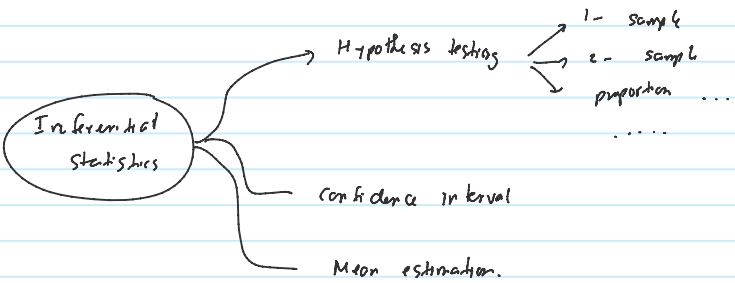
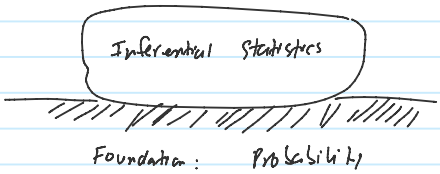
Sample Spaces and Probabilities

Thursday, March 9, 2023 1:54 PM





1. Sample spaces.

(a) Experiment: Tossing a coin

All the possible outcomes: {Head, Tail}

Sample space = {Heat, Tail}

(b) Roll a die:

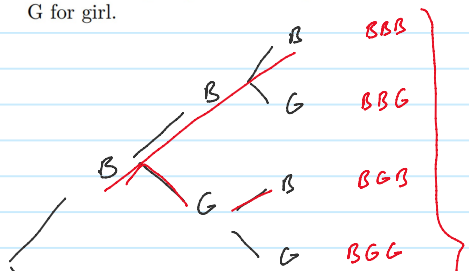
Sample space = {1, 2, 3, 4, 5, 6}

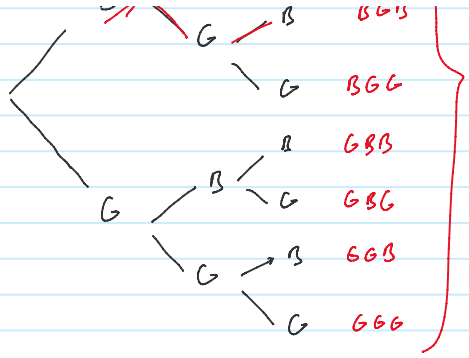
(c) Roll 2 dice:

Sample space =

$$\{(1,1)\ (1,2)\ (1,3)\ (1,4)\ (1,5)\ (1,6)$$
$$(2,1)\ (2,2)\ (2,3)\ (2,4)\ (2,5)\ (2,6)$$
$$\vdots \quad \vdots \quad \vdots \quad \vdots \quad \vdots \quad \vdots$$
$$(6,1)\ (6,2)\ (6,3)\ (6,4)\ (6,5)\ (6,6)\}$$

1. Find the sample space for the gender of the children if a family has three children. Use B for boy and G for girl.





2. Probabilities

⊛ Events :

the gender of the children if a family has three children.

Event 1 : All the children have the same gender. { GGG, BBB }

Event 2 : At least 2 childs are girls

{ BGG, GBG, GGB, GGG }

Event 3 : The second child is a boy

{ GBG, GBB, BBB, BBG }

Event 4 : Two boys in a row

{ BBG, GBB, BBB }

. . .

We have the concept : probability of an event (event is a sub set of sample space)

Prob of event 4 or = Prob of having 2 boys in a row :

$$= \frac{\text{The number of possible outcomes of the event}}{\text{The total number of all possible outcomes}} = 3/8$$

⊛ Find the prob. of having an even number when rolling a die.

Even number = { 2, 4, 6 } (3 outcomes)

Sample space = { 1, 2, 3, 4, 5, 6 } (6 outcomes)

=) Prob. = $3/6$ = 50%

⊛ Find the prob of getting a sum of 7 when rolling 2 dice.

rolling 2 dice.

sum of 7 = $\{(1,6), (6,1), (2,5), (5,2), (3,4), (4,3)\}$

or 6 outcomes

Total possible outcomes is 36

Prob = $6/36 = 1/6$.