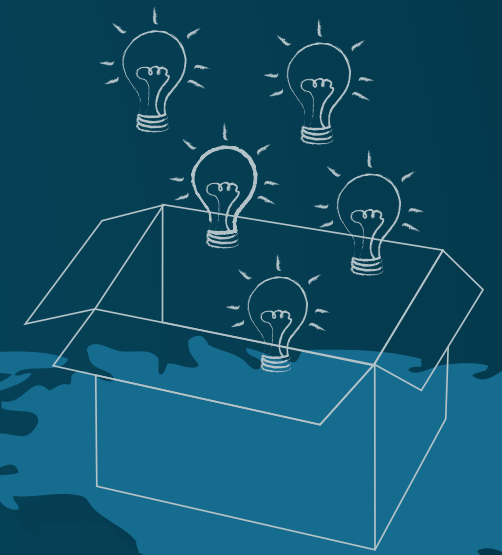


HUMAN-CENTERED
DESIGN

Representation Matters

Scott Klemmer

UC San Diego
The Design Lab



The Oranges Puzzle

goal Order the oranges by size: largest-to-smallest, left-to-right

rule 1 Only one orange can be transferred at a time

rule 2 An orange can only be transferred to a plate on which it will be the largest

rule 3 Only the largest orange on a plate can be transferred to another plate

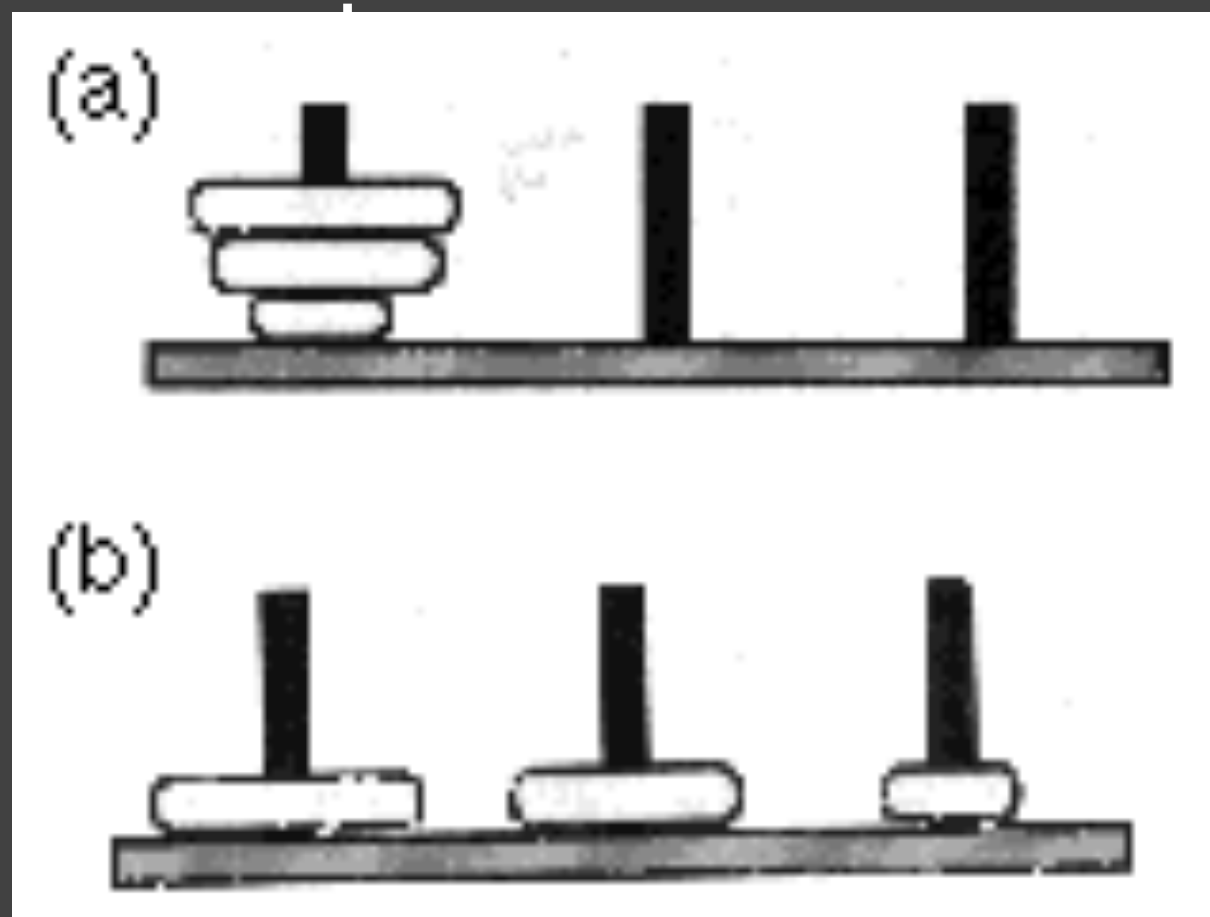
The Bagels Puzzle

goal Order the donuts by size: largest-to-smallest, left-to-right

rule 1 Only one donut can be transferred at a time

rule 2 A donut can only be transferred to a peg on which it will be the largest

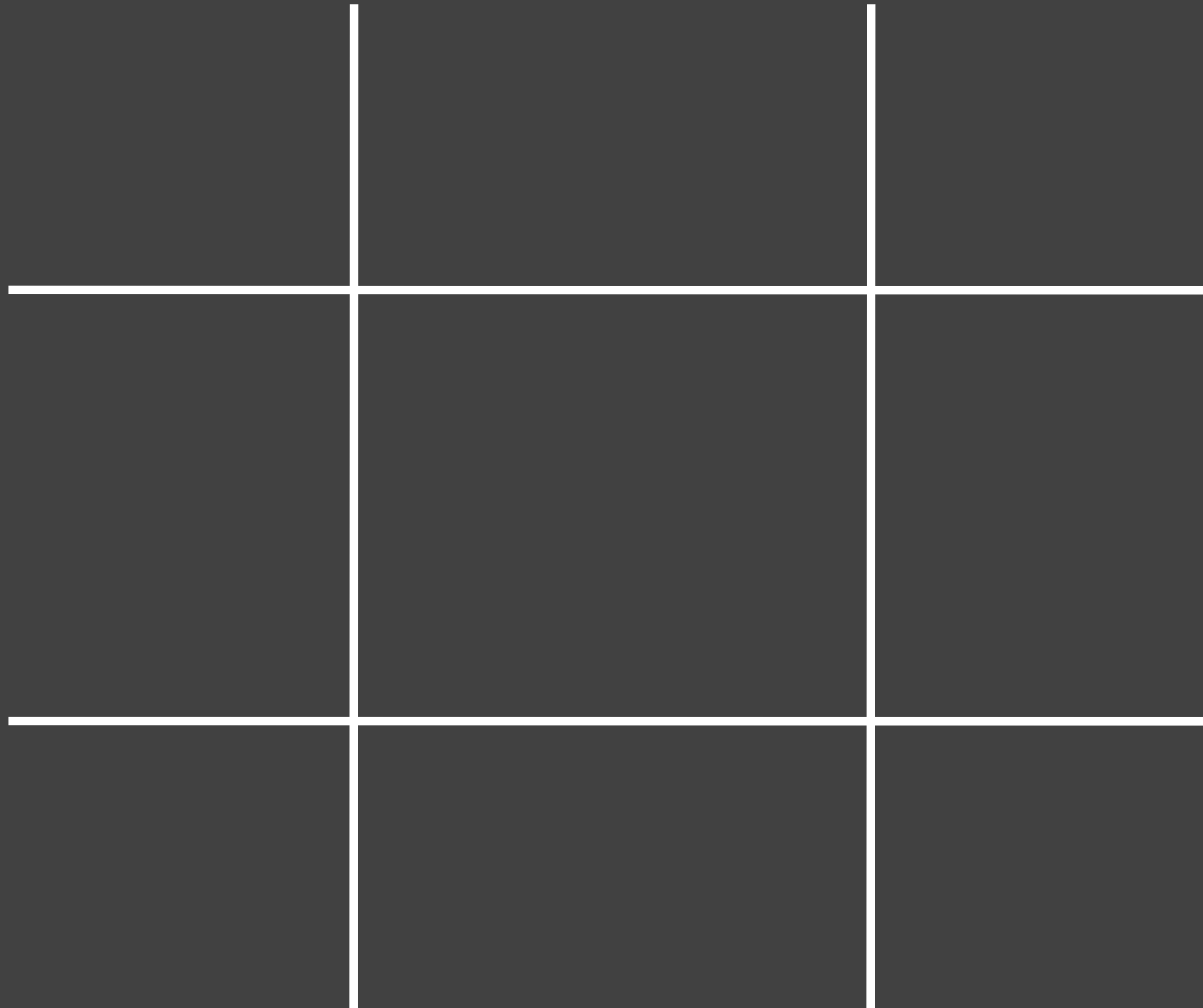
rule 3 Only the largest donut on a peg can be transferred to



Let's play a number game!

- Two players
- Think of the numbers 1 to 9
- Players draw alternately, without replacement
- The objective is to make a set of 3 that adds to 15

How 'bout Tic-Tac-Toe?



These Games are Isomorphs

4	9	2
3	5	7
8	1	6

Problem Solving as Representation

“Solving a problem simply means
representing it so as to make the solution
transparent”

—Herbert Simon, *The Sciences of the Artificial*

Working Memory

Getting Things Done

Naturalness Principle

- Experiential cognition is aided when the properties of the **representation** match the properties of the **thing** being represented

Proteus Ingestable Networked Pill



- Sensor and transmitter encapsulates pill
- Stomach acid is part of battery
- Transmits pill
 - > patch
 - > iPhone
 - > Internet

Stanford Academic Calendar 2009-10

An online version of this calendar is available at the University Registrar's web site: http://registrar.stanford.edu/academic_calendar/

AUTUMN QUARTER

AUGUST

1 (Sat)	Axess opens for course enrollment.
27 (Thu)	M.D. students, first day of instruction.

SEPTEMBER

11 (Fri, 5:00 p.m.)	Course enrollment deadline to receive stipend or refund check on first day of term.
15 (Tue)	New undergraduates arrive; Convocation.
21 (Mon)	First day of quarter; instruction begins.
21 (Mon, 5:00 p.m.)	Preliminary Study List deadline Students must be "at status"; i.e., students must have a study list with sufficient units to meet requirements for their status, whether full-time, 8-9-10 units (graduate students only), or approved Special Registration Status.
21 (Mon, 5:00 p.m.)	Deadline to submit Leave of Absence for full refund. A full refund schedule is available here.
24 (Thu)	Conferral of degrees, Summer Quarter.
28 (Mon)	Yom Kippur (classes held; some students will be observing Yom Kippur and are not expected to attend classes; some faculty will not be holding classes).

OCTOBER

9 (Fri, 5:00 p.m.)	Final Study List deadline. Last day to add or drop a class; last day to adjust units on a variable-unit course. Students may withdraw from a course until the Course Withdrawal deadline and a "W" notation will appear on the transcript.
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NOVEMBER

9 (Mon, 5:00 p.m.)	Term withdrawal deadline; last day to submit Leave of Absence to withdraw from the University with a partial refund. A full refund schedule is available here.
13 (Fri, 5:00 p.m.)	Change of grading basis deadline.
13 (Fri, 5:00 p.m.)	Course withdrawal deadline.
13 (Fri, 5:00 p.m.)	Application deadline for Autumn Quarter degree conferral.
23-27 (Mon-Fri)	Thanksgiving Recess (no classes).
30-December 6 (Mon-Sun)	End-Quarter Period.

DECEMBER

4 (Fri)	Last day of classes (unless class meets on Sat.)
4 (Fri)	Last opportunity to arrange Incomplete in a course, at last class.
4 (Fri, noon)	University thesis, D.M.A. final project, or Ph.D. dissertation, last day to submit.
4 (Fri, 5:00 p.m.)	Late application deadline for Autumn Quarter degree

SPRING QUARTER

FEBRUARY

7 (Sat)	Course enrollment deadline to receive stipend or refund check on first day of term.
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MARCH

19 (Mon)	Students may receive stipend or refund check on first day of term.
29 (Mon)	Instruction begins.
29 (Mon, 5:00 p.m.)	Students must be "at status"; i.e., students must have a study list with sufficient units to meet requirements for their status, whether full-time, 8-9-10 units (graduate students only), or approved Special Registration Status.
29 (Mon, 5:00 p.m.)	Deadline to submit Leave of Absence for full refund. A full refund schedule is available here.

APRIL

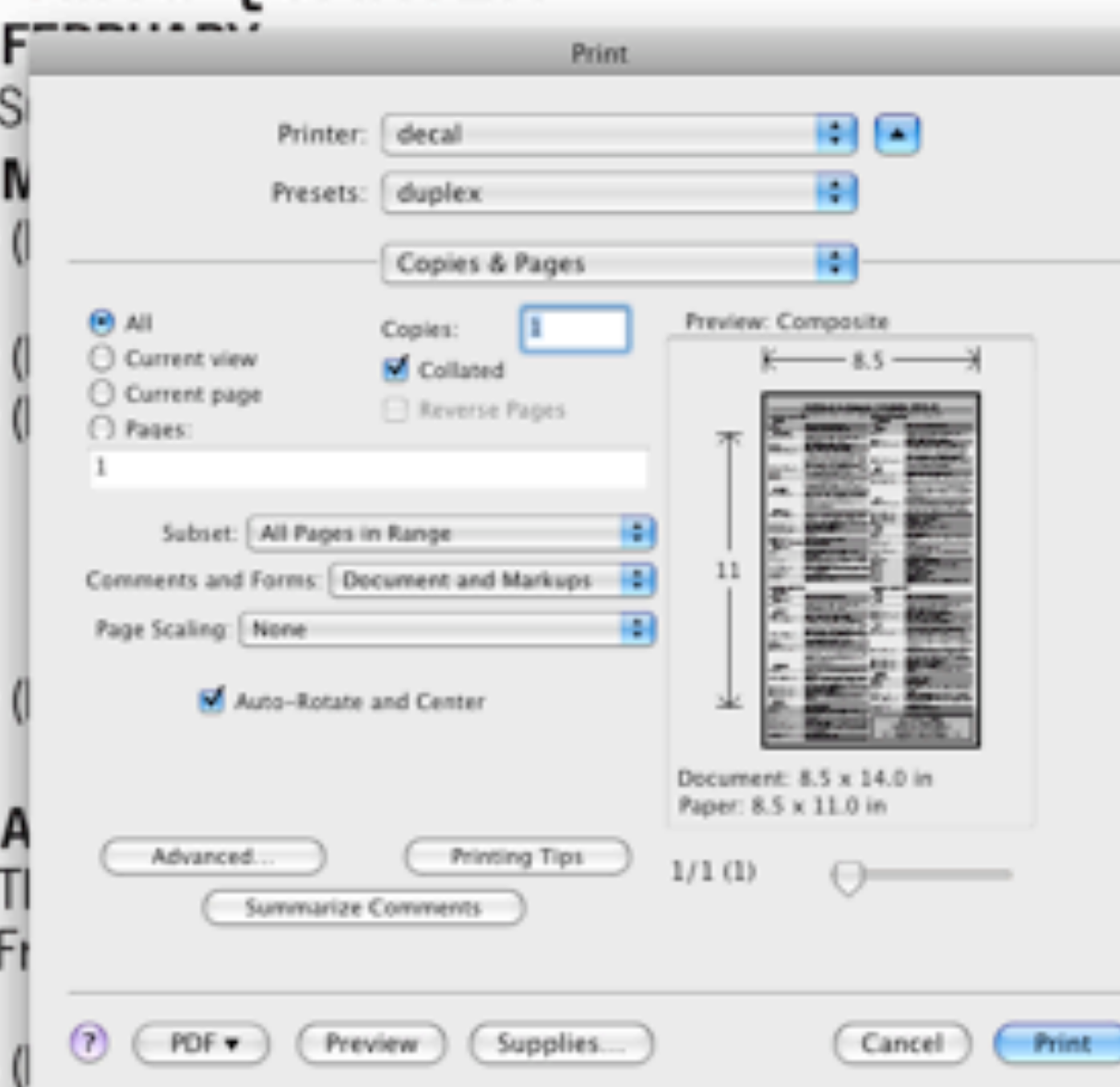
1 (Thu)	First day of quarter; instruction begins.
9 (Fri)	Final Study List deadline. Last day to add or drop a class; last day to adjust units on a variable-unit course. Students may withdraw from a course until the Course Withdrawal deadline and a "W" notation will appear on the transcript.
16 (Fri)	Term withdrawal deadline; last day to submit Leave of Absence to withdraw from the University with a partial refund. A full refund schedule is available here.

MAY

12 (Wed, 5:00 p.m.)	Term withdrawal deadline; last day to submit Leave of Absence to withdraw from the University with a partial refund. A full refund schedule is available here.
21 (Fri, 5:00 p.m.)	Change of grading basis deadline.
21 (Fri, 5:00 p.m.)	Course withdrawal deadline.
28-June 3 (Fri-Thu)	End-Quarter Period.
31 (Mon)	Memorial Day (holiday, no classes) .

JUNE

2 (Wed)	Last day of classes.
2 (Wed)	Last opportunity to arrange Incomplete in a course, at last class.
2 (Wed, noon)	University thesis, D.M.A. final project, or Ph.D. dissertation, last day to submit.
2 (Wed, 5:00 p.m.)	Late application deadline for Spring Quarter degree conferral (\$50 fee).
3 (Thu)	Day before finals, no classes.
4-9 (Fri-Wed)	End-Quarter examinations.
10 (Thu)	Grades for graduating students due at noon.
12 (Sat)	Senior Class Day.



2009-10

[nd.edu/academic_calendar/](http://registrar.stanford.edu/academic_calendar/)

opens for course enrollment.

se enrollment deadline to receive stipend check on first day of term.

day of quarter; instruction begins.

Primary Study List deadline Students must be "at status"; i.e., students must have a study list with sufficient units to meet requirements for their status, whether full-time, 8-9-10 units (graduate students only), or approved Special Registration Status. Line to submit Leave of Absence for full refund schedule is available here.

Conferral of degrees, Winter Quarter.

Application deadline for Spring Quarter degree

Study List deadline Last day to add or drop a class; last day to adjust units on a variable-unit course.

Students may withdraw from a course until the Course Withdrawal deadline and a "W" notation will appear on the transcript.

Students may add or drop a

class; last day to adjust units on a variable-unit course.

Students may withdraw from a course until the Course Withdrawal deadline and a "W" notation will appear on the transcript.

Change of grading basis deadline.

Course withdrawal deadline.

End-Quarter Period.

Memorial Day (holiday, no classes) .

Last day of classes.

Last opportunity to arrange Incomplete in a course, at last class.

University thesis, D.M.A. final project, or Ph.D. dissertation, last day to submit.

Late application deadline for Spring Quarter degree conferral (\$50 fee).

Day before finals, no classes.

End-Quarter examinations.

Grades for graduating students due at noon.

Senior Class Day.

Graduation ceremony.

Grades for non-graduating students due at noon.

opens for course enrollment.

se enrollment deadline to receive stipend check on first day of term.

day of quarter; instruction begins.

