

LOGARITHMS

Like 30a

$$\left(\frac{1}{16}\right)^{x-2} = \sqrt[3]{2^x}$$

$$\left(\frac{1}{2^4}\right)^{x-2} = 2^{x/3}$$

$$(2^{-4})^{x-2} = 2^{x/3}$$

$$2^{-4x+8} = 2^{x/3}$$

$$3[-4x+8 = \frac{x}{3}]$$

$$\frac{21}{13} = x \quad \begin{matrix} -12x+24 = x \\ \leftarrow 24 = 13x \end{matrix}$$

$$2 \log x - \log(x^2-10) = 1$$

$$\log x^2 - \log(x^2-10) = 1$$

$$\log \left(\frac{x^2}{x^2-10} \right) = 1$$

$$10^{\log \left(\frac{x^2}{x^2-10} \right)} = 10^1$$

$$(x^2-10) \frac{x^2}{x^2-10} = 10(x^2-10)$$

$$x^2 = 10x^2 - 100$$

$$\frac{100}{9} = \frac{9x^2}{9}$$

$$\sqrt{\frac{100}{9}} = \sqrt{x^2}$$

$$\pm \frac{10}{3} = x$$

$$\log_7(x+2) + \log_7(x-3) = 2 \log_7 6$$

$$\log_7(x^2-3x+2x-6) = \log_7 6^2$$

$$\log_7(x^2-x-6) = \log_7 36$$

$$x^2-x-6 = 36$$

$$x^2-x-42 = 0$$

$$(x+6)(x-7) = 0$$

$$x+6=0 \quad x-7=0$$

$$\cancel{x=-6} \quad x=7$$

Make
Common
bases!

$$8^{\log_8 9} = 9$$

$$\ln x = \log_e x$$

$$\log x = \log_{10} x$$

$$\log_5 125 = \log_5 5^3 = 3$$

$$\log_7 \frac{1}{49} = \log_7 7^{-2} = -2$$

$$\ln \sqrt[3]{e^2} = \ln e^{2/3} = 2/3$$

PROPERTIES OF LOGS

$$\log_b m + \log_b n = \log_b (mn)$$

$$\log_b m - \log_b n = \log_b \left(\frac{m}{n} \right)$$

$$\log_b m^p = p \cdot \log_b m$$

EXPONENTIATE!

Pop. of Seneca is 2000.
Growing at 2.3% per
year. How many years
to reach 3000 people?

$$N = N_0 (1 \pm r)^t$$

$\uparrow$ final $\uparrow$ initial

$$3000 = 2000(1+0.023)^t$$

$$\frac{3000}{2000} = \frac{2000(1.023)^t}{2000}$$

$$1.5 = 1.023^t$$

$$\ln(1.5) = \ln(1.023^t)$$

$$\ln(1.5) = t \cdot \ln(1.023)$$

$$\frac{\ln(1.5)}{\ln(1.023)} = \frac{t \cdot \ln(1.023)}{\ln(1.023)}$$

$$17.8 \text{ yrs.} = t$$

$$\frac{5000}{2000} = \frac{2000 e^{0.106t}}{2000}$$

$$\ln(2.5) = \ln e^{0.106t}$$

$$\ln(2.5) = 0.106t$$

$$\frac{\ln(2.5)}{0.106} = t$$

STATS

{3, 7, 9, 17}

Measures of central tendency?

Mean, Median, Mode

Measures of variation?

St. Dev, Range, IQR

# of cars	mpg	
3	20	= 60
5	24	= 120
2	28	= 56
1	39	= 39
		<u>275</u>

Find st. dev.

1) Find mean $\bar{x} = \frac{36}{4} = 9$

2) Data-mean $(-6)^2 + (-2)^2 + 0^2 + 8^2 =$

3) Square differences = $\frac{104}{4}$

4) Find mean of squares = $\sqrt{51}$

5) $\sqrt{\quad} = 7.14$

Find mean, median + mode

Mean = $\frac{275}{11} = 25 \text{ mpg}$

Median = $\frac{11}{2} = 5.5 \approx 6^{\text{th}}$

= 24 mpg

Mode = 24 mpg

Outliers

IQR = $77 - 65 = 12$

IQR * 1.5 = $12 * 1.5 = 18$

Upper: $Q_3 + \# = 77 + 18 = 95$

Lower: $Q_1 - \# = 65 - 18 = 47$

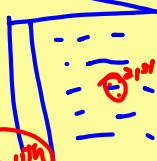
Med = 72

$Q_1 = 65$

$Q_3 = 77$



$\frac{41 - 70.5}{2} = 21.5$
Quantiles
 $\frac{20}{2} = 10^{\text{th}} \text{ \& } 11^{\text{th}}$



Normal Distribution

$Z = \frac{x - \mu}{\sigma} = \frac{\text{Raw Score} - \text{Mean}}{\text{St. Dev.}}$

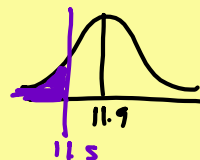
500 H.S. 100 m dash competitors

$\mu = 11.9 \text{ sec}$ $\sigma = 0.4$

How many runners below 11.5 sec?

$Z = \frac{11.5 - 11.9}{0.4} = -1.00$

% = 0.1587 * 500 $\approx$ 79 runners



Top 25% advance to state

What is slowest time that can still go to state?



$0.4 - \frac{0.67}{0.4} = \frac{x - 11.9}{0.4}$ a.y

Col C = 0.2500

$-0.268 = x - 11.9$

$10.632 = x$
sec

Permutations - Patterns

All objects: $n!$

Part of objects: nPr

Alike: $\frac{\text{total}!}{\text{alike!} \text{ alike!}}$

Special positions or repeat: Draw blanks

Combinations - Groups

nCr

CONDITIONAL PROB



$$\text{PROBABILITY} = \frac{\text{suc}}{\text{total}} \quad \text{ODDS} = \frac{\text{suc}}{\text{fail}}$$

COMBINATIONS: 1) No order
2) No replacement
3) Dependent

ORDER: Indiv. fractions

Replacement: Indiv. fractions

Think $\frac{\text{suc}}{\text{total}}$

AND = Multiply

OR = Add = subtract Duplicates

BINOMIAL < only 2 outcomes
Indep. events

$${}^8C_2 O^6 S^2$$

At Least/At Most

$$\text{at least 6 times} = {}^8C_2 O^6 S^2 \text{ or } {}^8C_1 O^7 S^1 \text{ or } {}^8C_0 O^8 S^0$$

What is prob of selecting
Someone who passed?

$$P(P) = 0.03 + 0.56 = 0.59$$

If a person who failed
is selected, what is prob
he/she took the evil test?

$$P(E|F) = \frac{P(EF)}{P(F)} = \frac{0.27}{0.27 + 0.14} = 0.659$$