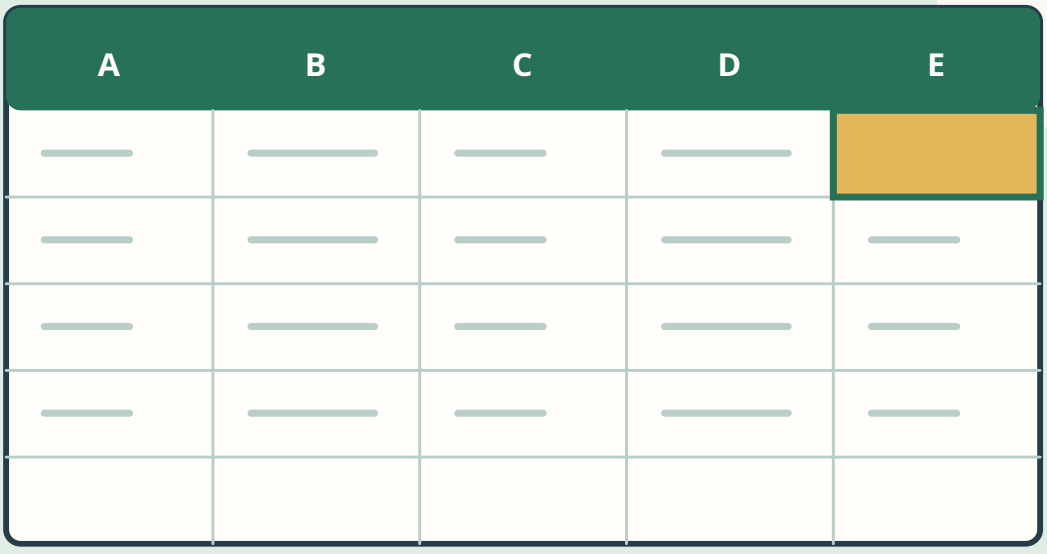
PIVOT CONTRIBUTION PERCENTAGES

Displaying Contribution Percentages in Pivot Reports



PART / TOTAL

Displaying Contribution Percentages in Pivot Reports

Learning outcomes

- Calculate row, column and grand-total shares from the same matrix.
- Name the denominator next to every percentage.
- Explain rounding and filtering effects without changing source quantities.
- Identify numerator, denominator and included population for every share.
- Calculate and audit row, column and grand-total panels with exact anchors.
- Explain rounding, zero denominators, filtered populations and fixed-baseline coverage.
- Distinguish weighted composition, percentage-point change and signed-net ratios.

Practical office learning with wholly fictional records. No certification, compliance opinion, or authorization to act on real records is implied.

Study the foundations, work through the applied units, complete the practice tasks, and then attempt the assessment. Use only the supplied fictional practice data. Keep your original inputs and your revised work separate.

Core concepts

A percentage needs a question

A value of 25% is incomplete until its denominator is known. In a department-by-resource matrix, row share asks how a department divides its usage among types. Column share asks how a type is divided among departments. Grand-total share asks how much one intersection contributes to all included usage. The numerator can be identical in all three calculations while the percentages differ. Write the denominator in words before selecting a display option. A percentage format applied to a count is not a contribution calculation; it merely changes how the existing number is shown.

Build three comparable panels

Start from the verified quantity matrix and retain an absolute-value panel for reference. In Excel a duplicated value field can use Show Values As with the required total. For clarity, this exercise uses separate row-share, column-share and grand-share panels. Label both the grouping dimensions and the denominator. Keep their filters identical; otherwise the panels no longer compare the same population. Inspect a corner cell with a hand calculation and test sums in the proper direction. Row shares sum across each row, column shares down each column, and grand shares over all detail cells.

Interpret display precision honestly

Rounded displayed percentages may total 99.9% or 100.1% even when underlying fractions sum to one. Retain full precision in the calculation and explain the displayed discrepancy instead of adjusting a convenient cell without a stated allocation rule. Zero denominators require an explicit not-applicable result, not an invented zero share. Filtering also changes the included denominator unless a separate fixed-population method is deliberately built. The report should say whether percentages refer to the current filtered population. Large shares show composition, not necessarily growth or effectiveness.

Worked example

Scenario: A mini-matrix is East: Guide 6, Template 4; West: Guide 2, Template 8.

Walkthrough

East-Guide is 6/10=60% of its row, 6/8=75% of the Guide column and 6/20=30% of all units. Each answer is correct for a different question. If West is filtered out, the visible-population Guide-column share becomes 100%; this does not mean East originally supplied all Guide usage.

Foundation practice

ReceiptID	UsedOn	Department	ResourceType	Quantity
U01	2025-12-02	Design	Guide	4
U02	2025-12-14	Support	Guide	3
U03	2025-12-20	Design	Template	2
U04	2026-01-03	Support	Template	5
U05	2026-01-07	Design	Guide	6
U06	2026-01-09	Support	Guide	4
U07	2026-01-12	Design	Template	3
U08	2026-02-01	Support	Template	7
U09	2026-02-04	Design	Guide	5
U10	2026-02-11	Support	Guide	2
U11	2026-02-18	Design	Template	4
U12	2026-02-22	Support	Template	6

Context

Fictional learning-resource desk. One row records one receipt; Quantity counts resource units, not people. All dates are Gregorian ISO dates, with no time zone conversion.

Types

- text identifier
- date
- text category
- text category
- whole number of resource units

Requested panels

- Share of department usage (row denominator)
- Share of resource-type usage (column denominator)
- Share of all included resource units (grand denominator)

Display rule: Show one decimal place; keep full calculation precision.

Foundation tasks

- Build and label all three contribution panels.
- Verify Design-Guide independently in each panel, and test the appropriate 100% direction.

Foundation capstone

Task: Deliver three percentage panels and a one-paragraph interpretation of Design-Guide.

Criteria

- Every denominator is stated.
- All panels use identical records and filters.
- Underlying sums equal 100% in the correct direction.
- Rounding is explained rather than silently redistributed.

01 State the denominator before choosing a percentage

The fictional Fern Seed Exchange distributes practice seed packets through Desk, Partner and Mail channels in Coast, Hill and Valley regions. Each source row is one issue record, and Packets counts individual packets. The analytical question is how the same absolute matrix can answer three different composition questions. All records are synthetic and contain no personal recipients.

A row share asks how one region divides its packets among channels. A column share asks how one channel divides its packets among regions. A grand-total share asks how one region-channel intersection contributes to all included packets. The numerator can be

identical in all three calculations, while the denominator changes. A number such as 45% is incomplete unless the reader knows which of these populations it describes.

Coast-Desk contains eighteen packets. Coast has forty packets across all channels, Desk has thirty across all regions, and the full source has eighty. Coast-Desk is therefore 18/40=45% of Coast packets, 18/30=60% of Desk packets, and 18/80=22.5% of all packets. These deliberately different denominators prevent an accidental equality from disguising a wrong setting.

Write a denominator sentence before touching a menu: Divide this cell's packets by all packets in the same region, by all packets in the same channel, or by all packets in the currently included population. The sentence is the specification. A display option should implement that sentence, not replace it. If a percentage surprises you, return to the sentence and identify the exact amount being divided.

The main case uses nonnegative quantities and a complete supplied population of eighteen issue records totaling eighty packets. It does not measure distinct recipients, success rates or growth. A contribution share describes composition of a stated quantity. Other interpretations require other measures and evidence, even when the same percent sign appears.

Question	Numerator	Denominator	Coast-Desk answer
How does Coast split its packets?	Coast-Desk 18	Coast row 40	45.0%
How is Desk distributed by region?	Coast-Desk 18	Desk column 30	60.0%
How much does Coast-Desk contribute overall?	Coast-Desk 18	All included packets 80	22.5%

E01-X1 Write three denominator sentences

For Coast-Desk, calculate row, column and grand-total share. Name each denominator in words and as an exact quantity.

Submit: Three fractions, percentages and interpretation sentences.

02 Verify the absolute matrix before normalizing it

The supplied packet_issues.csv and contribution_lab.xlsx contain the same eighteen issue records. The workbook's Issues table occupies Source!A1:E19 with fields IssueID, IssuedOn, Region, Channel and Packets. Dates are typed date values and packet quantities are numeric whole numbers. P14 is a valid zero-packet issue record in Valley-Desk; it remains part of the source even though it contributes nothing to quantity shares.

Before calculating any percentage, build or inspect the absolute region-by-channel matrix. Coast has Desk eighteen, Partner twelve and Mail ten. Hill has six, nine and five. Valley has

six, three and eleven. The row totals are forty, twenty and twenty; the column totals are thirty, twenty-four and twenty-six. Both routes sum to eighty packets.

A percentage can conceal an amount error because normalization rescales whatever values it receives. If a source omits half the records in every group proportionally, the shares can still look unchanged. A row panel that sums to 100% is not proof that the underlying quantities are complete. Retain the absolute panel and reconcile it to the source before interpreting shares.

Line count is a useful companion control but not the denominator for packet composition. The eighteen source records contain eighty packets. Dividing Coast-Desk eighteen packets by eighteen records would mix units and produce one packet per record, not a contribution fraction. A percent format could make that number look plausible, but its dimensions would still be wrong.

Trace at least one cell to records. Coast-Desk is P01 ten plus P02 eight. Valley-Desk is P13 six plus P14 zero. Those traces show that a valid zero record can affect record counts without changing packet totals. They also establish the numerator independently of the percentage display. Normalization should be the final transformation of a verified amount, not a shortcut around source checking.

IssueID	IssuedOn	Region	Channel	Packets
P01	2026-06-01	Coast	Desk	10
P02	2026-06-02	Coast	Desk	8
P03	2026-06-03	Coast	Partner	7
P04	2026-06-04	Coast	Partner	5
P05	2026-06-05	Coast	Mail	4
P06	2026-06-06	Coast	Mail	6
P07	2026-06-07	Hill	Desk	4
P08	2026-06-08	Hill	Desk	2
P09	2026-06-09	Hill	Partner	5
P10	2026-06-10	Hill	Partner	4
P11	2026-06-11	Hill	Mail	3
P12	2026-06-12	Hill	Mail	2
P13	2026-06-13	Valley	Desk	6
P14	2026-06-14	Valley	Desk	0
P15	2026-06-15	Valley	Partner	1

IssueID	IssuedOn	Region	Channel	Packets
P16	2026-06-16	Valley	Partner	2
P17	2026-06-17	Valley	Mail	7
P18	2026-06-18	Valley	Mail	4

Region	Desk	Partner	Mail	Total packets
Coast	18	12	10	40
Hill	6	9	5	20
Valley	6	3	11	20
Total	30	24	26	80

03 Create three panels from the same measure

In a native Excel PivotTable based on Issues, place Region on rows, Channel on columns and Packets in Values summarized by Sum. Keep one absolute-value view. Add copies of the same value field or use separate clearly labelled panels for the three requested percentage calculations. The underlying measure must remain Sum of Packets in each view.

Use Show Values As with the relevant row, column or grand-total option where supported. This is different from merely applying Percentage number format. Show Values As changes the calculation relative to a denominator; number formatting changes only the displayed representation of an existing value. A cell containing numeric eighteen displays as 1800% when formatted as a percent, not as eighteen percent of anything.

The practice workbook supplies a live formula equivalent of the three panels and an absolute control matrix. It does not contain a prebuilt native PivotTable. Creating and testing the native feature is the learner's task. The formula panels make the denominators explicit and can be checked without relying on a particular field-list interface. They are not evidence that native Show Values As was executed.

Keep all panels on the same population. If one panel excludes Valley while another includes it, equal-looking labels no longer describe the same source. Before comparing row and column shares, check the source table, field settings and active report filters. The absolute panel should be available nearby so a reviewer can see the quantities behind the ratios.

Use descriptive captions: Share of region packets, Share of channel packets, and Share of all included packets. Add current-filter context where appropriate. Avoid a generic Percent heading repeated over three different computations. The point of multiple panels is to answer different questions transparently, not to decorate the same number three times.

Panel	Native calculation choice	Formula concept
Absolute	No contribution transformation	Sum of Packets
Region mix	Percent of row total	Cell / region row total
Channel distribution	Percent of column total	Cell / channel column total
Overall contribution	Percent of grand total	Cell / included grand total

04 Read and test row shares horizontally

A row-share panel uses a separate denominator for each region. Coast’s denominator is forty; Hill’s and Valley’s are twenty each. The Coast shares are 45%, 30% and 25% for Desk, Partner and Mail. Hill’s are 30%, 45% and 25%. Valley’s are 30%, 15% and 55%. Each row sums to one before display rounding.

The horizontal sum is the relevant test because the channels partition each region’s packets. Adding all nine row-share cells gives three, or 300%, because there are three independent denominators. That does not mean the panel is wrong. It means the percentages are not parts of a single shared whole across the entire matrix. A grand total of all row shares would be an unhelpful number.

The same displayed 30% can represent different quantities. Coast-Partner is twelve of forty packets, while Hill-Desk is six of twenty. Equal shares do not imply equal volumes. Retain the absolute amounts when the reader may use the report to allocate resources or compare scale. Composition and size are complementary information.

The largest share in Valley is Mail at 55%, based on eleven of twenty packets. This supports the statement that Mail accounts for a majority of Valley’s supplied packet distribution. It does not establish that Valley has the largest Mail volume overall: Coast has ten and Hill five, so Valley does lead here, but that second claim requires comparing absolute cells rather than relying on its row percentage.

Row shares are appropriate when the question is internal mix. If the question instead asks which region handles most of the Desk channel, use column shares. Choosing the denominator is a substantive analytical decision. A correctly calculated row percentage can still be the wrong answer to a channel-distribution question.

Region	Desk row share	Partner row share	Mail row share	Row check
Coast	18/40 = 45.0%	12/40 = 30.0%	10/40 = 25.0%	100.0%
Hill	6/20 = 30.0%	9/20 = 45.0%	5/20 = 25.0%	100.0%
Valley	6/20 = 30.0%	3/20 = 15.0%	11/20 = 55.0%	100.0%

E04-X1 Complete the row-share panel

Calculate all nine row shares at full precision and display one decimal place. State the correct direction of the 100% check and explain why summing all detail cells is not a single-composition test.

Submit: A three-by-three panel and an interpretation of its totals.

05 Read and test column shares vertically

A column-share panel fixes the channel denominator. Desk has thirty packets across the three regions, Partner twenty-four and Mail twenty-six. Coast supplies 60% of Desk, 50% of Partner and approximately 38.4615% of Mail. These are three different channel-distribution statements, not Coast’s internal mix.

The vertical sum is the relevant check. Desk shares are 60%, 20% and 20%; Partner shares are 50%, 37.5% and 12.5%; Mail shares are 10/26, 5/26 and 11/26. Each column sums to one at full precision. Row sums in this panel do not generally equal one because they combine shares of different channel totals.

Mail illustrates display rounding. With one decimal place its shares display 38.5%, 19.2% and 42.3%, which happen to total 100.0%. That agreement is not guaranteed for every dataset. Keep the unrounded fractions in cells and apply number formatting only for display. Do not calculate one region as a leftover merely to force displayed totals unless a separate allocation rule explicitly requires it.

Coast’s column shares show that it accounts for a large part of Desk and Partner distribution. They do not show that Desk is 60% of Coast’s activity; the correct row share for that question is 45%. The numerator eighteen is the same, which makes the confusion plausible. Naming the denominator prevents the reader from reversing the question.

When presenting a column-share panel, place a short explanation near the heading: each channel column totals 100% across included regions. This sentence tells the reader both the normalization direction and the included population. It is more useful than relying on the visual orientation alone, especially when the report may be transposed or copied into another document.

Region	Desk / 30	Partner / 24	Mail / 26
Coast	60.0%	50.0%	38.5%
Hill	20.0%	37.5%	19.2%
Valley	20.0%	12.5%	42.3%
Column check	100.0%	100.0%	100.0%

E05-X1 Audit the Mail column

Give exact fractions and one-decimal displayed shares for Coast, Hill and Valley in Mail. Explain why 10/40 would be the wrong denominator for Coast’s share of Mail.

Submit: Three fractions, three displays and a denominator diagnosis.

06 Read grand-total shares as one shared composition

Grand-total shares use eighty as the denominator for every detail cell. Coast-Desk is 22.5%, Coast-Partner 15% and Coast-Mail 12.5%. Hill contributes 7.5%, 11.25% and 6.25%. Valley contributes 7.5%, 3.75% and 13.75%. All nine underlying fractions sum to one because every packet belongs to exactly one region-channel intersection.

Unlike row and column shares, these cells can be added across either axis to form meaningful marginal shares. Coast’s row sums to 50% of all packets, while Hill and Valley each sum to 25%. Desk’s column sums to 37.5%, Partner to 30% and Mail to 32.5%. Every one of those margins still uses the same eighty-packet denominator.

Do not add grand-total margins to detail shares when checking 100%. The margins repeat amounts already represented by the detail cells. If you add the nine detail shares, three row margins, three column margins and the grand total, you count the same underlying whole multiple times. Choose one nonoverlapping partition for the check.

A grand share answers an overall contribution question, not a within-region preference question. Valley-Mail is 13.75% of all packets but 55% of Valley packets. Both are correct. The first emphasizes its size within the complete distribution, while the second describes Valley’s internal channel mix. Neither should be labelled simply Mail percentage without context.

Keep one-decimal display separate from exact values. Hill-Partner 11.25% will display according to the application's rounding behavior at the requested precision; the stored ratio should remain 9/80. When verifying totals, sum underlying fractions rather than adding formatted strings copied from a report. Displayed percentages are a communication layer, not the authoritative arithmetic.

Region	Desk grand share	Partner grand share	Mail grand share	Region contribution
Coast	18/80 = 22.5%	12/80 = 15%	10/80 = 12.5%	50%
Hill	6/80 = 7.5%	9/80 = 11.25%	5/80 = 6.25%	25%
Valley	6/80 = 7.5%	3/80 = 3.75%	11/80 = 13.75%	25%
Channel contribution	37.5%	30%	32.5%	100%

E06-X1 Complete the grand-share panel

Provide all nine exact grand shares and the three region and channel contributions. State which nonoverlapping cells you would sum to test one.

Submit: A complete panel with both margins.

07 Write formulas whose anchors reveal the denominator

The workbook's Control sheet holds the absolute matrix at A4:E8. Region rows are 5 through 7, channel columns B through D, row totals E5:E7 and column totals B8:D8. E8 is eighty. The Shares sheet uses the same region order and three distinct panels so you can inspect the denominator in every formula.

Row shares occupy B5:D7. The first formula is =IF(Control!$E5=0,"N/A",Control!B5/Control!$E5). The fixed E column keeps the denominator on the region total when copied across, while the row changes for Hill and Valley. This is a mixed reference because one coordinate is fixed and the other remains relative.

Column shares occupy B13:D15. The first formula is =IF(Control!B$8=0,"N/A",Control!B5/Control!B$8). The fixed row 8 keeps the denominator on channel totals, while the column changes from Desk to Partner to Mail. Because the display panel is offset from the control grid, inspect the numerator references rather than blindly filling a formula that points to the wrong source row.

Grand shares occupy B21:D23. The first formula is =IF(Control!$E$8=0,"N/A",Control!B5/Control!$E$8). Both denominator coordinates are fixed because every cell uses the same included total. The numerator still changes with the corresponding region and channel. These three anchor patterns are a compact way to audit the intended question.

The IF condition handles a known zero denominator, not every possible error. Do not wrap every formula in IFERROR and return zero, because that could hide a broken reference, invalid type or missing source. A zero share means a known zero numerator divided by a positive denominator. An undefined ratio should be labelled not applicable with its reason, and unrelated calculation failures should remain visible for investigation.

```
Shares!B5 =IF(Control!$E5=0,"N/A",Control!B5/Control!$E5)
Shares!B13 =IF(Control!B$8=0,"N/A",Control!B5/Control!B$8)
Shares!B21 =IF(Control!$E$8=0,"N/A",Control!B5/Control!$E$8)
```

E07-X1 Write three Valley-Mail formulas

Using the documented cell maps, give exact formulas for Valley-Mail row share at Shares!D7, column share at D15 and grand share at D23. Include the expected full-precision values.

Submit: Three formulas and results.

08 Separate zero contribution from an undefined share

A known zero numerator over a positive denominator is a valid zero share. P14 has zero packets, and its contribution to the eighty-packet source is zero. A category group with zero packets could likewise have 0% of a positive grand total. That result does not mean the record is missing or the formula failed.

A zero denominator is different. In a separate complete mini-case, a region called Meadow has no packets in any channel. Its row total is zero. Each attempted row share is 0/0, which is undefined. Displaying 0% in every cell would imply measured proportions of a whole that does not exist. Use N/A with the reason No packets in this region.

A channel called Reserve can create the analogous column case. If its total is zero, a region’s share of Reserve cannot be calculated, even if the report can display an absolute zero. The absolute matrix remains useful because it explains why the percentage is unavailable. Do not remove the whole region or channel merely to avoid a denominator issue unless the reporting scope explicitly requires that exclusion.

Unknown and zero are also different. If a packet quantity is blank, the total may be incomplete rather than truly zero. A formula that sees a partial sum of zero cannot establish that all contributing values were measured. Validate missingness before interpreting the denominator. The main case has no missing quantities, so its positive denominators are fully known.

A useful output pairs a numeric or N/A result with the denominator amount and a short status. For a normal row it might say 45.0%, denominator forty packets. For Meadow it might say N/A, denominator zero, no packets in the complete case. For missing data it should say unresolved coverage or missing quantity rather than a fabricated percentage. These distinctions make the report accurate at the edges, not just for ordinary nonzero values.

Numerator	Denominator	Result	Interpretation
0	80	0%	Known zero contribution to a positive whole
18	40	45%	Valid region mix
0	0	N/A	No nonzero whole for a share
Unknown	80	Unresolved	Numerator evidence missing
0	Incomplete total	Unresolved	Cannot assume denominator is complete

E08-X1 Classify percentage boundary cases

Classify 0/80, 18/40, 0/0 and unknown/80. Give the numeric result where defined and an appropriate reason where not. Explain why returning zero for every error is unsafe.

Submit: Four output decisions and an error-handling rule.

09 Keep full precision and explain display rounding

The source quantities are integers, but their ratios may repeat indefinitely in decimal form. Mail shares include 10/26, 5/26 and 11/26. Store those fractions as formulas and use number format 0.0% for presentation. Do not replace the formulas with the displayed strings 38.5%, 19.2% and 42.3% if the workbook will be reused for further calculation.

A separate three-category example has one packet in each category and three in total. Each exact share is one third. At one decimal place the displayed values are 33.3%, 33.3% and 33.3%, adding to 99.9%. The underlying fractions still sum to one. This is ordinary rounding, not evidence that a packet is missing.

Do not arbitrarily change one category to 33.4% to force 100.0% unless a stated allocation convention requires adjusted display shares. Such an adjustment can be appropriate in a designed allocation process, but it is not the same as displaying the original ratios. If used, the method and affected values should be documented. The main report uses unadjusted one-decimal display.

Verification should compare full-precision values with a suitable tolerance. For exact rational relationships, an independent fraction calculation can establish that row, column or grand sums equal one mathematically. A spreadsheet's floating-point representation may produce a value extremely close to one rather than textually identical to it. The check should distinguish numerical precision from a material denominator error.

A percentage rounded to 0.0% can still be a small positive contribution. Conversely, a displayed 100.0% can be slightly below one. If that distinction matters to the decision, increase display precision or show the underlying amount. Do not interpret a rounded label more precisely than it was designed to communicate.

Separate rounding example	Exact fraction	Displayed 0.0%
Category A	1/3	33.3%
Category B	1/3	33.3%
Category C	1/3	33.3%
Total of exact fractions	1	100.0%
Sum of displayed labels	0.999 as displayed arithmetic	99.9%

10 Understand how a row filter changes the whole

For an ordinary worksheet-based pivot in this exercise, the intended percentage population is the records included by the report's current filters. Start from all three regions and then filter Region to Coast only. The included packet total becomes forty. Coast-Desk remains eighteen packets, but its grand-total share changes from 18/80=22.5% to 18/40=45%.

Coast’s row shares remain 45%, 30% and 25% because its row denominator was already forty. Its column shares become 100% for each channel because Coast is now the only included region in those channel columns. These changes are not contradictions. Each calculation follows a different denominator, and the filter removes different parts of those denominators.

The original source quantities do not change. The filter changes which records participate in the report. Keep the absolute filtered totals available so the percentage movement can be explained. A reader seeing 45% after previously seeing 22.5% should not infer that Coast-Desk doubled its packet volume; its numerator is unchanged at eighteen.

Verify the actual native report's settings and behavior rather than assuming every model or total option handles filters identically. This lesson specifies a flat local source with the currently included population as the denominator. More advanced models can deliberately preserve different totals. If your observed result does not match the specified population, inspect source, filters and total settings before interpreting it.

A filter-aware caption should say Share of packets within current filters, with Region=Coast visible nearby. A copied percentage without its filter context is easy to misread as an all-region contribution. When exporting or sharing a report, include the selection state and denominator amount, not just the colorful percentage panel.

Coast-Desk measure	All regions	Coast only	What changed
Packets	18	18	Nothing in source amount
Row share	18/40 = 45%	18/40 = 45%	Same region denominator
Column share	18/30 = 60%	18/18 = 100%	Other regions removed from Desk
Grand share	18/80 = 22.5%	18/40 = 45%	Included population reduced

E10-X1 Predict the Coast-only filter

Give Coast-Desk absolute packets and all three shares after Region=Coast. State the included grand denominator and compare with the unfiltered grand share.

Submit: Four values and a filter-context sentence.

11 Understand how a column filter changes the whole

Now restore all regions and filter Channel to Desk only. The included total is thirty packets. Coast contributes eighteen, Hill six and Valley six. Each region’s row share for Desk becomes 100% because Desk is the only included channel in that row. The column shares remain 60%, 20% and 20% because all regions remain included within Desk.

Grand-total shares now equal those Desk column shares because the entire filtered population is that one channel. Coast-Desk is eighteen of thirty, or 60%. This is not the same

as its all-channel row share of 45% or its unfiltered grand share of 22.5%. A single cell can legitimately display several values as the report's population changes.

A useful test compares row and column filtering as separate actions. Coast-only filtering preserves the Coast row denominator and changes the Desk column denominator. Desk-only filtering preserves the Desk column denominator and changes the Coast row denominator. Predicting which denominator remains stable is a more powerful check than memorizing that filters change percentages.

Do not apply both filters accidentally while trying to compare them. Region=Coast and Channel=Desk leaves only eighteen packets, so all three share types for the remaining cell become 100%. That result is mathematically correct for the tiny selected population, but it answers a much narrower question. Reset to the declared baseline between tests.

For a recurring report, retain a compact denominator test table that names each filter state and expected total. It helps diagnose whether a percentage change came from new quantities, a selection change or a different calculation setting. This course focuses on denominator interpretation; the safe-filter course covers broader filter-state management. Here, the crucial discipline is to keep the population explicit whenever a share is compared.

Filter state	Included packets	Coast-Desk row	Coast-Desk column	Coast-Desk grand
All regions/channels	80	45%	60%	22.5%
Coast only	40	45%	100%	45%
Desk only	30	100%	60%	60%
Coast and Desk	18	100%	100%	100%

12 Distinguish a fixed baseline denominator from visible-population share

Sometimes the requested question is not What share of the current selection is this? but How much of the original whole remains visible? That requires a fixed baseline denominator. For the supplied case, the all-source baseline is eighty packets. If Coast is selected, its forty packets represent 50% of that fixed baseline even though they represent 100% of the visible population.

Coast-Desk would remain 18/80=22.5% under a fixed-baseline calculation. The three visible Coast cells would sum to 50%, not 100%. This is correct because half of the original population is excluded from view. A report that forces those shares to sum to 100% has switched to a visible-population denominator and changed the question.

Keep the baseline amount in a clearly identified control cell with its scope and as-of definition. A hardcoded eighty without provenance can become stale when the source changes. For this exercise the baseline is the complete supplied eighteen-record population;

no additional records are authorized. In a recurring real report, specify whether the baseline is a frozen snapshot or an all-source total that updates with new data.

Do not label a fixed-baseline ratio Percent of current grand total. Use Share of original eighty-packet population or another precise caption. If the native pivot does not implement the desired denominator directly, calculate the ratio transparently outside it or use an appropriately defined model measure. The method should preserve the stated population rather than imitate a preferred display.

The distinction is analytical, not a contest between correct and incorrect percentages. Coast-Desk at 45% answers its share within Coast-only selection. Coast-Desk at 22.5% answers its share of the original all-region population. Both are valid when labelled accurately. The error is silently moving between them while treating the resulting numbers as comparable.

Coast-only output	Denominator	Coast-Desk	Sum of visible Coast detail
Current selection share	40	45%	100%
Fixed all-source baseline share	80	22.5%	50%

E12-X1 Calculate fixed-baseline coverage

With Coast selected, calculate fixed-baseline shares for Desk, Partner and Mail using eighty packets. Give their sum and compare with the current-selection shares.

Submit: Two three-cell panels and their denominator labels.

13 Do not average percentages with unequal denominators

The Desk row shares are Coast 45%, Hill 30% and Valley 30%. Their simple average is 35%. That is not Desk’s share of all packets, which is thirty of eighty, or 37.5%. The region totals differ, so each region percentage represents a different-sized whole.

To combine them, weight each share by its denominator: (0.45×40 + 0.30×20 + 0.30×20)/(40+20+20). The numerator reconstructs eighteen plus six plus six Desk packets, giving thirty. The denominator reconstructs eighty total packets. The result is 0.375. This calculation is equivalent to summing the original numerators and denominators before dividing.

An unweighted average would answer the average of the three region percentages, giving each region equal influence regardless of volume. That may be a legitimate separate statistic if explicitly requested, but it is not overall packet composition. The word average should not conceal which entities receive equal weight.

The same issue arises when combining months, departments or products. A 50% share in a ten-packet group and a 20% share in a hundred-packet group do not combine to 35% of all

packets. Their combined share is (5+20)/(10+100), approximately 22.7273%. Keeping numerator and denominator amounts makes the correct combination possible.

A percentage-only export can lose this information. If the report retains only 45%, 30% and 30%, a later reader cannot reconstruct 37.5% without the region totals. Include the absolute matrix or denominator column whenever the shares might be recombined. This is one reason a well-designed percentage report does not discard the quantities that generated it.

Region	Desk packets	All region packets	Desk row share
Coast	18	40	45%
Hill	6	20	30%
Valley	6	20	30%
Combined	30	80	37.5%, not unweighted 35%

E13-X1 Recover the overall Desk share

Calculate the unweighted mean of region Desk shares and the correct overall Desk contribution. Give the exact weighted expression and explain the role of denominator weights.

Submit: Two values and a weighted calculation.

14 Separate percentage points, relative change and quantity change

A contribution share can rise while its absolute quantity falls. In a separate comparison case, Coast-Desk previously had twenty packets out of fifty Coast packets, a 40% row share. In the current case it has eighteen out of forty, a 45% share. Desk packets fell by two, but the Coast total fell by ten, so Desk occupies a larger portion of the smaller whole.

The share increased by five percentage points: 45% minus 40%. Its relative share increase is five divided by forty, or 12.5%. Its absolute packet change is negative two, and its packet growth rate is negative ten percent. These four statements describe different calculations. Calling the change simply five percent is ambiguous.

Use percentage points when subtracting two percentages directly. Use percent change when dividing a change by a defined prior value. Always identify what is changing: packet quantity, row share, column share or grand share. The same percent sign can refer to composition or growth, and the source requirements differ.

The prior-period figures are supplied only for this separate comparison exercise. Do not add them to the eighteen-row current source or mix the fifty-packet prior denominator into the current matrix. A comparison needs two clearly labelled populations with consistent measure definitions. If the channel definitions changed between periods, the apparent share movement could reflect reclassification rather than behavior.

A defensible interpretation is Coast-Desk’s share of Coast packets rose from 40% to 45%, while Desk packets declined from twenty to eighteen. That sentence communicates both composition and scale. It does not claim improved performance or demand because the case provides no outcome or causal evidence.

Comparison measure	Calculation	Result
Prior row share	20 / 50	40%
Current row share	18 / 40	45%
Percentage-point change	45% - 40%	+5 points
Relative change in share	(45%-40%)/40%	+12.5%
Packet quantity change	18 - 20	-2 packets
Packet growth rate	(18-20)/20	-10%

E14-X1 Write a precise comparison sentence

Using the supplied prior twenty-of-fifty and current eighteen-of-forty figures, calculate both shares, percentage-point change, relative share change and packet growth. Write one sentence that does not confuse them.

Submit: Five calculations and a concise interpretation.

15 Recognize when signed totals are not ordinary composition

The main seed-packet source uses nonnegative issued quantities. A separate signed-net example illustrates a limit of contribution percentages. Suppose one category has net ten units and another net negative two from returns, leaving a net total of eight. Dividing by the net total yields 125% and negative 25%. The fractions sum to 100%, but they are not a simple nonnegative parts-of-a-whole composition.

The arithmetic is valid for contribution to a signed net total when labelled that way. It would be misleading to display those results as an ordinary pie chart or to claim one category physically contains more than all packets. The positive category exceeds the net whole because the negative category reduces that whole. The denominator's meaning must be understood before interpreting the range of percentages.

A near-zero net denominator can make shares extremely large and unstable. If ten and negative 9.9 sum to 0.1, the resulting ratios are 10000% and negative 9900%. That is not a calculation malfunction; it is a warning that a net contribution ratio may be a poor summary for the user's question. Show gross issues, returns and net separately when that better explains the process.

A zero net total is undefined for a share calculation even when positive and negative activity occurred. Ten and negative ten produce a denominator of zero, not a lack of activity. An N/A

result should explain net total zero rather than imply no records. This distinction extends the zero-denominator reasoning beyond the main nonnegative case.

Do not introduce signed values into the current Issues table. Its contract is nonnegative packets issued, and P14's zero is already explicitly defined. The signed examples are separate diagnostic cases. Their lesson is that a sum-to-100 check cannot by itself establish that a percentage panel is suitable for a composition interpretation.

Separate signed case	Numerators	Net denominator	Net shares
Returns offset some issues	10 and -2	8	125% and -25%
Returns offset all issues	10 and -10	0	Undefined; net total zero
Near cancellation	10 and -9.9	0.1	10000% and -9900%

16 Audit denominators cell by cell

A denominator ledger records the numerator, denominator amount, denominator meaning, filter state and resulting ratio for a few representative cells. It is more informative than checking that every panel displays a percent sign. For Coast-Desk, the ledger should show eighteen over forty for row share, eighteen over thirty for column share and eighteen over eighty for grand share under the all-region, all-channel state.

Choose cells that distinguish possible mistakes. Coast-Desk is useful because its three denominators differ. Valley-Mail also separates twenty, twenty-six and eighty. A cell whose row and column totals happen to match cannot expose a row-versus-column substitution numerically. The foundation contains such a coincidence for Design-Guide, so the new case deliberately tests a noncoincident cell.

Check formulas at the first, middle and last positions of a panel. A copied formula may anchor correctly at the first cell but drift later. For row shares, confirm that the denominator stays in Control column E while the row changes. For column shares, confirm that denominator row 8 remains fixed. For grand shares, both E and 8 must remain fixed. Trace the numerator separately so a correct denominator does not hide a shifted source cell.

Use totals in the direction appropriate to the panel, then compare a hand-calculated cell. Row sums alone can pass even when the wrong absolute values are proportionally normalized. A cell trace alone can pass while a copied formula fails elsewhere. The combination gives stronger evidence without requiring every calculation to be checked manually.

A useful defect note names the exact formula and effect: Shares D15 divides Valley-Mail eleven by Valley total twenty, producing 55%, but the requested column share must divide by Mail total twenty-six, producing approximately 42.3077%. That statement identifies the mistaken denominator and the correct question. It is more actionable than saying the percentages seem too high.

Audit cell	Numerator	Correct denominator	Expected ratio
Coast-Desk row	18	Coast 40	0.45
Coast-Desk column	18	Desk 30	0.60
Coast-Desk grand	18	All 80	0.225
Valley-Mail row	11	Valley 20	0.55
Valley-Mail column	11	Mail 26	11/26
Valley-Mail grand	11	All 80	0.1375

E16-X1 Diagnose the wrong Valley-Mail denominator

A report labels Valley-Mail as share of Mail packets but displays 55%, with formula numerator eleven divided by twenty. Identify the wrong denominator, supply the correct denominator and ratio, and state which legitimate question 55% actually answers.

Submit: A precise defect note and corrected calculation.

17 Communicate composition without inventing performance

A large contribution share describes where a quantity is concentrated. It does not by itself establish efficiency, success or fairness. Coast accounts for half of the supplied packets, but the source contains no population size, demand forecast, staffing level or delivery outcome. Calling Coast the best-performing region would exceed the evidence.

A clear conclusion can combine scale and composition: Coast issued forty of eighty packets, and Desk accounted for eighteen of Coast’s forty, or 45%. This sentence names both denominators and retains the absolute amounts. A shorter statement such as Coast is 45% omits the channel and the whole, making it impossible to interpret reliably.

If comparing channels, choose the panel that answers the question. Desk’s overall contribution is 37.5% of all packets. Coast’s share of Desk is 60%. Desk’s share of Coast is 45%. These phrases sound similar but reverse or widen the denominator. Read each one aloud as numerator of denominator to catch ambiguity before publishing the report.

Visual choices should follow the same semantics. A row-normalized stacked bar can show each region’s internal mix, but equal bar lengths hide the difference between forty and twenty packets. Pairing the chart with total quantities restores scale. A grand-share view can show overall composition, but it does not replace a regional mix analysis. Do not let a chart's shape imply a denominator the data does not use.

The required deliverable is a verified percentage report, not a persuasive claim. Keep captions, source scope, current filters and rounding conventions close to the values. Where a share is undefined or coverage is incomplete, say so directly. Honest limits make the percentages more useful because readers know which decisions the report can support.

E17-X1 Deliver the three-panel contribution report

Provide the verified absolute matrix and three percentage panels, with denominator captions, directional sum tests, two cell traces, zero-denominator handling and the Coast-only filter comparison. State which native Excel steps were actually performed.

Submit: A reproducible report and denominator audit record.

18 Predict the effects of one supported quantity change

A static correct result is useful, but a controlled change can reveal whether the denominators are linked correctly. Use a disposable hypothetical copy in which P01 changes from ten to fourteen packets under an explicit exercise correction. No other source value changes. Coast-Desk rises from eighteen to twenty-two, Coast total from forty to forty-four, Desk total from thirty to thirty-four and the grand total from eighty to eighty-four.

The Coast row-share panel changes in all three cells, not only Desk. Desk becomes 22/44=50%, Partner becomes 12/44 and Mail 10/44. Their numerators for Partner and Mail stay unchanged, but their shared regional denominator grows. Hill and Valley row shares remain unchanged because their own row totals remain twenty. This is a precise test of whether a row-share formula anchors to the correct row.

The Desk column-share panel also changes in all three regions. Coast becomes 22/34, Hill 6/34 and Valley 6/34. Partner and Mail column shares remain unchanged because their column totals and numerators are unchanged. In the grand-share panel, every detail ratio changes because the common denominator is now eighty-four; Coast-Desk additionally has a changed numerator.

These effects distinguish a live formula from a typed percentage. A hardcoded 22.5% at Coast-Desk would remain stale. A mistaken grand denominator of eighty might change the numerator correctly but produce 27.5% instead of 22/84. A row formula that accidentally uses a fixed Coast denominator for every region would change Hill and Valley row shares when they should remain stable.

Record expected affected and unaffected cells before performing a native application test. Then inspect the actual results, restore the original source or discard the disposable copy, and confirm that the accepted deliverable still contains eighty packets. A test scenario is not permission to change the main source facts. Its value is the causal map of what should respond to a change.

Panel after hypothetical P01 correction	Coast-Desk	Other affected cells	Unaffected detail
Row shares	22/44 = 50%	Coast-Partner 12/44; Coast-Mail 10/44	All Hill and Valley row shares
Column shares	22/34	Hill-Desk 6/34; Valley-Desk 6/34	Partner and Mail columns

Panel after hypothetical P01 correction	Coast-Desk	Other affected cells	Unaffected detail
Grand shares	22/84	All other cells use denominator 84	No detail ratio remains numerically identical here
Absolute matrix	22 packets	Coast 44; Desk 34; grand 84	Other eight detail amounts

E18-X1 Map a controlled quantity change

For the separate P01 ten-to-fourteen scenario, give the changed absolute totals and all three Coast-Desk shares. List which row-share rows and column-share columns must remain unchanged. Do not alter the accepted workbook.

Submit: A change-impact ledger.

19 Transpose the matrix without reversing the meaning

Suppose the report is transposed so that Channel appears on rows and Region on columns. The underlying quantities do not change, but the phrases row share and column share now refer to different business questions. Desk is a row with Coast eighteen, Hill six and Valley six, totaling thirty. A row share in this transposed layout is therefore a share of channel packets.

Coast-Desk in the transposed matrix has row share 18/30=60% and column share 18/40=45%. Those are the original column and row shares respectively. Grand share remains 18/80=22.5% because the total population is unchanged. This is why a durable report caption names the business denominator rather than relying only on the physical orientation.

The transposed Partner row is twelve, nine and three, totaling twenty-four. Its row shares are 50%, 37.5% and 12.5%. The transposed Mail row is ten, five and eleven, totaling twenty-six. Its row shares match the original Mail column shares. A reviewer can use these identities to verify that transposition changed presentation, not source membership or quantities.

Do not carry an old caption such as Share of region packets onto a new row-normalized channel-by-region matrix without checking the operation. The numbers can remain mathematically normalized to 100% while the words describe the opposite question. This is a semantic defect that directional sum tests alone will not detect.

The requested primary deliverable retains Region rows and Channel columns. The transposition is a separate interpretation exercise. Its transferable lesson is to express denominators in domain terms: region total, channel total or all included packets. Those terms remain meaningful when a pivot layout is rearranged, whereas row and column are only positional descriptions.

Transposed Channel row	Coast	Hill	Valley	Channel total
Desk	18	6	6	30
Partner	12	9	3	24
Mail	10	5	11	26
Region total	40	20	20	80

E19-X1 Relabel a transposed panel

For Channel rows and Region columns, give Coast-Desk row, column and grand shares, then write business-denominator captions for row and column panels.

Submit: Three values and two captions.

20 Do not normalize away missing quantity evidence

A percentage report can look complete even when a source amount is missing. In a hypothetical copy, P18 Valley-Mail has a blank quantity instead of its approved four packets. The known numeric sum becomes seventy-six, Valley's known sum sixteen and Mail's known sum twenty-two. Treating those partial sums as complete denominators would produce apparently tidy shares that conceal the missing evidence.

The approved packet_issues.csv supplies four for P18, so this teaching defect can be repaired from an exact source. Before repair, however, the report should not claim that Valley-Mail is seven of twenty-two Mail packets or seven of seventy-six total packets without labelling those as known-data-only ratios. The true requested denominator is incomplete, not newly defined by whichever values remain numeric.

Dependency matters. Coast's internal row shares can still be calculated from its complete forty packets because neither their numerators nor their row denominator depends on P18. Hill's internal row shares are also unaffected. Valley row shares are incomplete, Mail column shares are incomplete, and every grand-share denominator is incomplete. Desk and Partner column shares remain supported by their complete channel data.

This analysis helps avoid both extremes: silently normalizing incomplete totals, and declaring every possible statistic unusable when only one part of the source is unresolved. State the scope of the missing evidence and identify which outputs depend on it. If a report requires all three panels as one coherent complete-source deliverable, withhold that completion claim until P18 is restored and controls reconcile.

After restoring numeric four from the approved CSV, verify eighteen numeric quantities, eighty packets, Valley twenty and Mail twenty-six. Refresh any native pivot and recheck the affected shares. Do not merely type the old percentages back into the report. The repair should reestablish the evidence and let the formulas or pivot recompute the result.

Output before P18 restoration	Evidence state	Reason
Coast and Hill row shares	Supported	Their quantities and row totals are complete
Valley row shares	Incomplete	Missing P18 affects Valley denominator
Desk and Partner column shares	Supported	Their channel totals exclude P18 by definition
Mail column shares	Incomplete	Missing P18 affects Mail denominator
All grand shares	Incomplete denominator	Missing four affects the common all-source total

E20-X1 Trace a missing value through denominators

For the hypothetical blank P18, calculate known all-source, Valley and Mail sums. Identify supported and incomplete panels, then give restored controls using the approved four-packet source fact.

Submit: A dependency ledger and repair checks.

Assessment

Choose one best answer per question. Questions 1–10 check the foundation concepts; questions 11–20 apply the extended study units. Complete and submit the practical tasks separately. A strong quiz score does not replace correct practical work.

1. Foundation Design-Guide has 15 units and Design total 24. What is its row share?

A. 55.6%

B. 29.4%

C. 62.5%

D. 15.0%

2. Foundation Support-Guide is 9 units and Guide total 24. What is its column share?

A. 37.5%

B. 62.5%

C. 33.3%

D. 17.6%

3. Which denominator gives Design-Guide contribution to all foundation units?

A. 15 Design-Guide units

B. 24 Design units

C. 12 receipts

D. 51 units

4. Which cells should sum to 100% in a row-share panel?

A. All detail shares across every department combined

B. The detail shares across each department row

C. Each individual cell

D. The same resource-type column down all departments

5. What should retain the authoritative precision in a percentage report?

A. The displayed grand-total label

B. Underlying unrounded ratios

C. Rounded display strings

D. A manually balanced final cell

6. A contribution denominator is zero. Which output is defensible?

A. The previous period percentage

B. 100% because all included values are zero

C. 0% without explanation

D. N/A with a zero-denominator reason

7. What happens if numeric quantity 15 is only formatted as a percentage?

A. It displays 1500% without dividing by a denominator

B. It becomes 15 divided by the row total

C. It becomes 15 divided by the grand total

D. It becomes a distinct count

8. A report filter removes Support. What can change in current-population percentages?

A. Original receipt quantities

B. The meaning of a resource unit

C. Included denominators and resulting shares

D. Original ReceiptIDs

9. Which caption best identifies a column-share panel?

A. Performance contribution

B. Percent

C. Total result

D. Share of resource-type units within current filters

10. What does Design-Guide row share 62.5% establish by itself?

A. Composition of Design usage

B. Service effectiveness

C. Distinct people served

D. Growth since last month

11. Fern Coast-Desk has 18 packets. Which row, column and grand shares are correct?

A. 60%, 45%, 22.5%

B. 45%, 60%, 22.5%

C. 45%, 22.5%, 60%

D. 22.5%, 60%, 45%

12. Why can all nine row shares sum to 300% without error?

A. The source has duplicate records

B. Rounding always triples totals

C. Each region is a separate 100% whole

D. The grand denominator is missing

13. What is Valley-Mail share of Mail packets?

A. 11/80 = 13.75%

B. 26/80 = 32.5%

C. 11/26, about 42.3%

D. 11/20 = 55%

14. After filtering to Coast only, what is Coast-Desk grand share under the current-population rule?

A. 45%

B. 60%

C. 22.5%

D. 100%

15. With Coast visible but a fixed original denominator of 80, what do its three detail shares sum to?

A. 100%

B. 22.5%

C. 45%

D. 50%

16. Three exact one-third shares display as 33.3% each. What is appropriate?

A. Assume one packet is missing

B. Keep exact ratios and explain the 99.9% displayed sum

C. Change every stored ratio to 0.333

D. Delete a category to force 100%

17. What is overall Desk share across regions?

A. 30/80 = 37.5%

B. The unweighted regional mean, 35%

C. 18/40 = 45%

D. 60% because Coast leads Desk

18. A share rises from 40% to 45%. What is the direct percentage-point change?

A. 45 points

B. 5% relative growth

C. 12.5 points

D. 5 percentage points

19. Which case produces a valid measured 0% contribution?

A. Unknown numerator divided by 80

B. Zero divided by zero

C. Known zero numerator divided by positive 80

D. A broken reference replaced with zero

20. Net amounts 10 and -2 sum to 8. How should 125% and -25% be interpreted?

A. Ordinary nonnegative packet composition

B. Signed contributions to a net total, not ordinary parts-of-a-whole shares

C. Proof that the source must be wrong

D. Percentages that must be forced into the range 0%-100%

Sources and further reading

Show different calculations in PivotTable value fields
https://support.microsoft.com/en-us/excel/show-different-calculations-in-pivottable-value-fields

Pivot data in a PivotTable or PivotChart
https://support.microsoft.com/en-us/excel/pivot-data-in-a-pivottable-or-pivotchart

Filter data in a PivotTable
https://support.microsoft.com/en-us/excel/get-started/filter-data-in-a-pivottable