



## Background Information

In recent decades, the United States economy has increasingly shifted from a basis in manufacturing to one based on services and research. This is especially noticeable in the technology industry, where many companies get their money not from making products but from licensing their patents, copyrights, trademarks, and other intellectual property to other companies.



Revenue from the licensing of intellectual property has exploded since 1970. In 1970, about \$2 billion (in 2024-valued dollars) was charged for licensing in the United States. By 2022, this number climbed to a peak of \$58 billion [1].

## Problem Statement

In this project, students will explore the change in licensing charges based on different growth rates. The generated values will be compared with data from the World Bank.

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## Instructions

**WARNING:** This is not the actual Exam for your section. You will not receive any credit for completing this project.

**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.



# Exam #1 Review

## IP Licensing Problem

1. Download and extract the provided Data Files ZIP file. It contains the following files for use in this assignment:
  - a. **licensing.csv** – World Bank estimate of intellectual property licensing costs in the United States from 1970 through 2022 [1].

| Column Name                          | Type     | Description   |
|--------------------------------------|----------|---|
| <b>Year</b>                          | Number   | Year of the data.   |
| <b>Licensing Charges in Billions</b> | Currency | Charges for licensing intellectual property in 2024-valued billions of dollars. |
| <b>5% Rate</b>                       | Currency | Licensing charges in 2024-valued billions of dollars with 5% annual growth.     |
| <b>6% Rate</b>                       | Currency | Licensing charges in 2024-valued billions of dollars with 6% annual growth.     |
| <b>7% Rate</b>                       | Currency | Licensing charges in 2024-valued billions of dollars with 7% annual growth.     |
| <b>8% Rate</b>                       | Currency | Licensing charges in 2024-valued billions of dollars with 8% annual growth.     |
| <b>9% Rate</b>                       | Currency | Licensing charges in 2024-valued billions of dollars with 9% annual growth.     |
| <b>Average</b>                       | Currency | Empty column.   |
| <b>Maximum</b>                       | Currency | Empty column.   |
| <b>Minimum</b>                       | Currency | Empty column.   |
| <b>Class</b>                         | Text     | Empty column.   |

2. Create a new Microsoft Excel workbook named **examreview1\_ipip\_lastname\_firstname.xlsx**.
3. We must adjust the sheets in our workbook.
  - a. Rename *Sheet1* to *Licensing Charges*.
  - b. Add a new sheet named *Analysis Questions*.
4. Import the following item into the workbook:
  - a. **licensing.csv** file – Import starting in cell **A4** of the *Licensing Charges* sheet. The file is comma-delimited. Its first row contains headers.
5. We wish to apply formatting to the *Licensing Charges* sheet.
  - a. We must set up a table to store data on licensing charges.
    - i. If a table does not already exist in cells **A4** through **K57**, create one using a style of your choice. The table has headers and will overlap external data ranges. If prompted, convert the selection to a table and remove all external connections.
    - ii. If a table already exists in cells **A4** through **K57**, format the table using a style of your choice other than the default table style.
  - b. For the table, turn on the **Total Row** option.



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- c. Enter text in the cells as indicated below:
    - i. **A1**: Intellectual Property Licensing Charges
    - ii. **A3**: Annual Growth Rate:
    - iii. **C3**: 5.0%
    - iv. **D3**: 6.0%
    - v. **E3**: 7.0%
    - vi. **F3**: 8.0%
    - vii. **G3**: 9.0%
    - viii. **A58**: Average
  - d. Merge-and-center cells **A1** through **K1**.
  - e. Merge (but not center) cells **A3** through **B3**.
  - f. Apply the *Title* cell style to cell **A1**.
6. We need to perform calculations to analyze the *Licensing Charges* sheet data.
- a. We would like to summarize the charges and projections.
    - i. In the total row, individually average columns **B** through **G**.
    - ii. In the total row, do not display any statistics in columns **H** through **K**.
7. On the *Licensing Charges* sheet, we wish to calculate licensing estimates with different assumptions about the carrying capacity and growth rate.
- a. We want to estimate future licensing charges values.
    - i. Enter the formula into the cell as indicated below.
- HINT:** To avoid errors, copy-and-paste the provided formula.
- (1) **C6**:  $=C5 * (1+C3) ^ (A6-A5)$

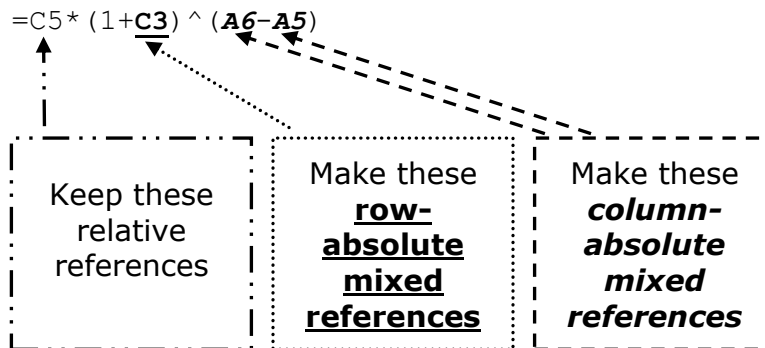


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- ii. We must adjust the future values formula so its cell references are correct when the formula is copied.

In cell **C6**, modify the cell references so they are column-absolute mixed, row-absolute mixed, or relative references as indicated:



- iii. We will now AutoFill the modified formula. Enter the formula into the cells as indicated below:

(1) **C6** through **G57**: AutoFill the formula from cell **C6**.

- b. In column **H**, write a formula that, for each year, uses a function to find the average of the projected licensing charges. Compare each year's projections from columns **C** through **G**.
- c. In column **I**, write a formula that, for each year, uses a function to find the highest of the projected licensing charges. Compare each year's projections from columns **C** through **G**.
- d. In column **J**, write a formula that, for each year, uses a function to find the lowest of the projected licensing charges. Compare each year's projections from columns **C** through **G**.
- e. In column **K**, calculate the licensing charges class by nesting **IF()** functions to display a class according to the following rules:
- Class of **A** if the average of projected licensing charges was at least \$30 billion.
  - Class of **B** if the average of projected licensing charges was at least \$10 billion but less than \$30 billion.
  - Class of **C** if the average of projected licensing charges was less than \$10 billion.
8. We must apply additional formatting to the *Licensing Charges* sheet.
- a. Format the cells as indicated below:
- B5** through **J58**: currency with 3 decimal places



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- b. AutoFit the widths of columns **A** through **K**.
  - c. Apply the *Green-Yellow-Red* color scale conditional formatting option to cells **B5** through **G57**.
9. We would like to create a chart to plot the licensing charges over time.
  - a. Create a 2-D line chart based on cells **A4** through **B57** of the *Licensing Charges* sheet. Move the chart to a new chart-only sheet named *Licensing Charges Chart*.

Ensure that the years are shown as labels for the horizontal (category) axis, not plotted as chart data. Specify appropriate chart and axis titles.
  - b. Add a trendline based on the licensing charges. Use the trendline type that best fits the data and project the values forward 20 periods (through the year 2042). Display the **R-squared** value on the chart.

**NOTE:** You cannot use the *Moving Average* type for your trendline.
10. To better understand our data, we wish to create a PivotTable.
  - a. Create a new PivotTable based on the data in cells **A4** through **K57** of the *Licensing Charges* sheet. Place the PivotTable on a new sheet named *Licensing Charges PivotTable*.
  - b. On the PivotTable, do the following:
    - i. Add the year as a **Rows** field.
    - ii. Add the licensing charges as a **Values** field.
  - c. We need to perform formatting on our PivotTable.
    - i. Group the years into sets of 10 starting at 1970.
    - ii. Summarize the licensing charges by averaging them.
    - iii. Format the cells as indicated below:
      - (1) **Average of Licensing Charges in Billions** field: currency with 3 decimal places
11. We need to set up the *Analysis Questions* sheet so that it can store responses to the analysis questions.
  - a. Enter text in the cells as indicated below:
    - i. **A1:** Question Number
    - ii. **B1:** Response
  - b. Bold the contents of row **1**.
  - c. AutoFit the width of column **A**. Set the width of column **B** to 100.



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- d. Set the height for rows **2** through **4** to 110.
  - e. Change the vertical alignment setting for columns **A** and **B** so that the text is displayed at the top of each row.
  - f. Turn on text wrapping for column **B**.
12. Starting in row **2** of the *Analysis Questions* sheet, answer three of the five analysis questions below. Respond to one question per row.
- a. Which trendline type did you use on *Licensing Charges Chart*? Why did you choose this type of trendline?
  - b. Why might a company choose to license its intellectual property to others rather than keep it just for itself?
  - c. Historically, patents have been for physical inventions like machines. In recent years, procedures and processes have become increasingly patented. For example, Amazon.com received a patent for its one-click buying process [2]. Do you think patents like this should be allowed? Why or why not?
  - d. Many technology standards, such as those used for cell phones and computer networks, incorporate patented technology for which would-be users must acquire licenses. Do you think it is a good idea to allow patented technology to be incorporated into standards like this? Explain your reasoning.
  - e. Do you think companies should be required to license their intellectual property to others? Should there be any limit on the price they can charge? Explain your reasoning.

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## Grading Rubric

This is a practice assignment and is worth no points. A comparable Exam would be worth 150 points and graded using this rubric, with partial credit awarded as appropriate:

|            |                   |                           |                  |
|------------|-------------------|---------------------------|------------------|
| Steps 3a-b | 5 points total    | Steps 8a-c                | 7.5 points total |
| Step 4     | 7.5 points        | Step 9a                   | 15 points        |
| Steps 5a-f | 15 points total   | Step 9b                   | 10 points        |
| Step 6a    | 7.5 points        | Steps 10a-c               | 15 points total  |
| Step 7a    | 20 points         | Steps 11a-f               | 7.5 points total |
| Steps 7b-e | 17.5 points total | Steps 12a-e (pick 3 of 5) | 7.5 points each  |



The analysis questions in Steps 12a-e will be evaluated using this rubric:

| <b>Standard</b>       | <b>Meets Requirements (3.75 points)</b>   | <b>Does Not Meet Requirements (0 points)</b>   |
|-----------------------|---|--|
| 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.   |

## Acknowledgments

The image in the introduction appears courtesy of the United States Patent and Trademark Office [3].

## References

- [1] "Charges for the use of intellectual property, payments (BoP, current US\$)," World Bank, Jun. 2024. Available: <http://data.worldbank.org/indicator/BM.GSR.ROYL.CD?locations=US>.
- [2] P. Hartman, J. P. Bezos, S. Kaphan, and J. Spiegel, "Method and system for placing a purchase order via a communications network," US5960411 A, Sep. 28, 1999.
- [3] *Seal of the United States Patent and Trademark Office*. 2003. Available: <https://commons.wikimedia.org/wiki/File:US-PatentTrademarkOffice-Seal.svg>.