The number 1830 (decimal) is written as:

- 11101000110 in binary (base 2)
- 130212 in quaternary (base 4)
- 3406 in octal (base 8)
- 726 in hexadecimal (base 16)

Attendance link at ignite.byu.edu/cbe400/lectures

A measure of the cost of the system is the number of symbols (10 in decimal, 2 in binary) times the number of digits needed to represent a number.

Which base is best of 2, 3, 4, 5, 6, 7, 8, ..., ∞ ?

Assume a continuous base b. Find b for minimum cost C, where, for any number n, we have

$$C = b \log_b(n) = b \frac{\ln n}{\ln b},$$

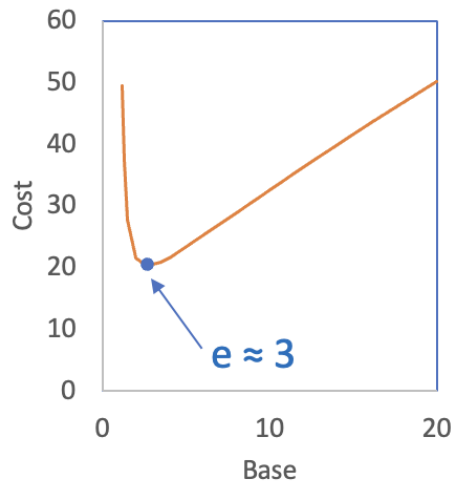
that is, the cost is the number of symbols (the base b) times the number of digits ($\log_b(n)$).

Find the minimum by taking the derivative, setting to zero, and solving.

$$\frac{dC}{db} = \ln n \frac{\ln(b) - 1}{(\ln b)^2}$$

$$\frac{dC}{db} = 0 \rightarrow b = e$$

Base	Number	# Places	# Symbols	Cost = Places*Symbols
Binary (2)	11101000110	11	2	**22**
Ternary (3)	2111120	7	3	**21**
Octal (8)	3406	4	8	**32**
Decimal (10)	1830	4	10	**40**
Hexidecimal (16)	726	3	16	**48**



3 is the closest integer to e, so base 3 has the smallest cost. Base 3 is best.

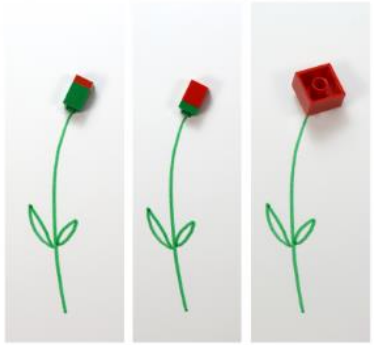
Show and Tell

Brady
Tem
Davis

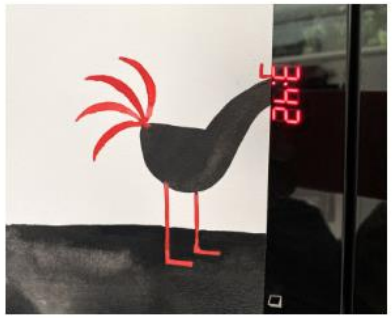


Next week: Kaiden, Hailey, Gwendolyn

Christoff Niemann



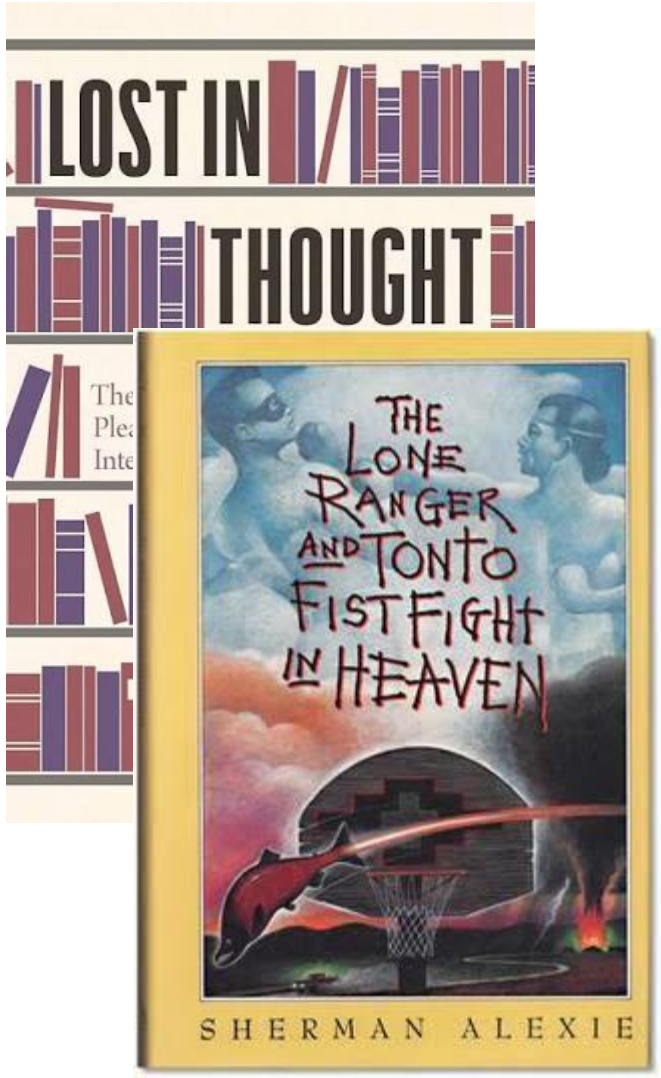




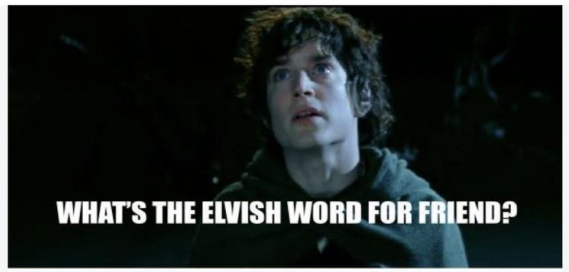




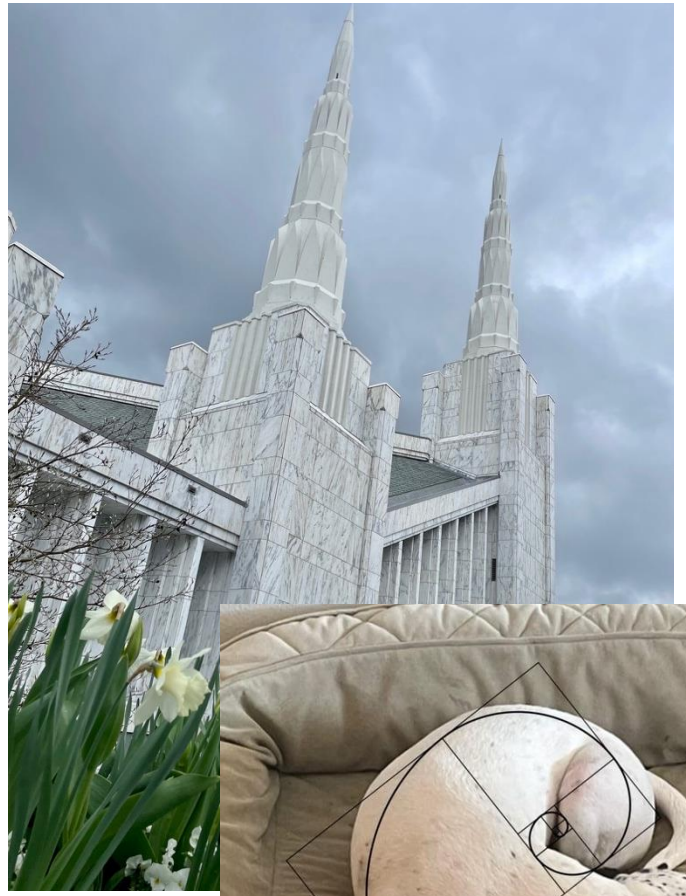

Where does your inspiration come from?







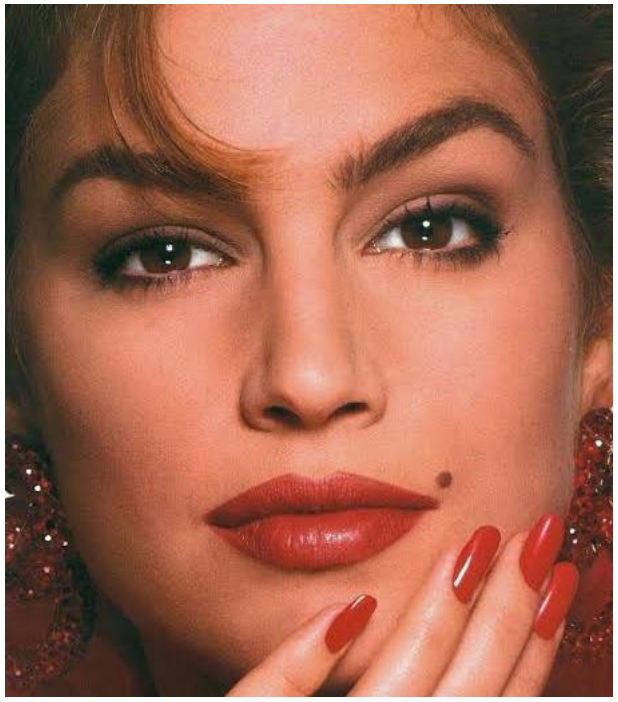


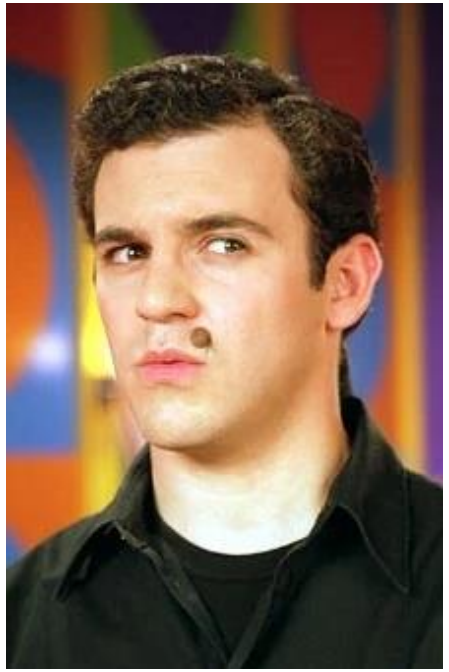




Friday is Mole Day 6:02 10^{23}











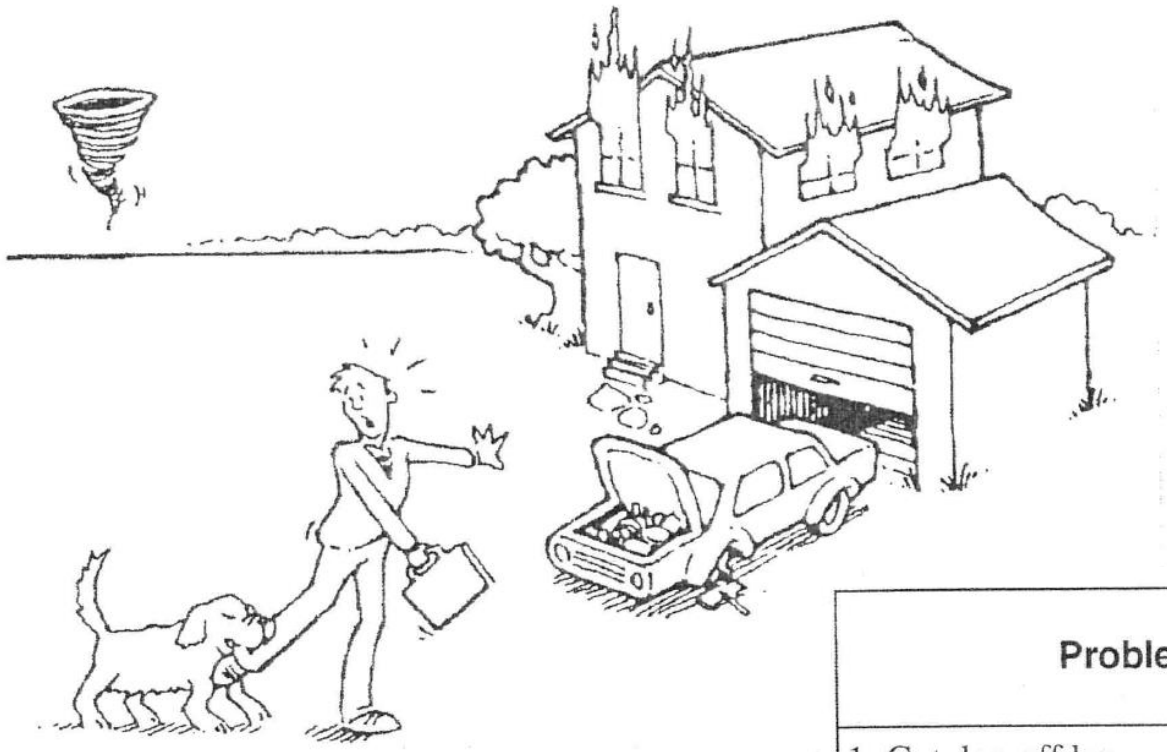
We are excited to remind you that Mole Day is just around the corner! This special day, celebrated on October 23 from 6:02 a.m. to 6:02 p.m., is dedicated to honoring Avogadro's Number (6.02 x 10^23) and the fundamental principles of chemistry.

What is Mole Day? Mole Day is an annual celebration for chemistry enthusiasts around the world. It aims to foster interest in chemistry and commemorate the significant contributions of Amedeo Avogadro to molecular science. Avogadro's Number is a cornerstone in chemistry, representing the number of atoms or molecules in one mole of a substance.

Four types of analysis (according to Kepler & Trogue)

- Situation analysis – What to do next, what is the priority
- Problem analysis – Distinguish what the problem is or is not
- Decision analysis – Choose the optimum of several competing decisions
- Potential problem analysis – Carefully look at the consequences of your decision to determine if this is best in the long run

Situation Analysis



Issues can be complicated
Having a structure can help
Organize thought

Problem	Timing (H, M, L)	Trend (H, M, L)	Impact (H, M,L)	Next Process (PA, DA, PPA)
1. Get dog off leg				
2. Repair car				
3. Put out fire				
4. Protect papers in briefcase				
5. Prepare for touchdown of tornado				

Problem Analysis (Chapter 5)

The Four K.T. Dimensions of a Problem

		Is	Is Not	Distinction	Cause
What	Identify	What is the problem?	What is not the problem?	What is the distinction between the **is** and the **is not?**	What is a possible cause?
Where	Locate	Where is the problem found?	Where is the problem not found?	What is distinctive about the difference in locations?	What is the possible cause?
When	Timing	When does the problem occur?	When does the problem not occur?	What is distinctive about the difference in the timing?	What is a possible cause?
		When was the problem first observed?	When was the problem last observed?	What is the distinction between these observations?	What is a possible cause?

Decision Analysis

1. Decision Statement: what to decide; gather info
2. List objectives: musts and wants
3. List of options or alternatives to choose from
4. Evaluate options against the musts: go or no go
5. Evaluate objectives against the wants
   - Assign weights (1-10), *subjective*
6. Evaluate each option against the wants
   - Assign rating (0-10)

While identifying weights and scoring may at first seem somewhat subjective, it is an extremely effective technique for those who can dissociate themselves from their personal biases and arrive at a logical evaluation of each alternative

K.T. DECISION ANALYSIS: JOB OFFER

Objectives		Dow Corning			ChemaCo			TrueOil	
Musts									
In Midwest		Midland, Michigan	Go		Toledo, Ohio	Go		Detroit, Michigan	Go
Located within 40 miles of spouse's position		Another major company also in Midland	Go		Industrialized Northern Ohio	Go		Major metropolitan area	Go
No-transfer policy		Major plant in Midland	Go		Major plant in Toledo	Go		Must transfer	No Go
Wants	**Weight**		**Rating**	**Score**		**Rating**	**Score**		
Plant safety	10	Good (silicone)	7	70	Mainly oil derivatives (okay)	5	50		
Type of position	9	Process engineer	9	81	Pilot plant design and operation	10	90		
Salary and benefits	7	Good	6	42	Very good	7	49		
Near hometown (Traverse City, Michigan)	6	150 miles	10	60	400 miles	5	30		
Large company	4	Medium size	6	24	Small size	3	12		
Encourage advanced degree	4	Very positive	9	36	Positive	8	32		
Total				313			263		

The “secretary” problem





Potential Problem Analysis

What could possibly go wrong?



Potential Problem Analysis

Potential Problem	Possible Causes	Preventive Action	Contingent Actions
A.	1. 2.		
B.	1. 2.		

- California will no longer allow gasoline-powered cars by 2035
- Drug legalization
- Remove cash bail

Lost in Death Valley









Lost in Death Valley

Instructions: While on a weekend trip with your roommate, your car breaks down in a very remote gulley in northern Death Valley. It's 110°F . Your phone is out of batteries and your car battery is dead. You are approximately one hundred miles north of the Death Valley National Park Visitors Center. You cannot stay with your car because you have noticed 5 rattlesnakes coming out of the brush in the gulley to the shade of your car. There's a communication tower on a hill about 5 miles away to the east. You don't know if you should hike to the tower, or hike 5 miles to the shadows of the mountain valleys in the west.

You have a small backpack that can hold 8 of 15 items in your car.

Your assignment is threefold: (1) what is your long-term plan for survival, (2) decide what your immediate goal is and (3) rank the fifteen items below in terms of their importance to your survival. Place the number 1 by the most important item, the number 2 by the second most important, and so on through number 15, the least important.

_____ Jumper cables	_____ Cosmetic mirror	_____ One-gallon can of gasoline (full)
_____ Five 1-pint bottles of water	_____ Mosquito repellant	_____ Old transistor radio (listening only)
_____ Car jack with tire iron	_____ Map of California	_____ Plastic tableware kit (knife fork spoon napkin)
_____ shovel	_____ Box of matches	_____ Two boxes of chocolate bars
_____ Blue plastic tarp 20' x 20'	_____ One quart of motor oil	_____ Fifteen feet of nylon rope
_____ Small backpack (take with you)		