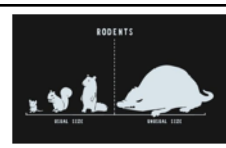
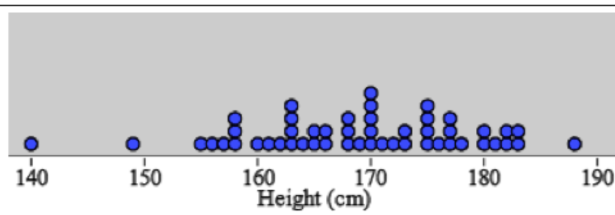
Pick Up The Handout

Do the front only



How tall are high school seniors in Michigan? Attached are the heights of all 50 high school seniors at a small high school in the upper peninsula.

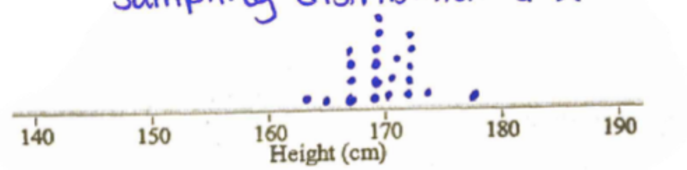


1. Make a guess at the mean of all 50 students. Make another guess of the standard deviation of all 50 students.

$\mu = 165, 170$ cm $\sigma = 5$ cm

2. A bunch of students in an AP Stats class each selected several random sample of 5 heights and calculated the mean height for the sample. They then made a class ***approximate sampling distribution of the sample means, $\bar{x}$.*** (shown below)

Sampling distribution of $\bar{x}$



3. Describe the shape, center, and variability of this dotplot.

Shape: symmetric, unimodal

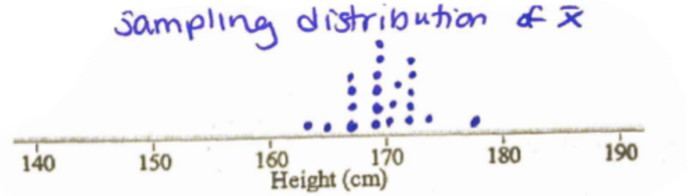
Center: 169 cm or 170 cm

Variability: 2 cm

3 cm

sampling distribution of the sample means, $\bar{x}$. (shown below)

Sampling distribution of $\bar{x}$



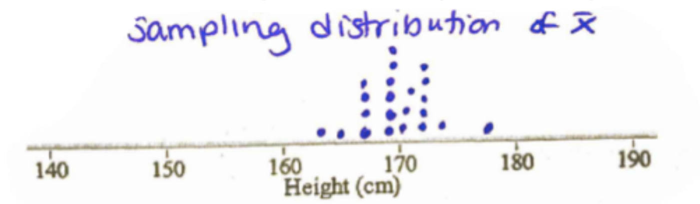
3. Describe the shape, center, and variability of this dotplot.

Shape: Roughly Symmetric, unimodal, at 169 cm.

Center: approx 169 cm

Variability: around $\sigma \approx 2$ or 3 ?

sampling distribution of the sample means, $\bar{x}$. (shown below)



3. Describe the shape, center, and variability of this dotplot.

Shape: Roughly Symmetric, unimodal, at 169 cm.

Center: approx 169 cm

Variability: around $\sigma \approx 2$ or 3 ?

if population is approx Normal, the sampling distribution is approx Normal

---

The last couple of lessons
We looked at Sampling Distributions of
Proportions

Population

p

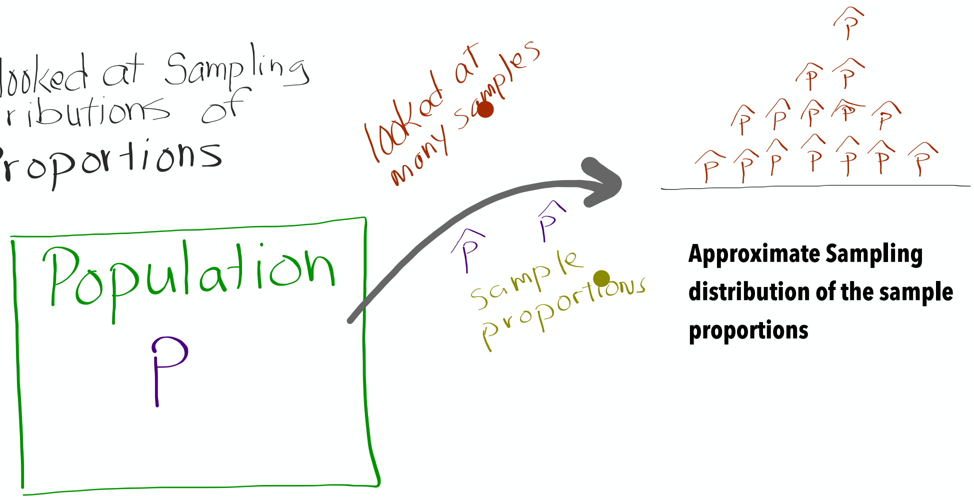
$p_1 - p_2$

$\hat{p}$

and

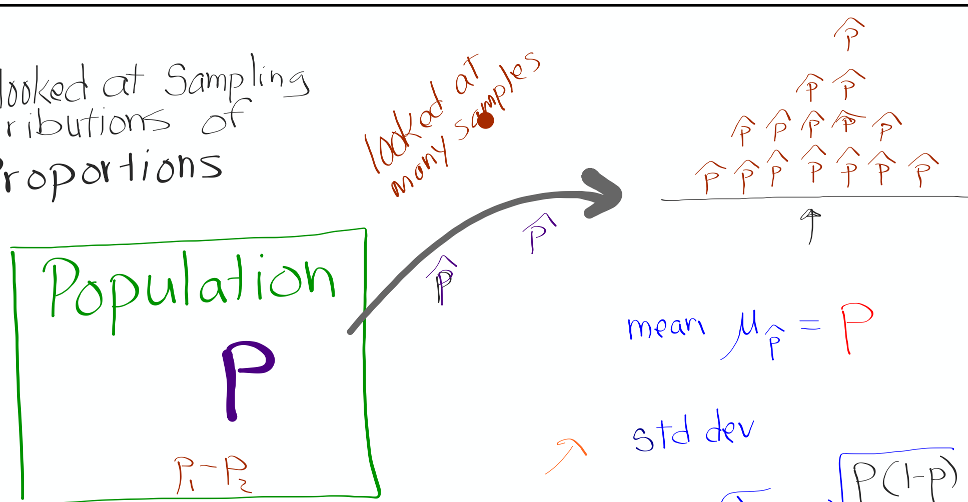
$\hat{p}_1 - \hat{p}_2$

We looked at Sampling Distributions of Proportions



Approximate Sampling distribution of the sample proportions

We looked at Sampling Distributions of Proportions



mean $\mu_{\hat{p}} = p$

std dev

$$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$$

assuming 10% condition is met.

Sampling Distribution for a *Difference in Proportions*

portant ideas:

Shape, Center, Variability of the Sampling Distribution of $\hat{p}_1 - \hat{p}_2$

from 10.1

ape

prox Norm
Large Counts

$n_1 p_1$
$n_1(1-p_1)$ ≥ 10

$n_2 p_2$
$n_2(1-p_2)$ ≥ 10

Center

$$\mu_{\hat{p}_1-\hat{p}_2} = p_1 - p_2$$

Variability

$$\sigma_{\hat{p}_1-\hat{p}_2} = \sqrt{\frac{p_1(1-p_1)}{n_1} + \frac{p_2(1-p_2)}{n_2}}$$

as long as the 10% condition met

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y
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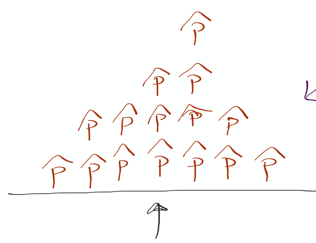
e

s

ion

looked at many samples

$\hat{p}$



Not a distribution of the data

It's a sampling distribution of a statistic, $\hat{p}$

mean $\mu_{\hat{p}} = p$

std dev

$$\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$$

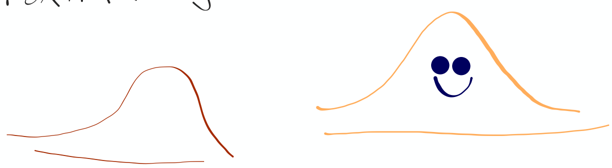
assuming 10% condition is met.

Also

$np \geq 10$
$n(1-p) \geq 10$

If the <u>large counts</u> condition is met, the sampling distribution of the sampling distribution is approximately normal.

$np \geq 10$
$n(1-p) \geq 10$



7.3 is about sampling of <u>means</u>

Population

$\cancel{p}$ μ

7.3 is about sampling of means

Population

$\cancel{p}$ μ

and from 10.2

Sampling distrib of difference of means

$\mu_1 - \mu_2$

7.3 is about sampling of means

Population

$\cancel{p}$ μ

$\bar{x}$

$\bar{x}$

$\bar{x}$ $\bar{x}$ $\bar{x}$

$\bar{x}$ $\bar{x}$ $\bar{x}$ $\bar{x}$ $\bar{x}$

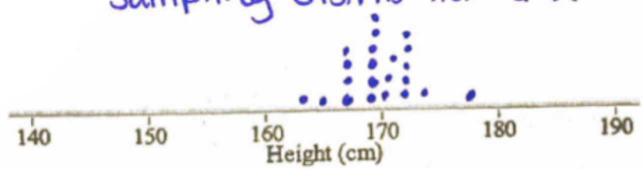
$\mu_{\bar{x}} = \mu$

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

The derivation is on page 470 if you are interested.

sampling distribution of the sample means, $\bar{x}$. (shown below)

Sampling distribution of $\bar{x}$



3. Describe the shape, center, and variability of this dotplot.

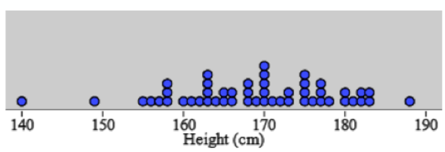
Shape: Roughly Symmetric, single peak, 169?

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

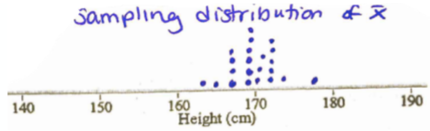
Center: approx 169 cm

Variability: around $\sigma \approx 2$ or 3 ?

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} =$



Sampling distribution of $\bar{x}$

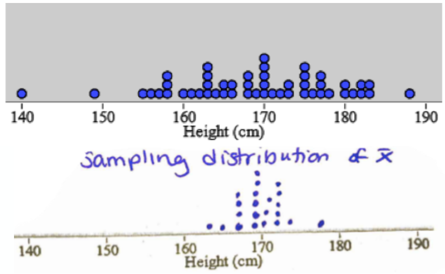


4. Compare the population and sampling distributions above. How are the dotplots similar? How are they different?

Shape:

Center:

Spread:



4. Compare the population and sampling distributions above. How are the dotplots similar? How are they different?

Shape: both roughly symmetric

Center: Same center, approx.

Spread: Sampling distribution has signif. less variability.

Sample Means

Important ideas:

Sampling Distrib. of $\bar{x}$

$\mu_{\bar{x}} =$

$\sigma_{\bar{x}} =$

provide 10% condition is met

$n < 0.1N$

Sample Means

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

$\sigma_{\bar{x}} = \sigma / \sqrt{n}$

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Thought

be able to recognize that problems involving totals can be also solved with means and vice versa

ex to find the prob that the total weight of 4 men is greater than 800 Pounds,

you can find the mean weight of 4 men is greater than 200 lbs.

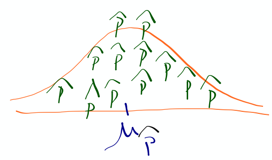
AP® Exam Tip

Notation matters. The symbols $\hat{p}$, $\bar{x}$, n, p, μ, σ, $\mu_{\hat{p}}$, $\sigma_{\hat{p}}$, $\mu_{\bar{x}}$, and $\sigma_{\bar{x}}$ all have specific and different meanings. Either use notation correctly—or don't use it at all. You can expect to lose credit if you use incorrect notation.

p true (population) proportion

$\hat{p}$ sample proportion

$\mu_{\hat{p}}$ mean of a sampling distribution of a proportion

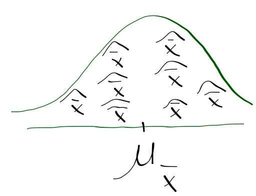


$\sigma_{\hat{p}}$ Std. deviation of a sampling distrib. of proportion

μ true (pop. mean)

$\bar{x}$ mean of a sample

$\mu_{\bar{x}}$ mean of a sampling distribution of a mean



$\sigma_{\bar{x}}$ SD of a sampling distrib. of a mean

n sample size

N

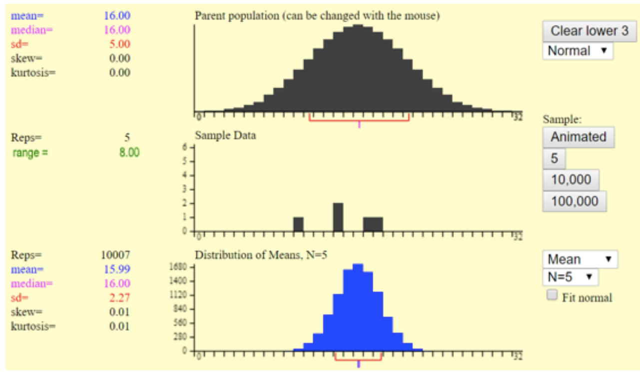
Whole class Activity ← or maybe in pairs

(p. 471)

I need one volunteer to read the instructions aloud while I mess with the applet. (when you come to a question, read slowly so everybody hears)

Sampling from a Normal Population

We have described the mean and standard deviation of the sampling distribution of a sample mean $\bar{x}$ but not its shape. That's because the shape of the sampling distribution of $\bar{x}$ depends on the shape of the population distribution.



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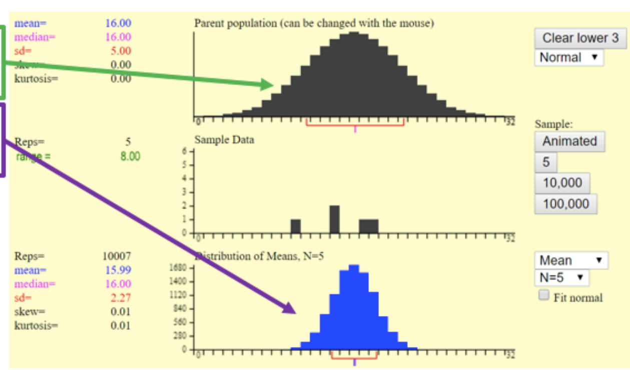
If the population distribution is Normal,

then so is the sampling distribution of $\bar{x}$.



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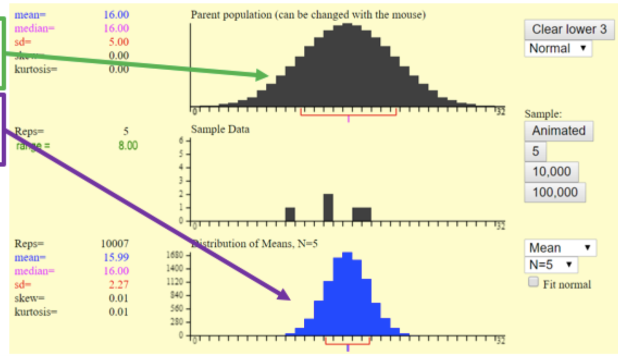

This is true no matter what the sample size is.

Wow!

Sample Means

Important ideas:

Sampling Distrib. of $\bar{x}$

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

$\sigma_{\bar{x}} = \sigma/\sqrt{n}$

provide 10% condition is met

$n < 0.1N$

If a popul. is approx Normal...

the sampling distrib of $\bar{x}$ will also be approx normal

Sample Means

Important ideas:

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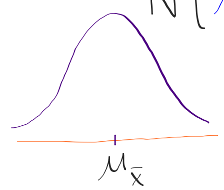
$N\left(\mu_x, \frac{\sigma}{\sqrt{n}}\right)$



$Z =$

Sample Means

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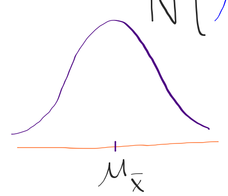

$$Z = \frac{\text{statistic} - \mu_{\bar{x}}}{\frac{\sigma}{\sqrt{n}}}$$

Check
Ur
Understanding

Check Your Understanding - The length of human pregnancies from conception to birth varies according to a distribution that is approximately Normal with mean 266 days and standard deviation 16 days.

1. Find the probability that a randomly chosen pregnant woman has a pregnancy that lasts for more than 270 days.

Check Your Understanding - The length of human pregnancies from conception to birth varies according to a distribution that is approximately Normal with mean 266 days and standard deviation 16 days.

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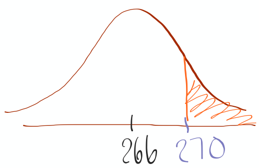
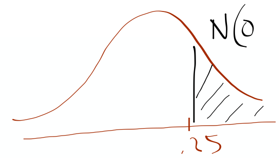
$N(266, 16)$



$Z = \frac{X - \mu}{\sigma}$

$= \frac{270 - 266}{16}$

$= 0.25$



$P(Z > .25)$

TABLE A
or
technology

$= 40.13\%$

Suppose we choose an SRS of 6 pregnant women. Let $\bar{x}$ = the mean pregnancy length for the sample.

2. What is the mean of the sampling distribution of $\bar{x}$?

3. Calculate and interpret the standard deviation of the sampling distribution of $\bar{x}$ and Verify that the 10% condition is met.

4. Find the probability that the mean pregnancy length for the women in the sample exceeds 270 days.

Suppose we choose an SRS of 6 pregnant women. Let $\bar{x}$ = the mean pregnancy length for the sample.

$n = 6$

2. What is the mean of the sampling distribution of $\bar{x}$? $\mu_{\bar{x}} = \mu = 266$

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10% condition

$6 < \frac{1}{10}$ of all pregnant women

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10%

$6 < \frac{1}{10}$ of all pregnant women

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{16}{\sqrt{6}} = 6.532 \text{ days}$$

4. Find the probability that the <u>mean</u> pregnancy length for the women in the sample exceeds 270 days.

AP <u>Tip</u>

Easy to forget to divide by $\sqrt{n}$ ← sample size when finding probabilities involving the <u>sample mean</u>.

What does it

Meeeen?

Suppose we choose an SRS of 6 pregnant women. Let $\bar{x}$ = the mean pregnancy length for the sample.

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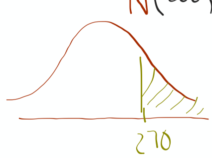
If we take many many samples of size 6 we expect the sample mean typically varies by 6.532 from the mean of 266 days

4. Find the probability that the <u>mean</u> pregnancy length for the women in the sample exceeds 270 days.

$N(266, 6.53)$



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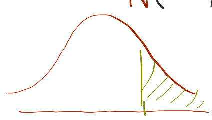
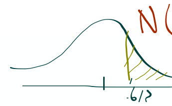
N(266, 6.53)



$$Z = \frac{270 - 266}{6.532}$$

$$= 0.612$$

N(0,1)



$p(Z > .612)$

27.03%

See your LCQ

7.3....53, 55, 57, 61 and p. 467......51

study....468-474