KT 2- Sheets

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Definitions and exercise doc- Sheets exercise
Sample database for exercise- Sheets exercise dataset

Basic Formulas

- =SUM(range)
  - Components: range = contiguous cells (e.g., A1:A10) or multiple ranges separated by commas.
  - What it does: Adds all numeric values in the specified range(s).
  - Where to use: Totals (sales, costs, hours) in reports and consolidated dashboards.
  - Consulting example: Sum monthly expenses across departments: =SUM(B2:B13) to calculate total monthly spend.

- =AVERAGE(range)
  - Components: range = cells to average.
  - What it does: Computes the arithmetic mean of numeric values in the range.
  - Where to use: KPI summaries, trend baselines, average unit costs.
  - Consulting example: Average revenue per store: =AVERAGE(C2:C51).

- =COUNT(range)
  - Components: range = cells (counts only numbers).
  - What it does: Counts how many cells in the range contain numbers.
  - Where to use: Quantity of numeric entries (e.g., number of completed transactions).
  - Consulting example: Count how many transactions were recorded: =COUNT(D2:D1000).

- =COUNTA(range)
  - Components: range = cells (counts non-empty cells of any type).
  - What it does: Counts how many cells are not empty (numbers, text, dates).
  - Where to use: Counting records, survey responses, or populated rows.

- Consulting example: Count non-empty rows in a client list: =COUNTA(A2:A500).

- =COUNTIF(range, criteria)
  - Components: range = cells to evaluate; criteria = condition (e.g., ">1000" or "Completed").
  - What it does: Counts cells in range that meet one condition.
  - Where to use: Simple conditional counts (e.g., count orders > threshold).
  - Consulting example: Count clients with revenue > 1M: =COUNTIF(B2:B500, ">1000000").

- =COUNTIFS(criteria_range1, criteria1, [criteria_range2, criteria2], ...)
  - Components: pairs of range + criteria.
  - What it does: Counts rows meeting multiple criteria across ranges.
  - Where to use: Multi-condition counts (region + product + status).
  - Consulting example: Count closed deals in APAC over $50k:

=COUNTIFS(RegionRange,"APAC", AmountRange,">50000", StatusRange,"Closed").

- =SUMIF(range, criteria, [sum_range])
  - Components: range to test, criteria to match, optional sum_range to add (if omitted, range is summed).
  - What it does: Sums values in sum_range where range meets criteria.
  - Where to use: Conditional totals (e.g., total sales for a product).
  - Consulting example: Sum sales for Product A: =SUMIF(ProductRange,"Product A", SalesRange).

- =SUMIFS(sum_range, criteria_range1, criteria1, ...)
  - Components: sum_range then pairs of criteria_range + criteria.
  - What it does: Sums cells in sum_range that satisfy all criteria.
  - Where to use: Multi-dimension totals (region & quarter & product).
  - Consulting example: Total Q2 sales for Product A in North region: =SUMIFS(SalesRange, ProductRange, "Product A", RegionRange, "North", QuarterRange, "Q2").

- =AVERAGEIFS(average_range, criteria_range1, criteria1, ...)
  - Components: average_range + criteria pairs.
  - What it does: Calculates average of values in average_range meeting all criteria.
  - Where to use: Conditional averages (e.g., average deal size for a segment).

        - Consulting example: Average deal size for enterprise clients: =AVERAGEIFS(DealSizeRange, ClientTypeRange, "Enterprise").

- =IF(logical_test, value_if_true, value_if_false)
    - Components: logical_test (e.g., A2>100), value_if_true, value_if_false.
    - What it does: Returns one value if test is TRUE, another if FALSE.
    - Where to use: Data cleanups, flagging, conditional calculations.
    - Consulting example: Flag high-margin deals: =IF(Margin>0.2, "High", "Normal").

Complex Formulas

- =IFERROR(value, value_if_error)
    - Components: value = formula/expression to evaluate; value_if_error = return when an error occurs.
    - What it does: Replaces Excel errors (e.g., #N/A, #DIV/0!) with a cleaner value.
    - Where to use: Wrapping lookups or division operations to keep reports tidy.
    - Consulting example: Show blank instead of #N/A when lookup fails: =IFERROR(VLOOKUP(A2, Table, 2, FALSE), "").
- =VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])
    - Components: lookup_value (value to find), table_array (e.g., A:D), col_index_num (column number in table to return), range_lookup (TRUE=approximate, FALSE=exact).
    - What it does: Searches the first column of table_array for lookup_value and returns value from specified column.
    - Where to use: Simple vertical lookups when the key is in the leftmost column.
    - Consulting example: Find client name by ID: =VLOOKUP(A2, Clients!A:C, 2, FALSE).

- =HLOOKUP(lookup_value, table_array, row_index_num, [range_lookup])
    - Components: same as VLOOKUP but searches the first row and returns values from a specified row.
    - What it does: Horizontal lookup across top row.
    - Where to use: When headers are horizontal and you need values beneath them.
    - Consulting example: Pull monthly target from a header row: =HLOOKUP("Mar", A1:L5, 3, FALSE).

- =XLOOKUP(lookup_value, lookup_array, return_array, [if_not_found], [match_mode], [search_mode])
  - Components: lookup_value, lookup_array (column/row to search), return_array (column/row to return), optional if_not_found, match_mode (exact/approx), search_mode (first-to-last, last-to-first).
  - What it does: Modern flexible lookup — can replace VLOOKUP/HLOOKUP/INDEX+MATCH, supports left lookups, defaults to exact match, handles not-found values.
  - Where to use: Robust lookups across tables, reverse lookups, approximate matches, and when you need cleaner error handling.
  - Consulting example: Get account manager by client ID (key anywhere): =XLOOKUP(A2, Clients[ID], Clients[Manager], "Not found").
- =INDEX(array, row_num, [column_num])
  - Components: array = range to pull from; row_num = row index within array; optional column_num.
  - What it does: Returns value at the intersection of given row and column of an array.
  - Where to use: When you need to fetch a value by position (often combined with MATCH).
  - Consulting example: Return the 3rd row, 2nd column of a results table: =INDEX(B2:E100, 3, 2).

- =MATCH(lookup_value, lookup_array, [match_type])
  - Components: lookup_value, lookup_array to search, match_type (0=exact, 1=less than, -1=greater than).
  - What it does: Returns the relative position of lookup_value within lookup_array.
  - Where to use: Get index to feed into INDEX (for flexible lookups).
  - Consulting example: Find row number for client ID: =MATCH(A2, Clients[ID], 0).

- INDEX + MATCH (combination)
  - Components: INDEX(return_range, MATCH(lookup_value, lookup_range, 0)).
  - What it does: Look up value anywhere in a table without left-most-column limitation (more flexible than VLOOKUP).
  - Where to use: Preferred for robust lookups and when columns may move.
  - Consulting example: Lookup revenue by client where ID is not left-most: =INDEX(RevenueRange, MATCH(A2, Clients[ID], 0)).

- =CONCAT(text1, [text2], ...) or =TEXTJOIN(delimiter, ignore_empty, text1, ...)
  - Components: CONCAT joins values; TEXTJOIN allows delimiters and option to ignore empty cells.
  - What it does: Concatenates strings or cell values into one text string.

- Where to use: Build labels, combined keys, or export-ready strings.
- Consulting example: Combine First and Last name: =TEXTJOIN(" ", TRUE, A2, B2).

❖ =LEFT(text, num_chars), =RIGHT(text, num_chars), =MID(text, start_num, num_chars)

- Components: text source; num_chars length or start_num position for MID.
- What it does: Extracts substrings from text fields.
- Where to use: Parse IDs, extract area codes, or transform supplier codes.
- Consulting example: Extract year from a code ABC2024X: =MID(A2,4,4).

❖ =TRIM(text)

- Components: text = cell or string.
- What it does: Removes leading, trailing, and extra internal spaces (leaves single spaces between words).
- Where to use: Clean messy imported data before matching/lookups.
- Consulting example: Normalize client names before joining: =TRIM(A2).

❖ =LEN(text)

- Components: text.
- What it does: Returns the number of characters in text.
- Where to use: Data validation (ID length checks), parsing logic.
- Consulting example: Validate 10-digit account numbers: =LEN(A2)=10.

❖ =EOMONTH(start_date, months)

- Components: start_date and months (offset).
- What it does: Returns the last day of the month a number of months from start_date.
- Where to use: Month-end schedules, rolling-period calculations, financial reporting.
- Consulting example: Find end-of-quarter date for a month in A2: =EOMONTH(A2,0).

❖ =NETWORKDAYS(start_date, end_date, [holidays])

- Components: start_date, end_date, optional holidays range.
- What it does: Counts business days between two dates (excludes weekends and listed holidays).
- Where to use: Project timelines, SLA calculations, resource planning.
- Consulting example: Calculate working days to complete an audit: =NETWORKDAYS(B2, C2, HolidaysRange).

❖ =RANK.EQ(number, ref, [order]) (or RANK.AVG)

- Components: number to rank, ref = list to rank against, order (0 or omitted = descending, 1 = ascending).

- What it does: Gives the rank of a number within a list (ties get same rank in RANK.EQ).
- Where to use: Prioritization, top-N analysis, scoring.
- Consulting example: Rank stores by sales: =RANK.EQ(D2, $D$2:$D$101, 0).

- =UNIQUE(range) and =SORT(range) and =FILTER(range, include, [if_empty]) *(grouped as modern dynamic array tools)*
  - Components: UNIQUE(range) returns unique values; SORT(range, [sort_index], [order]) sorts; FILTER(range, include, [if_empty]) returns subset where include is TRUE.
  - What it does: UNIQUE deduplicates; SORT arranges; FILTER slices data dynamically.
  - Where to use: Prepare dynamic lists, dashboards, clean tables for analysis.
  - Consulting example: Create a dynamic list of active clients sorted by name: =SORT(UNIQUE(FILTER(ClientRange, StatusRange="Active"))).

Five additional complex / high-value formulas often used in consulting

- =SUMPRODUCT(array1, [array2], ...)
  - Components: array1, array2, ... — arrays or ranges of equal dimensions.
  - What it does: Multiplies corresponding elements of arrays and returns the sum of those products. Can be extended to combined logical conditions (by coercion).
  - Where to use: Weighted sums, conditional counts or sums across multiple criteria when you want one-formula solutions (powerful replacement for some SUMIFS scenarios), cross-join-style calculations.
  - Consulting example: Weighted average price where weights and prices are separate ranges: =SUMPRODUCT(PriceRange, WeightRange)/SUM(WeightRange)

- =AGGREGATE(function_num, options, array, [k])
  - Components: function_num selects operation (e.g., 14 = LARGE, 9 = SUM), options control ignoring errors/hidden rows, array input, optional k for nth elements.
  - What it does: Performs various functions (SUM, SMALL, LARGE, AVERAGE, etc.) with flexible options to ignore errors or hidden rows.
  - Where to use: Robust calculations when source data may contain errors or you need to ignore filtered/hidden rows.
  - Consulting example: Get 2nd largest revenue ignoring errors: =AGGREGATE(14, 6, RevenueRange, 2) (14=LARGE, option 6 = ignore errors).

- =LET(name1, expression1, name2, expression2, ..., result)
  - Components: Pairs of name and expression followed by result expression using those names.

- ➢ What it does: Define variables inside a formula for readability and performance (avoids repeated calculation).
- ➢ Where to use: Complex nested formulas, multi-step calculations inside a single cell, reusable intermediate arrays.
- ➢ Consulting example: Compute normalized score using intermediate calculated mean and sd inside one formula:

❖ =NPV(rate, value1, [value2], ...) (and =XNPV for irregular dates)

- ➢ Components: rate = discount rate per period; value1... = cash flows (first value usually period 1).
- ➢ What it does: Calculates net present value of a series of cash flows using discount rate (time value of money). XNPV allows date-specific cash flows.
- ➢ Where to use: Project valuation, investment appraisal, comparing alternative projects.
- ➢ Consulting example: Calculate project NPV with 10% discount: =NPV(0.10, C2:C6) + InitialOutflow (note sign convention: often add initial outflow separately).

❖ =IRR(values, [guess]) (and =XIRR(dates, values) for irregular intervals)

- ➢ Components: values = series of cash flows (with at least one negative and one positive), optional guess to help iteration.
- ➢ What it does: Returns the internal rate of return (percentage return) for the cash flows.
- ➢ Where to use: Compare returns of projects, determine breakeven discount rate for investments.
- ➢ Consulting example: Compute project IRR from cash flow column C2:C7: =IRR(C2:C7) to judge whether it exceeds the hurdle rate.