Computational Basics

Spreadsheet Logic
Announcements

- exam0 available 1/24 through 1/30 (extra credit)
- lab00 this week
- No assignments due until Wed 1/31
- go.illinois.edu
Today is a trial, not for credit.

Base: AA

Register your name on Compass soon or I cannot know who you are.

Attendance counts starting 1/29—don’t bother excusing absences unless extended because we forgive a few absences automatically.
Spreadsheets
Conditional Logic
Grading

Conditional Logic

IF( CONDITION, RESULT_IF_TRUE, RESULT_IF_FALSE )
Conditional Logic

=IF(A4>1, 0, 1)
Piecewise functions

abs(x) = \begin{cases} 
-x & \text{if } x < 0 \\
x & \text{if } x \geq 0 
\end{cases}

Piecewise functions

\[ \text{abs}(x) = \begin{cases} 
-x & \text{if } x < 0 \\
x & \text{if } x \geq 0 
\end{cases} \]

=IF( A1<0,-A1,A1 )
Piecewise functions

\[ H(x) = \begin{cases} 
0 & \text{if } x < 0 \\
1 & \text{otherwise} 
\end{cases} \]
Piecewise functions
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\[ H(x) = \begin{cases} 
0 & \text{if } x < 0 \\
1 & \text{otherwise} 
\end{cases} \]

=IF( A1<0,0,1 )
Piecewise functions

=IF(A5>0,"Yes","No")
Conditional Functions

- **IF**—branch between optional results
- **COUNTIF**—count only if condition met
- **SUMIF**—add to sum only if condition met
Conditional Functions

- **IF**—branch between optional results
- **COUNTIF**—count only if condition met
- **SUMIF**—add to sum only if condition met
- `=COUNTIF(A1:A10,"<0")`
- `=SUMIF(A1:A10,">1000")`
Data Retrieval
Lookup Functions

- LOOKUP
- VLOOKUP
- HLOOKUP

You only need to learn VLOOKUP in CS 101.
Lookup Functions

- LOOKUP
- VLOOKUP
- HLOOKUP
- You only need to learn VLOOKUP in CS 101.
## Lookup functions

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>COST</th>
<th>NUMBER IN STOCK</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-47</td>
<td>$105</td>
<td>24</td>
</tr>
<tr>
<td>U-96</td>
<td>$115</td>
<td>27</td>
</tr>
<tr>
<td>U-110</td>
<td>$312</td>
<td>22</td>
</tr>
<tr>
<td>U-505</td>
<td>$117</td>
<td>14</td>
</tr>
<tr>
<td>U-744</td>
<td>$1,400</td>
<td>2</td>
</tr>
</tbody>
</table>

U-505 = VLOOKUP(A8, $A$2:$C$6, 2)
Lookup Functions

- VLOOKUP( VALUE, TABLE_RANGE, COLUMN_IN_RANGE )

Caution! VLOOKUP may return a value even if a match isn't made!

VLOOKUP( VALUE, TABLE_RANGE, COLUMN_IN_RANGE, SORTED )

TRUE(), FALSE() in SORTED
Lookup Functions

- **VLOOKUP( VALUE, TABLE_RANGE, COLUMN_IN_RANGE )**
- **Caution!** VLOOKUP may return a value even if a match isn’t made!
Lookup Functions

- VLOOKUP( VALUE, TABLE_RANGE, COLUMN_IN_RANGE )
- Caution! VLOOKUP may return a value even if a match isn’t made!
- VLOOKUP( VALUE, TABLE_RANGE, COLUMN_IN_RANGE, SORTED )
- TRUE(), FALSE() in SORTED
Matrix operations vary in form by the size of the array!
Array Operations

\[
\begin{bmatrix}
1 & 0 & 0 \\
0 & 1 & 0 \\
0 & 0 & 1 \\
\end{bmatrix} \times \mathbf{x} = \begin{bmatrix} 2 \\ 3 \\ 4 \end{bmatrix}
\]
Array Operations

\[ Ax = b \]
Array Operations

\[ Ax = b \rightarrow x = A^{-1}b \]
Array Operations

\[ x = A^{-1} b \]

\[
A^{-1} = \frac{1}{\det(A)} \sum_{s=0}^{n-1} A^s \sum_{k_1, k_2, \ldots, k_{n-1}} \prod_{l=1}^{n-1} \frac{(-1)^{k_l+1}}{l^{k_l} k_l!} \text{tr}(A^l)^{k_l}
\]
Array Operations

\[ x = A^{-1}b \]

\[
A^{-1} = \frac{1}{\det(A)} \sum_{s=0}^{n-1} A^s \sum_{k_1, k_2, \ldots, k_{n-1}} \prod_{l=1}^{n-1} \frac{(-1)^{k_l+1}}{l^{k_l} k_l!} \text{tr}(A^l)^{k_l}
\]

=MINVERSE( A1:C3 )
=MMULT( A5:C7,E1:E3 )

Ctrl + Shift + Enter to set range jointly
More Formatting
Date formatting is a number; the integer is days, the fractional part is hours and minutes.

Percent formatting can be tricky since the cell automatically scales the value.
Next steps
Next steps

- Complete quizzes and hw00, hw01
- Office hours start on 1/29
- Schedule and take exam0 if you like