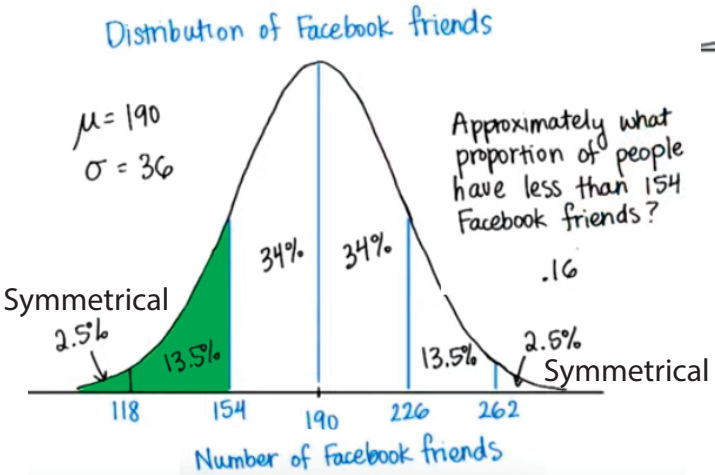
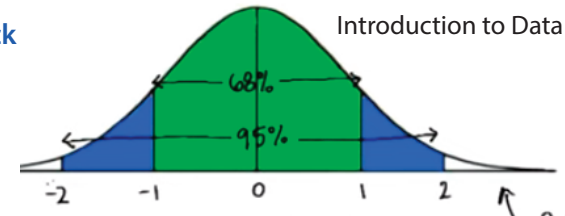
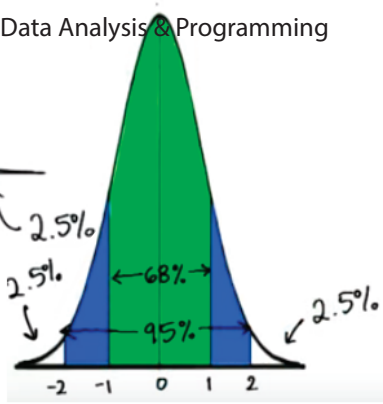
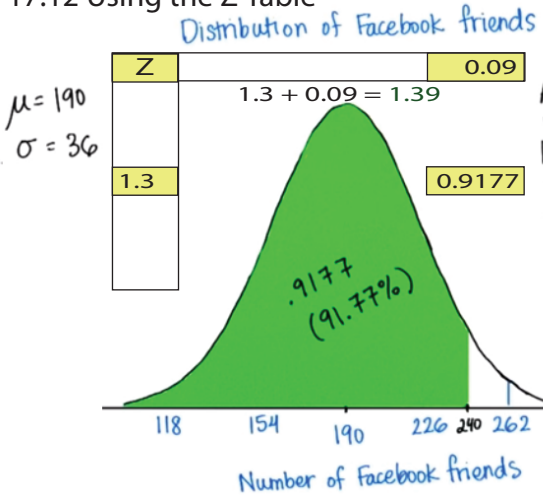
17.6 2 SDs Below or Above
17.7 Proportion of Facebook Friends



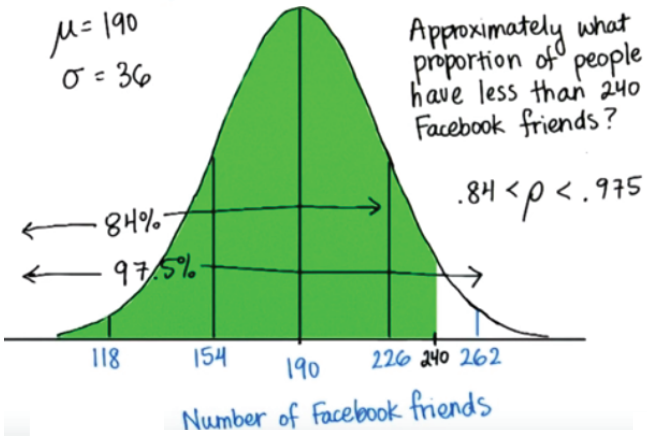




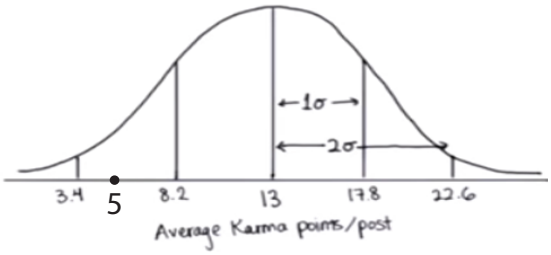
17.10 Less than 240 ---------->>
17.12 Using the Z-Table



$Z = \frac{240 - 190}{36} = 1.39$

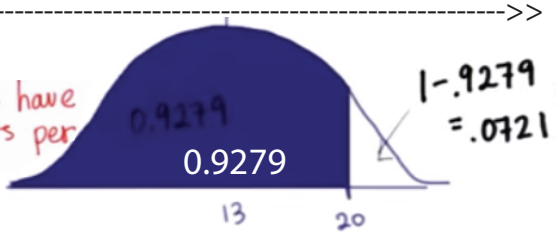


17.16 Integer SDs
Standardized Distribution =/= UnStandardized Distribution
17.17 Less than 5 ---------->>
17.18 More than 20



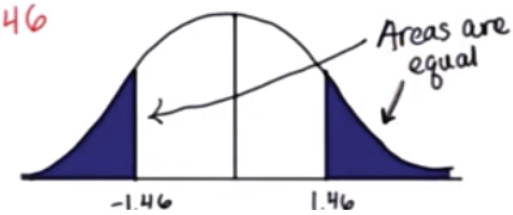
$\mu = 13$ avg. Karma points/post
$\sigma = 4.8$ avg. Karma points/post

What proportion of students have gotten more than 20 points per post on average?



1 - .9279 = .0721

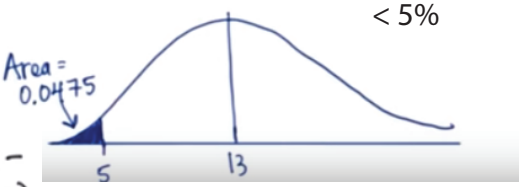
$Z = \frac{20 - 13}{4.8} = \frac{7}{4.8} = 1.46$



What proportion of students have gotten less than 5 points per post on average?

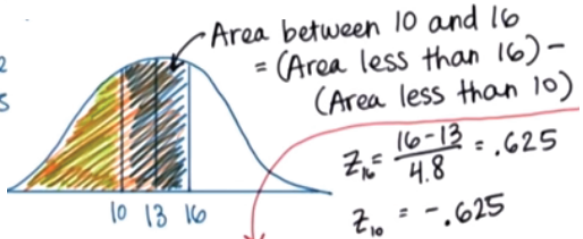
$Z = \frac{5 - 13}{4.8} = \frac{8}{4.8} = -1.67$

z-table = 0.0475
< 5%



17.19 Between 10 and 16

What proportion of students have gotten between 10 and 16 points per post on average?



$Z_{16} = \frac{16 - 13}{4.8} = .625$

$Z_{10} = -.625$

$= .7357 - .2643$

$= .4714$

0.7357 + 0.2643 = 1
Property of the symmetry of normal distribution

visualize the area under the curve
http://www.seeingstatistics.com/

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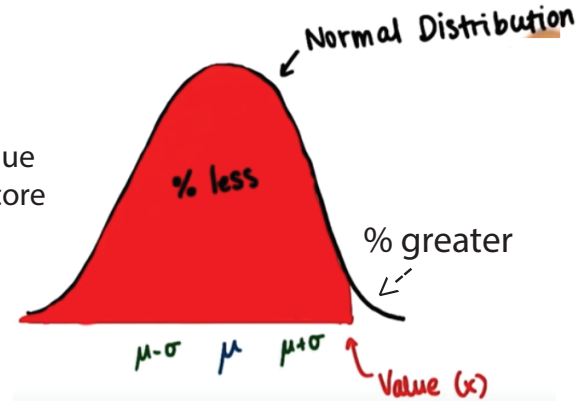
LESSON 18

PS 6: Normal Distribution

18.1 Heights >> Area = 0.14 = proportion value = 0.14 = probability value << use to find back z-score >> Have proportion value >> find back z-score

18.6 Houses

- Find proportion of houses cost at least $100,000 = Z score = 1 = 0.8413 - 1 = 0.1587
- Once you have that, multiply your proportion by 120,500 x 0.1587 = 19123 houses cost at least $100,000



LESSON 19 Sampling Distributions

19.1 Compare Sample Means

19.3 Tetrahedral Die

19.4 Total Number of Samples

Samples (n=2)	Sample mean	
1, 2	→ mean = 1.5	LOSE
1, 1	→ mean = 1	LOSE
3, 4	→ mean = 3.5	WIN

Population: 1, 2, 3, 4

$\mu = 2.5$ M = 2.5

What's the mean of the "population"?

1 + 2 + 3 + 4 = 10

$\frac{10}{4} = 2.5$

16 samples of size 2 (expected value)

1, 1 $\bar{x}_1 = 1$	2, 1 $\bar{x}_5 = 1.5$	3, 1 $\bar{x}_9 = 2$	4, 1 $\bar{x}_{13} = 2.5$
1, 2 $\bar{x}_2 = 1.5$	2, 2 $\bar{x}_6 = 2$	3, 2 $\bar{x}_{10} = 2.5$	4, 2 $\bar{x}_{14} = 3$
1, 3 $\bar{x}_3 = 2$	2, 3 $\bar{x}_7 = 2.5$	3, 3 $\bar{x}_{11} = 3$	4, 3 $\bar{x}_{15} = 3.5$
1, 4 $\bar{x}_4 = 2.5$	2, 4 $\bar{x}_8 = 3$	3, 4 $\bar{x}_{12} = 3.5$	4, 4 $\bar{x}_{16} = 4$

How many total possibilities (i.e. samples of size 2) can we select from this population?

19.7 Sampling Distribution

- Distribution of sample means = Sampling Distribution
- Shape of this Sampling Distribution = Histogram = Normal

19.10 Calculate Standard Deviation =

Avg. squared de = $\frac{\Sigma(x_i - \bar{x})^2}{10}$ = 291,622,740 (VARIANCE)

square root of VARIANCE = Standard Deviation

$\sigma = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{10}}$ = 17,077

	A		C	D
1		1	2.25	1.25	
2		2	0.25	1.11803398874989	<-- sigma
3		3	0.25		
4		4	2.25		
5					
6		1	2.25	0.625	
7		1.5	1	0.790569415042095	<-- SE
8		2	0.25		
9		2.5	0		
10		1.5	1		
11		2	0.25		
12		2.5	0		
13		3	0.25		
14		2	0.25		
15		2.5	0		
16		3	0.25		
17		3.5	1		
18		2.5	0		
19		3	0.25		
20		3.5	1		
21		4	2.25		
22					

Population

Distribution of sample means

What is the ratio of σ to SE?

1.12 / 0.79 = 1.41

$\frac{\sigma}{SE} = \sqrt{2}$

2 is sample size

Do you know what this number is?

The square root of our sample size!

19.12 Ratio of SDs ----------->>

19.13 SD of Sampling Distribution

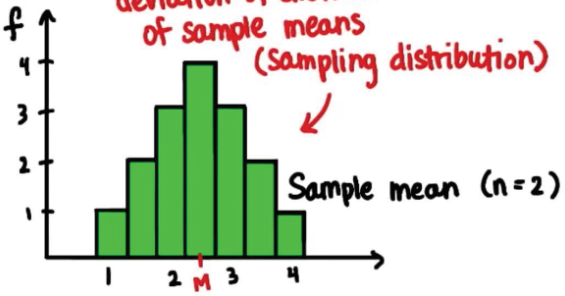
1, 2, 3, 4

Population standard deviation

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

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

Standard deviation of distribution of sample means (Sampling distribution)



19.14 The Central Limit Theorem

CENTRAL LIMIT THEOREM

$\frac{\sigma}{\sqrt{n}}$ = Standard error

n = 2

$\frac{\sigma}{\sqrt{n}} = 1.2076$

n = 5

$\frac{\sigma}{\sqrt{n}} = 0.76$

19.20 Standard Error When n Increases

As the sample size increases, the standard error

- increases
- ✓ decrease

$\frac{\sigma}{\sqrt{n}}$ ← bigger (bigger) } quotient gets smaller

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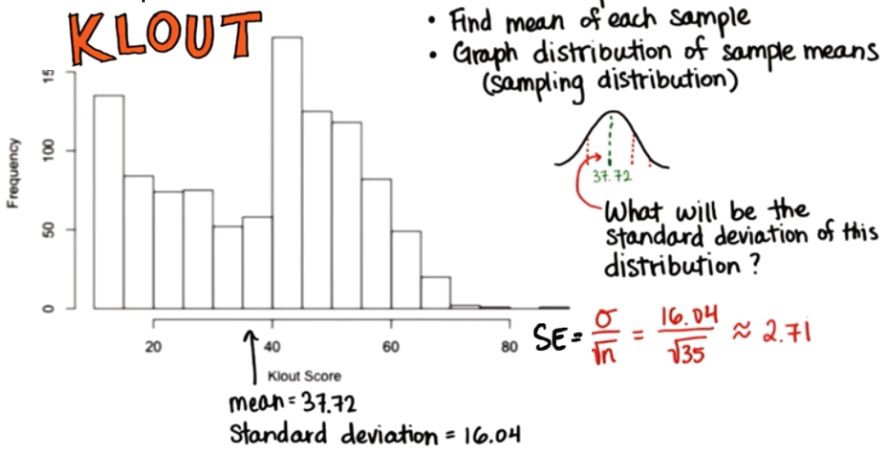
19.21 Shape of Distribution When n Increases
- Quadruple n to get half the SE standard error

19.27 Klout Parameters

19.29 Klout Sampling Distribution (SD)

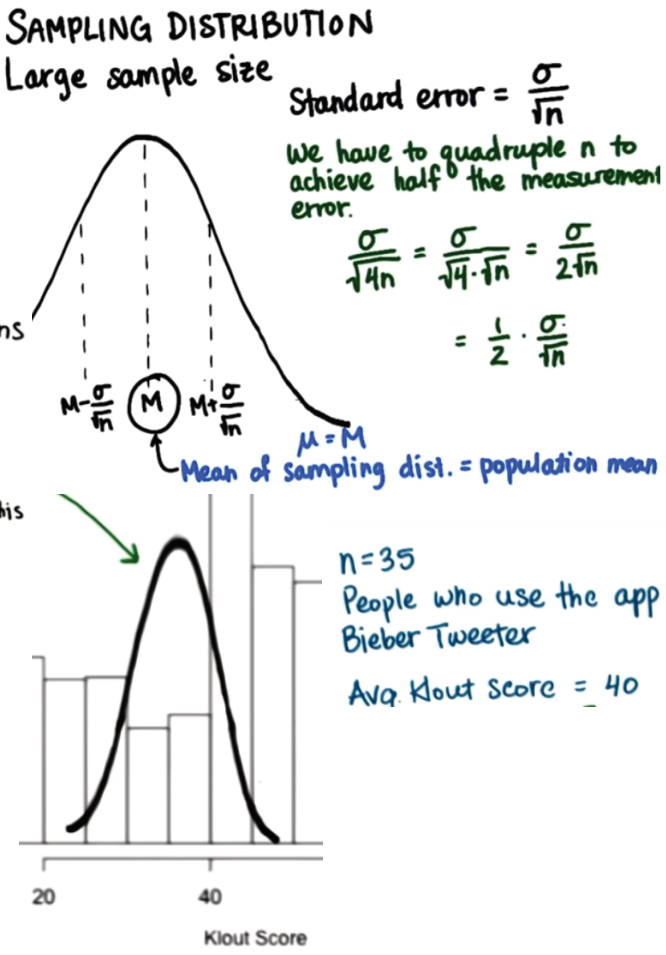
SE = standard deviation of the Klout scores by the square root of the sample size.



- Take all samples of size 35
- Find mean of each sample
- Graph distribution of sample means (sampling distribution)

What will be the standard deviation of this distribution?

$SE = \frac{\sigma}{\sqrt{n}} = \frac{16.04}{\sqrt{35}} \approx 2.71$



19.32 Location of Mean on Distribution > Z score = 0.84

$M = 37.72$

$\frac{\sigma}{\sqrt{n}} = 2.71$

$\text{Z score} = \frac{40 - 37.72}{2.71} = 0.84$ $\quad \frac{x - \mu}{SE}$

LESSON 20 PS7: Sampling Distribution

20.17 Sampling Distribution Shape

You might think the sampling distribution would be positively skewed, since population is positively skewed. But Central Limit Theorem tells us that even for a non-normal population, the sampling distribution will be normal.

20.18 Mean of Sampling Distribution

The mean of the distribution of sample means will be the same as the population mean. That means your answer should be the average of all the values in the spreadsheet.

If we take all samples of size 10, find the average of each, and create a distribution of sample means, this distribution will have a mean equal to:

Histogram of Facebook Friends

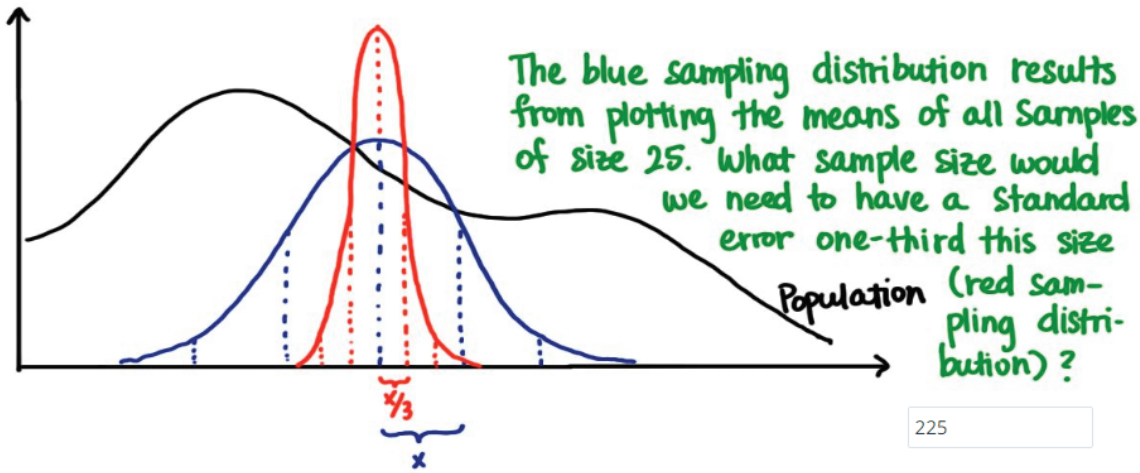
20.19 SD of Sampling Distribution

To find the standard deviation of the sampling distribution, you'll need to calculate the standard deviation of the population, then divide by the square root of the sample size.

20.22 **CHALLENGE** 22. What Sample Size?

use this equation: $SE = \frac{\sigma}{\sqrt{n}}$

Suppose your population has a standard deviation of 1. Then what would be the standard error for samples of size 25? And what sample size would you need reduce the standard error to one third of that?



$0.2 = \frac{1}{25:5}$

$0.0666 = \frac{1}{15}$

225 = 15 x 15

225

FINISH STATISTIC