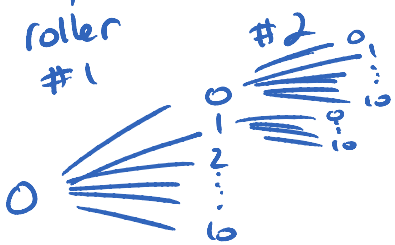
$(3)(3) = 9$ options

(Sweat, Shorts)

Ex2

$(10)(10)(10) = 1000$ possible lock combinations

roller #1, #2, #3




0

1

2

3

.

.

.

Variation: no repetition allowed in the #'s

say the 1st # is 3, 2nd # is 5, last # can't be a 3 or 5

___ ___ ___

So how many combinations

$(10)(9)(8) = 720$

10

$(10)(9)(8) = 720$

1st # is a 5, repetion is allowed

#5 _ _

$(1)(10)(10) = 100$

"OR" → add the #'s

"AND" → multiply the #'s

Practice
Pg 235 #1-16

# Summary of 4.1 to 4.3

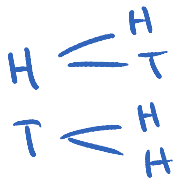
Quiz in 2 days

Tuesday, April 02, 2013
8:57 AM

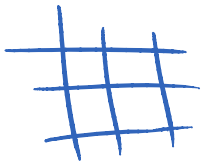
## Fundamental Counting Principle:

- tasks connected by "and"
- $a \cdot b \cdot c \cdots$ = # of ways to perform all the tasks
- 3 shorts × 4 shirts = 12 outfits

use: tree diagrams




outcome tables



blanks $\underline{10} \times \underline{10} \times \underline{10} \times \underline{10}$ – combination lock

"and" → multiply "or" → add

## Factorial Notation

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

$n! = n \cdot (n-1)(n-2) \cdots 1$ ← $n \geq 0$
$= n(n-1)!$

$\frac{1000!}{998!} = \frac{1000 \cdot 999 \cdot \cancel{998!}}{\cancel{998!}}$
$= 1000 \cdot 999$

$1! = 1$
$0! = 1$

$0! = 1$

$= n(n-1)!$

$(n+1)! = (n+1)(n)(n-1)\cdots 1$ $\leftarrow n \geq -1$

Permutations $\quad {}_nP_r = \dfrac{n!}{(n-r)!}$

$n$ = # of objects to choose from

$r$ = # of objects chosen

Practice pg 259 # 1 - 13