

Decision matrix

Your goal: Use a weighted decision matrix to choose among competing prototype design options.

One product: Weighted decision matrix with three options, four criteria, weights, scores, weighted totals, and a written justification.

Question: Which option fits the stated priorities, and what could change that recommendation?

Start the work

1. List three candidate design options for your prototype.
2. Define four selection criteria such as cost, safety, feasibility, and effectiveness.
3. Assign each criterion a weight that sums to 100 percent.
4. Score each option against each criterion and compute weighted totals.
5. Write a justification naming the winning option and the criterion that decided it.

Save the complete work if access or the exact assignment is missing. Record the route hold; do not claim upload, teacher approval or official completion.

Words you will use

prototype

A preliminary design or model used to explore a proposed solution.

option

One candidate design being compared.

criterion

A defined feature used to judge an option; criteria is the plural.

constraint

A requirement an option must satisfy rather than trade away.

mandatory requirement

A must-pass condition before weighted comparison.

stakeholder

A person or group affected by a decision.

decision matrix

A table comparing options against explicit criteria.

weight

The share of importance assigned to a criterion.

percent

A part out of one hundred.

decimal weight

A percent divided by 100 for multiplication.

score

A number assigned by the stated criterion rule.

anchor

A specific count or condition that corresponds to a score.

weighted contribution

A criterion score multiplied by its decimal weight.

weighted total

The sum of an option's contributions across all criteria.

partial total

A sum that omits at least one required contribution.

rank

An option's position after totals are compared.

runner-up

The option with the second-highest total.

justification

A reasoned explanation connecting a recommendation to evidence and limits.

tradeoff

A gain in one valued feature paired with a loss in another.

bias

A systematic influence that can favor one conclusion over another.

assumption

A condition accepted for an analysis but not established by its arithmetic.

sensitivity check

A recalculation showing how a stated change affects a result.

percentage point

One unit on a percentage scale; 40% minus 10 points is 30%.

relative percent change

Change expressed as a fraction of the starting value.

feasibility

Whether a plan can be carried out under stated resources and constraints.

effectiveness

How well a design achieves its intended outcome, requiring suitable outcome evidence.

validation

Checking whether a design meets its intended use with suitable evidence.

metric

A defined quantity used to assess a feature or outcome.

literature review

A synthesis of relevant prior sources and their evidence.

peer review

Evaluation of a scholarly work by relevant experts; it does not guarantee correctness.

CER

Claim, evidence and reasoning used to explain a conclusion.

MP3

The third marking period in the course schedule.

uncertainty

What is not known well enough to treat as settled.

audit

A check of whether a result can be traced to its inputs and rules.

E1: what a decision matrix can support

NASA describes decision analysis as support for choices made with incomplete knowledge. Inputs include facts and judgments. A matrix makes assumptions inspectable; arithmetic does not remove bias.

NASA distinguishes mandatory requirements from desirable features. Exclude an option that fails a mandatory requirement before comparing weighted benefits. A cheap option cannot compensate for a failed safety requirement.

Define each scoring scale before scoring. Record evidence, assumptions and uncertainty. Reconsider the recommendation when reasonable changes could alter the ranking. These principles guide this original paper-design exercise.

S1: original design challenge and boundary

Original fictional challenge: choose a paper aid for preparing appointment questions. Today you compare supplied design plans on paper. No plan has been used by patients or tested for safety, understanding or health benefit.

The classroom screen requires paper-only plans, blank question spaces and no request for names or medical information. A, B and C meet this narrow screen as specified. This is not clinical safety approval.

All content stays blank or uses invented labels. No one writes personal health questions. Do not build or test a medical device, collect patient information or change care.

Choose among A, B and C below for this original practice challenge. If your teacher requires your actual prototype instead, obtain its three documented options and evidence. Ask for the missing inputs before making that transfer.

The fictional brief prioritizes instruction coverage at 40%, editable question capacity at 30%, assembly simplicity at 20% and sheet economy at 10%. These are stated practice preferences, not surveyed user priorities.

E2: three inspectable paper design plans

The following plans are invented inputs, not observed trial results. Counts describe the plans. Do not report them as time saved, errors prevented or measured effectiveness.

A, single sheet: use one sheet and one assembly action, placing that sheet in a folder. It has two editable question boxes labeled Q1 and Q2. Its printed instructions are Write a question and Circle a priority.

B, three-sheet set: use three sheets and three assembly actions, placing each sheet in the folder. It has five editable boxes, Q1 through Q5. Its printed instructions are Write a question; Circle a priority; Bring the sheet; and Leave a box blank if unsure.

C, five-sheet set: use five sheets and five assembly actions, placing each sheet in the folder. It has four editable boxes, Q1 through Q4. It prints the same four instructions as B plus Ask for clarification.

Text equivalent for inspection: A has sheets 1, actions 1, boxes 2 and instruction types 2. B has 3, 3, 5 and 4. C has 5, 5, 4 and 5, in that same order.

The instruction list has five types: Write a question; Circle a priority; Bring the sheet; Leave a box blank if unsure; Ask for clarification. Presence is countable. Presence does not prove readers understand or follow it.

R1: four defined criteria and anchored scores

Use the criterion order C1 sheet economy, C2 assembly simplicity, C3 editable question capacity and C4 instruction coverage. Higher scores always mean better fit to this fictional brief.

C1: planned sheet count. One sheet scores 5; two score 4; three score 3; four score 2; five or more score 1. This represents material economy without invented prices.

C2: planned assembly actions. One action scores 5; two score 4; three score 3; four score 2; five or more score 1. Actions are defined in E2, not timed labor or measured ease of use.

C3: number of editable question boxes. One box scores 1; two score 2; three score 3; four score 4; five or more score 5. Capacity does not measure question quality.

C4: number of the five listed instruction types present. One type scores 1; two score 2; three score 3; four score 4; five score 5. This measures planned coverage, not clinical effectiveness.

Sheet and assembly counts happen to move together in these plans. Their separate weights can count related preferences twice; disclose this modeling choice when interpreting the rank.

These anchors cover every supplied option. An option with zero boxes or zero instruction types falls outside this rubric; revise the brief instead of inventing a score.

Assign the S1 weights before scoring: C1 10%, C2 20%, C3 30%, C4 40%. Write one reason for the highest priority. Keep this base matrix for comparison before trying a different weighting.

R2: calculation and blank-matrix structure

Convert each weight to a decimal by dividing by 100. The base weights are 0.10, 0.20, 0.30 and 0.40; their sum is 1.00.

Weighted contribution equals score multiplied by decimal weight. Total equals the sum of all four contributions. Do not add raw scores to weighted contributions or count how many categories an option wins.

Make a matrix with rows A, B and C. Use columns Option; C1 score and contribution; C2 score and contribution; C3 score and contribution; C4 score and contribution; Total.

Above the columns, write each criterion, anchor rule and weight. In each scoring cell, record the E2 count, the R1 score and its multiplication. There are twelve scored cells and three totals.

Check every score against its count, every multiplication and every sum. All base totals must be between 1 and 5 because weights sum to 1 and all supplied scores are between 1 and 5.

Compare the winner with the runner-up. Subtract their contributions one criterion at a time. The largest positive difference identifies the strongest deciding advantage under these weights. Also name a disadvantage and a limit.

No result from this matrix establishes safety or effectiveness. It recommends a paper design for later review under stated assumptions. An actual validation test would still need its own approved plan and evidence.

W1: warmups and two-phone recovery

Warmup: name two requirements you would want a medical device to meet. Then choose which deserves more weight, cost or safety, and explain why mandatory safety checks come before weighted tradeoffs.

Also name three features that could distinguish design options. You may use the paper-plan features in E2; do not claim a feature improves health without evidence.

For a smaller practice matrix, compare invented Phone P and Phone Q on price and battery duration. P has a stipulated price of 200 credits and duration of 8 hours. Q has 400 credits and 16 hours. These are fictional specifications, not brands or test results.

Use price weight 40% and battery weight 60%. On this two-level rubric, price at most 200 credits scores 5; more than 200 scores 1. Duration at least 16 hours scores 5; below 16 scores 1.

Compute both contributions and the total for each phone. Check: P is $5 \times 0.40 + 1 \times 0.60 = 2.60$. Q is $1 \times 0.40 + 5 \times 0.60 = 3.40$. Q ranks first under this rubric.

Use this recovery within the scoring period if multiplication is a barrier. Then return to all three paper options and all four criteria; the phone exercise does not replace the required matrix.

X1: partial-weight check and sensitivity extension

Given check: Option A scores 8 on cost with weight 20%, and 4 on safety with weight 60%. Option B scores 4 on cost and 8 on safety, with the same weights.

These given scores use a different scale from the paper matrix. Keep them in this separate check. Multiply each score by its decimal weight, then add the two contributions for each option.

Before naming a winner, add the listed weights. If they total less than 100%, your sums are partial totals, not full totals.

Then decide what you would need to know about the remaining criteria before declaring an overall winner, and explain which supplied weight makes its score difference count more.

Extension: identify your two largest base weights, C4 at 40% and C3 at 30%. Transfer 10 percentage points from C4 to C3. The new C1-to-C4 weights are 10%, 20%, 40%, 30%.

Then test the reverse transfer from the original base: C1-to-C4 weights 10%, 20%, 20%, 50%. Keep all scores fixed. Both tests total 100% and have no negative weight.

Recompute all three totals for each test. Report whether the winner changes and whether its lead widens or narrows. A stable winner in two checks does not establish stability for every possible weighting.

Ten percentage points means 40% becomes 30%. A ten-percent relative decrease would make 40% become 36%; that is not the operation assigned here.

P1: checks, recovery and actual course work

Peer check: swap matrices and check all twelve score anchors, the 100% weight sum, multiplications, totals and deciding advantage. Record the actual correction or why the calculations agree.

If alone, hide your totals and recalculate from E2/R1. Compare the results, then record a correction or a specific check that matches. Do not invent a partner response.

After a break, confirm three options and four criteria first. Next confirm weights total 100%. Resume at the first missing count, score, product or total. If absent, E2/R1/R2 supply the complete original inputs and matrix structure.

If the teacher requires the classroom template or scores from your own notes, ask for those authentic inputs before completing that requirement. Request the required weight check before claiming teacher approval. A self-check is not that approval.

Today, Thursday, March 25, is the decision matrix. Confirm with your teacher when the separate validation plan is due.

This week also requires prototype validation notes, literature/prototype evidence, prototype testing and a simulated validation plan. Ask your teacher which other weekly work, such as an MP3 tracker audit, also applies; this matrix does not complete it.

March 22 source ethics and March 24 literature review are prior work, not assumed complete. The dated March 24 activity is 3.1.2 Gathering the Facts. Request its three actual citations, synthesis and any missing portfolio work.

Today's instruction names Problem 3.1.3 Design Innovations and the Data Tables folder. Open the assigned portion when available; complete the actual portfolio upload plus photo or screenshot with justification before saying it is done.

Problem 3.1.3 is broader than a matrix: it includes a proposal, model/prototype or detailed schematic, and marketing pitch across multiple stages. Obtain the assigned stopping point, rubric, materials and later evaluation requirements.

The wider unit also asks for a problem statement, three source facts with peer-review status, two measurable validation metrics, and a test plan with trials and success criteria. Keep those separate; no clinical testing is authorized by this paper exercise.

March 26 is no school. No homework is due before this class. Use the linked assignment and check its posted deadline; ask the teacher if the required format is unclear.

Finish with one sentence explaining why the lowest-scoring option was not selected under your base weights. Save the matrix, justification and check notes together. Completed work and submitted work are different states.

M1: distinct worked example, workshop handout packets

Invented worked example: choose a paper handout packet for a school workshop. This is different from the appointment-question aid. No workshop outcomes were measured.

Compare Red, Blue and Green on material economy, assembly simplicity, writable panels and topic coverage. Use weights 15%, 15%, 35%, 35%, respectively.

For economy and assembly, counts 1, 2, 3, 4 and 5 map to scores 5, 4, 3, 2 and 1. For panels and topics, counts 1, 2, 3, 4, 5 map to scores 1, 2, 3, 4, 5.

Red specifies 1 sheet, 2 assembly actions, 2 writable panels and 3 topics. Its scores are 5, 4, 2, 3. Contributions are 0.75, 0.60, 0.70 and 1.05. Total: 3.10.

Blue specifies 3 sheets, 3 assembly actions, 4 writable panels and 4 topics. Its scores are 3, 3, 4, 4. Contributions are 0.45, 0.45, 1.40 and 1.40. Total: 3.70.

Green specifies 4 sheets, 4 assembly actions, 5 writable panels and 2 topics. Its scores are 2, 2, 5, 2. Contributions are 0.30, 0.30, 1.75 and 0.70. Total: 3.05.

Blue leads Red by 0.60. Blue minus Red contributions are -0.30, -0.15, +0.70 and +0.35. Writable panels provide the largest positive advantage, overcoming weaker economy and assembly scores.

Model justification: choose Blue under these weights because its panel and topic contributions outweigh its disadvantages. This recommendation concerns the supplied plan features, not proven learning benefit. Inspect usability before adopting it.

Model check: weights sum to 100%; each score follows the anchor; four contributions make each total. Changing panel and topic weights could change the result, so disclose that uncertainty.

Try the decision

What can the base matrix justify?

- A conditional paper-design recommendation based on the matrix's explicit scores and weights.
- Proof that the highest-scoring design is clinically safe and effective.
- An overall winner from two criteria totaling only 80%, with no other information.

Explain your choice using the reading. Discuss it or say it to yourself. This practice does not add another submission.

Your 80-minute flow

0–5 minutes	Answer W1 warmups and distinguish mandatory conditions from scored features.
5–20 minutes	Read E1/S1/E2/R1; define the problem, options, criteria and base weights.
20–45 minutes	Use M1/R2 to calculate twelve cells and three totals. Use W1 phone recovery if needed.
45–60 minutes	Compare winner and runner-up; write the deciding advantage, tradeoff and limit.
60–72 minutes	Peer-check or independently recalculate; complete X1 partial-weight check. Try sensitivity if ready.
72–80 minutes	Write the lowest-option exit sentence and save or submit; describe only what actually happened.

Your response record

Use these labels on paper or in your document. The space below also works when this page is printed.

Name priorities and boundaries

Answer both W1 warmups and name three distinguishing features. Explain why a mandatory safety requirement cannot be offset by low cost.

Use E1/S1. If multiplication is unfamiliar, complete the two-phone W1 recovery during scoring.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

Frame three options and four criteria

State the S1 problem, list A/B/C and define C1 through C4 using R1. Record the mandatory screen and assign the four S1 weights with a reason for the highest weight.

This is original paper-design practice. Do not infer actual patient benefit or completion of your own prototype research.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

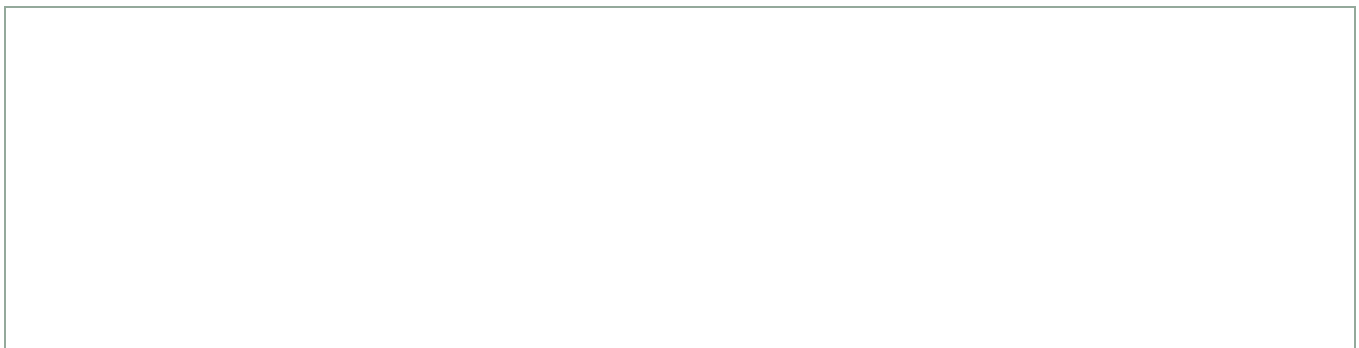


Build and calculate the full matrix

Complete all twelve cells from E2/R1 using the R2 structure. Show the count, score, multiplication and weighted contribution in each cell, then all three totals.

Keep the criterion order fixed. Use decimals 0.10, 0.20, 0.30, 0.40 and retain arithmetic so it can be checked.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.



Choose and justify

Name the base winner and runner-up with totals. Compare their four contribution differences to identify the deciding advantage. Explain a tradeoff and one limit on the recommendation.

A score is not evidence of safety or clinical effectiveness. A largest weight is not automatically the deciding contribution difference.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

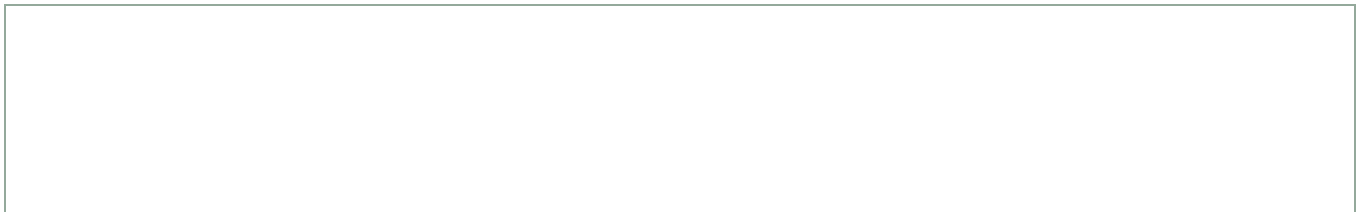


Check calculations and missing weights

Complete an actual peer check or the P1 solo check. Record a correction or verified match. Solve the X1 80% check and state the condition needed for an overall winner.

The separate check uses 8 and 4 scores. Do not replace them with the paper rubric or silently fill the missing 20%.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.



Test two weight changes

If ready, run both X1 transfers of 10 percentage points. Record each new weight set, all totals, the winner and change in its lead.

Keep the original base matrix and all scores. No flip in these two checks does not prove that bias or uncertainty disappeared.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.

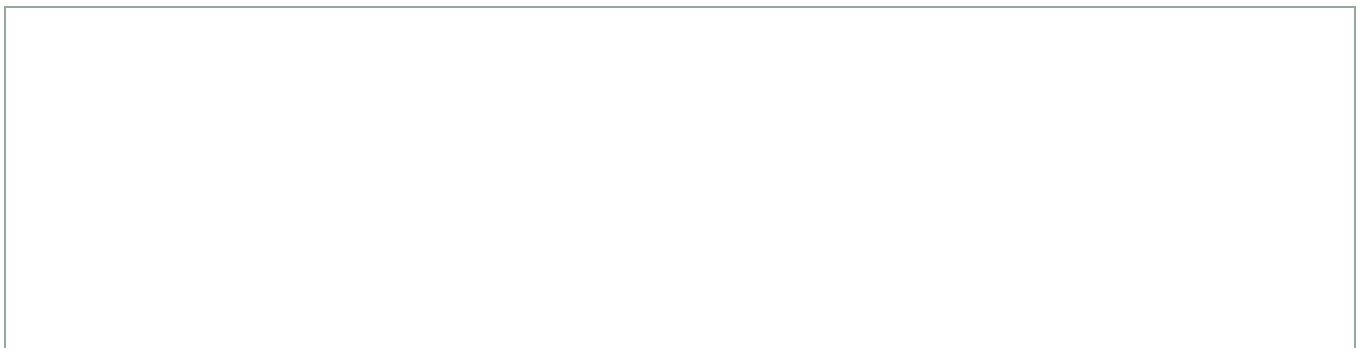


Finish and check your work

Write the one-sentence reason the lowest base scorer was not selected. Check actual prior work, the official portion, peer/teacher check, portfolio/photo and whether Schoology shows Submitted.

Use P1 to separate original completed practice from missing authentic work. Save the same product when access is missing.

Use this space or the same labeled section in your existing document. Add paper when your table, graph or drawing needs more room.



Check your product

- Three options and four defined criteria have inspectable inputs and anchors.
- Weights sum to 100%; all twelve products and three totals are shown.
- The justification identifies the deciding contribution advantage and a tradeoff.
- The partial-weight check is explicit, and claims of authentic completion have evidence.

Keep the limit: Original fictional plan comparison only. Weighted rankings depend on criteria, scales, weights and inputs; they cannot establish clinical safety, effectiveness or official project completion.

Turn in your work

Use the linked March 25 BI assignment. Keep the weighted matrix and written justification together; attach a photo or screenshot to the assigned Problem 3 portfolio when required. After uploading, check that Schoology shows Submitted.

Save the complete work if access or the exact assignment is missing. Record the route hold; do not claim upload, teacher approval or official completion.

[Open this assignment in Schoology](#)

Carry forward

Multiply each anchored score by its weight, then explain the tradeoff and the limits of the resulting rank.

Keep the matrix for the separate validation plan; ask for missing literature and official prototype instructions. What observation would test the matrix's preferred option?

Sources and resources

[Open today's page](#)

NASA-DA · 6.8 Decision Analysis

NASA Systems Engineering Handbook

<https://www.nasa.gov/reference/6-8-decision-analysis/>