Statistics

Lecture 12

Feb 19-8:47 AM

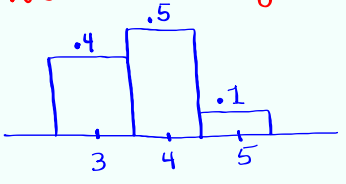
Consider the chart below

x	P(x)
3	.4
4	.5
5	.1

1) $P(x=5) = 1-[.4+.5]$

$= \boxed{.1}$

2) Prob. dist. histogram



3) $\mu = \sum x p(x)$

$= 3\cdot(.4) + 4(.5) + 5(.1) = \boxed{3.7}$

4) $\sigma^2 = \sum x^2 p(x) - \mu^2$

$= 3^2\cdot(.4) + 4^2\cdot(.5) + 5^2(.1) - 3.7^2$

$= \boxed{.41}$

5) $\sigma = \sqrt{\sigma^2} = \sqrt{.41} \approx \boxed{.640}$

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Clear all lists

$x \to L1$, $P(x) \to L2$

L1	L2
3	.4
4	.5
5	.1

STAT → CALC

1: 1-Var Stats

List: L1

FreqList: L2

Calculate

$\mu = \bar{x} = 3.7$

$\sigma = \sigma_x = .640$

$n = 1$

$S = S_x$ blank

VARS

5: Statistics

4: σ_x x^2

Enter

$\sigma^2 = .41$

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x	P(x)
1	.3
2	.25
3	.2
4	.15
5	.1

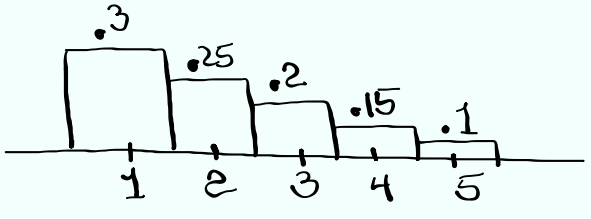
1) $P(x=1)$

$= 1 - [.25 + .2 + .15 + .1] = .3$

2) $P(x=2 \text{ or } x=4)$

$= .25 + .15 = .4$

3) Draw prob. dist. histogram



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4) Find μ, σ, and σ^2 in reduced fraction

$x \rightarrow L1$

$P(x) \rightarrow L2$

1-Var Stats with L1 & L2.

$\mu = \bar{x} = 2.5$

$\sigma = \sigma_x = 1.323$

$\boxed{\sigma^2 = \frac{7}{4}}$

Mar 23-7:09 PM

30 Tkts Sold

$5 each

one TKT Drawn

winner gets $50

Expected value Per tKT Sold

Net	P(Net)
5 − 50	1/30
5 − 0	29/30

E.V. $= \mu = \bar{x}$

$\approx \$3.33$

$\sigma^2 \doteq \frac{725}{9}$

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Pay $10

Draw 2 cards

No replacement

2 Aces → $50

1 Ace → $10

No Aces → Nothing

L1 Net	L2 P(Net)	
10 − 50	1/221	AA
10 − 10	32/221	1 Ace
10 − 0	188/221	No Ace

$P(AA) = \frac{4}{52} \cdot \frac{3}{51} = \frac{1}{221}$

$P(\text{No Aces}) = \frac{48}{52} \cdot \frac{47}{51} = \frac{188}{221}$

$\mu = \bar{x} = 8.326$

E.V. $8.33

$\sigma^2 = \frac{155083}{6746}$

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Consider a binomial Prob. dist with $n = 200$ and $p = .4$.

1) $q = 1 - .4 = \boxed{.6}$

2) $np = 200(.4) = \boxed{80}$

3) $npq = 200(.4)(.6) = \boxed{48}$

4) $\sqrt{npq} = \sqrt{48} \approx \boxed{7}$

5) $P(x = 100) = \text{binompdf}(200, .4, 100)$ [2nd] [VARS] $= \boxed{9.5 \times 10^{-4}}$

6) $P(x \leq 100) = \text{binomcdf}(200, .4, 100) = \boxed{.998}$

7) $P(x \geq 100) = 1 - P(x \leq 99) = 1 - \text{binomcdf}(200, .4, 99) = \boxed{.003}$

we don't: 99 | we want: 100

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Consider a binomial Prob. dist with $n=250$ & $P=.8$

1) $q = 1-.8 = .2$

2) $np = 250(.8) = 200$

3) $npq = 250(.8)(.2) = 40$

4) $\sqrt{npq} = \sqrt{40} \approx 6.325$

5) P(exactly 190 successes)

$P(x=190) = \text{binompdf}(250, .8, 190)$

$= .018$

6) P(below 210 successes)

$x<210$

$P(x<210) = P(x \leq 209)$

$= \text{binomcdf}(250, .8, 209)$

$= .936$

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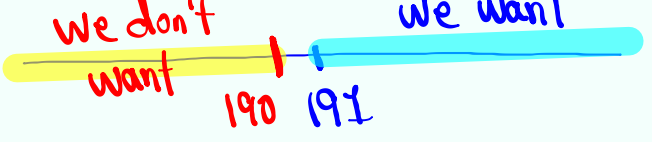
7) P(more than 190 successes)

$x>190$

$P(x>190) = P(x \geq 191) = 1 - P(x \leq 190)$



$= 1 - \text{binomcdf}(250, .8, 190)$

$= .931$

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I flipped a fair coin 400 times.

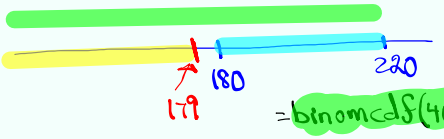
1) $n = 400$ 2) $p = .5$ 3) $q = .5$

4) $np = 400(.5) = 200$ 5) $npq = 400(.5)(.5) = 100$ 6) $\sqrt{npq} = \sqrt{100} = 10$

Suppose landing tails is a Success.

$P(\text{between } 180 \text{ and } 220 \text{ tails, inclusive})$

$P(180 \le x \le 220) = P(x \le 220) - P(x \le 179)$



$= \text{binomcdf}(400, .5, 220) - \text{binomcdf}(400, .5, 179)$

$= .960$

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Mean $\mu = np$

Variance $\sigma^2 = npq$

Standard deviation $\sigma = \sqrt{\sigma^2}$

Binomial Prob. Dist.

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100 questions

True / false only

Guessing on every question.

1) $n = 100$ 2) $p = .5$ 3) $q = .5$

4) $\mu = np = 100(.5) = \boxed{50}$

5) $\sigma^2 = npq = 100(.5)(.5) = \boxed{25}$

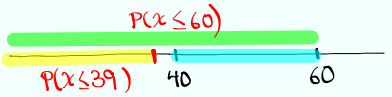
6) $\sigma = \sqrt{\sigma^2} = \sqrt{25} = \boxed{5}$

7) Usual Range (95% Range)

$\mu \pm 2\sigma = 50 \pm 2(5) = 50 \pm 10 = \boxed{40 \text{ to } 60}$

8) P(guess correctly between 40 and 60, inclusive)

$P(40 \le x \le 60)$



$= \text{binomcdf}(100, .5, 60) - \text{binomcdf}(100, .5, 39)$

$= \boxed{.964} \approx 96\%$

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Prob. of full recovery from certain operation is .8. 400 patients were randomly selected.

1) $n = 400$ 2) $p = .8$ 3) $q = .2$

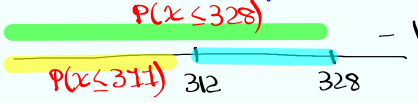
4) $\mu = np = \boxed{320}$ 5) $\sigma^2 = npq = \boxed{64}$ 6) $\sigma = \sqrt{\sigma^2} = \boxed{8}$

7) 68% Range $\rightarrow \mu \pm \sigma = 320 \pm 8$

$\Rightarrow \boxed{312 \text{ to } 328}$

Let x be # of full recovery

$P(312 \le x \le 328) = \text{binomcdf}(400, .8, 328)$



$- \text{binomcdf}(400, .8, 311)$

SG 16 ✓

$= \boxed{.712} \approx 71\%$

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Prob. dist. with Continuous random Variable

1) Uniform Prob. dist.

2) Standard Normal Prob. dist.

3) Normal Prob. dist.

4) Central - Limit - Theorem CLT

5) Applications

SG 17-20

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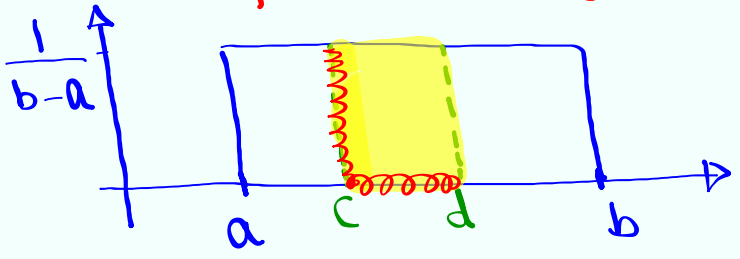
Uniform Prob. dist.

Let x be any values from a to b

with uniform Prob. dist.

Graph is rectangular



$P(x=c)=0$ $\quad P(c<x<d)=(d-c)\cdot\frac{1}{b-a}$

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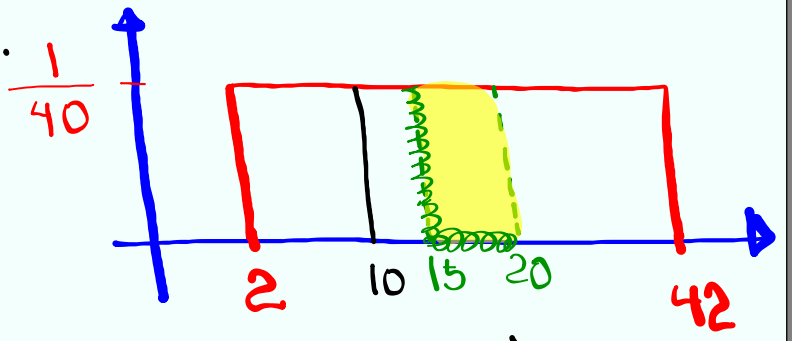
Suppose $2 \le x \le 42$ with Uniform Prob. dist.



$P(x=10) = 0$

Line has 0 Area

$P(15 < x < 20)$

$= (20-15) \cdot \frac{1}{40}$

$= \frac{5}{40} = \boxed{\frac{1}{8}} = \boxed{.125}$

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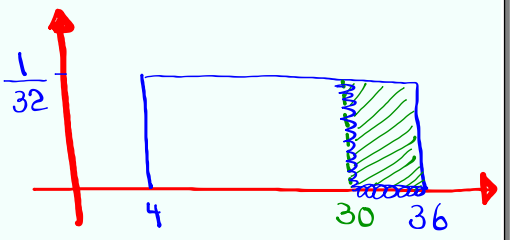
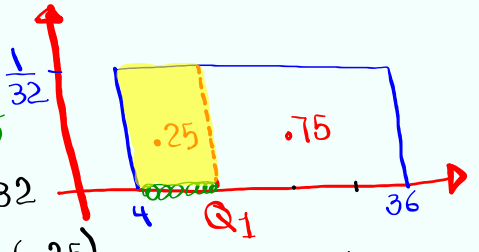
Consider a **Uniform Prob. dist.** for all values from 4 to 36.



$P(x > 30) = (36-30) \cdot \frac{1}{32} = \frac{6}{32} = \frac{3}{16} \approx \boxed{.188}$

Find $x = Q_1$



$(Q_1 - 4) \cdot \frac{1}{32} = .25$

Multiply by 32

$Q_1 - 4 = 32(.25)$

$Q_1 - 4 = 8$

$Q_1 = 8 + 4$

$= \boxed{12}$

Mar 23-8:35 PM

Class QZ 6

x	$P(x)$
1	.1
2	.15
3	.2
4	.25
5	.3

Find

1) $\mu = 3.5$

2) $\sigma \approx 1.32$ } Round to 2-dec.

3) $\sigma^2 = \frac{7}{4}$ } Reduced fraction

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