A general introduction

One unit of credit

1 unit is (at least) 45 hours of work per semester

"Traditional accounting" for one unit:

- 1 hour of lectures per week
- 2 hours of discussion sections per week
- 3 hours of lab work per week

Ramifications for USC's 15-week semester:

- 1 unit is 3 hours of work per week
- 16 units = 48 hours of work per week
- a 4-unit math class = 7 hours of *independent* work per week

And this is the bare minimum!

Good news: one week is 168 hours; 168=48+60+60.

An absolute grading scheme

A	100–95
A-	94–90
B+	89–87
B	86–83
B-	82–80
C+	79–77
C	76–73
C-	72–70
D+	69–67
D	66–63
D-	62–60
F	59 and below

Think!

Quotation number 1:

Most people would rather die than think; in fact, many do so.

A variation on *Bertrand Russell* (1872-1970)

Quotation number 2:

Tänka fritt är stort men tänka rätt är store.

Do!

A quotation:

> Education is what you get when you read the fine print.
> Experience is what you get when you do not.
>
> *Unknown*, on investing.

A generalization:

> Education is what you get when you ⟨ DO ⟩.
> Experience is what you get when you ⟨ DO NOT ⟩.

Three other suggestions:

1. Ask questions [try two `serious ones` per week].
   - At the lecture (right on the spot, before/after).
   - During office hours.
   - By e-mail
2. Keep your notes.
3. Have fun while learning the material.

The 7%-38%-55% rule

Communication:

- **Verbal** (words): 7%
- **Vocal** (tone of voice): 38%
- **Visual** (body language): 55%

Source: Albert Mehrabian (Professor of Psychology at UCLA, b. 1939) studies on communication in 1960's.

The fine print: This only applies to messages pertaining to feelings and attitudes.

Conclusion: For a (math) lecture, make it 100% verbal (lecture words) and visual (blackboard and/or video).

Probability and Statistics

Subject	Word	Motivation
Probability	Probus (Latin) = honest	Gambling
	Probabilis (Latin) = provable	
Statistics	Stare (Latin) = stand	Agriculture
	Statistik (German) = political arithmetic	

First department of statistics in the USA: 1933, Iowa State University
World: 1911, University College London

As a math problem

In the background is a model with uncertain outcomes.

Probability is mathematical study of uncertainty: Given a model, describe the outcomes — a *forward* problem.

Statistics is collecting, organizing, analyzing, interpreting, and presenting data.
Applied Statistics: understanding whether the observed difference is due to chance or is caused by something else — all about facts (data). `Theorem-free`.

Mathematical Statistics: Given the outcomes (data), determine the underlying model — an *inverse* problem. Provides the tools to interpret the facts (process the data) and safeguards against wrong interpretations and conclusions. `Proves theorems`.

$X_1, X_2, \ldots, X_n$

Sample mean

$$\bar{X}_n = \frac{X_1 + X_2 + \ldots + X_n}{n} = \frac{1}{n}\sum_{k=1}^{n} X_k$$

Sample median M_n

$$11, 25, \mathbf{38}, 478, 5000 \mapsto M_5 = 38;$$

$$16, 27, \mathbf{324}, \mathbf{450}, 598, 61111 \mapsto M_6 = \frac{324 + 450}{2} = 387.$$

Sample standard deviation

$$s_n = \sqrt{\frac{1}{n-1}\sum_{k=1}^{n}(X_k - \bar{X}_n)^2}$$

Random models

Tossing a coin, with outcomes $\mathrm{H}(\textsc{eads})$, $\mathrm{T}(\textsc{ails})$

Rolling a Die, with outcomes $\{1, 2, 3, 4, 5, 6\}$

Drawing Cards

- 52 cards;
- 2 *colors*: black, red;
- 4 *suits*: hearts (red), clubs (black), diamonds (red), spades (black);
- 13 *ranks* per suit: A(ce), 2,3,4,5,6,7,8,9,10, J(ack), Q(ueen), K(ing).