Spreadsheets

Spreadsheets are a powerful abstraction for organizing data and computation.

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An Array of Cells

A spreadsheet is a 2 dimensional array of cells ... it’s 3D with multiple sheets

- The idea is that the rows or columns represent a common kind of data
- They will be operated upon similarly, so that’s easy to do
- Adding more data of the same type means adding more rows or columns
- Often spreadsheets contain numbers, but text-only spreadsheets are useful, too

Looking for Similar Ideas

Spreadsheets are not so unusual ...

- The position (row/column) names the data, as with memory locations, variables, forms...
- Operating on all elements of a column (or row) is an iteration, though not usually a WFI
- Setting a cell to a formula is an (unevaluated) assignment statement with cells as variables
- The formula is an expression
- Functions are (built-in) functions

Think of spreadsheets as a handier interface for computing ideas than JS

Familiar Terminology

row name column name cell formula referenced cell L2

Formulas

The data in a spreadsheet can be manipulated using formulas

Formulas

The value in H2 (selected cell) is the value in F2 times 0.621 ... the result is shown, but the cell has the formula

Apply Formula Again

One way to repeat the formula is to copy-and-paste

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Filling Replicates Formulas

Fill is a spreadsheet shortcut for copy-and-paste

- Grab the fill tab with the cursor and pull in the direction to be pasted

![Fill Tab](image)

Relative & Absolute Addr

Reference to cells happens in 2 ways: Relative and Absolute (with $)

- F2 relative column, relative row
- FS2 relative column, absolute row
- SF2 absolute column, relative row
- SF$2 absolute column, absolute row

Relative references change when pasted/filled; absolute references do not change

A Powerful Translation

The graphic shows the equations in the cells with the translation: The row changes going down, but the column doesn't

A Example

Creating a discount table is case of using both relative and absolute refs

- Consider store credit of $1 per $10 spent
- $3 store credit for every 2 CDs (1 earns $1)

<table>
<thead>
<tr>
<th>Store Credit</th>
<th>Price Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 $3</td>
<td>$20-$30</td>
</tr>
<tr>
<td>1 $3</td>
<td>$31-$40</td>
</tr>
<tr>
<td>1 $3</td>
<td>$41-$50</td>
</tr>
<tr>
<td>1 $3</td>
<td>$51-$60</td>
</tr>
<tr>
<td>1 $3</td>
<td>$61-$70</td>
</tr>
<tr>
<td>1 $3</td>
<td>$71-$80</td>
</tr>
<tr>
<td>1 $3</td>
<td>$81-$90</td>
</tr>
<tr>
<td>1 $3</td>
<td>$91-$100</td>
</tr>
<tr>
<td>1 $3</td>
<td>$101-$110</td>
</tr>
<tr>
<td>1 $3</td>
<td>$111-$120</td>
</tr>
<tr>
<td>1 $3</td>
<td>$121-$130</td>
</tr>
<tr>
<td>1 $3</td>
<td>$131-$140</td>
</tr>
<tr>
<td>1 $3</td>
<td>$141-$150</td>
</tr>
</tbody>
</table>

A cell is based on first column, top row data in that row and column... must mix relative and absolute references

Series

Another handy property of fill is that it can make a series based on constants

- Fill Sunday => Monday, Tuesday, Wed...
- Fill 22 Feb => 23 Feb, 24 Feb, 25 Feb, ...

More generally

- Series fill will even count using a constant
- Counting by odd sizes: give $n^{th}$ two items

Demo