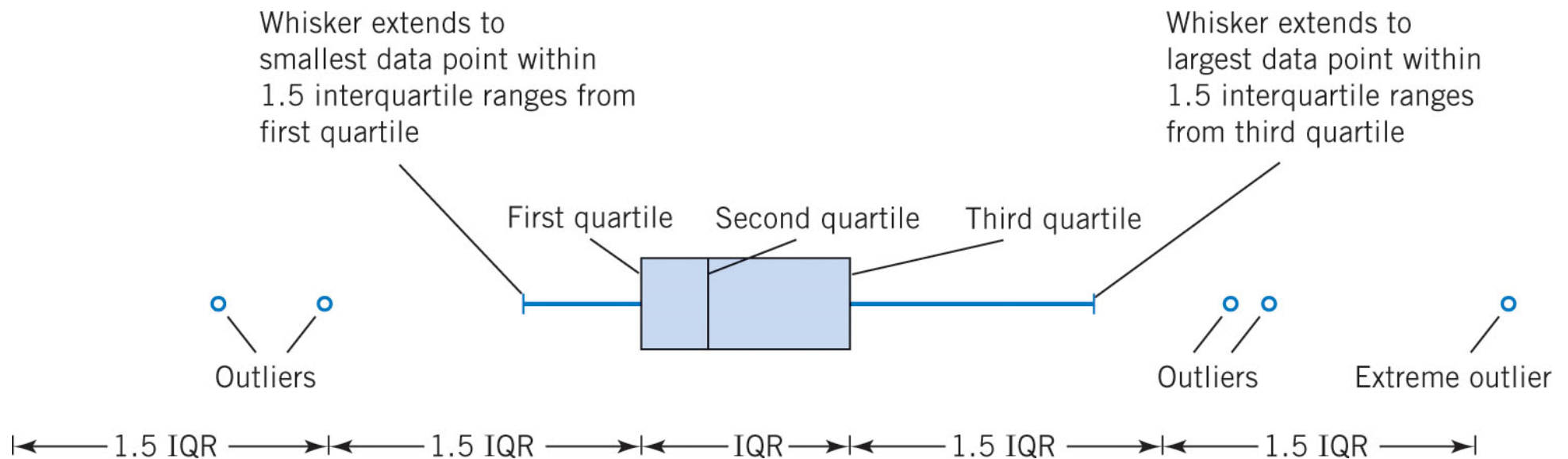


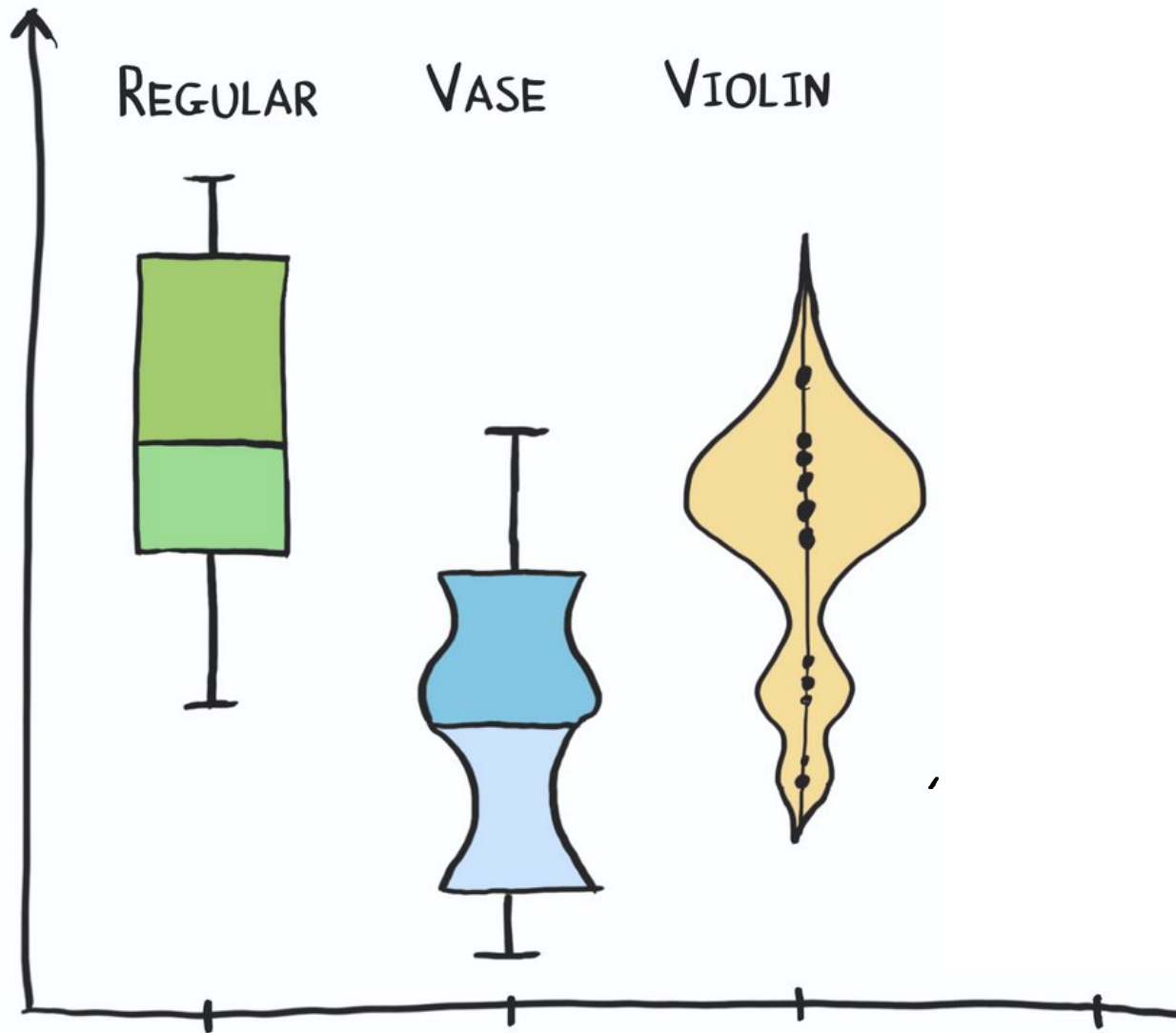
# Box-and-Whisker Plot

- A box plot is a graphical display showing **S**pread, **O**utliers, **C**enter, and **S**hape (**SOCS**).
- It displays the **5-number summary**: *min*,  $q_1$ , *median*,  $q_3$ , and *max*.



**Figure 6-13** Description of a box plot.

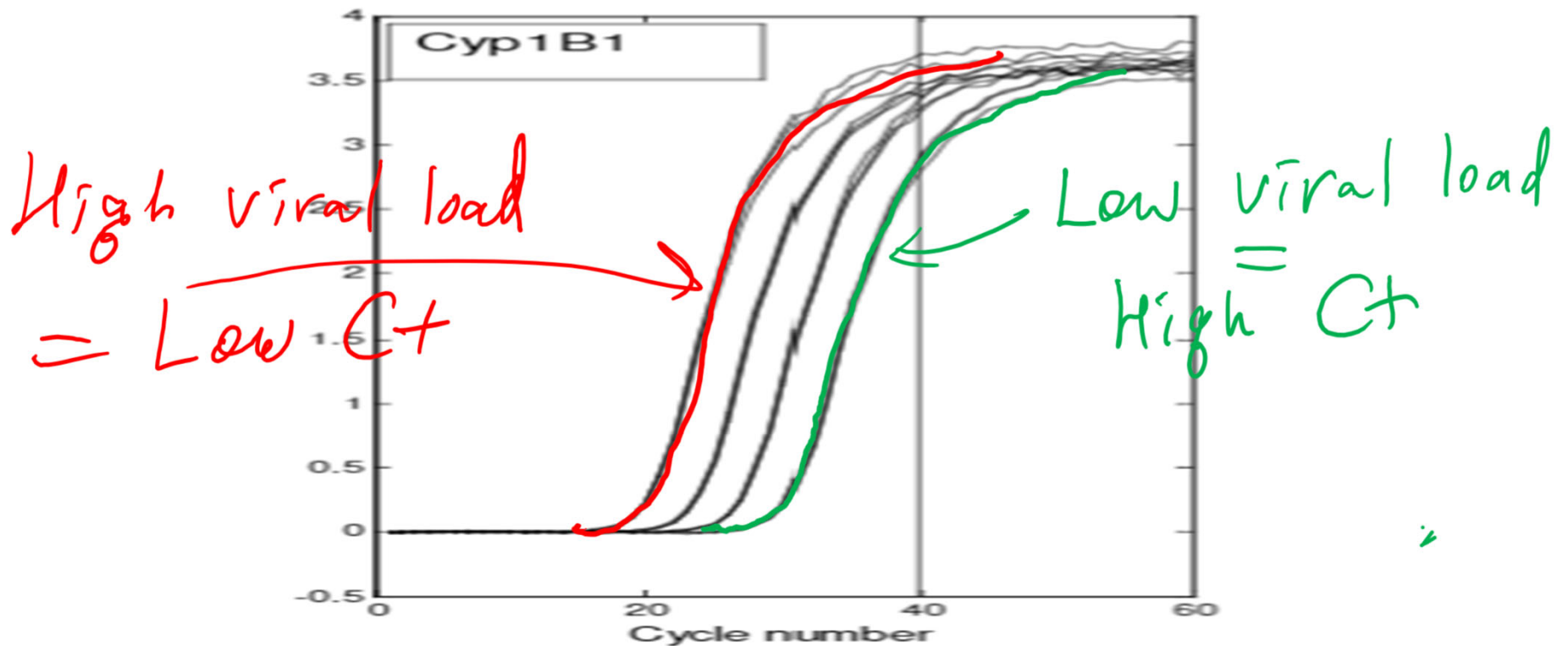
# TYPES OF BOX AND WHISKER PLOT



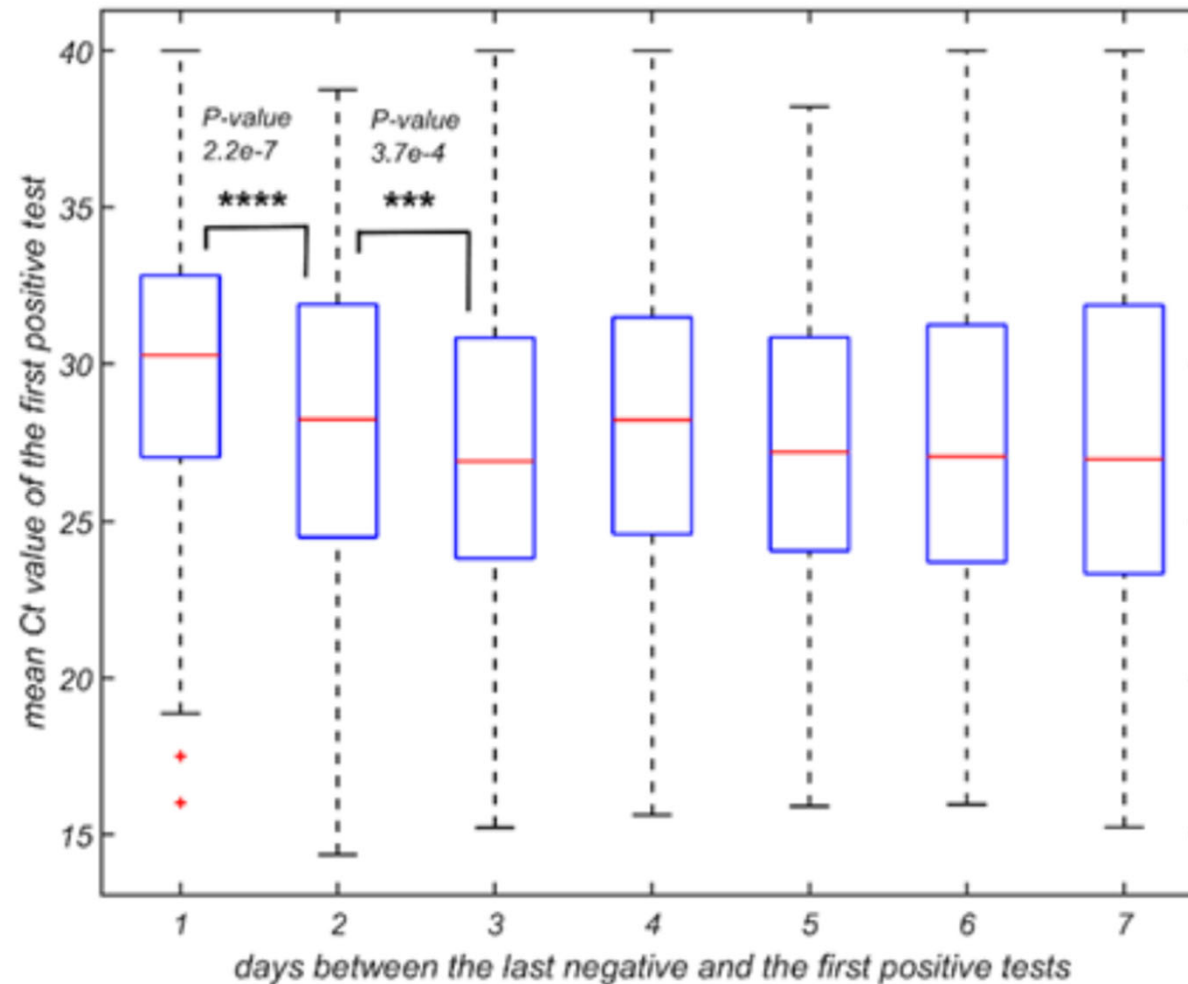
# Reminder

What is the Cycle threshold (Ct)  
value of a PCR test?

$$Ct = \text{const} - \log_2(\text{viral DNA concentration})$$



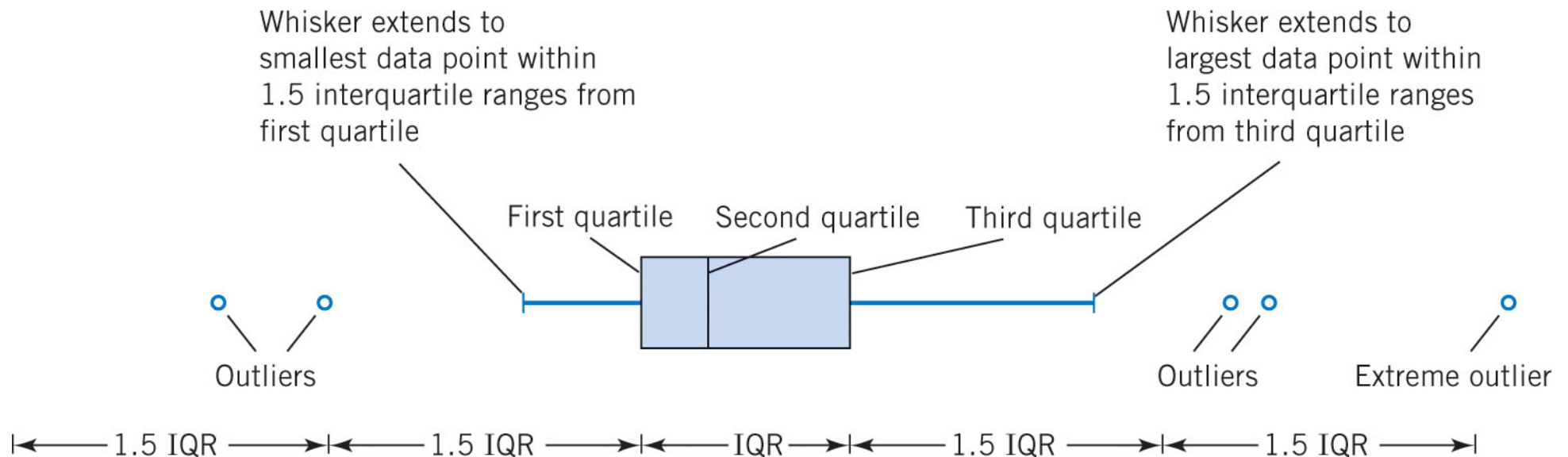
# Bar plot based on COVID-19 tests at UIUC



Ranoa, D. R. E. et al. Mitigation of SARS-CoV-2 transmission at a large public university. Nat Commun 13, 3207 (2022)

# Matlab exercise #2:

- Generate a sample with  $n = 1000$  following **standard normal distribution**
- Calculate **median, first, and third quartiles**
- Calculate **IQR** and find ranges shown below
- Find and count **left and right outliers**
- **Do not use built-in Matlab functions for this!**
- Make box and whisker plot: use **boxplot**



How many right outliers one expects in a sample of  $n=1000$  following normal distribution?

- **% find the third quartile of a standard distribution**
- **norminv(0.75) %ans = 0.6745**
- **% Calculate IQR - Inter Quartale Range**
- **IQR=2.\*norminv(0.75) % 1.3490**
- **% Calculate  $0.5*IQR+1.5*IQR$  - the right whisker position**
- **whisker=0.5.\*IQR+1.5\*IQR %ans = 2.6980**
- **% Find the probability to be above the right whisker**
- **1-normcdf(whisker) %ans = 0.00349**
- **% Find number of right outliers in a sample of 1000 points**
- **1000.\*(1-normcdf(whisker)) %ans = 3.49**



Credit: XKCD  
comics

# WHY ARE THERE SLAVES IN THE BIBLE

WHY DO TWINS HAVE DIFFERENT FINGERPRINTS  
WHY ARE AMERICANS AFRAID OF DRAGONS

WHY IS HTTPS CROSSED OUT IN RED  
WHY IS THERE A LINE THROUGH HTTPS  
WHY IS THERE A RED LINE THROUGH HTTPS ON FACEBOOK  
WHY IS HTTPS IMPORTANT

# QUESTIONS FOUND IN GOOGLE AUTOCOMplete



WHY ARE THERE WEEKS  
WHY DO I FEEL DIZZY

WHY DO WHALES JUMP  
WHY ARE WITCHES GREEN  
WHY ARE THERE MIRRORS ABOVE BEDS  
WHY DO I SAY UH  
WHY IS SEA SALT BETTER  
WHY ARE THERE TREES IN THE MIDDLE OF FIELDS  
WHY IS THERE NOT A POKEMON MMO  
WHY IS THERE LAUGHING IN TV SHOWS  
WHY ARE THERE DOORS ON THE FREEWAY  
WHY ARE THERE SO MANY SVCHOST.EXE RUNNING  
WHY AREN'T THERE ANY COUNTRIES IN ANTARCTICA  
WHY ARE THERE SCARY SOUNDS IN MINECRAFT  
WHY IS THERE KICKING IN MY STOMACH  
WHY ARE THERE TWO SLASHES AFTER HTTP  
WHY ARE THERE CELEBRITIES  
WHY DO SNAKES EXIST  
WHY DO OYSTERS HAVE PEARLS  
WHY ARE DUCKS CALLED DUCKS  
WHY DO THEY CALL IT THE CLAP  
WHY ARE KYLE AND CARTMAN FRIENDS  
WHY IS THERE AN ARROW ON AANG'S HEAD  
WHY ARE TEXT MESSAGES BLUE  
WHY ARE THERE MUSTACHES ON CLOTHES  
WHY ARE THERE MUSTACHES ON CARS  
WHY ARE THERE MUSTACHES EVERYWHERE  
WHY ARE THERE SO MANY BIRDS IN OHIO  
WHY IS THERE SO MUCH RAIN IN OHIO  
WHY IS OHIO WEATHER SO WEIRD

WHY AREN'T ECONOMISTS RICH  
WHY DO AMERICANS CALL IT SOCCER  
WHY ARE MY EARS RINGING  
WHY ARE THERE SO MANY AVENGERS  
WHY ARE THE AVENGERS FIGHTING THE X MEN  
WHY IS WOLVERINE NOT IN THE AVENGERS

WHY ARE THERE SWARMS OF GNATS  
WHY IS THERE PHLEGM  
WHY ARE THERE SO MANY CROWS IN ROCHESTER, MN  
WHY IS PSYCHIC WEAK TO BUG  
WHY DO CHILDREN GET CANCER  
WHY IS POSEIDON ANGRY WITH ODYSSEUS  
WHY IS THERE ICE IN SPACE

# WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE BRIDESMAIDS  
WHY DO DYING PEOPLE REACH UP  
WHY AREN'T THERE VARICOSE ARTERIES  
WHY ARE OLD KUNGONS DIFFERENT



WHY ARE THERE TINY SPIDERS IN MY HOUSE  
WHY DO SPIDERS COME INSIDE  
WHY ARE THERE HUGE SPIDERS IN MY HOUSE  
WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE  
WHY ARE THERE SPIDERS IN MY ROOM  
WHY ARE THERE SO MANY SPIDERS IN MY ROOM  
WHY DO SPIDER BITES ITCH  
WHY IS DYING SO SCARY



WHY IS THERE AN OWL IN MY BACKYARD  
WHY IS THERE AN OWL OUTSIDE MY WINDOW  
WHY IS THERE AN OWL ON THE DOLLAR BILL  
WHY DO OWLS ATTACK PEOPLE  
WHY ARE AK 47s SO EXPENSIVE  
WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE  
WHY ARE THERE GODS  
WHY ARE THERE TWO SPOCKS

WHY IS MT VESUVIUS THERE  
WHY DO THEY SAY T MINUS  
WHY ARE THERE OBELISKS  
WHY ARE WRESTLERS ALWAYS WET  
WHY ARE OCEANS BECOMING MORE ACIDIC  
WHY IS ARWEN DYING  
WHY AREN'T MY QUAIL LAYING EGGS  
WHY AREN'T MY QUAIL EGGS HATCHING  
WHY AREN'T THERE ANY FOREIGN MILITARY BASES IN AMERICA

WHY ARE CIGARETTES LEGAL  
WHY ARE THERE DUCKS IN MY POOL  
WHY IS JESUS WHITE  
WHY IS THERE LIQUID IN MY EAR  
WHY DO Q TIPS FEEL GOOD  
WHY DO GOOD PEOPLE DIE



WHY ARE DOGS AFRAID OF FIREWORKS  
WHY IS THERE NO KING IN ENGLAND

WHY IS PROGRAMMING SO HARD  
WHY IS THERE A 0 OHM RESISTOR  
WHY DO AMERICANS HATE SOCCER  
WHY DO RHYMES SOUND GOOD  
WHY DO TREES DIE  
WHY IS THERE NO SOUND ON CNN  
WHY AREN'T POKEMON REAL  
WHY AREN'T BULLETS SHARP  
WHY DO DREAMS SEEM SO REAL

WHY IS THERE NO GPS IN LAPTOPS  
WHY DO KNEES CLICK  
WHY AREN'T THERE E GRADES  
WHY IS ISOLATION BAD  
WHY DO BOYS LIKE ME  
WHY DON'T BOYS LIKE ME  
WHY IS THERE ALWAYS A JAVA UPDATE  
WHY ARE THERE RED DOTS ON MY THIGHS  
WHY IS LYING GOOD

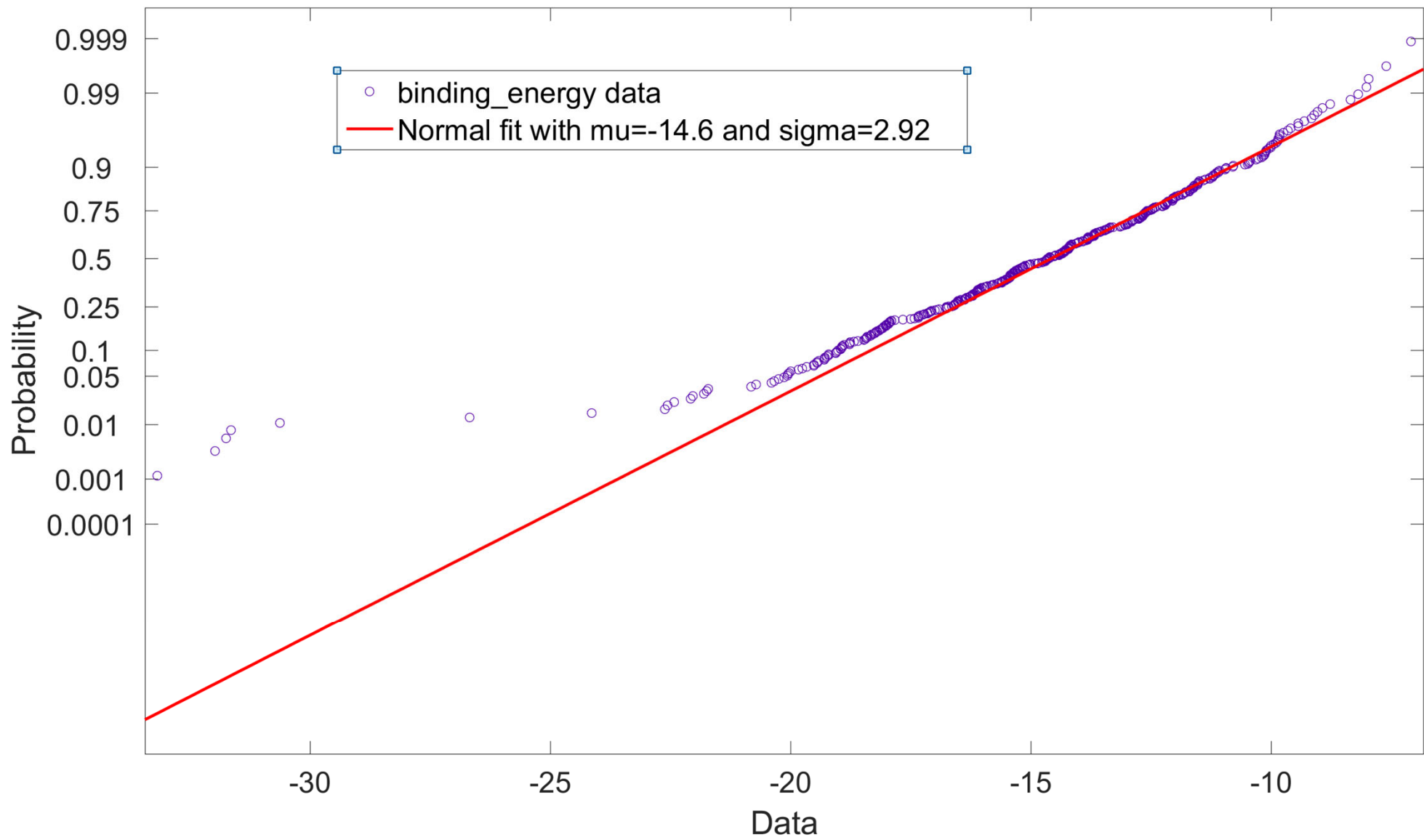


WHY IS GPS FREE

# Probability Plots

- How do we know if a particular probability distribution is a reasonable model for a data set?
- A **histogram** of a large data set **reveals the shape of a distribution**. The histogram of a small data set does not provide a clear picture.
- A **probability plot** is helpful for all data set size. How good is the model based on a particular probability distribution can be verified using a **subjective visual examination**.

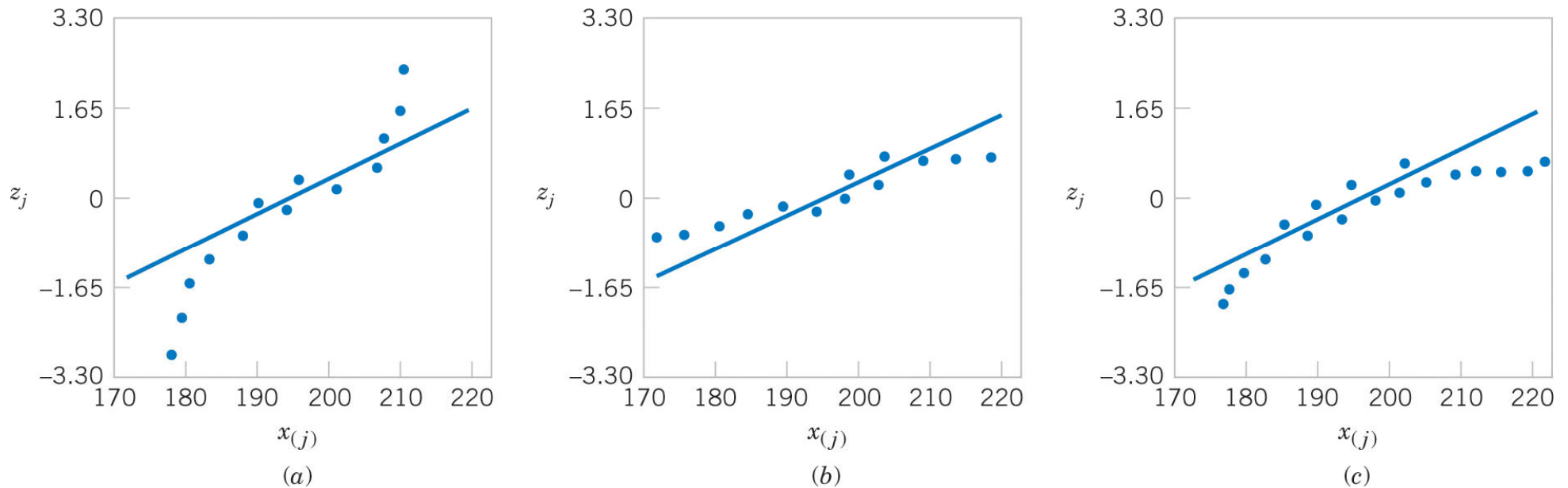




# How To Build a Probability Plot

- Sort the data observations in ascending order:  
 $X_{(1)}, X_{(2)}, \dots, X_{(n)}$ .
- Empirically determined cumulative frequency  
 $\text{Prob}(x \leq x_{(j)}) = j/n$ . To correct for discreteness of  $x_{(j)}$  better use  $\text{Prob}(x \leq x_{(j)}) = (j-0.5)/n$
- If you believe that  $\text{CDF}(x)$  describes your random variable  $(j-0.5)/n$  should be close to  $\text{CDF}(x_{(j)})$
- Probability plot is  $x_{(j)} \cdot [(j-0.5)/n] / \text{CDF}(x_{(j)})$  plotted versus the observed value  $x_{(j)}$ .
- If the fit is good - one gets a straight line
- Deviations can be seen especially at tails.

# Probability Plot Variations



**Figure 6-21** Normal probability plots indicating a non-normal distribution.

(a) Light tailed distribution (squeezed together)

(b) Heavy tailed distribution (stretched out)

(c) Right skewed distribution (left end squeezed, right end stretched)

Credit: XKCD  
comics

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WHY DO AMERICANS CALL IT SOCCER

WHY IS PSYCHIC WEAK TO BUG

WHY ARE MY EARS RINGING

WHY DO CHILDREN GET CANCER

WHY ARE THERE SO MANY AVENGERS

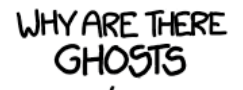
WHY IS POSEIDON ANGRY WITH ODYSSEUS

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WHY IS THERE ICE IN SPACE

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WHY IS EARTH TILTED



WHY IS THERE AN OWL IN MY BACKYARD

WHY IS SPACE BLACK



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WHY IS OUTER SPACE SO COLD

WHY IS THERE AN OWL ON THE DOLLAR BILL

WHY ARE THERE PYRAMIDS ON THE MOON

WHY DO OWLS ATTACK PEOPLE

WHY IS NASA SHUTTING DOWN

WHY ARE AK 47s SO EXPENSIVE

WHY ARE THERE MALE AND FEMALE BIKES

WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE

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WHY ARE THERE GODS

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WHY DO SPIDER BITES ITCH

WHY ARE OCEANS BECOMING MORE ACIDIC

WHY IS DYING SO SCARY

WHY IS ARWEN DYING



WHY IS LIFE SO BORING  
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WHY ARE ULTRASOUND MACHINES EXPENSIVE  
WHY IS STEALING WRONG  
WHY AREN'T THERE ANY FOREIGN MILITARY BASES IN AMERICA

WHY DO WHALES JUMP  
WHY ARE WITCHES GREEN  
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WHY DO TREES DIE  
WHY IS THERE NO SOUND ON CNN

WHY DO IGUANAS DIE  
WHY AREN'T THERE DINOSAUR GHOSTS

WHY ARE THERE FEMALE MR NIMES  
WHY IS GPS FREE

WHY IS SEX SO IMPORTANT



WHY IS THERE HELL IF GOD FORGIVES



# Descriptive statistics:

Sample mean and  
its variance

Standard error vs  
Standard deviation



# Some Definitions

- The random variables  $X_1, X_2, \dots, X_n$  are a **random sample** of **size  $n$**  if:
  - a) The  $X_i$  are **independent** random variables.
  - b) Every  $X_i$  has **the same probability distribution**.

Such  $X_1, X_2, \dots, X_n$  are also called independent and identically distributed (or **i. i. d.**) random variables

- A **statistic** is any function of the observations in a random sample.
- The probability distribution of a statistic is called a **sampling distribution**.

# Statistic #1: Sample Mean

If the values of  $n$  observations in a random sample are denoted by  $x_1, x_2, \dots, x_n$ , the **sample mean** is

$$\bar{x} = \frac{x_1 + x_2 + \dots + x_n}{n} = \frac{\sum_{i=1}^n x_i}{n} \quad (6-1)$$

New random variable  $\bar{X}$  is a linear combination of  $n$  independent identically distributed variables  $X_1, X_2, \dots, X_n$

$$\bar{X} = \frac{X_1 + X_2 + \dots + X_n}{n}$$

# Mean & Variance of a Linear Function

$$Y = c_1X_1 + c_2X_2 + \dots + c_pX_p$$

$$E(Y) = c_1E(X_1) + c_2E(X_2) + \dots + c_pE(X_p) \quad (5-25)$$

$$V(Y) = c_1^2V(X_1) + c_2^2V(X_2) + \dots + c_p^2V(X_p) + 2 \sum_{i < j} c_i c_j \text{cov}(X_i, X_j) \quad (5-26)$$

If  $X_1, X_2, \dots, X_p$  are **independent**, then  $\text{cov}(X_i, X_j) = 0$ ,

$$V(Y) = c_1^2V(X_1) + c_2^2V(X_2) + \dots + c_p^2V(X_p) \quad (5-27)$$



## IMPORTANT:

Sample mean  $\bar{X}$  is drawn from a random variable

$$\bar{X} = \frac{X_1 + X_2 + \dots + X_n}{n}$$

$$E(\bar{X}) = \frac{n \cdot E(X_i)}{n} = \frac{n \cdot \mu}{n} = \mu$$

$$V(\bar{X}) = \frac{n \cdot V(X_i)}{n^2} = \frac{n \cdot \sigma^2}{n^2} = \frac{\sigma^2}{n}$$

$$\text{Stand. dev. } (\bar{X}) = \frac{\sigma}{\sqrt{n}}$$



# Central Limit Theorem

If  $X_1, X_2, \dots, X_n$  is a random sample of size  $n$  is taken from a population with mean  $\mu$  and **finite variance  $\sigma^2$** , and **any distribution**. If  $\bar{X}$  is the sample mean, then the **limiting form of the distribution** of

$$Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} \quad (7-1)$$

for **large  $n$** , is the **standard normal distribution**.

If  $X_1, X_2, \dots, X_n$  are themselves normally distributed – for any  $n$

# Test CLT for your own random variable

- Go to:  
[https://onlinestatbook.com/stat\\_sim/sampling\\_dist/](https://onlinestatbook.com/stat_sim/sampling_dist/)
- Select “Custom” at the top and use mouse to sketch the PMF of your own random variable
- Select “mean” and  $n=5$  in the third panel
- Choose “Animated” in the second panel and use `number_of_experiments=5` to see one sample being generated
- Repeat with `number_of_experiments =10,000`
- Now select “mean” and  $n=25$  in the fourth panel
- Skewness and Kurtosis are measures of how good is the normal (Gaussian) fit (choose “fit normal”)

# Sampling Distributions of Sample Means

Figure 7-1 Distributions of average scores from throwing dice.

$$\text{Mean} = (6+1)/2=3.5$$

$$\text{Sigma}^2 = [(6-1+1)^2-1]/12=2.92$$

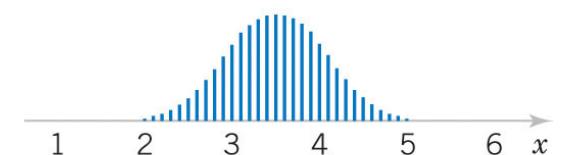
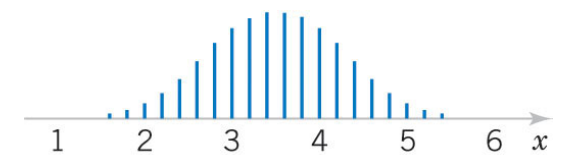
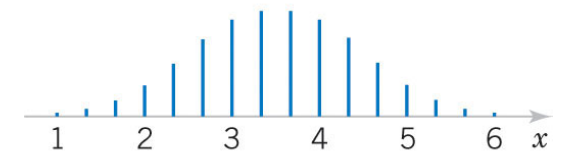
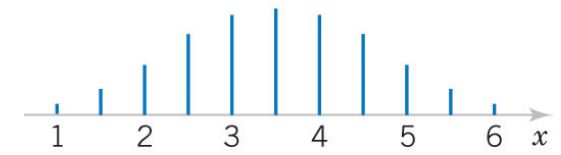
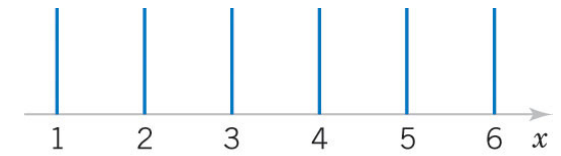
$$\text{Sigma}=1.71$$

Formulas

$$\mu = \frac{b+a}{2} = 3.5$$

$$\sigma_X^2 = \frac{(b-a+1)^2-1}{12} = 35/12$$

$$\sigma_{\bar{X}}^2 = \frac{\sigma_X^2}{n}$$



show  
Matlab

# Matlab exercise

- Do a numerical experiment: generate a **sample of size  $n$**  by rolling  **$n$  fair dice**
- Calculate the **sample mean** 
$$\bar{x} = \frac{x_1 + x_2 + \dots + x_n}{n}$$
- Repeat **Stats=100,000 times**
- Generate **PDFs of sample means** for different samples sizes:  $n=1$ ,  $n=2$ ,  $n=3$ ,  $n=5$ , and  $n=10$
- **Plot them in the same** (semi-logarithmic) **figure**
- **What do you see?**
- Template is at the website:  
`central_limit_theorem_template.m`

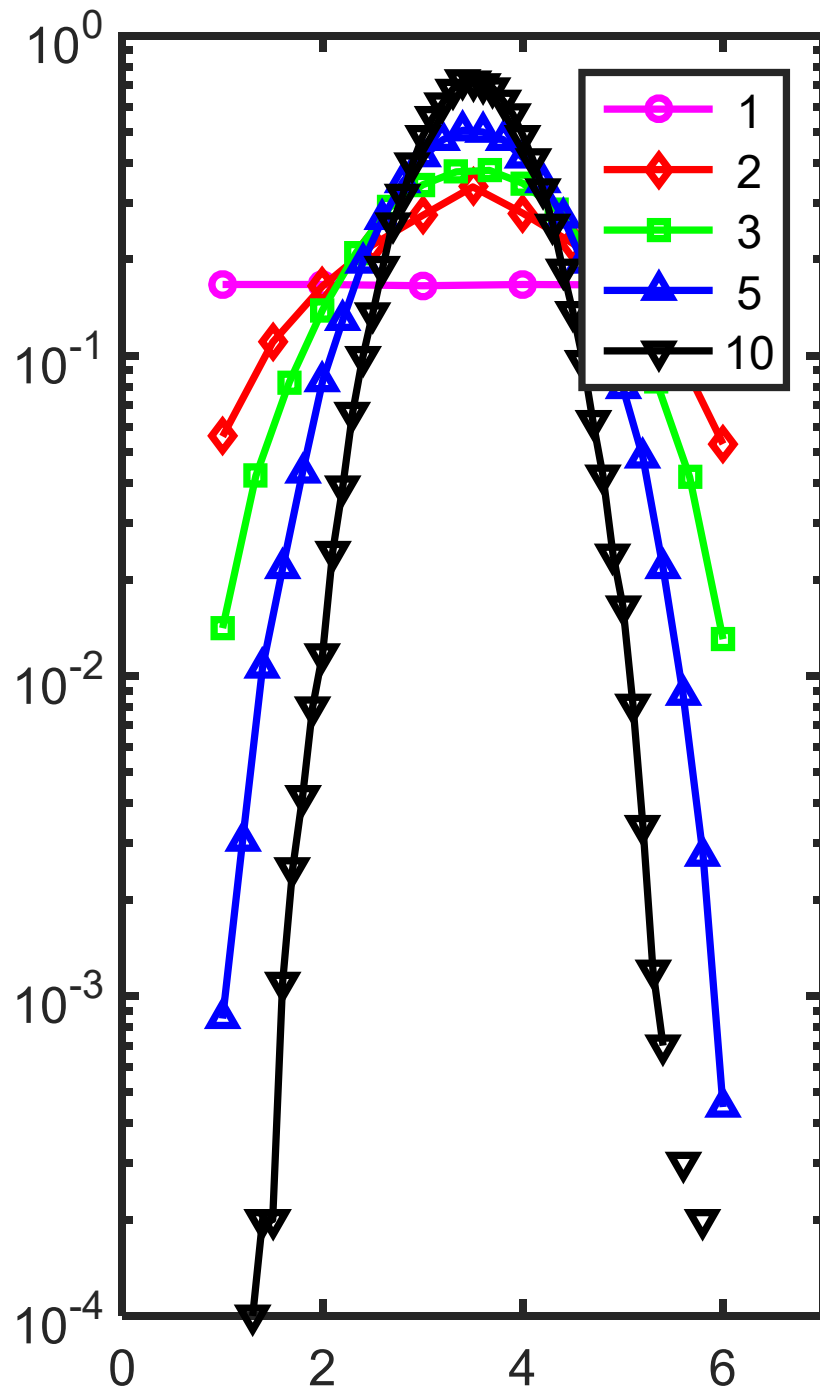
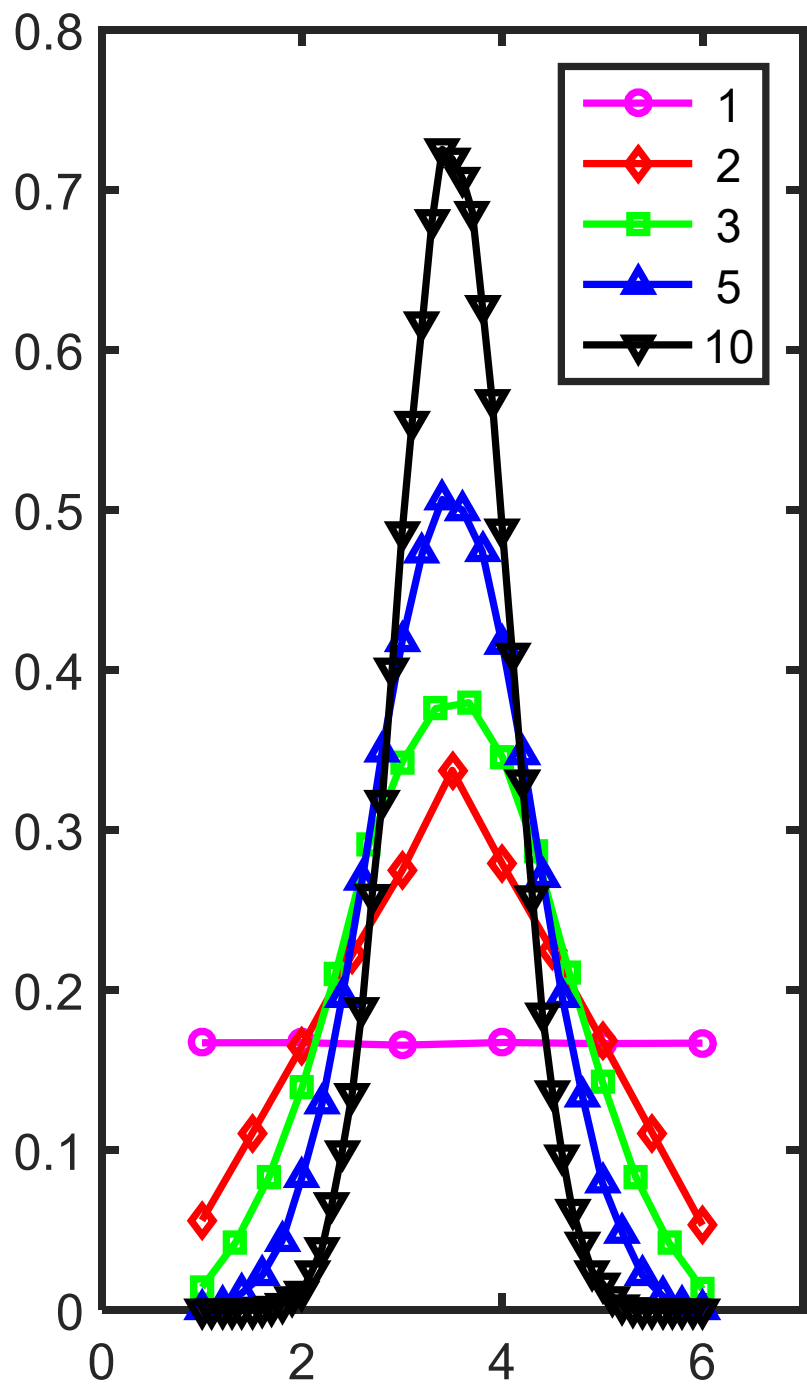
# How did I do it?

- **Stats=100000;**
- **figure;**
- **for n=[1,2,3,5,10];**
- **r\_sample=floor(6.\*rand(Stats,n))+1;**
- **sample\_mean=sum(r\_sample,2)./n;**
- **step=1./n;**
- **[a,b1]=hist(sample\_mean,1:step:6);**
- **pdf\_r1=a./sum(a)./step;**
- **semilogy(b1,pdf\_r1,'o-'); hold on;**
- **end;**
- **legend('1','2','3','5','10');**



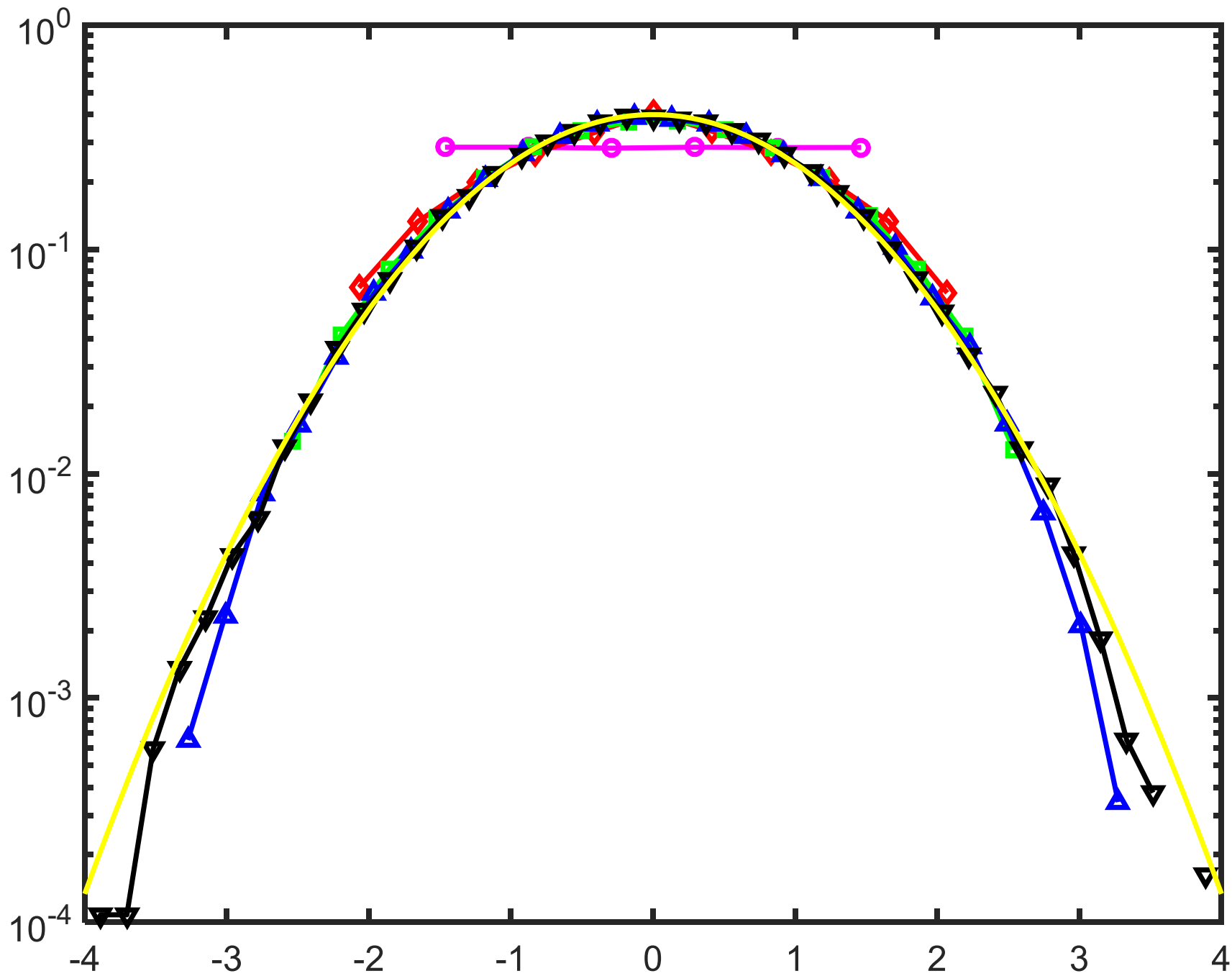
# Matlab demonstration

- `Stats=100000; N=10;`
- `r_table=floor(6.*rand(Stats,N))+1;`
- `%%`
- `r1=r_table(:,1);`
- `step=1; [a,b1]=hist(r1,1:step:6);`
- `pdf_r1=a./sum(a)./step;`
- `figure; hold on; subplot(1,2,1); plot(b1,pdf_r1,'mo-'); hold on; axis([0 7 0 0.2]); subplot(1,2,2);`  
`semilogy(b1,pdf_r1,'mo-'); hold on; axis([0 7 1e-3 1]);`
- `%%`
- `r2=(r_table(:,1)+r_table(:,2))./2;`
- `step=0.5; [a,b2]=hist(r2,1:step:6); pdf_r2=a./sum(a)./step;`
- `subplot(1,2,1); plot(b2,pdf_r2,'rd-'); axis([0 7 0 0.4]); subplot(1,2,2); semilogy(b2,pdf_r2,'rd-');`
- `%%`
- `r3=(r_table(:,1)+r_table(:,2)+r_table(:,3))./3;`
- `step=1./3; [a,b3]=hist(r3,1:step:6); pdf_r3=a./sum(a)./step;`
- `subplot(1,2,1); plot(b3,pdf_r3,'gs-'); axis([0 7 0 0.4]); subplot(1,2,2); semilogy(b3,pdf_r3,'gs-');`
- `%%`
- `r5=sum(r_table(:,1:5),2)./5;`
- `step=1./5; [a,b5]=hist(r5,1:step:6); pdf_r5=a./sum(a)./step;`
- `subplot(1,2,1); plot(b5,pdf_r5,'b^-'); axis([0 7 0 0.6]); subplot(1,2,2); semilogy(b5,pdf_r5,'b^-'); axis([0 7 1e-4 1]);`
- `%%`
- `r10=sum(r_table(:,1:10),2)./10;`
- `step=1./10; [a,b10]=hist(r10,1:step:6); pdf_r10=a./sum(a)./step;`
- `subplot(1,2,1); plot(b10,pdf_r10,'kv-'); axis([0 7 0 0.8]); legend(num2str([1,2,3,5,10]'));`
- `subplot(1,2,2); semilogy(b10,pdf_r10,'kv-'); legend(num2str([1,2,3,5,10]'));`



# Matlab demonstration; part 2

- `%%Now plot all of them normalized to 0 and std 1`
- `sigma=sqrt(35/12);`
- `mu=3.5;`
- `figure;`
- `sigma1=sigma;`
- `semilogy((b1-mu)./sigma1,pdf_r1.*sigma1,'mo-');`
- `axis([-4 4 1e-3 1]);`
- `hold on;`
- `%%`
- `sigma2=sigma./sqrt(2);`
- `semilogy((b2-mu)./sigma2,pdf_r2.*sigma2,'rd-');`
- `%%`
- `sigma3=sigma./sqrt(3);`
- `semilogy((b3-mu)./sigma3,pdf_r3.*sigma3,'gs-');`
- `%%`
- `sigma5=sigma./sqrt(5);`
- `semilogy((b5-mu)./sigma5,pdf_r5.*sigma5,'b^-');`
- `axis([-4 4 1e-4 1]);`
- `%%`
- `sigma10=sigma./sqrt(10);`
- `semilogy((b10-mu)./sigma10,pdf_r10.*sigma10,'kv-');`
- `axis([-4 4 1e-4 1]);`
- `%%`
- `%Let's see how well does the Gaussian fits it`
- `x=-4:0.1:4;`
- `semilogy(x,1./sqrt(2*pi)*exp(-x.^2./2),'y-');`



Credit: XKCD  
comics

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# QUESTIONS FOUND IN GOOGLE AUTOCOMplete



WHY ARE THERE WEEKS  
WHY DO I FEEL DIZZY

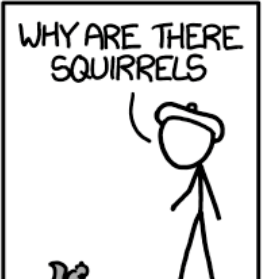
WHY DO WHALES JUMP  
WHY ARE WITCHES GREEN  
WHY ARE THERE MIRRORS ABOVE BEDS  
WHY DO I SAY UH  
WHY IS SEA SALT BETTER  
WHY ARE THERE TREES IN THE MIDDLE OF FIELDS  
WHY IS THERE NOT A POKEMON MMO  
WHY IS THERE LAUGHING IN TV SHOWS  
WHY ARE THERE DOORS ON THE FREEWAY  
WHY ARE THERE SO MANY SVCHOST.EXE RUNNING  
WHY AREN'T THERE ANY COUNTRIES IN ANTARCTICA  
WHY ARE THERE SCARY SOUNDS IN MINECRAFT  
WHY IS THERE KICKING IN MY STOMACH  
WHY ARE THERE TWO SLASHES AFTER HTTP  
WHY ARE THERE CELEBRITIES  
WHY DO SNAKES EXIST  
WHY DO OYSTERS HAVE PEARLS  
WHY ARE DUCKS CALLED DUCKS  
WHY DO THEY CALL IT THE CLAP  
WHY ARE KYLE AND CARTMAN FRIENDS  
WHY IS THERE AN ARROW ON AANG'S HEAD  
WHY ARE TEXT MESSAGES BLUE  
WHY ARE THERE MUSTACHES ON CLOTHES  
WHY ARE THERE MUSTACHES ON CARS  
WHY ARE THERE MUSTACHES EVERYWHERE  
WHY ARE THERE SO MANY BIRDS IN OHIO  
WHY IS THERE SO MUCH RAIN IN OHIO  
WHY IS OHIO WEATHER SO WEIRD

WHY AREN'T ECONOMISTS RICH  
WHY DO AMERICANS CALL IT SOCCER  
WHY ARE MY EARS RINGING  
WHY ARE THERE SO MANY AVENGERS  
WHY ARE THE AVENGERS FIGHTING THE X MEN  
WHY IS WOLVERINE NOT IN THE AVENGERS

WHY ARE THERE SWARMS OF GNATS  
WHY IS THERE PHLEGM  
WHY ARE THERE SO MANY CROWS IN ROCHESTER, MN  
WHY IS PSYCHIC WEAK TO BUG  
WHY DO CHILDREN GET CANCER  
WHY IS POSEIDON ANGRY WITH ODYSSEUS  
WHY IS THERE ICE IN SPACE

# WHY ARE THERE ANTS IN MY LAPTOP

WHY ARE THERE BRIDESMAIDS  
WHY DO DYING PEOPLE REACH UP  
WHY AREN'T THERE VARICOSE ARTERIES  
WHY ARE OLD KUNGONS DIFFERENT



WHY ARE THERE TINY SPIDERS IN MY HOUSE  
WHY DO SPIDERS COME INSIDE  
WHY ARE THERE HUGE SPIDERS IN MY HOUSE  
WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE  
WHY ARE THERE SPIDERS IN MY ROOM  
WHY ARE THERE SO MANY SPIDERS IN MY ROOM  
WHY DO SPIDER BITES ITCH  
WHY IS DYING SO SCARY



WHY IS THERE AN OWL IN MY BACKYARD  
WHY IS THERE AN OWL OUTSIDE MY WINDOW  
WHY IS THERE AN OWL ON THE DOLLAR BILL  
WHY DO OWLS ATTACK PEOPLE  
WHY ARE AK 47s SO EXPENSIVE  
WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE  
WHY ARE THERE GODS  
WHY ARE THERE TWO SPOCKS

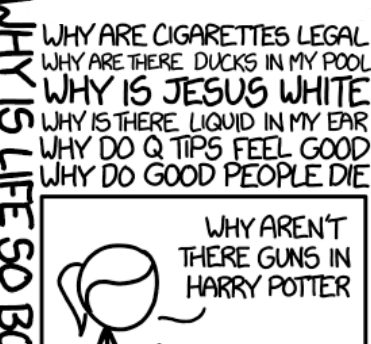
WHY ARE DOGS AFRAID OF FIREWORKS  
WHY IS THERE NO KING IN ENGLAND

WHY IS PROGRAMMING SO HARD  
WHY IS THERE A 0 OHM RESISTOR  
WHY DO AMERICANS HATE SOCCER  
WHY DO RHYMES SOUND GOOD  
WHY DO TREES DIE  
WHY IS THERE NO SOUND ON CNN  
WHY AREN'T POKEMON REAL  
WHY AREN'T BULLETS SHARP  
WHY DO DREAMS SEEM SO REAL

WHY IS THERE NO GPS IN LAPTOPS  
WHY DO KNEES CLICK  
WHY AREN'T THERE E GRADES  
WHY IS ISOLATION BAD  
WHY DO BOYS LIKE ME  
WHY DON'T BOYS LIKE ME  
WHY IS THERE ALWAYS A JAVA UPDATE  
WHY ARE THERE RED DOTS ON MY THIGHS  
WHY IS LYING GOOD



WHY IS MT VESUVIUS THERE  
WHY DO THEY SAY T MINUS  
WHY ARE THERE OBELISKS  
WHY ARE WRESTLERS ALWAYS WET  
WHY ARE OCEANS BECOMING MORE ACIDIC  
WHY IS ARWEN DYING  
WHY AREN'T MY QUAIL LAYING EGGS  
WHY AREN'T MY QUAIL EGGS HATCHING  
WHY AREN'T THERE ANY FOREIGN MILITARY BASES IN AMERICA



WHY ARE CIGARETTES LEGAL  
WHY ARE THERE DUCKS IN MY POOL  
WHY IS JESUS WHITE  
WHY IS THERE LIQUID IN MY EAR  
WHY DO Q TIPS FEEL GOOD  
WHY DO GOOD PEOPLE DIE  
WHY ARE ULTRASOUNDS IMPORTANT  
WHY ARE ULTRASOUND MACHINES EXPENSIVE  
WHY IS STEALING WRONG