Research 201

Using Advanced Excel Tools for Managing Your Data

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Excel Functions

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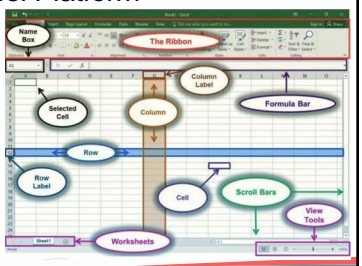
Navigating the Excel Platform

- This presentation assumes you have a basic understanding of the Excel platform.
- If you are a true Excel novice, I recommend going to YouTube, Coursera, or LinkedIn Learning for intro information.



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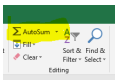
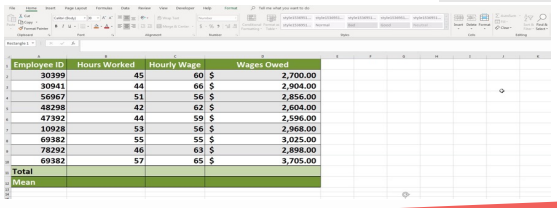
Excel Tips and Tricks

Using built in tools for quick summary stats

- Functions auto-update when numbers change
- Need correct cell references (be careful when adding/removing columns)





Employee ID	Hours Worked	Hourly Wage	Wages Owed
30399	45	60	$ 2,700.00
30941	44	66	$ 2,904.00
56967	51	56	$ 2,856.00
48298	42	62	$ 2,604.00
47392	44	59	$ 2,596.00
10928	53	56	$ 2,968.00
69382	55	55	$ 3,025.00
78292	46	63	$ 2,898.00
69382	57	65	$ 3,705.00
Total			
Mean			

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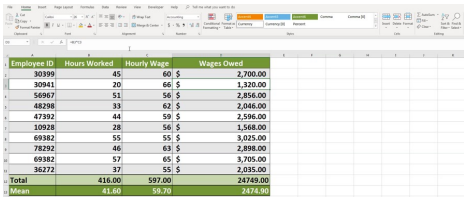
Excel Tips and Tricks

Add conditional formatting to make cells stand out



Employee ID	Hours Worked	Hourly Wage	Wages Owed
30399	45	60	$ 2,700.00
30941	20	66	$ 1,320.00
56967	51	56	$ 2,856.00
48298	33	62	$ 2,046.00
47392	44	59	$ 2,596.00
10928	28	56	$ 1,568.00
69382	55	55	$ 3,025.00
78292	46	63	$ 2,898.00
69382	57	65	$ 3,705.00
36272	37	55	$ 2,035.00
Total	416.00	597.00	24749.00
Mean	41.60	59.70	2474.90

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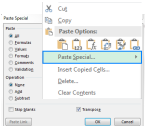
Manipulating/Rotating Data

The "Transpose" special paste option can let you turn rows into columns (and vice versa)!

Copy -> Right Click -> Paste Special -> Transpose

Be aware if you are copying cells that have formulas/reference other cells

NOTE: you cannot *cut* and transpose



Employee ID	Hours Worked	Hourly Wage	Bi Weekly Wages Owed
30399	45	60	$ 2,700.00
30941	44	66	$ 2,904.00
56967	51	56	$ 2,856.00

Employee ID	30399	30941	56967
Hours Worked	45	44	51
Hourly Wage	60	66	56
Bi Weekly Wages Owed	$ 2,700.00	$ 2,904.00	$ 2,856.00

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Relative, Absolute, and Mixed Cell References

Relative Cell Reference (ex. A1)

- **Changes** if the formula is moved or copied to a new cell
- *Useful when*: carrying out formula when the values do not matter
  - i.e. Hours Worked (B1) x Hourly Wage (B2) = Compensation (B1 * B2)

Absolute Cell Reference (ex. A1)

- If you move or copy the formula to a new cell, it will **always** reference the absolute cell reference
- *Useful when:* carrying out a formula that includes a value that is fixed
  - *i.e.* Hours Worked x Hourly Wage x Overtime = Compensation

Mixed Cell Reference

- **A$1** relative column, absolute row
  - If moved or copied, the **column changes**, but the row does not
- **$A1** absolute column, relative row
  - If moved or copied, the **row changes**, but the column does not

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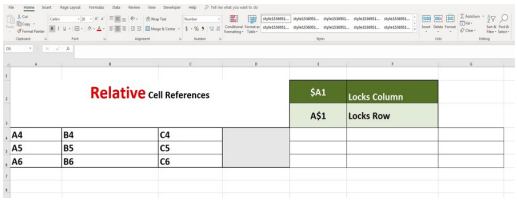
So, what does this look like?



Where do we go from here?

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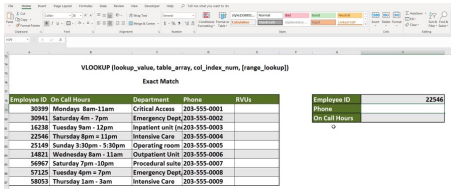
Excel Tips and Tricks

Using VLOOKUP to lookup a value in a table array and retrieve a matched value

- **VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])**



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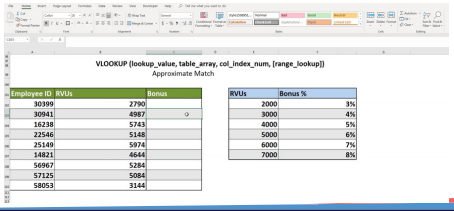
Excel Tips and Tricks

Using VLOOKUP approximate match to lookup a value in a table array and retrieve a matched value

- **[range_lookup]) =TRUE (Data must be sorted ascending)**



VLOOKUP (lookup_value, table_array, col_index_num, [range_lookup])

Approximate Match

Employee ID	RVUs	Bonus
30399	2790	
30941	4987	
16238	5743	
22546	5148	
25149	5974	
14821	4644	
56967	5284	
57125	5084	
58053	3144	

RVUs	Bonus %
2000	3%
3000	4%
4000	5%
5000	6%
6000	7%
7000	8%

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VLOOKUP: Pros and Cons

Pros

- Easy to use
- Effective on small data sets

Cons

- Easy to make mistakes
  - *Requires mixed and absolute references*
  - *Adding/removing columns leads to invalid references*
- Limited functionality and flexibility
  - *You can only look up values on the "right" of the reference value*
  - *Only works when the data is vertically arranged ("**V**" lookup)*
- Requires manual assignment, which can be cumbersome.
  - *Manual work is slow, other functions (like INDEX) have more automation*

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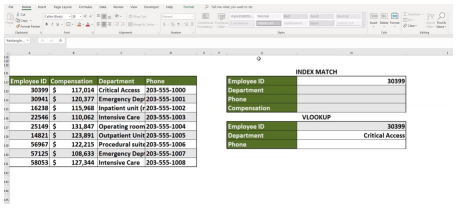
Excel Tips and Tricks

Using INDEX vs. VLOOKUP



Employee ID	Compensation	Department	Phone
30399	$ 117,014	Critical Access	203-555-1000
30941	$ 120,377	Emergency Dep	203-555-1001
16238	$ 115,968	Inpatient unit (r	203-555-1002
22546	$ 110,062	Intensive Care	203-555-1003
25149	$ 131,847	Operating room	203-555-1004
14821	$ 123,891	Outpatient Unit	203-555-1005
56967	$ 122,215	Procedural suite	203-555-1006
57125	$ 108,633	Emergency Dep	203-555-1007
58053	$ 127,344	Intensive Care	203-555-1008

INDEX MATCH

Employee ID	30399
Department	
Phone	
Compensation	

VLOOKUP

Employee ID	30399
Department	Critical Access
Phone	

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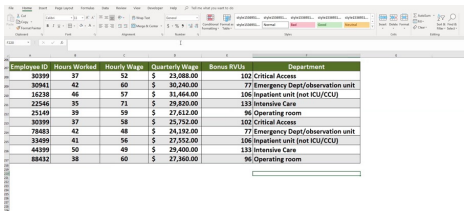
Excel Tips and Tricks

Pivot tables and charts



Employee ID	Hours Worked	Hourly Wage	Quarterly Wage	Bonus RVUs	Department
30399	37	52	$ 23,088.00	102	Critical Access
30941	42	60	$ 30,240.00	77	Emergency Dept/observation unit
16238	46	57	$ 31,464.00	106	Inpatient unit (not ICU/CCU)
22546	35	71	$ 29,820.00	133	Intensive Care
25149	39	59	$ 27,612.00	96	Operating room
30399	37	58	$ 25,752.00	102	Critical Access
78483	42	48	$ 24,192.00	77	Emergency Dept/observation unit
33499	41	56	$ 27,552.00	106	Inpatient unit (not ICU/CCU)
44399	50	49	$ 29,400.00	133	Intensive Care
88432	38	60	$ 27,360.00	96	Operating room

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Data Visualization

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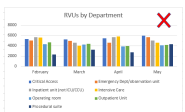
Visualization on Excel: What charts to use

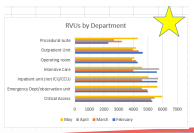
Clustered Column

- 2-4 data groups (series)
- Compared on the same data *type*
- Compensation differences between men and women



Bar vs. Column Chart

- Can better display multiple data series
- Bar charts allow you to have longer labels



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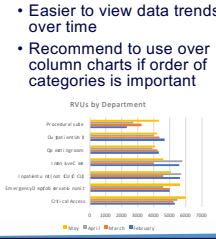
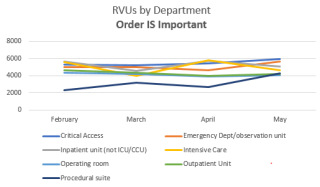
Visualization on Excel: What charts to use

Line Charts

- Easier to view data trends over time
- Recommend to use over column charts if order of categories is important





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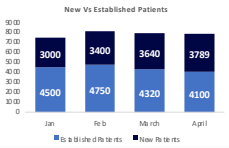
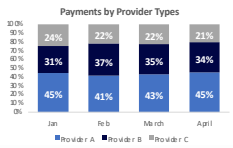
Visualization on Excel: What charts to use

Stacked Column (values) vs. Stacked Column (%)

- Both compare the proportion of the series within each category
- Stacked values make the trend in the absolute difference easier to interpret
- Stacked % emphasizes proportion of categories





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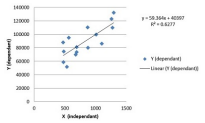
Visualization on Excel: What charts to use

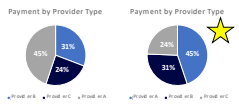
Scatter Chart

- Charts relationship between two variables
- More data points, stronger chart
- Illustrates "why" factors are related



Pie Chart

- Composition of a single variable
- Works best with less than 5 categories
- Pie slices should be ordered from largest to smallest



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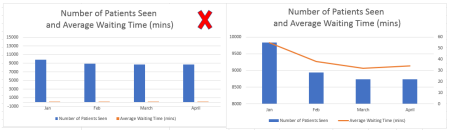
Visualization on Excel: What charts to use

Combination Charts

- Best used when your data series are two different *types* of data
  - For example, measuring % class attendance and average test score
- Data would not be interpreted well on the same scale/axis



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Communicating your Findings

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Communicating your findings

The language you use to share your results is related to how well you can leverage your data.

You are not trying to sell the *numbers*; you are trying to tell a story.

- Communicate the big picture of the results through your tables and figures
- Why does this matter? What should be done?

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Stress the importance of the data (numerically)!

- Excel can be used to calculate statistical tests (which lets us say if the interactions between numbers matter)
- The Data Analysis button can be used to calculate:
  - ANOVA
  - Correlation
  - Moving averages
  - Regression
  - T-Test
  - Z-Test

Excel (especially scatter and line charts) can be great for forecasting and trend analysis

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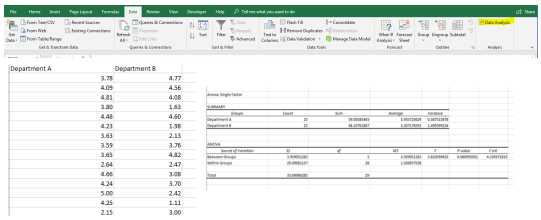
Finding the Data Analysis Tool



Department A	Department B
3.78	4.77
4.09	4.56
4.81	4.08
3.80	1.63
4.48	4.60
4.23	1.98
3.63	2.13
3.59	3.76
3.65	4.82
2.64	2.47
4.66	3.08
4.24	3.70
5.00	2.42
4.25	1.11
2.15	3.00

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Communicating your findings

Here are some general tips for communicating your research

- Avoid jargon
  Do not assume the audience all understands an industry-specific (or workplace specific) term/acronym. "Plain" language is easier to follow.
- Be concise
  Keep your points short and include only what is necessary. Your audience can easily lose their "train of thought".
- Know your audience
  This is key. Relate your message/data to what your AUDIENCE cares about.
- Fact check yourself
  Understand your data. Be prepared for questions. Some people in the audience may try to poke holes in your logic.
- Prepare for anything
  You might lose power, the technology might fail, or you may run into someone interested in the hall. Be ready to adapt your message to the situation.

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Communicating your findings

Looking for more? Try Grice's Maxims of Conversation

Maxim of Quantity: Be informative but say no more than is needed.
Maxim of Quality: Be truthful and say nothing that is not supported by your data/evidence.
Maxim of Relation: Be relevant to the discussion at hand.
Maxim of Manner: Be clear, brief, and orderly.

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