Formulas & Functions I

WV Mining Problem

Topics

- Use statistical functions
- Use cell references
- Use AutoFill
- Write formulas
- Use the `RANK.EQ` function

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_ppff1_wvmp.xlsx** – Information on coal mining in West Virginia [1], [2].

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

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

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

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

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

2. Open the **mining_ppff1_wvmp.xlsx** workbook in Microsoft Excel.

Use statistical functions / Use cell references / Use AutoFill

3. We need to perform some additional calculations to analyze the *Coal Mined* sheet data.
   a. Using relative cell references, enter the minimum value formula into the cells as indicated below.
      i. **C60**: `=MIN(C4:C58)`
      ii. **C60** through **G60**: AutoFill the formula from cell **C60**.
   b. Using absolute cell references, enter the maximum value formula into the cells as indicated below.
      i. **C61**: `=MAX($C$4:$C$58)`
      ii. **C61** through **G61**: AutoFill the formula from cell **C61**.
      iii. **D61** through **G61**: Modify the formula so it displays the correct maximum value for each year (column). Continue to use absolute cell references.
   c. Using row-absolute mixed cell references, enter the average value formula into the cells as indicated below.
      i. **C62**: `=AVERAGE(C$4:C$58)`
      ii. **C62** through **G62**: AutoFill the formula from cell **C62**.
   d. Using column-absolute mixed cell references, enter the median value formula into the cells as indicated below.
      i. **C63**: `=MEDIAN($C4:$C58)`
      ii. **C63** through **G63**: AutoFill the formula from cell **C63**.
      iii. **D63** through **G63**: Modify the formula so it displays the correct median value for each year (column). Continue to use column-absolute mixed cell references.

4. We need to perform some additional calculations to analyze the *Prices* sheet data.
   a. Calculate the average price in each county using the `SUM()` and `COUNT()` functions by entering the formula into the cells as indicated below.
      i. **H4**: `=SUM(C4:G4)/COUNT(C4:G4)`
      ii. **H4** through **H58**: AutoFill the formula from cell **H4**.

Write formulas

5. On the *Coal Mined* sheet, we want to use a formula to calculate the percentage of coal mined in each county in 2019.
   a. In column **H**, calculate the percentage of coal mined in each county using the formula:

$$\frac{[2019]}{[Total\ of\ 2019]}$$

6. On the *Forecasts* sheet, we want to use formulas to forecast the amount and values of coal that will be mined in 2024.
   a. In column **G**, calculate the forecasted amount of coal mined in each region in 2024 using the formula:

$$[2019\ Tons] * (1 + [2019\text{-}2024\ Production\ Change\ Rate])$$

   b. In column **I**, calculate the total value of coal mined in 2024 using the formula:

$$[2024\ Tons] * [2024\ Price]$$

Use the RANK.EQ function

7. On the *Prices* sheet, we want to use a formula to rank the counties by price of coal.
   a. In column **J**, use the `RANK.EQ()` function to rank each county by its 2019 price.
8. Starting in row **2** of the *Analysis Questions* sheet, answer the analysis question below. Respond to one question per row.
   b. In 2019, coal from some counties was substantially more expensive than most other counties. Why might this coal have been more costly?

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.

The analysis question in Step 8b 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/*.