Chapter 9: Counting & Probability

Introduction

* **Sample Set** = The set of all possible outcomes of a random process or experiment.
* **Event** = Subset of a Sample space.

ex.) Rolling one die
Sample Set = {1, 2, 3, 4, 5, 6}
event = {Even}

* **Equal Likely Probability:**
S = Sample Space, N(s) = # of elements in S.
E = event, N(E) = # of elements in E

$$P(E) = \frac{N(E)}{N(s)}$$ → # of ways event can occur / → total # of outcomes

ex.) Find the probability of rolling an even #.
N(E) = 3
N(s) = 6

$$P(\text{even}) = \frac{1}{2} \cdot 100 = 50\%$$

§23 4.) 52 cards
4 suits clubs, spades, diamonds, hearts
(clubs, spades: black; diamonds, hearts: red)

N(E) = 10
N(S) = 52

$$P(E) = \frac{10}{52} \cdot 100 \approx 19\%$$

6.) at most 4, aces high; what's the probability?

means 4 or smaller

$3 \times 4 = 12$ total cards

$P(E) = \frac{12}{52}$

* Number of Elements in a list:
- Let m & n be integers where $m \leq n$ then there are $n - m + 1$ integers from n to m, inclusive

22.) How many Z^+ that are 3 digits are multiples of 6.

$100 \rightarrow 999$ (range)

$6 \times 17 \quad 6 \times 18 \ldots 6 \times 166$

$166 - 17 + 1 = 150$ numbers that are 3 digits and divisible by 6.

$999 - 100 + 1 = 900$

$P(E) = \frac{150}{900}$

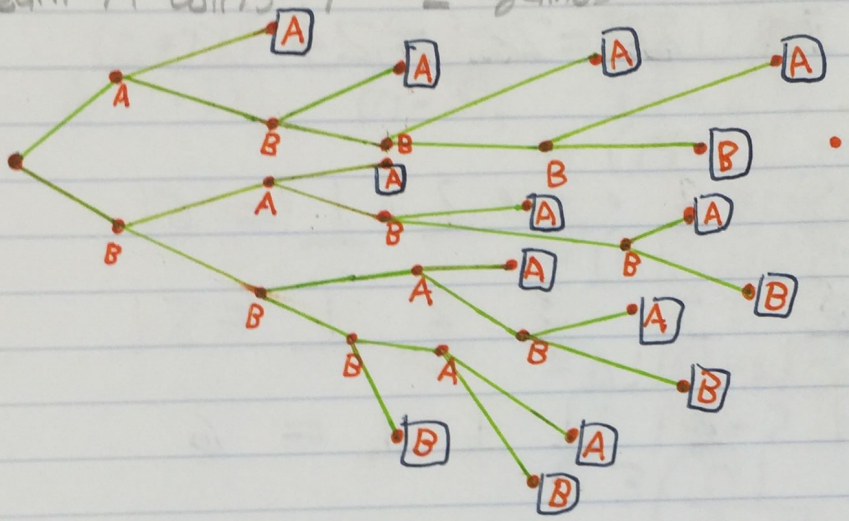
HW Pg $Z \rightarrow 9$ odd 13, 14, 21

Possibility Trees & the Multiplication Rule

* Possibility Tree: gives a visual for outcomes.

536

2.) Team A wins 1st 2 games



So there are 15 different ways to have the series play out.

Try # 5 on your own, good luck!! Make sure you email the teacher if you have no idea what you just did!

* The Multiplication Rule

- If an operation can occur in k steps and
  1st in n_1 ways, then there will be $n_1 \cdot n_2 \cdot \ldots n_k$ ways.
  :
  k^{th} n_k

42.) Proove that $\forall \mathbb{Z}\ n \geq 3$

$$P(n+1,3) - P(n,3) = 3P(n,2)$$

$$\frac{(n+1)!}{(n+1-3)!} - \frac{(n)!}{(n-3)!} = \frac{(n+1)!}{(n-2)!} - \frac{n!}{(n-3)!}$$

$$= \frac{(n+1)! - n!(n-2)}{(n-2)!}$$

$$= \frac{(n+1)(n!) - n!(n-2)}{(n-2)!}$$

$$= \frac{n!((n+1)-(n-2))}{(n-2)!}$$

$$= 3\left(\frac{n!}{(n-2)!}\right)$$