

MATH 3342 Section 3.2

Discrete Random Variables

- An RV whose possible values either:
- Constitute a finite set OR
- Can be listed in an infinite **ordered** sequence

Probability Distributions

- The probability distribution of X says how the total probability of 1 is allocated to the various possible X values.
- Commonly described using:
 - Probability Mass Functions (pmfs)
 - Probability Tables
 - Probability Histograms

Probability Mass Functions

- Also called the probability distribution of a discrete RV
- Defined for every number x by:
- p(x) = P(X = x) = P(all s in S : X(s) = x)





Example: Flipping a Coin

- Classical example of a Bernoulli RV
- Let p(0) = P(X = 0) = P(Flip T) = P(T)
- Then p(1) = P(X = 1) = P(Flip H) = P(H)
- If the coin is *fair*, what is p(0)? p(1)?
- What changes if the coin is weighted to make H more likely?



Example: Coin Flipping

- Flip a coin until you flip a head
- Let p = P(H)
- Let X be a RV denoting the number of flips needed
- Calculate the formula for p(x), the pmf.
- What is p(3) if p = 0.5? If p = 0.25?
- If p = 0.5, $P(X \le 3) = ???$

The Cumulative Distribution Function

- Often shortened as cdf
- The cdf F(x) of a discrete RV X with pmf p(x) is defined for every number x by:

$$F(x) = P(X \le x) = \sum_{y:y \le x} p(y)$$

• F(x) is the probability that the observed value of X will be **at most** x.

Example: AC Units						
Weekly Air Conditioning Units Ordered						
Units ordered X	0	1	2	3	4	5
Probability	0.05	0.15	0.27	0.33	0.13	0.07
Construct the cdf for X						

