



# Formulas & Functions II

WV Mining Problem

## Topics

- Write 3-D formulas
- Use the IF function
- Use AND/OR criteria
- Use nested IF functions

## Background Information

This project includes information on coal mining in West Virginia from 1999 to 2019.

## Instructions

**IMPORTANT:** Complete the steps below in the order they are given. Completing the steps out of order may complicate the assignment or result in an incorrect result.

1. Download and extract the provided Data Files ZIP file. It contains the following files for use in this assignment:
  - a. **mining\_ppff2\_wvmp.xlsx** – Information on coal mining in West Virginia [1], [2].

Sheet: <i>Coal Mined</i>		
Column Name	Type	Description
<b>County</b>	Text	Name of the West Virginia county.
<b>Region</b>	Text	Region where the county is located.
<b>1999</b>	Number	Tons of coal mined in the county in 1999.
<b>2004</b>	Number	Tons of coal mined in the county in 2004.
<b>2009</b>	Number	Tons of coal mined in the county in 2009.
<b>2014</b>	Number	Tons of coal mined in the county in 2014.
<b>2019</b>	Number	Tons of coal mined in the county in 2019.
<b>Pctg of Total Mined</b>	Percentage	Percentage of all coal mined in 2019 that was mined in the county.
<b>2019 Top 10 County</b>	Text	Empty column.
<b>1999+ Top 10 County</b>	Text	Empty column.



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<b>Sheet: Prices</b>		
<b>Column Name</b>	<b>Type</b>	<b>Description</b>
<b>County</b>	Text	Name of the West Virginia county.
<b>Region</b>	Text	Region where the county is located.
<b>1999</b>	Currency	Per-ton price of coal sold in 1999.
<b>2004</b>	Currency	Per-ton price of coal sold in 2004.
<b>2009</b>	Currency	Per-ton price of coal sold in 2009.
<b>2014</b>	Currency	Per-ton price of coal sold in 2014.
<b>2019</b>	Currency	Per-ton price of coal sold in 2019.
<b>Average Price</b>	Currency	Average of coal prices during the period 1999-2019.
<b>Inflation-Adjusted 1999</b>	Currency	Empty column.
<b>2019 Rank</b>	Number	Rank of coal prices in 2019.
<b>2019 Rank Class</b>	Text	Empty column.
<b>Coal Pricing</b>	Text	Empty column.

<b>Sheet: Total Values</b>		
<b>Column Name</b>	<b>Type</b>	<b>Description</b>
<b>County</b>	Text	Name of the West Virginia county.
<b>Region</b>	Text	Region where the county is located.
<b>1999</b>	Currency	Empty column.
<b>2004</b>	Currency	Empty column.
<b>2009</b>	Currency	Empty column.
<b>2014</b>	Currency	Empty column.
<b>2019</b>	Currency	Empty column.
<b>Coal Pricing</b>	Text	Empty column.
<b>2014-2019 Change</b>	Text	Empty column.
<b>Sparkline</b>	Sparkline	Empty column.
<b>County (Region)</b>	Text	Empty column.

<b>Sheet: Forecasts</b>		
<b>Column Name</b>	<b>Type</b>	<b>Description</b>
<b>Region</b>	Text	Region where the county is located.
<b>1999 Tons</b>	Number	Tons of coal mined in the region in 1999.
<b>2004 Tons</b>	Number	Tons of coal mined in the region in 2004.
<b>2009 Tons</b>	Number	Tons of coal mined in the region in 2009.
<b>2014 Tons</b>	Number	Tons of coal mined in the region in 2014.
<b>2019 Tons</b>	Number	Tons of coal mined in the region in 2019.
<b>2024 Tons</b>	Number	Forecasted tons of coal mined in the region in 2024.
<b>2024 Price</b>	Currency	Forecasted per-ton price of coal in 2024, assuming 2.5% inflation from 2019.
<b>2024 Total Coal Value</b>	Currency	Forecasted total value of coal mined in 2024.



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Sheet: <i>Analysis Questions</i>		
Column Name	Type	Description
Question Number	Text	Question being answered.
Response	Text	Response to the analysis question prompt.

2. Open the **mining\_ppff2\_wvmp.xlsx** workbook in Microsoft Excel.

### Write 3-D formulas

3. On the *Total Values* sheet, we want to use a formula to calculate the total value of coal mined.
- In column **C**, write a formula to calculate, for each year and county, the total value of coal mined. Reference the values on the *Coal Mined* and *Prices* sheets in your formula.

You can calculate the total value using the formula:

*[Coal Mined for Year and County] \* [Price for Year and County]*

- In columns **C** through **G**, AutoFill the total value formula from column **C**.

### Use the IF function

4. On the *Coal Mined* sheet, we want to use formulas to determine which counties were in the top 10 for coal mined.
- Use a formula to determine which counties ranked in the top 10 for coal mined in 2019. Enter the logical formula into the cells as indicated below.
    - I4:** =IF(G4>=4473004, "Yes", "No")
    - I4** through **I58:** AutoFill the formula from cell **I4**.

### Use AND/OR criteria

- Use a formula to determine which counties ranked in the top 10 for coal mined any time 1999 or later. Enter the logical formula into the cells as indicated below.
    - J4:**  
=IF(OR(C4>=6764585, D4>=5143988, E4>=4636665, F4>=4635222, G4>=4473004), "Yes", "No")
    - J4** through **J58:** AutoFill the formula from cell **J4**.
5. On the *Total Values* sheet, we wish to determine how the total value of coal mined in each county changed between 2014 and 2019.
- In column **I**, write a formula to determine if each county's 2019 total value of coal mined was greater than its 2014 total value. If it was, display *Increasing*; otherwise, display *Not Increasing*.



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### Use nested IF functions

6. On the *Prices* sheet, we wish to determine the relative pricing of coal for each county in 2019.
  - a. Use a formula to determine if a county's 2019 coal price was high (at least \$100.00), moderate (\$75.00-\$99.99), or low (less than \$75.00). Enter the logical formula into the cells as indicated below.
    - i. **L4:** =IF(G4>=100, "High", IF(G4>=75, "Moderate", "Low"))
    - ii. **L4** through **L58:** AutoFill the formula from cell **L4**.
  - b. In column **K**, calculating the 2019 rank class by nesting IF() functions to display a class according to the following rules:
    - i. Class of *Top Third* if the 2019 rank is not more than 18.
    - ii. Class of *Middle Third* if the 2019 rank is between 19 and 37.
    - iii. Class of *Bottom Third* if the 2019 rank is 38 or greater.
7. Starting in row **2** of the *Analysis Questions* sheet, answer the analysis question below. Respond to one question per row.
  - a. Identify several counties where coal mining stopped by 2019. Does the end of mining in these counties mean there are no remaining coal deposits in those areas?

### Grading Rubric

This assignment is worth 8 points. It will be graded by your instructor using this rubric:

Standard	Meets Requirements (8 points)	Does Not Meet Requirements (0 points)
Student made reasonable effort in correctly completing assignment.	Assignment is at least 70% complete and correct, or student contacted instructor for help on incorrect or incomplete items.	Assignment is less than 70% complete and correct, and student did not contact instructor for assistance on incorrect or incomplete items.

This rubric will be used for peer evaluation of this assignment:

Standard	Excellent	Satisfactory	Needs Improvement
Assignment is correct and complete.	Assignment is at least 90% complete and correct.	Assignment is 70%-89% complete and correct.	Assignment is less than 70% complete and correct.



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The analysis question in Step 7a will be evaluated using this rubric:

Standard	Meets Requirements	Does Not Meet Requirements
Answer is reasonable.	Answer addresses the question prompt and is factually correct or a reasonable interpretation of available data.	Answer does not address the question prompt, is factually incorrect, or is an unreasonable interpretation of available data.
Answer is supported.	Logical rationale is provided to support the given answer.	Logical rationale is not provided to support the given answer.

## References

- [1] "Historical & Statistical Data," *West Virginia Office of Miners' Health, Safety and Training*, May 18, 2021. Available: <https://minesafety.wv.gov/historical-statistical-data/>.
- [2] "Annual Coal Report: Table 30," *Energy Information Administration*, Oct. 05, 2020. Available: <http://www.eia.gov/coal/annual/>.