

## Lesson #7

Aim: What is theoretical Probability ?

Do Now: Anik, Roy and Yu each purchased one raffle ticket. If a total of 14 tickets were sold and 3 winners will be selected, what is the probability that all 3 (Anik, Roy, Yu) will win ?

Probability =  $\frac{\text{Numerator}}{\text{Denominator}}$    
 Numerator → what you want   
 Denominator → all possibilities (sample space)

$$3 \text{ winner} = 1^{\text{st}} \text{ winner} \quad 2^{\text{nd}} \text{ winner} \quad 3^{\text{rd}} \text{ winner}$$

$$\frac{6}{2184} = \frac{3}{14} \cdot \frac{2}{13} \cdot \frac{1}{12}$$

Process of multiplying probabilities = counting Principle.

## I- Probability

- 1) It's the chance of an event will happen
- 2) It's represented by a proper fraction

$$\frac{n}{D} \quad n < D \quad \text{not possible } \frac{4}{2}$$

- 3) You can't take more than what's available.

- 4) Symbol  $P(\text{Event}) = P(E)$

- 5)  $0 \leq P(E) \leq 1$

- 6) How do you measure probability?

a) theoretical Probability (all events have the same opportunity to happen)

b) Empirical Probability  $\rightarrow$  to conduct an experiment to find the answer.



theoretical

$$P(6) = \frac{1}{6}$$

$$P(5) = \frac{1}{6}$$

$$P(4) = \frac{1}{6}$$

$$P(3) = \frac{1}{6}$$

$$P(2) = \frac{1}{6}$$

$$P(1) = \frac{1}{6}$$

SAMPLE  
SPACE

{1, 2, 3, 4, 5, 6}

EXAMPLE: Empirical - to throw a bottle of a WATER to see the prob. it lands on its top.

## Exercises

1) Identify Probability values

a) You have a 50-50 chance ( $\frac{1}{2}$ )

b) there is a 30% chance ( $30\% = \frac{30}{100} = \frac{3}{10}$ )

c) You have a snowball chance in hell (0)

d) there is a 90% chance ( $\frac{9}{10}$ )

e) It will definitely happen (1)

2) If the prob of snow is 70%. What's the prob of no snow? 30% or  $\frac{3}{10}$

$P(A)$ : prob. an event will happen

$P(\overline{A})$ : Not A - prob. that an event will not happen

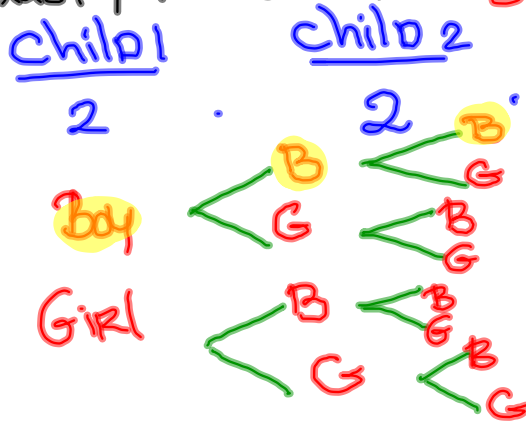
$$P(A) + P(\overline{A}) = 1$$

$$\text{ex) } \frac{1}{6} + \frac{5}{6} = \frac{6}{6} = 1$$

## II - TREE DIAGRAMS

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$P(\text{Among 3 children, there is exactly one girl}) = \frac{3}{8}$   
 $P(\text{Exactly two GIRLS}) = \frac{3}{8}$



$\frac{2}{2} = 8$  SAMPLE SPACE

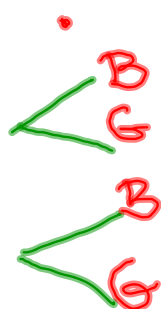
- List
- (BBB) (GBB)
  - (BBG) (GBG)
  - (BGB) (GGB)
  - (BGG) (GGG)

Construct a tree for 2 children

child  
2

Boy

Girl



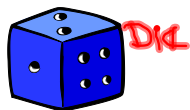
child  
2

= 4

$$P(\text{only Girls}) = \frac{1}{4}$$

Construct a tree for a coin and a die

$$P(\text{head and an even number}) = \frac{3}{12} =$$



$$6 \cdot 2 = 12$$



List

- 1, H
- 1, T
- 2, H
- 2, T
- ...