




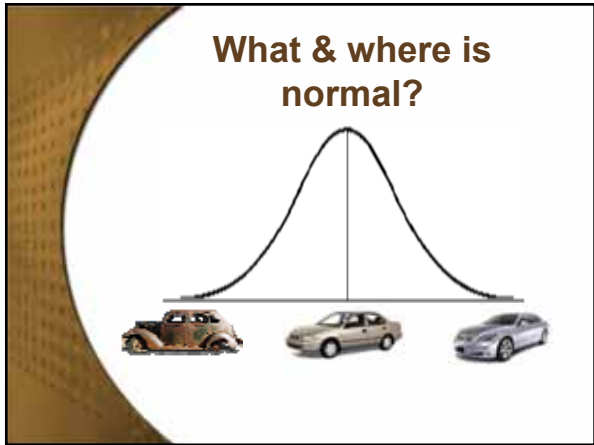
NORMAL DISTRIBUTIONS



- ## Objectives
1. Understand and be able to use the known characteristics of the normal curve to solve problems dealing with sample distributions
 2. Find areas under the curve and scores cutting off particular areas.
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- ## Important Questions
- Are you as good a student of French as you are in math?
 - What scores are so deviant that they cut off the deviant 5% of a distribution?
 - How do you compare apples and oranges? Or for that matter, turkey and chicken?
 - WHAT IS TULY NORMAL?
- 







Finding Yourself on the Normal Curve

- Performance may be viewed as relative to one's distribution

$X=60$ French mean=70

$X=60$ Math mean=50

A Picture of the Standard Normal Curve

- Definition: The standard normal distribution is a normal distribution with:
 - ▶ A mean of zero
 - ▶ A standard deviation of one
 - ▶ A total area under the curve equal to 1.00

$\sigma = 1$ Total Area = 1.00
 $\mu = 0$

Areas, Percents & Probability Under the Curve

68%
95%
99%

Finding Yourself on the Normal Curve

- Our math student got a 60 on the test. The mean was 50, and we'll assume a standard deviation of 10.
- What was that student's z score?

$$z = \frac{X - \bar{X}}{s}$$

Finding Yourself on the Normal Curve

- ...Let's try another one:
 - Assume women's shoe sizes: mean is 8.25 and standard deviation is 1.17. What is the z score for a shoe of size 6?
 - What shoe lies 2.5 standard deviation units above the mean?

$$X = zs + \bar{X}$$

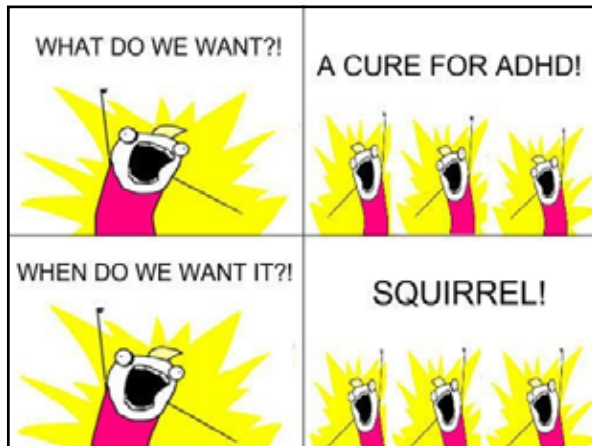
- What does it all mean?



Z Table

- Flip to Normal Curve Table in the back of your instructional manual.
- Instructions at top critical for understanding.
- Let's look up a z score of .52. What does the table tell us about this?
- How about a z score of -2.8?
- Can you find the z score cutting off the lower 73% of scores from the upper 27%?





LOOK CLOSER!

- How's your attention? Let's find out. Go to the following web address and take the adult quiz for attention-deficit disorder: <http://psychcentral.com/addquiz.htm>
 - After all data have been collected, figure out the sample standard deviation and average. Use your calculator's functions to make quick work of these calculations.

PsychCentral
ADHD

STEPS TO FOLLOW

1. Draw your curve
2. Guess the answer
3. Create your outline
4. Calculate your answer

Finding the Percentile Rank

- **Percentile rank:** percentage of cases up to and including the one in which we are interested.
 - found the same way in any type of distribution (e.g., normal, skewed, bimodal)
- Why would we want to know about someone's percentile rank?

Finding the Percentile Rank

- Suppose that you just took the SAT and want to know how you compare to others who took the test.
 - Mean = 500
 - S = 100
 - Your score = 700
- Find the z score and then use the appropriate columns in the z Table to determine your percentile rank.

X → z → Area



Try Another...

- What was your ADD score? What is your percentile rank?
- How would you find the % of the curve BELOW a score?





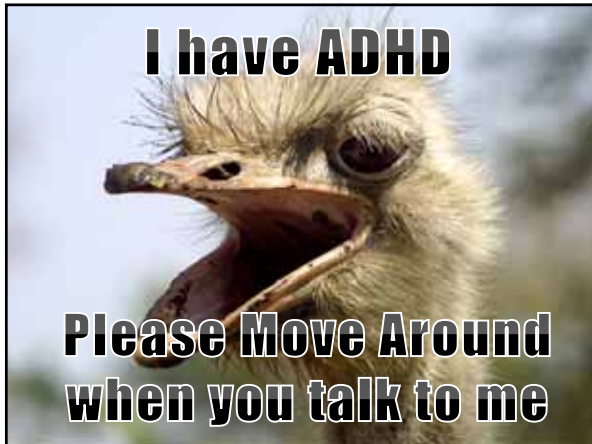
Finding Percent Frequency

- Percentage frequency: number of scores falling above, below or between cutoff points
 - Suppose that you have trained a randomly selected group of snails to crawl a certain distance. The average speed is 2.4 inches per second, with a standard deviation of .8 inches per second. Now, if we trained 300 new snails, how many of these could we expect to reach a crawling speed of 3.28 inches per second or faster?

X → z → Area → Number

Try Another...


- Take the score of the person sitting next to you and estimate how many people got a lower score on the ADD quiz.
 - Now, what if we had a class of 100 take this quiz? How many people would we expect to get a lower score than did your neighbor?
 - HINT: Always list the information that you know, first. Also, anytime you see a “z” or “Area” in your outline, you know that you will be looking in your z Table.



Finding the Number of Scores Between Two Scores

- What if you want to find out how many scores fall within a certain range in the middle of the distribution? What can you do?
 - Figure for two scores

X → z → Area → Number

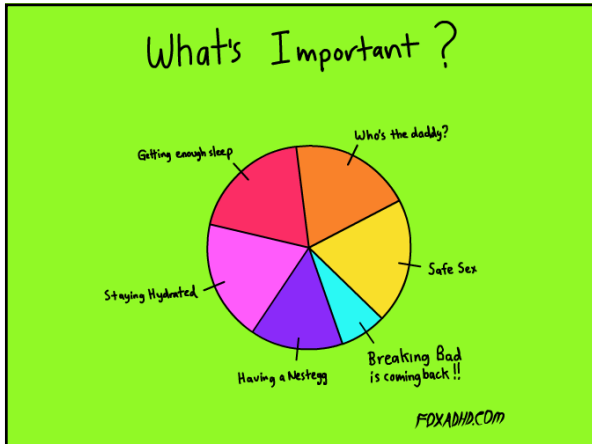


Finding the Percent Frequency Between Scores

Suppose a random sample of 1000 individuals addicted to *The Simpsons* TV show. Average number of episodes watched per week is 100 with a standard deviation of 16. Determine the number of people that watch between 90 and 120 episodes per week.

1. Figure high and low z scores
2. Identify areas for both
3. Find DIFFERENCE between areas
4. Multiply difference times N to get number of people between 90 and 120

X_{low} → z → Area → Number
X_{high} → z → Area → Number




Area and Probability

- Inferential statistics → PROBABILITY.
 - Divide the % area by 100.
- SAT problem:
 - Mean = 500
 - S = 100
 - Your score = 700
 - What is the probability of someone scoring higher than x? What is the probability of someone scoring lower?

X → z → Area → Probability

Try Another...

- What was the z score associated with your ADD score? What is the probability of someone else getting lower than you? What about higher than you?



Finding Scores Cutting Off Areas

- What if you knew the percentile above which you needed to score in order to be accepted to some snooty culinary arts school?
 - Suppose a group average of 73.5. A standard deviation of 9.8. Score needs to be in the upper 15%. Translate this percentile into a score to shoot for?

$$X = z\sigma + \bar{X}$$



» HINT: The outline for this problem is reversed: (area $\rightarrow z \rightarrow x$). Remember that PERCENTILE is not the same as PERCENT correct on a test.



Deviant Scores of the Distribution

- Deviance refers to extreme scores on the high and low end of a distribution
 - Extreme scores are unlikely due to chance alone
 - Unlikely scores may indicate trends, associations and causes

Deviant Scores of the Distribution

- Suppose that you are a mental health administrator and need to differentially treat the 10% of patients who score the most deviantly on a social adjustment scale.
- Same question as before; only now we are looking at both ends of the normal curve.
 - Suppose a standard deviation of 16 and a mean of 100. Which scores will cut off the top and bottom 5% of scores?

Area \rightarrow $z \rightarrow X$
