

Topic 1 - Sets and Probability Spaces

Def: A set is a collection of  
objects/elements.  
If x is an element of a set S  
then we write 
$$x \in S$$
.  
then we write  $x \in S$ .  
Tf x is not an element of a  
set S, then we write  $x \notin S$   
read:  
"x is not  
in S"

a set that EX: Let's make 6-sided die. models rolling a Let  $S = \{1, 2, 3, 4, 5, 6\}$ pussible OUTCOMES We have that: rolling a 6-sided 5eS 1 die ZES Later we will NES call this the sample

Space

Note: In a set, order doesn't matter. So,  $\{1, 2, 3, 4, 5, 6\} = \{2, 3, 1, 6, 5, 4\}$ Note: Set's can't have duplicates. 31,1,53 is not a set.

General way to make a set conditions description ut ) what the elements in the set look that the elements must satisfy to be in the set like sume people use of

EX: Let's model rolling two 6-sided die, one gréen and one red.  $S = \{ (g,r) \mid g = 1,2,3,4,5,6 \}$ ordered Pair. Use when order matters  $= \frac{1}{2}(1,1), (1,2), (1,3), (1,4), (1,5), (1,6)$ (2,1), (2,2), (2,3), (2,4), (2,5), (2,6),(3,1), (3,2), (3,3), (3,4), (3,5), (3,6),(4,1), (4,2), (4,3), (4,4), (4,5), (4,6),(S,1), (S,2), (S,3), (S,4), (S,5), (S,6), $(6,1), (6,2), (6,3), (6,7), (6,5), (6,6) \}$ green die is 3  $(3,5) \in means$ red die is 5

Note: |S| = 36

Def: Let A and B be Sets. We say that A a subset of B, 15 and write A = B, if every element of A is also an element of B.



Ex: Consider rolling a 6-sided die. Sample  $S = \{2, 2, 3, 4, 5, 6\}$  $E = \{2, 3, 5\}$ Then,  $E \leq S$ . Later we will Call E an event. We will say that E "occured", F when we voll the die we get either 1,3, or 5.

two EX: Suppose we roll 6-side die, one green and one red.  $S = \{(g,r) \mid g = 1, 2, 3, 4, 5, 6\}$  Sample space Let's make a subset of S containing the rolls where the dice add up to 7.  $E = \{(1,6), (2,5), (3,4), (4,3), (5,2), (6,1)\}$  $Here E \leq S.$ Later we will say that E is the event that the dice add up to 7

EX: Suppose we flip a COIN three times in a row and get record each time we H=heads or T=tails. vse parentheser to mean order to matters Sample space:  $S = \{(H,H,H),(H,H,T),$ (H,T,H), (H,T,T),(T, H, H), (T, H, T),(T, T, H), (T, T, T)(H, T, H) Means: Here Hon Ist flip T on 2nd flip H on 3rd flip

The event E representing exactly one head occurs in three flips would be  $E = \left\{ (H_{T}, T_{T}) \cdot (T_{T}, H_{T}) \cdot (T_{T}, T_{T}, H) \right\}$ 

|S| = 8Note and |E|=3