Note Title 1/12/2011

The above "axioms" are very intuitive and can be taken as granted and used to show some non-intuitive results.

Corollary 1

Coroll 2

Corollary 3

Corollary 5

Corollary 4

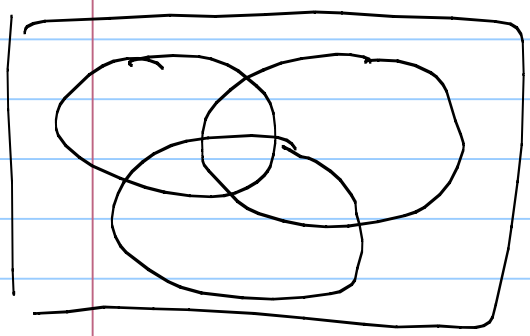
Ex: X is the outcome of a fair 6-faced die.

$P(X \text{ is a prime or } X \geq 5)$

Corollary 7

Corollary 6

Question for the team: Explain the following "inclusion/exclusion" principle by the Venn Diagram



Q: $P(A \cup B \cup C \cup D) = ?$

01.9

We start by ① "set operations": how to include/exclude the events.

② Then discuss properties of a valid W.A.

③ The next question is how to construct a valid W.A by ourselves.

Case 1:

(ex: A card game, a coin)

Step 1:

Step 2:

Ex: A coin has two outcomes $\{H, T\}$

We can assign

In many cases, we are interested in random experiments that have output being integers, then the weight assignment is described by

This special type of experiments is called "" & the associated weight assignment is called ""

* random: we do not know what the outcome will be.
Variable: The outcome is (usually) a number.
Discrete: values are integers
* The p_k used for describing a discrete distribution (W.A) is called the [ ]
Example: A fair die is a discrete random variable & its distribution is described by pmf

If we let 0 denote tail, 1 for head, then the previous coin experiment is a discrete R.V. & its distribution is described by the following pmf.

Example: A discrete R.V has sample space $S=\{0,1,2,\cdots,\infty\}$ and it pmf (W.A) is

$$p_k = \frac{1}{4}\left(1-\frac{1}{4}\right)^k \quad \text{for } k=0,\cdots,\infty$$

Q: Is this a valid W.A
Ans:

* We define W.A first & then make prob statements.
* Be careful when we try to design a W.A to "retro-fit" some prob. statement.

Ex: $S = \{1, 2, 3\}$ ex: 1: sunny
2: rainy
3: snowy

If someone says that

The prob $(X \neq 2)$ is $5/8$

prob $(X \neq 1) = \frac{1}{4}$

Q: Are these two statements consistent? (Equivalently, can we find a valid W.A satisfying the above two statements?

A:

Case 2: Suppose the sample space is continuous, and the output of a random experiment is the real number. Ex: the temperature, the time that the instructor enters the classroom.

We say this type of random experiment is a _____, its W.A is a

The W.A is described by _____

Namely