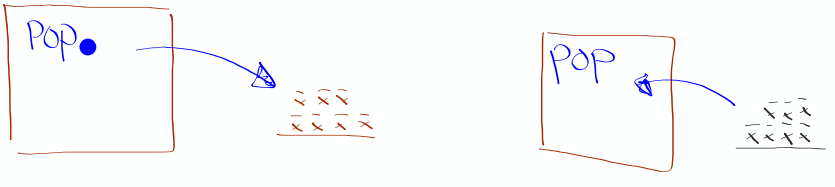
Ch. 8 Estimating with Confidence

This chapter begins the formal study of statistical inference.

Please have your textbooks out

How is this chapter different than Chapter 7?

In Chapter 7, we pretended to know the truth about a population and asked questions about what could happen in a sample. In this chapter, we begin with information about a sample (more likely in real life) and ask questions about the population.



Ch. 8

BASICS OF CONFIDENCE INTERVALS

ESTIMATE A Population Proportion

p

ESTIMATE A Population Mean

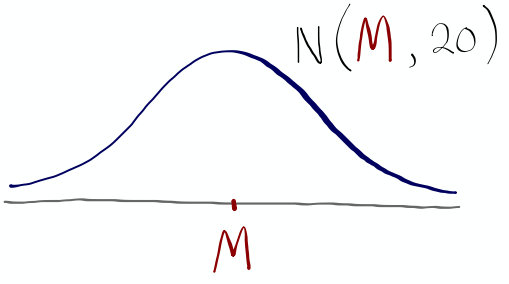
μ

Mystery Mean

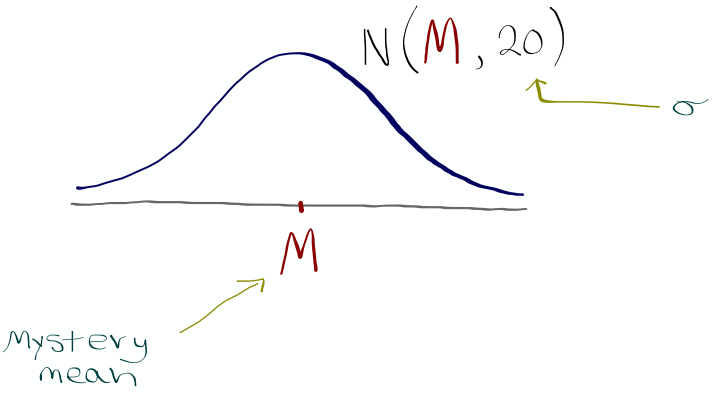
an activity that should give you an idea of what lies ahead.

Teams of 3 to 4 will try to estimate the mystery value of the population mean, μ, that Mr. Cedarlund has selected before class.

IB Math Raw Scores on Final Exam at Sheldon



IB Math Exam Raw Scores



randNorm(M, 20, 16)

σ

16 scores randomly selected from this Normal Distribution.

Will tell the calculator to choose a SRS of 16 scores

mean[randNorm(M, 20, 16)] =

will find the sample mean.

2nd/Stat/math math/Prob

Do you believe that the sample mean shown is equal to the mystery mean, M ?

3. In your group:

Determine an interval of believable values for the population mean, μ.
Use the result from step 2 and what you learned about sampling distributions.

$\sigma = 20$ from 16

240.3

about 6 to 7 min.

Think about:

- Sampling Distributions
  - Distribution of all possible $\bar{x}$ (sample means)

$$\sigma_{\bar{x}} = \frac{20}{\sqrt{16}}$$

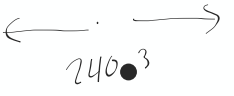
$\mu_{\bar{x}} = \mu$

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

Share your teams intervals.

	from	TO
1	235.3	245.3
2	230	250
3	225	255 ✓
4	235.3	245.3
5	235.3	245.3

$\bar{x} = 240.3$



The True mean = 242

p. 495

- We'll read first two paragraphs
- Then pick up a handout.

Estimating with Confidence AP Statistics 8.1 – Day 1

Learning Targets

- ✓ IDENTIFY an appropriate point estimator and CALCULATE the value of a point estimate.
- ✓ INTERPRET a confidence interval in context.
- ✓ DETERMINE the point estimate and margin of error from a confidence interval.
- ✓ USE a confidence interval to MAKE a decision about the value of a parameter.

What is a point estimator? What is a point estimate?

Estimator: is a formula

Point estimator: is a statistic that provides a reasonable guess of a population parameter.

Point estimate: A single best guess for the value of a population parameter.

Do you get enough sleep?

Identify the point estimator you would use to estimate the parameter in each of the following settings and calculate the value of the point estimate.

(a) A counselor at a large high school wants to estimate the mean amount of sleep μ that students got the previous night. She selects a random sample of 10 students and asks them to record the number of hours they slept last night. Here are the results:

4 5 5.5 6 6 7 7 7.5 8 10

Point Estimator:

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Point Estimator: Use the sample mean, $\bar{x}$, as a point estimator for the popul mean, μ.

The point estimate is

$$\bar{x} = \frac{4+5+5.5+\dots 10}{10} = 6.6 \text{ hours}$$

(b) It is recommended that high school students get 8 hours or more of sleep each night, so the counselor wants to estimate the proportion p of all students at this large high school who got the recommended amount of sleeping time.

Point Estimator:

(b) It is recommended that high school students get 8 hours or more of sleep each night, so the counselor wants to estimate the proportion p of all students at this large high school who got the recommended amount of sleeping time.

Point Estimator:

Use the sample proportion $\hat{p}$ as the point estimator for p

The point estimate = PE is $\hat{p} = \frac{2}{10} = 0.2$

(c) The counselor also wants to investigate the variability in sleep times by estimating the population standard deviation σ.

Point Estimator:

(c) The counselor also wants to investigate the variability in sleep times by estimating the population standard deviation σ.

Point Estimator: Use sample std deviation S_x

PE is $S_x = 1.696$ hours

from GDC
1-Variable Stat

$S_x =$

$\sigma_x =$

$S_x = \sqrt{\frac{(x-\bar{x})^2}{n-1}}$

Just
watch

The Idea of a Confidence Interval

When the estimate of a parameter is reported as an interval of values, it is called an interval estimate, or **confidence interval.**

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A **confidence interval** gives an interval of plausible values for a parameter based on sample data.

let's read !!!
p. 497

What is a confidence interval?

An interval of plausible (believable) values for a parameter based on sample data.
"Plausible" does not mean the same thing as possible. ----We shouldn't be surprised if any of one of the values in the interval is equal to the value of the parameter (the truth).

Confidence Interval:

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Confidence Interval: = Point Estimate ± Margin of Error

CI = P.E. ± M.O.E.

Confidence Level

What is a confidence level?

Confidence intervals are constructed so that we know how much confidence we should have in the interval. The most common confidence level is 95%.

The confidence level 95% (for example) gives the overall success rate of the method used to calculate the confidence interval. That is, in C% of all possible samples, the interval computed from the sample data will capture the true parameter value.

What is a confidence level?

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Long term

The confidence level 95% (for example) gives the overall success rate of the method used to calculate the confidence interval. That is, in C% of all possible samples, the interval computed from the sample data will capture the true parameter value.

contain

How to interpret a confidence interval?

Interpretation: "We are C% confident that the interval from __A__ to __B__ captures the true parameter of parameter of context.

Example for format: *"We are 95% confident that the interval from 0.48 to 0.54 captures the true proportion of all registered voters who favor Candidate Y in the election."*

AP® Exam Tip

When interpreting a confidence interval, make sure that you are describing the parameter and not the statistic.

Creating Confidence intervals

The Idea of a Confidence Interval

To create an interval of plausible values for a parameter, we need two components: a point estimate to use as the midpoint of the interval and a **margin of error** to account for sampling variability.

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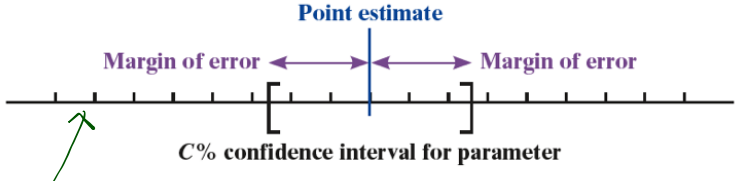
Confidence Interval = point estimate ± margin of error



IB math Raw Scores

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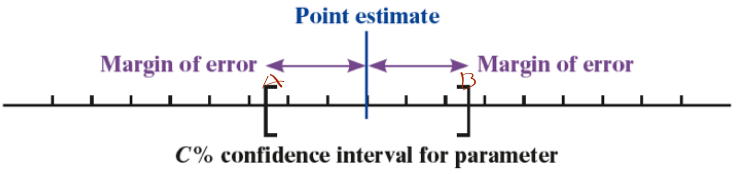

for Confidence interval (A, B):

$P.E. = \frac{A+B}{2}$ $M.O.E. = \frac{B-A}{2}$

Knowledge of Science

The Pew Research Center and Smithsonian magazine recently quizzed a random sample of 1006 U.S. adults on their knowledge of science. One of the questions asked, "Which gas makes up most of the Earth's atmosphere: hydrogen, nitrogen, carbon dioxide, or oxygen?" A 95% confidence interval for the proportion who would correctly answer nitrogen is 0.175 to 0.225.

1. Interpret the confidence interval.

↖ Use the exact format shown earlier.

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2. Calculate the point estimate and the margin of error.

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2. Calculate the point estimate and the margin of error.

Pt. Est. $= \frac{.175 + .225}{2} = 0.2$

Marg of Error $= \frac{.225 - .175}{2} = .025$

3. If people guess one of the four choices at random, about 25% should get the answer correct. Does this interval provide convincing evidence that less than 25% of all U.S. adults would answer this question correctly? Explain your reasoning.

.175 to .225

3. If people guess one of the four choices at random, about 25% should get the answer correct. Does this interval provide convincing evidence that less than 25% of all U.S. adults would answer this question correctly? Explain your reasoning.

All of the plausible values are less than 25%. Therefore the interval does give convincing evidence that less than 25% of all US adults would answer correctly.

Needed:
Brain Breaks for AP stats !

Must be appropriate !

up to 3 min max

Send me e-mail with links

8.1 .... 1-9 (odds) and

study pp. 495-499