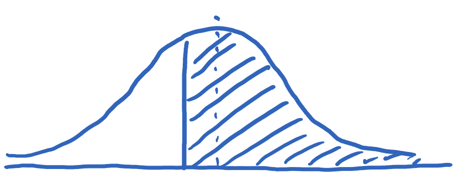
Section 5.2: cont'd

Monday, February 26, 2018 8:30 AM

example: The dean of admissions in a large university has determined that the scores of the first-year class on a math test are normally distributed with a mean of 82 and a standard deviation of 8.

a) what is the probability that <u>any</u> <u>one</u> student drawn at random from the class has a score of at least 80?

b) what is the probability that the mean score of a random sample of 64 students is at least 80?

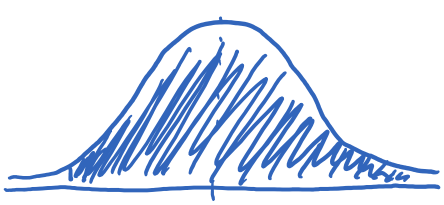
a) 

$z = -0.25$

area = 0.0987

$$z = \frac{x - \mu}{\sigma} = \frac{80 - 82}{8} = -0.25$$

$$P(z > -0.25) = 0.5 + 0.0987$$
$$= 0.5987$$
$$\approx 60\%$$

b) 

$z = -2$

area

= 0.4772

$$\mu_{group} = 82$$

$$\sigma_{group} = \frac{\sigma}{\sqrt{n}} = \frac{8}{\sqrt{64}} = 1$$

$$z_{group} = \frac{x_{group} - \mu_{group}}{}$$

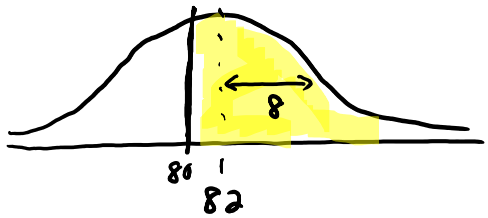
$\underbrace{\qquad}_{\text{area} = 0.4772}$

$$z_{group} = \frac{\bar{x}_{group} - \mu_{group}}{\sigma_{group}}$$

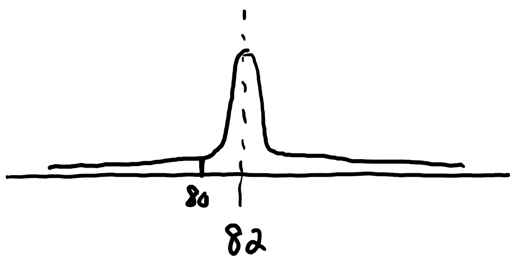
$$= \frac{80 - 82}{1} = -2$$

$$P(z > -2) = 0.5 + 0.4772$$
$$= 0.9772$$
$$\approx 97\%$$

what is actually happening?



individual scores



average score of group of 64 students

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nitpicker's note: (don't bother to use this)

for finite populations, should really use a correction factor

$$\sigma_{group} = \frac{\sigma}{\sqrt{n}} \sqrt{\frac{N-n}{N-1}}$$

or N? need to look up

N = population size
n = sample size

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summary: will the means/sums of a group be normally distributed with

$$\mu_{group} = \mu \qquad \mu_{sum} = n\mu$$

$$\sigma_{group} = \frac{\sigma}{\sqrt{n}} \qquad \sigma_{sum} = \sigma\sqrt{n}$$

?

	size of group: $n < 30$	$n \geq 30$
individuals normally distributed	✓	✓
not normally distributed	maybe?	✓

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standard error: standard deviation of a statistic used as an estimator of a population parameter

→ if you are using samples to predict things about a population, you use this standard error as a measure of the variability of your prediction

for large populations with continuous variables

$$SE = \frac{\sigma}{\sqrt{n}}$$

we use this in the next chapter