Agenda

- Use spreadsheet to find a payment that gives A GIVEN LOAN LIFE.

- Homework: Due Fri, Oct 2: Compare results from your loan HW assignments with results from a spreadsheet. 2nd chance redo of parts 2 and 3.

- Lab teams choose 2 questions each for answers and discussion. Class vote on 3 of 8 best questions!

- Please recommend domains for interesting examples, besides temperature conversion, robots, elem. finance, and graphics/images.
A simpler problem: **Interest-free loan**

- Amount you owe the bank at a given time: *current principal* (variable money).
- How many months old is the loan when the corresponding row's data is relevant: *month* (0,1,2..)
- How much you paid the band during the relevant month (constant money): *payment*
- New payment = previous payment (except for month 0)
- New principal=previous principal – new payment
- New month = previous month + 1
Now program the spreadsheet to generate the loan table.

Problem: Given loan amount and lifetime in months, choose a payment that makes the loan have that lifetime.
Some Solutions

- Since the domain is mathematically simple, we can derive a closed-form (formula) solution:
  - payment(principal, lifetime) = (principal/lifetime) rounded up.

- Most problems (except in school) DON'T HAVE CLOSED FORM SOLUTIONS. And some closed form solutions are hard to compute accurately. (.note and ask.)

- Program a simulation in a Python-like language and USE it to guess/check the payment.

- Program a guess/check algorithm that USES the simulation as above.

- Use a spreadsheet as business-people do to investigate alternative “scenarios” (i.e. payments.)
Thinking like a ... scientist

- Interesting real problems (unlike school problems) are those for which “the” solution is not known, but for which conflicting partial solutions or good ideas have been guessed.

- HOMEWORK: APPLY: Multiple DIFFERENT ways of checking a tentative solution provide scientific evidence for it.

- Polya wrote in “How to Solve It” that if a problem is too hard, find a easier (but related) problem. The easier problem may give you ideas for the original.
Homework Details

- Submit 6 Excel spreadsheets that show 12, 36 and 360 month loans, one with fixed 8% interest per month and one for our 8% initial with 1% multiplicative interest rate hike after each month. The common initial principal is $20,000. The spreadsheets must do the calculations, so that I can change the rate and constant payment. I'll publish sample printouts.

- Write an accurate, honest account of how well your part 2 and part 3 solutions compare with the results from the spreadsheets. (i.e. grade part 2 and 3 yourself!)

- Get 85% credit back for part 2 and 3 for corrections.
Spreadsheet demonstrated..

- Follow my example to develop programs with a WRITTEN PLAN, draft, algorithm outline, description of key variables and calculations VISIBLE on paper or on the computer desktop. We referred to the slides copied below:

- After getting started, I asked for you to RECORD ON PAPER the exact sequence of steps to select, copy, select a target range, and paste, for getting a formula copied to a range of cells. This record will be used in a future introduction to Excel's Visual Basic.
Payment for a given term, rate and principal is NOT UNIQUE!
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Variable (OBJECT) Oriented Programming

- current principal
- month
- payment

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Problem: Given loan amount and lifetime in months, choose a payment that makes the loan have that lifetime.