

TEACHER AND STUDENT RESOURCE

Association, design and causal claims



NC Math 1 • NC.M1.S-ID.9

Statistics and Probability

Seven instructional sections • 30 multiple-choice tasks • 30 open or performance tasks. Includes exact alignment, teaching models, technology directions where needed, reusable organizers, student workspaces, worked keys and evidence records.

Free sample | Contents

NC.M1.S-ID.9 | NC Math 1 mathematics

This sample contains 29 complete selected pages from the 144-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-23, 52-53, 82-83, 112-113

Representative activities

M01: sample PDF page(s) 23; original page(s) 22

M02: sample PDF page(s) 24; original page(s) 23

O01: sample PDF page(s) 25; original page(s) 52

O02: sample PDF page(s) 26; original page(s) 53

Selected teacher prompts and keys: original page(s) 9, 82-83, 112-113

Using this sample

Read the preparation and access guidance before using a selected activity.
Keep teacher keys and private preparation pages separate from student copies.
Use the original resource contents to see the scope of the complete packet.

Complete paid download

The complete resource includes the full PDF task bank and teaching materials.

ALIGNMENT

Standard and learning targets

Distinguish between association and causation.

T1 • Distinguish an association from a causal conclusion.

T2 • Evaluate what random assignment and controls establish.

T3 • Propose alternative explanations and stronger study designs.

Current NC Math 1 standards apply during 2026–27 and 2027–28. Newly adopted standards begin in 2028–29. Course content is not assigned to a fixed high-school grade.

NAVIGATION

Plan several learning sessions

Warm-up: M01–M04 and O01–O04

I Do: M05–M08 and O05–O08

We Do: M09–M13 and O09–O13

Collaborative practice: M14–M18 and O14–O18

Independent practice: M19–M23 and O19–O23

Small-group reteach: M24–M27 and O24–O27

Exit ticket: M28–M30 and O28–O30

T1: M01, M02, M04, M06, M08, M10, M12, M14, M16, M18, M20, M22, M24, M26, M28, M30, O01, O02, O03, O04, O05, O06, O07, O08, O09, O10, O11, O12, O13, O14, O15, O16, O17, O18, O19, O20, O21, O22, O23, O24, O25, O26, O27, O28, O29, O30

T2: M03, M05, M07, M09, M11, M13, M15, M17, M19, M21, M23, M25, M27, M29, O01, O02, O03, O04, O05, O06, O07, O08, O09, O10, O11, O12, O13, O14, O15, O16, O17, O18, O19, O20, O21, O22, O23, O24, O25, O26, O27, O28, O29, O30

T3: O01, O02, O03, O04, O05, O06, O07, O08, O09, O10, O11, O12, O13, O14, O15, O16, O17, O18, O19, O20, O21, O22, O23, O24, O25, O26, O27, O28, O29, O30

PLANNING

Materials, access and evidence

Materials

Student pages, pencil, straightedge and graph paper. No regression technology or collection of personal information is needed for these fictional study-design tasks. Teacher keys are revealed after learners produce evidence.

Prerequisites

Identify explanatory and response variables, compare groups, understand timing, and distinguish observing a condition from assigning a treatment.

Pacing

Use two to four selected items per meeting, with more time for technology and study-design tasks. Session 1: interpret representations and model the process. Session 2: construct and analyze jointly. Session 3: collaborate and independently transfer. Session 4: targeted reteaching and exit evidence. The 60-item bank is reusable across multiple sessions.

Access

Read directions, enlarge graphs, allow dictation or alternate input devices, and provide neutral technology navigation support. Keep the data and mathematical demand unchanged. Record answer-supplying cues separately from access support.

Reasoning

Distinguish the observed association from a proposed causal explanation. Identify study design, timing and possible confounding. A randomized design supports a causal comparison, but no effect size, direction or reliability can be invented when results are not provided. Accept alternative feasible explanations and study plans when they fit the evidence and respect safety.

Evidence

Preserve the first independent response, the learner's original diagram or graph, and the explanation. Record neutral access supports separately from hints or answer-supplying cues. A copied teacher model is not evidence of independent understanding.

TEACHER MODEL

From data to a defensible claim

Fictional lake days show more ice-cream sales when boat rentals are higher. Draw temperature → ice-cream sales and temperature → boat rentals. This explains how association can arise without one sales count causing the other.

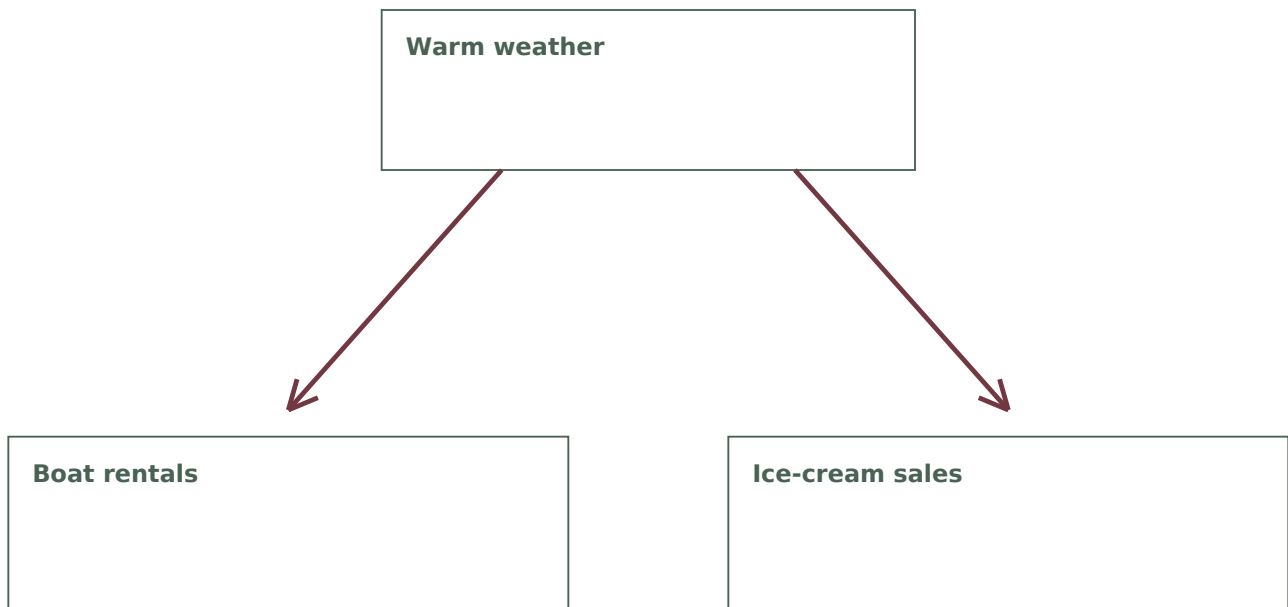
Contrast a controlled experiment: randomly assign identical test panels to two coatings, expose both groups equally, and measure peeling area using one procedure. Assignment supports causal comparison under those conditions, but finite-sample chance, measurement error and other settings still limit the conclusion. Random sampling targets representativeness; random assignment targets treatment comparability. Neither guarantees a result.

Ask: “What changed because of the researcher? What came first? Could another variable affect both? What evidence would distinguish explanations?” Have learners rewrite an overconfident causal headline into a bounded claim.

VISUAL ANCHOR

Two explanations for an association

Fictional lake-day observations. Arrows below are proposed influences; this diagram is an explanation to investigate, not proof.



A shared cause can make both quantities rise together. The observation does not require a direct causal arrow from boat rentals to ice-cream sales.

Experiment contrast: random assignment → coating group → peeling outcome. Equal exposure and a common measurement procedure strengthen the causal comparison. Random assignment does not ensure perfect balance, universal generalization or a nonzero effect.

REUSABLE ORGANIZER

Build an evidence chain

Variables, units, domain or study design

Representation / calculations / proposed causal diagram

Evidence supporting and challenging the claim

Conclusion, uncertainty and next evidence needed

WARM-UP

Teaching script and response plan

Core task O01. Optional bank: M01–M04; O01–O04. Select a few tasks; allow additional sessions for construction and technology.

Learning target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

Collect a first response. Ask learners to name the two variables and identify what the evidence can establish before calculating or debating the claim.

Ask: “What do the units or study design let you conclude? Which extra assumption does the stronger claim require?”

WARM-UP

001 • Core-task teacher solution

Explanatory variable as claimed: shade coverage; response: paint fading. This is observational, not a randomized experiment. The study supports a description of association, not an identified causal effect of changing shade coverage. No numerical effect size or uncertainty analysis is supplied. Proposed causal explanation diagram: bench age → shade coverage; bench age → paint fading. These arrows are proposed influences, not proven causal effects. Alternative explanation or limitation: Older benches may have longer weather exposure and may stand near older, larger trees. These are proposed explanations, not established causal findings. Follow-up: Use identically prepared, freshly painted bench-material test panels in a test rack. Randomly assign panels to two specified shade-cover levels, with multiple independently assigned panels per level. Keep panel material, paint batch, starting color, exposure period, and wetting schedule the same; randomize rack positions. Measure color change with the same instrument from baseline to a fixed date and compare average fading and its spread between groups. Generalization limit: This would concern the tested panels, paint, shade levels, weather, and observation period, not every existing park bench. The words "always" and "all" are unsupported; a large sample or a strong correlation would not by itself resolve the design limitations.

Evidence response: distinguish a wrong calculation from an unsupported interpretation. Revisit the relevant representation, then choose a fresh item from the bank. Suggested discussion: 10–20 minutes; adjust to evidence and access, never a fluency cutoff.

I DO

Teaching script and response plan

Core task O05. Optional bank: M05–M08; O05–O08. Select a few tasks; allow additional sessions for construction and technology.

Learning target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

Model the core task aloud using the exact data. Predict the form first, show each operation or causal arrow, and explain why the conclusion follows. Do not let learners copy a completed graph as independent evidence.

Ask: “What do the units or study design let you conclude? Which extra assumption does the stronger claim require?”

I DO

005 • Core-task teacher solution

Explanatory variable: storage temperature; response: remaining charge. This is a randomized experiment with the stated controls. Random assignment makes treatment groups comparable in expectation and supports a causal comparison under the tested conditions, but it does not guarantee perfect balance or eliminate measurement and implementation problems. The prompt supplies no sample size, group results, variability, or analysis, so it does not establish the direction, magnitude, or reliability of an effect. The claim that changing the treatment will always change every outcome is not supported. Proposed causal diagram: assigned storage temperature → remaining charge; storage duration and starting charge → remaining charge. Arrows describe possible influences, not effects proven by this prompt. Remaining limitation: Starting charge, battery age, chamber effects, and charge-measurement error may remain. Unsafe temperatures are not needed to test the design. Follow-up: Use batteries of the same model, age range, and starting charge. Randomly assign independent storage units or independently controlled slots to two manufacturer-approved temperatures, with multiple units per condition. Keep storage duration and charge-testing method the same. If multiple batteries share one chamber, account for chamber-level assignment rather than treating them as independent temperature replicates. Measure remaining usable charge by the same test and compare groups and variation. Generalization limit: Results apply to the battery models, safe temperature range, and storage duration tested. Random assignment is not random population sampling, and even a well-supported average effect need not occur for every specimen.

Evidence response: distinguish a wrong calculation from an unsupported interpretation. Revisit the relevant representation, then choose a fresh item from the bank. Suggested discussion: 10–20 minutes; adjust to evidence and access, never a fluency cutoff.

WE DO

Teaching script and response plan

Core task O09. Optional bank: M09–M13; O09–O13. Select a few tasks; allow additional sessions for construction and technology.

Learning target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

Ask learners to propose one step at a time. Have a second learner verify units, data pairing and the meaning of a sign or arrow. Invite a competing interpretation and test it against the prompt.

Ask: “What do the units or study design let you conclude? Which extra assumption does the stronger claim require?”

WE DO

009 • Core-task teacher solution

Explanatory variable: beam thickness; response: maximum supported load. This is a randomized experiment with the stated controls. Random assignment makes treatment groups comparable in expectation and supports a causal comparison under the tested conditions, but it does not guarantee perfect balance or eliminate measurement and implementation problems. The prompt supplies no sample size, group results, variability, or analysis, so it does not establish the direction, magnitude, or reliability of an effect. The claim that changing the treatment will always change every outcome is not supported. Proposed causal diagram: assigned beam thickness → maximum supported load; material and other dimensions → maximum supported load. Arrows describe possible influences, not effects proven by this prompt. Remaining limitation: Construction quality, material variation, and the load-test resolution can affect measurements even after randomization. Follow-up: Construct multiple small models, randomly assigning each model a specified thin or thick beam design. Keep material batch, span, joint construction, and other dimensions fixed. In a protected test setup, use the same load increments and predefined failure criterion for every model. Compare maximum supported loads and variability between thickness groups. Generalization limit: Findings concern these model dimensions, materials, and loading conditions and cannot automatically be transferred to full-size bridges. Random assignment is not random population sampling, and even a well-supported average effect need not occur for every specimen.

Evidence response: distinguish a wrong calculation from an unsupported interpretation. Revisit the relevant representation, then choose a fresh item from the bank. Suggested discussion: 10–20 minutes; adjust to evidence and access, never a fluency cutoff.

COLLABORATIVE PRACTICE

Teaching script and response plan

Core task O14. Optional bank: M14–M18; O14–O18. Select a few tasks; allow additional sessions for construction and technology.

Learning target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

Use reader, representer, checker and explainer roles. Each learner records an initial claim before the group compares evidence. Require each learner to produce a personal conclusion.

Ask: “What do the units or study design let you conclude? Which extra assumption does the stronger claim require?”

COLLABORATIVE PRACTICE

014 • Core-task teacher solution

Explanatory variable as claimed: number of restocking trips; response: number of empty spaces. This is observational, not a randomized experiment. The study supports a description of association, not an identified causal effect of changing number of restocking trips. No numerical effect size or uncertainty analysis is supplied. Proposed causal explanation diagram: earlier empty shelf spaces → restocking trips; continuing demand → earlier and later empty spaces. These arrows are proposed influences, not proven causal effects. Alternative explanation or limitation: Emptiness triggers restocking, while strong demand may keep emptying shelves. Therefore, more trips need not cause empty shelves. Follow-up: In a stockroom simulation using mock shelves, randomly assign independent shelf trials to a baseline restocking schedule or a schedule with extra trips. Use the same products, shelf capacity, initial inventory, removal schedule, and quantities delivered per trip. Count empty spaces at preset times over an identical trial period; compare average empty spaces and variation between schedules. Reset stock between trials. Generalization limit: This safely isolates the schedule contrast under the simulated demand pattern, but does not establish the same effect in every real shop or for every restocking policy. The words "always" and "all" are unsupported; a large sample or a strong correlation would not by itself resolve the design limitations.

Evidence response: distinguish a wrong calculation from an unsupported interpretation. Revisit the relevant representation, then choose a fresh item from the bank. Suggested discussion: 10–20 minutes; adjust to evidence and access, never a fluency cutoff.

INDEPENDENT PRACTICE

Teaching script and response plan

Core task O19. Optional bank: M19–M23; O19–O23. Select a few tasks; allow additional sessions for construction and technology.

Learning target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

Provide the complete task and neutral access supports. Preserve unaided work, technology records and explanations before discussion. Ask only neutral clarification questions.

Ask: “What do the units or study design let you conclude? Which extra assumption does the stronger claim require?”

INDEPENDENT PRACTICE

019 • Core-task teacher solution

Explanatory variable: tire pressure; response: rolling distance. This is a randomized experiment with the stated controls. Random assignment makes treatment groups comparable in expectation and supports a causal comparison under the tested conditions, but it does not guarantee perfect balance or eliminate measurement and implementation problems. The prompt supplies no sample size, group results, variability, or analysis, so it does not establish the direction, magnitude, or reliability of an effect. The claim that changing the treatment will always change every outcome is not supported. Proposed causal diagram: assigned tire pressure → rolling distance; starting energy and track conditions → rolling distance. Arrows describe possible influences, not effects proven by this prompt. Remaining limitation: Pressure-gauge error, track variation, and wheel differences may remain; repeated rolls of one wheel are not independent wheels. Follow-up: Randomly assign comparable test wheels to two manufacturer-approved pressures. Keep wheel design, load, track surface and slope, starting energy, and release method the same. Measure release-to-stop distance with the same rule and instrument; use multiple independently assigned wheels and report wheel-level group means and variation. Keep the test area clear. Generalization limit: Results concern these wheels, safe pressures, loads, and track conditions, not all vehicles or roads. Random assignment is not random population sampling, and even a well-supported average effect need not occur for every specimen.

Evidence response: distinguish a wrong calculation from an unsupported interpretation. Revisit the relevant representation, then choose a fresh item from the bank. Suggested discussion: 10–20 minutes; adjust to evidence and access, never a fluency cutoff.

SMALL-GROUP RETEACH

Teaching script and response plan

Core task O24. Optional bank: M24–M27; O24–O27. Select a few tasks; allow additional sessions for construction and technology.

Learning target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

Use prior evidence to identify the missing connection. Model one contrast, such as observed minus predicted versus its reverse, or association versus random assignment. Then check transfer on a fresh task.

Ask: “What do the units or study design let you conclude? Which extra assumption does the stronger claim require?”

SMALL-GROUP RETEACH

024 • Core-task teacher solution

Explanatory variable as claimed: number of umbrella rentals; response: ferry delays. This is observational, not a randomized experiment. The study supports a description of association, not an identified causal effect of changing number of umbrella rentals. No numerical effect size or uncertainty analysis is supplied. Proposed causal explanation diagram: rainy weather → umbrella-rental count; rainy weather → ferry delays. These arrows are proposed influences, not proven causal effects. Alternative explanation or limitation: Rain and related operating conditions can influence both demand for umbrellas and delays. The data do not show that umbrella rentals cause delays. Follow-up: Prospectively record aggregate umbrella rentals, departure delays under one fixed definition, scheduled departures, rainfall, wind, and relevant route conditions. Compare repeated harbor-days with similar weather, route schedules, and service hours, rather than assigning customer purchases or changing safety decisions. Standardize the delay comparison per scheduled departure as well as reporting counts, and use the same recording methods throughout. Generalization limit: Weather matching strengthens the observational comparison but cannot eliminate all unmeasured influences. Conclusions concern these routes, harbors, and observed weather ranges. The words "always" and "all" are unsupported; a large sample or a strong correlation would not by itself resolve the design limitations.

Evidence response: distinguish a wrong calculation from an unsupported interpretation. Revisit the relevant representation, then choose a fresh item from the bank. Suggested discussion: 10–20 minutes; adjust to evidence and access, never a fluency cutoff.

EXIT TICKET

Teaching script and response plan

Core task O28. Optional bank: M28–M30; O28–O30. Select a few tasks; allow additional sessions for construction and technology.

Learning target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

Collect a concise claim with mathematical or design evidence. Do not show a completed answer until responses are preserved; use the evidence to plan the next meeting.

Ask: “What do the units or study design let you conclude? Which extra assumption does the stronger claim require?”

EXIT TICKET

028 • Core-task teacher solution

Explanatory variable as claimed: number of cold-drink sales; response: sunscreen sales. This is observational, not a randomized experiment. The study supports a description of association, not an identified causal effect of changing number of cold-drink sales. No numerical effect size or uncertainty analysis is supplied. Proposed causal explanation diagram: hot sunny weather → cold-drink sales; hot sunny weather → sunscreen sales. These arrows are proposed influences, not proven causal effects. Alternative explanation or limitation: Weather can increase demand for both goods. Visitor levels, prices, promotions, and opening hours can also influence sales, so a direct sales-to-sales effect is not isolated. Follow-up: Record aggregate daily sales at the same stalls over time, with temperature, sunlight or cloud cover, rainfall, opening hours, and prices/promotions. Compare days at the same stall with similar weather and recorded conditions using identical counting windows. Examine whether the association persists after these comparisons. Do not attempt to assign customer purchase counts or collect identifying purchase records. Generalization limit: A residual association still need not be causal because not all influences are measured. Results are limited to these stalls, products, weather ranges, and season. The words "always" and "all" are unsupported; a large sample or a strong correlation would not by itself resolve the design limitations.

Evidence response: distinguish a wrong calculation from an unsupported interpretation. Revisit the relevant representation, then choose a fresh item from the bank. Suggested discussion: 10–20 minutes; adjust to evidence and access, never a fluency cutoff.

WARM-UP

M01 • Select and justify

Target: Distinguish an association from a causal conclusion.

A fictional study of park benches shows an association between shade coverage and paint fading; older benches tend to have more shade. Which conclusion is warranted?

- A. The association alone does not establish a causal effect.
- B. The association proves the first variable causes the second.
- C. A stronger correlation would automatically prove causation.
- D. The association proves neither variable is measured correctly.

Reasoning / evidence

WARM-UP

M02 • Select and justify

Target: Distinguish an association from a causal conclusion.

A fictional study of delivery routes shows an association between number of trucks and number of late parcels; routes carrying more parcels receive more trucks. Which competing condition is explicitly described in the setup?

- A. Parcel volume.
- B. The two variables were measured with different instruments.
- C. One group was measured at a different location.
- D. Objects in one group were stored longer before testing.

Reasoning / evidence

WARM-UP

001 • Construct and explain

Target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

A fictional study of park benches shows an association between shade coverage and paint fading; older benches tend to have more shade. An advertisement says, “Changing shade coverage will always change paint fading for all park benches.” Evaluate this claim. Identify the explanatory and response variables, classify the design, and state exactly what is supported. Draw a labeled causal explanation diagram (arrows mean a proposed influence, not proven causation). Give a plausible alternative explanation or remaining limitation. Design a feasible follow-up that would strengthen evidence; name what would be assigned or measured, the comparison, controls, and a limit on generalization. Avoid gathering personal information.

Proposed causal diagram: label variables and arrows

Bounded claim, alternative explanation, and follow-up design

WARM-UP

002 • Construct and explain

Target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

A fictional study of delivery routes shows an association between number of trucks and number of late parcels; routes carrying more parcels receive more trucks. An advertisement says, “Changing number of trucks will always change number of late parcels for all delivery routes.” Evaluate this claim. Identify the explanatory and response variables, classify the design, and state exactly what is supported. Draw a labeled causal explanation diagram (arrows mean a proposed influence, not proven causation). Give a plausible alternative explanation or remaining limitation. Design a feasible follow-up that would strengthen evidence; name what would be assigned or measured, the comparison, controls, and a limit on generalization. Avoid gathering personal information.

Proposed causal diagram: label variables and arrows

Bounded claim, alternative explanation, and follow-up design

WORKED TEACHER KEY

M01 • Reasoning and evidence

Target: Distinguish an association from a causal conclusion.

Answer: A. The association alone does not establish a causal effect.

The observational association does not distinguish a shade effect from a bench-age explanation.

A. Correct. The observational association does not distinguish a shade effect from a bench-age explanation.

B. Incorrect. Older benches may differ in both shade exposure and fading; association does not prove the proposed direction.

C. Incorrect. A strong association can still result from confounding or reverse causation.

D. Incorrect. No measurement-error evidence is given; association does not show either measurement is wrong.

WORKED TEACHER KEY

M02 • Reasoning and evidence

Target: Distinguish an association from a causal conclusion.

Answer: A. Parcel volume.

Parcel volume is the stated competing condition: routes carrying more parcels receive more trucks, and larger volume can also produce more late parcels. The other listed conditions are not described.

A. Correct. Routes carrying more parcels explicitly have greater parcel volume and receive more trucks.

B. Incorrect. Different measurement instruments are not described.

C. Incorrect. A difference in measurement location is not the competing condition described in this setup.

D. Incorrect. Storage duration is not mentioned and does not identify why busy routes receive more trucks.

WORKED TEACHER KEY

001 • Reasoning and evidence

Target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

Explanatory variable as claimed: shade coverage; response: paint fading. This is observational, not a randomized experiment. The study supports a description of association, not an identified causal effect of changing shade coverage. No numerical effect size or uncertainty analysis is supplied. Proposed causal explanation diagram: bench age → shade coverage; bench age → paint fading. These arrows are proposed influences, not proven causal effects. Alternative explanation or limitation: Older benches may have longer weather exposure and may stand near older, larger trees. These are proposed explanations, not established causal findings. Follow-up: Use identically prepared, freshly painted bench-material test panels in a test rack. Randomly assign panels to two specified shade-cover levels, with multiple independently assigned panels per level. Keep panel material, paint batch, starting color, exposure period, and wetting schedule the same; randomize rack positions. Measure color change with the same instrument from baseline to a fixed date and compare average fading and its spread between groups. Generalization limit: This would concern the tested panels, paint, shade levels, weather, and observation period, not every existing park bench. The words "always" and "all" are unsupported; a large sample or a strong correlation would not by itself resolve the design limitations.

Assess separately: representation, calculations or design logic, reasoning, and contextual interpretation. Accept valid alternative diagrams, explanations and equivalently precise computations.

WORKED TEACHER KEY

002 • Reasoning and evidence

Target: Distinguish an association from a causal conclusion.; Evaluate what random assignment and controls establish.; Propose alternative explanations and stronger study designs.

Explanatory variable as claimed: number of trucks; response: number of late parcels. This is observational, not a randomized experiment. The study supports a description of association, not an identified causal effect of changing number of trucks. No numerical effect size or uncertainty analysis is supplied. Proposed causal explanation diagram: parcel volume → number of trucks; parcel volume → number of late parcels. These arrows are proposed influences, not proven causal effects. Alternative explanation or limitation: High-volume routes may receive more trucks and still have more late parcels. Raw late-parcel counts also depend on how many parcels are sent. Follow-up: With a delivery operator's approval, use route-days for which both the normal allocation and one extra truck satisfy all service and safety requirements. Within groups of similar baseline parcel volume, distance, and delivery windows, randomly assign normal allocation or one extra truck. Keep dispatch rules and the definition of late the same. Measure aggregate late and total parcel counts over the same period; compare late proportions and comparable-volume counts across assignments. Do not collect customer names or addresses. Generalization limit: Results would concern the participating routes, demand levels, allocation contrast, and period; they would not guarantee a change on every route. The words "always" and "all" are unsupported; a large sample or a strong correlation would not by itself resolve the design limitations.

Assess separately: representation, calculations or design logic, reasoning, and contextual interpretation. Accept valid alternative diagrams, explanations and equivalently precise computations.