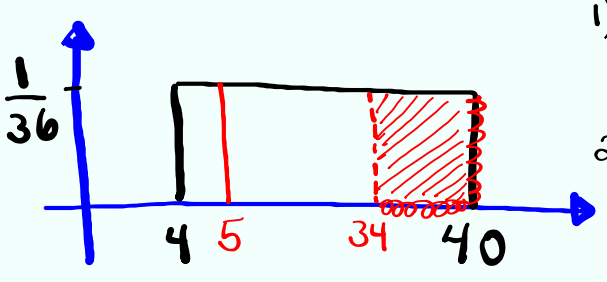
Statistics

Lecture 17

Feb 19-8:47 AM

Consider a uniform Prob. dist. for all values from 4 to 40.

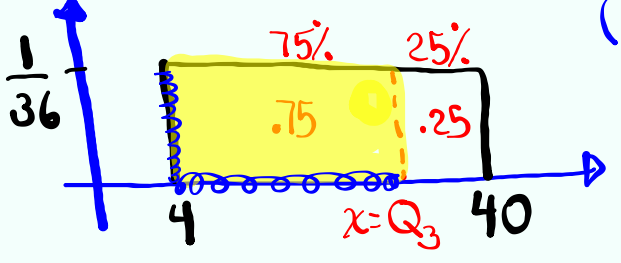


1) $P(x=5)=\boxed{0}$

2) $P(x>34)$

$=(40-34)\cdot\frac{1}{36}=\frac{6}{36}=\boxed{\frac{1}{6}}$

3) find $x=\boxed{Q_3}$, Round to whole.



$(x-4)\cdot\frac{1}{36}=.75$

$x-4=36(.75)$

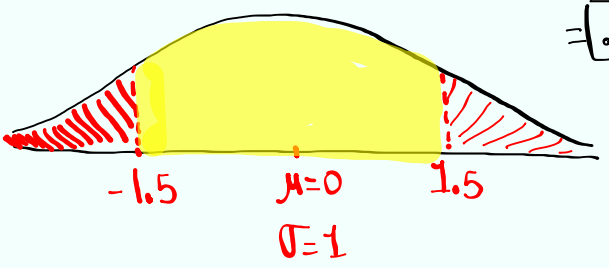
$x=4+36(.75)$ $\boxed{x=31}$

May 4-1:47 PM

Find $P(Z<-1.5 \text{ or } Z>1.5)$

$= 1 - \text{normalcdf}(-1.5, 1.5, 0, 1)$

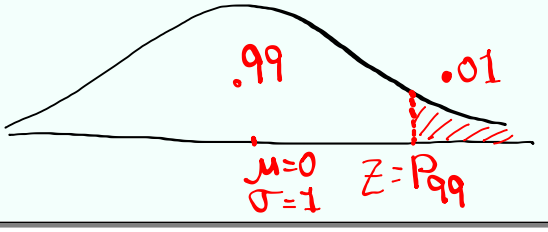
$= .134$



Find $Z = P_{99}$, round to 3-dec. places.

$Z = P_{99} = \text{invNorm}(.99, 0, 1)$

≈ 2.326

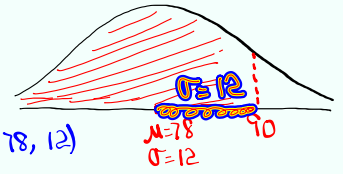


May 4-1:54 PM

Score of all exams are normally distributed with the mean of 78 and standard deviation of 12. $N(78, 12)$

If we randomly Select one exam find the Prob. that it is below 90.

$P(x<90)$



$= \text{normalcdf}(-E99, 90, 78, 12)$

$\approx .841$

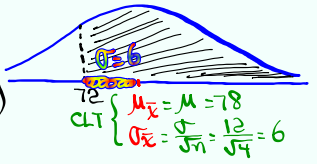
$n=4$

If we randomly Select 4 exams find the Prob. that their mean Score is above 72. $\bar{x}$

$P(\bar{x}>72)$

$= \text{normalcdf}(72, E99, 78, 6)$

$\approx .8411$



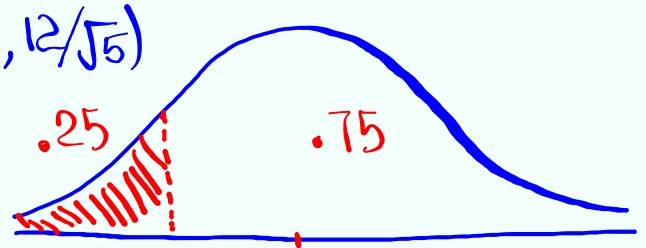
May 4-2:01 PM

Find $\bar{x} = Q_1$ for randomly selected groups of 5 exams.

$\bar{x} = \text{invNorm}(.25, 78, 12/\sqrt{5})$

≈ 74.380

$\approx \boxed{74}$



$\bar{x} = Q_1$ CLT $\begin{cases} \mu_{\bar{x}} = \mu = 78 \\ \sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{12}{\sqrt{5}} \end{cases}$

SE 17-20

May 4-2:10 PM

SE 21

① Given $.26 < p < .42$

$E = \frac{.42 - .26}{2} = \frac{.16}{2} = \boxed{.08}$

$\hat{p} = \frac{.42 + .26}{2} = \frac{.68}{2} = \boxed{.34}$

2) Given $n = 250$, $x = 98$, C-level: .9

Find Conf. interval for Pop. Prop. p

$\hat{p} = \frac{x}{n}$

STAT → TESTS ↓ 1-PropZInt

$= \frac{98}{250}$

$= .392$

$\approx \boxed{.39}$

$\boxed{.34 < p < .44}$

$E = \frac{.44 - .34}{2} = \boxed{.05}$

$\hat{p} = \frac{.44 + .34}{2} = \boxed{.39}$

May 4-2:15 PM

In a survey of 375 voters, 12.5% of them were following the news of Iran War.

$n = 375$ $\quad x = n\hat{p} = 375(.125) = 46.875 \approx 47$

$\hat{p} = 12.5\% = .125$ $\quad$ if decimal → Round-up

Find Conf. interval for the proportion of all voters that follow the news of Iran War.

No C-level → .95

1-PropZInt

$.09 < p < .16$

$E = \frac{.16 - .09}{2} = .035$

$\hat{p} = \frac{.16 + .09}{2} = .125$

May 4-2:23 PM

Estimating Population Mean μ:

$$< \mu <$$

$$\bar{x} - E < \mu < \bar{x} + E$$

$\bar{x}$: Sample Mean

Point-estimate

E: Margin of error

Case I: σ Known

$$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

STAT → TESTS ↓ ZInterval

inpt: Stats

May 4-2:31 PM

Given: $n=32$, $\bar{x}=84$, $\sigma=12$, C-level: .9

Find Conf. interval for pop. mean μ.

σ Known → Z Interval

inpt: Stats

$\sigma=12$

$\bar{x}=84$ ← whole #, we round our ans to whole #

$n=32$

C-level: .9

Calculate

$81<\mu<87$

$E=\frac{87-81}{2}=3$

$\bar{x}=\frac{87+81}{2}=84$

May 4-2:36 PM

I surveyed 30 students, their mean age was 31.8 yrs. $n=30$, $\bar{x}=31.8$

It is known that standard deviation of ages of all students is 7.5 yrs. $\sigma=7.5$

Find Conf. interval for the mean age of all students. no C-level: .95

σ Known → Z Interval

inpt: Stats

$\sigma=7.5$

$\bar{x}=31.8$

$n=30$

C-level: .95

Calculate

$29.1<\mu<34.5$

1-dec.

$E=\frac{34.5-29.1}{2}=2.7$

$\bar{x}=\frac{34.5+29.1}{2}=31.8$

May 4-2:41 PM

Estimating Population Mean μ:

$$\bar{x} - E < \mu < \bar{x} + E$$

$\bar{x}$: Sample Mean (Point-estimate)

E: Margin of error

Case I: σ Known	Case II: σ Unknown
$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$	$E = t_{\alpha/2} \cdot \frac{s}{\sqrt{n}}$, $df = n-1$
STAT → TESTS ↓ ZInterval	STAT → TESTS ↓ TInterval
inpt: Stats	inpt: Stats

May 4-2:31 PM

Given: $\bar{x} = 78$, $S = 10$, $n = 12$, C-level: .98

Find Conf. interval for population mean.

σ unknown → TInterval

inpt: Stats

$\bar{x} = 78$

$S = 10$

$n = 12$

C-level: .98

Calculate

$df = n - 1 = 11$

Whole #

$70 < \mu < 86$

$E = \frac{86 - 70}{2} = 8$

$\bar{x} = \frac{86 + 70}{2} = 78$

May 4-3:05 PM

10 randomly selected students had a mean age of 32.5 and standard deviation of 10.2

$n=10$ $\bar{x}=32.5$ $S=10.2$

$df=9$ C-level: .99 1-dec.

Find 99% Conf. interval for the mean age of all students.

σ unknown → T Interval

$22.0 < \mu < 43.0$

$E = \frac{43-22}{2} = 10.5$

$\bar{x} = \frac{43+22}{2} = 32.5$

May 4-3:11 PM

I randomly selected 12 exams. Here are the scores:

75	82	100	90
80	68	70	100
55	85	75	95

Find

1) $\bar{x} \approx 81.3$

2) $S \approx 13.7$

} Round to 1-dec.

NO C-level: .95

3) Find Conf. interval for the mean of all exams.

σ unknown → T Interval

$72.6 < \mu < 90.0$

May 4-3:17 PM

Consider the chart below

x	1	2	3	4	5	6
P(x)	.05	.15	.3	.3	.15	.05

1) $P(x=3)$
$= 1 - [.05 + .15 + .3 + .15 + .05]$
$= 1 - .7 = \boxed{.3}$

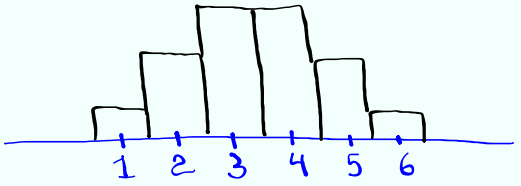
2) $P(2 \le x \le 4)$
$= .15 + .3 + .3$
$= \boxed{.75}$

3) $\mu = 3.5$

4) $\sigma \approx 1.204$

6) $\sigma^2 = 1.45$
$= \boxed{\frac{29}{20}}$

7) Draw Prob. dist. histogram



May 4-3:25 PM

Consider a binomial Prob. dist. with $n=175$ and $p=.6$.

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

2) $\mu = np$
$= 175(.6)$
$= \boxed{105}$

3) $\sigma^2 = npq$
$= 175(.6)(.4)$
$= \boxed{42}$

4) $\sigma = \sqrt{\sigma^2}$
$= \sqrt{42} \approx \boxed{6.5}$

5) Usual Range (95% Range)
$\mu \pm 2\sigma = 105 \pm 2(6.5)$
$= 105 \pm 13$
$\Rightarrow \boxed{92 \text{ to } 118}$

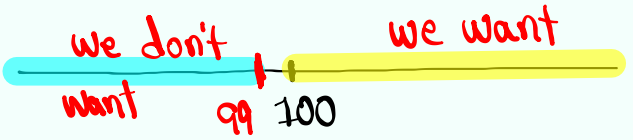
6) P(# of Successes is exactly 110)
$P(x = 110) = \text{binompdf}(175, .6, 110) = \boxed{.046}$

7) P(# of Successes is at most 110)
$P(x \le 110) = \text{binomcdf}(175, .6, 110) = \boxed{.802}$

May 4-3:34 PM

8) P(# of Successes is at least 100)

$P(x \geq 100) = 1 - P(x \leq 99)$



$= 1 - \text{binomcdf}(175, .6, 99)$

$= \boxed{.802}$

May 4-3:44 PM

200 TKTS Sold for $5 each.

1 ticket is drawn, the owner of ticket gets a laptop worth $1000.

Find expected value per ticket Sold.

L1 Net	L2 P(Net)
5 − 1000	1/200
5 − 0	199/200

E.V. $= \mu = \bar{x} = \boxed{0}$

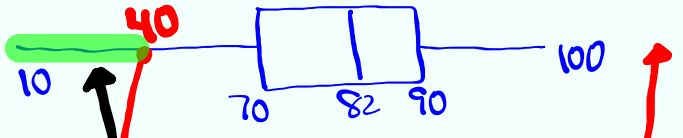
$\sigma^2 = 4975$

May 4-3:47 PM

Consider the 5-Number Summary below:

10 70 82 90 100

1) Draw Box Plot



2) $IQR = Q_3 - Q_1$
$= 90 - 70 = \boxed{20}$

3) Upper Fence
$Q_3 + 1.5(IQR) =$
$90 + 1.5(20) = \boxed{120}$

4) Lower Fence
$= Q_1 - 1.5(IQR)$
$= 70 - 1.5(20) = \boxed{40}$

outliers $\boxed{10\text{-}40}$

May 4-3:54 PM