Stat 101L: Lecture 23

Random Variables

- Discrete variables
  - Numerical values associated with elements in a sample space.
  - Only distinct (discrete) points on the number line.

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The Deal - Continued

- Bag o' chips (poker chips).
  - Some are red.
  - Some are white.
  - Some are blue.
- Draw a chip from the bag.

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The Deal - Continued

- Draw a blue chip get 3 Extra Credit points.
- Draw a red chip get 1 Extra Credit point.
- Draw a white chip lose 1 Extra Credit points.

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Discrete Random Variable

- X = number of bonus points

x	−1	+1	+3
P(x)	0.60	0.10	0.30

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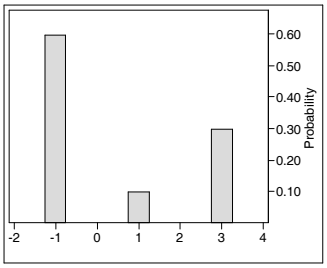
Discrete R.V.

- X = number of bonus points



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Discrete R.V.

- Property 1

$$\mathbf{0} \le P(x) \le \mathbf{1}$$

- Property 2

$$\sum P(x) = \mathbf{1}$$

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Mean of a Discrete R.V.

- The "center" of the distribution of values found as a weighted average of the values.

$$\mu = \sum [xP(x)]$$

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Discrete Random Variable

- X = number of bonus points

x	–1	+1	+3	
P(x)	0.60	0.10	0.30	
xP(x)	–0.60	+0.10	+0.90	μ = 0.4

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Variance of a Discrete R.V.

- The "spread" of the distribution of values found as a weighted average of the squared deviations from the mean.

$$\sigma^2 = \sum \left[(x-\mu)^2 P(x) \right]$$

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Discrete Random Variable

- X = number of bonus points

x	−1	+1	+3	
$(x-\mu)^2$	$(-1.4)^2$	$(+0.6)^2$	$(+2.6)^2$	
P(x)	0.60	0.10	0.30	
$(x-\mu)^2$ P(x)	+1.176	+0.036	+2.028	$\sigma^2=3.24$

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Rake it in!™

x	P(x)
$0	1,115,988/1,440,000
$1	192,000/1,440,000
$2	72,000/1,440,000
$3	28,800/1,440,000
$7	19,200/1,440,000
$14	7,200/1,440,000
$31	4,800/1,440,000
$1,500	12/1,440,000

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Rake it in!™

- If all 1,440,000 tickets are sold and if all prizes are claimed, the Iowa Lottery will payout $824,400
- Mean payout
  - μ = $824,400/1,440,000 = $0.5725
- This means the Iowa Lottery pays out, on average, under 60 cents for every $1 ticket sold.

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