

TEACHER AND STUDENT RESOURCE

Explain probability in everyday situations



NC Math 2 • NC.M2.S-CP.5

Conditional Probability and the Rules for Probability

Seven instructional sections with 30 multiple-choice and 30 open or performance tasks, teaching scripts, original mathematical visuals, generous workspaces, and worked keys.

Free sample | Contents

NC.M2.S-CP.5 | NC Math 2 mathematics

This sample contains 22 complete selected pages from the 123-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-16, 31-32, 61-62, 91-92

Representative activities

M01: sample PDF page(s) 17; original page(s) 16

M02: sample PDF page(s) 17; original page(s) 16

O01: sample PDF page(s) 18; original page(s) 31

O02: sample PDF page(s) 19; original page(s) 32

Selected teacher prompts and keys: original page(s) 61-62, 91-92

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

Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.

T1 Recognize and explain conditional probability by naming the known group and the event of interest.

T2 Explain independence as unchanged likelihood in everyday situations and justified random models.

T3 Communicate conditional and independence claims without reversing groups or claiming unsupported causation.

Each item names its own target. The bank supports multiple sessions; do not assign all 60 tasks in one sitting.

NAVIGATION

Choose evidence deliberately

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, M03, M05, M08, M10, M13, M16, M20, M23, M26, M29, O01, O03, O05, O08, O10, O13, O16, O20, O23, O26, O29

T2: M02, M04, M06, M09, M11, M12, M15, M17, M19, M22, M25, M28, M30, O02, O04, O06, O09, O11, O12, O15, O17, O19, O22, O25, O28, O30

T3: M07, M14, M18, M21, M24, M27, O07, O14, O18, O21, O24, O27

DAILY LEARNING TARGETS

A multi-session teaching path

Session 1 Identify and represent

Learning target: Recognize and explain conditional probability by naming the known group and the event of interest.

Learning target: Explain independence as unchanged likelihood in everyday situations and justified random models.

Use Warm-up, I Do, and early We Do tasks. Ask for a first response before showing the model.

Session 2 Explain and connect

Learning target: Explain independence as unchanged likelihood in everyday situations and justified random models.

Learning target: Communicate conditional and independence claims without reversing groups or claiming unsupported causation.

Use We Do and collaborative tasks. Compare approaches and justify each step with the original conditions.

Session 3 Transfer independently

Learning target: Recognize and explain conditional probability by naming the known group and the event of interest.

Learning target: Explain independence as unchanged likelihood in everyday situations and justified random models.

Learning target: Communicate conditional and independence claims without reversing groups or claiming unsupported causation.

Select independent items spanning the targets, reteach an evidenced gap, and use an unrehearsed exit item.

PLANNING

Materials, access and pacing

Materials

Pencils, erasers, straightedge, student pages, and optional graph paper. A calculator may support arithmetic after a learner states the intended relationship. No device or paid software is required.

Prerequisites

Understand simple fractions and percentages, sets of outcomes, and the distinction between a whole group and a subgroup. Read everyday comparisons carefully.

Pacing

Use a short diagnostic warm-up, a model and shared task in one session; collaborative and independent reasoning in later sessions; then targeted reteaching and an exit task. Select two to four tasks at a time based on evidence. Each section's full bank is reusable, not mandatory in one lesson.

Neutral access

Read directions aloud without interpreting the graph, enlarge a page, supply a writing or pointing response method, and allow a learner to dictate an explanation. Keep axes, units, data and mathematical demand unchanged.

Separate instruction from evidence

Keep the learner's first response. Record answer-supplying cues separately from access supports. A completed teacher graph or worked key is for discussion after independent work, never a student construction template.

Review convention

Contexts and data are fictional. Use the stated random model; do not assume every real-world pair is independent. Given that describes known information, not necessarily a causal action or an earlier time. Independent does not mean disjoint, equally likely, physically separated or guaranteed to balance in a small sample.

TEACHER MODEL

Say out of whom before saying how likely

A library has 100 books, 20 new, 30 fiction and 12 both new and fiction. Explain fiction given new and new given fiction to a reader without probability notation.

	Fiction	Nonfiction	Total
New	12	8	20
Older	18	62	80
Total	30	70	100

Fictional complete records for the group described; choose one record uniformly.

Say: Among the 20 new books, 12 are fiction, so 60% of new books are fiction. Now change the group: among the 30 fiction books, 12 are new, so 40% of fiction books are new. The same overlap appears in both statements, but the reference group changes. Neither percentage alone says that being new causes a book to be fiction.

VISUAL ANCHOR

Same experiment different information

A fair coin and a fair die are randomized independently. Each row of the grid is equally likely before the die result is revealed.

	Die 1	Die 2	Die 3	Die 4	Die 5	Die 6
Heads	H1	H2	H3	H4	H5	H6
Tails	T1	T2	T3	T4	T5	T6

Each of the twelve individual cells is equally likely under this independent fair model.

Before any die information, 6 of 12 outcomes show heads. Given any single die result, 1 of the 2 remaining outcomes shows heads. The chance remains $\frac{1}{2}$, which is the meaning of independence here.

REUSABLE REASONING GUIDE

Represent, justify, interpret

Name: _____ Date: _____

Sample space, events and known information**Representation and calculation****Justification or check****Conclusion in context**

WARM-UP

Teaching script

Core: 001 • T1: Recognize and explain conditional probability by naming the known group and the event of interest.

Optional bank: M01–M04; O01–O04. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 5–8 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O01, including its visual when present. Ask “Out of whom?” before any number. Have learners underline the words after given or among and restate the question without symbols.

Core task

Translate $P(\text{brings lunch} \mid \text{rides bus}) = 0.60$ into an everyday sentence. Name the reference group and explain one statement it does not imply.

Teacher solution and discussion

Among bus riders, 60% bring lunch. The reference group is bus riders. It does not imply 60% of lunch-bringers ride buses, nor that 60% of all students do both; those use different denominators.

Evidence and response

Listen for a named reference group and a clear event in every explanation. Require a before/after probability comparison to justify independence. Accept everyday wording without symbols when its meaning is exact; separately note reversals, causal claims and sample-generalization errors.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M01 to compare all alternatives after evidence is collected.

I DO

Teaching script

Core: 005 • T1: Recognize and explain conditional probability by naming the known group and the event of interest.

Optional bank: M05–M08; O05–O08. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 10–12 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O05, including its visual when present. Model two conditionals sharing one overlap. Change the visible reference group and speak the complete sentence each time. Do not imply that the group label causes the outcome.

Core task

Create an everyday conditional-probability question that begins Among and has no numbers. Rewrite it with given that, identify the event and condition, and contrast it with a joint-probability question.

Teacher solution and discussion

Example: Among library visitors, what fraction borrow a book? Given that a person is a library visitor, what is the chance they borrow a book? Event=borrowing; condition=visiting. A joint question asks what fraction of all people both visit the library and borrow, retaining a larger reference group.

Evidence and response

Listen for a named reference group and a clear event in every explanation. Require a before/after probability comparison to justify independence. Accept everyday wording without symbols when its meaning is exact; separately note reversals, causal claims and sample-generalization errors.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M05 to compare all alternatives after evidence is collected.

WE DO

Teaching script

Core: 009 • T2: Explain independence as unchanged likelihood in everyday situations and justified random models.

Optional bank: M09–M13; O09–O13. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 10–15 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O09, including its visual when present. Contrast independent physical models with changing-pool procedures. Ask learners to explain what information changes and what remains possible.

Core task

Explain the difference between disjoint and independent using one ordinary event pair for each. Include enough detail to justify your choices rather than merely naming unrelated activities.

Teacher solution and discussion

Disjoint example: one card drawn from a standard deck is a heart or a club; it cannot be both. These positive-probability events are not independent because knowing heart makes club impossible. Independent example: heads on a fair coin and an even result on an independently randomized fair die; knowing one leaves the other's chance unchanged.

Evidence and response

Listen for a named reference group and a clear event in every explanation. Require a before/after probability comparison to justify independence. Accept everyday wording without symbols when its meaning is exact; separately note reversals, causal claims and sample-generalization errors.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M09 to compare all alternatives after evidence is collected.

COLLABORATIVE PRACTICE

Teaching script

Core: O14 • T3: Communicate conditional and independence claims without reversing groups or claiming unsupported causation.

Optional bank: M14–M18; O14–O18. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 15–20 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O14, including its visual when present. Assign explainer, reference-group checker, counterexample finder and scope checker. Revise an ambiguous claim together, retaining the exact data.

Core task

A club of 10 chess players has 9 magazine readers; 90 other people read the magazine. Explain the original and reversed percentages to a reader who confuses them. Use a simple diagram or count organizer.

Teacher solution and discussion

Chess-reader overlap is 9; chess-only is 1; reader-only is 90. Thus $9/10=90\%$ of chess players read the magazine, but $9/99=1/11\approx 9.1\%$ of readers play chess. The common nine people occupy very different shares of the two groups.

Evidence and response

Listen for a named reference group and a clear event in every explanation. Require a before/after probability comparison to justify independence. Accept everyday wording without symbols when its meaning is exact; separately note reversals, causal claims and sample-generalization errors.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M14 to compare all alternatives after evidence is collected.

INDEPENDENT PRACTICE

Teaching script

Core: O19 • T2: Explain independence as unchanged likelihood in everyday situations and justified random models.

Optional bank: M19–M23; O19–O23. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 15–20 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O19, including its visual when present. Collect a written or dictated explanation before prompting. A correct percentage without its reference group is incomplete evidence.

Core task

A fair six-sided die is rolled. Let A be even and B be a multiple of 3. Explain whether learning B changes the chance of A, using outcome lists and everyday language.

Teacher solution and discussion

$A = \{2, 4, 6\}$, so the original chance is $3/6 = 1/2$. Given B, possible outcomes are $\{3, 6\}$; one is even, so the chance is $1/2$. Thus learning that the result is a multiple of 3 does not change the even chance; these events are independent.

Evidence and response

Listen for a named reference group and a clear event in every explanation. Require a before/after probability comparison to justify independence. Accept everyday wording without symbols when its meaning is exact; separately note reversals, causal claims and sample-generalization errors.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M19 to compare all alternatives after evidence is collected.

SMALL-GROUP RETEACH

Teaching script

Core: O24 • T3: Communicate conditional and independence claims without reversing groups or claiming unsupported causation.

Optional bank: M24–M27; O24–O27. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 10–15 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O24, including its visual when present. Use ordinary objects or a small outcome grid. Compare known-group, all-group and reversed-group questions; then transfer to an unfamiliar context.

Core task

A late parcel makes you consider a storm at its shipping location more likely. Explain conditional probability without suggesting the delivery outcome changes past weather. Give another example where later information changes an estimate of an earlier event.

Teacher solution and discussion

Late arrival is information used to restrict or reweight possible shipping circumstances; it does not alter the earlier weather. Another example: seeing a wet coat makes prior exposure to rain more likely, though the observation does not cause the rain. Both distinguish updated knowledge from physical causation.

Evidence and response

Listen for a named reference group and a clear event in every explanation. Require a before/after probability comparison to justify independence. Accept everyday wording without symbols when its meaning is exact; separately note reversals, causal claims and sample-generalization errors.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M24 to compare all alternatives after evidence is collected.

EXIT TICKET

Teaching script

Core: O28 • T2: Explain independence as unchanged likelihood in everyday situations and justified random models.

Optional bank: M28–M30; O28–O30. Select tasks across more than one meeting if needed.

Suggested discussion/work time: 5–8 minutes. Adjust for access and evidence; this is not a speed criterion.

Display student page O28, including its visual when present. Ask for a short explanation, a comparison and a limitation. Use a fresh situation to check meaning rather than memorized phrases.

Core task

Design two drawing procedures using the same bag of 2 red and 2 blue tiles: one with independent color results and one with dependent results. Explain the next-red chance after a known red first under each.

Teacher solution and discussion

Independent: replace the tile and mix independently before a uniform next draw; next-red chance stays $2/4=1/2$. Dependent: do not replace; after red first, 1 red remains among 3 tiles, so chance $1/3$. The original bag is the same; the between-draw procedure changes the model.

Evidence and response

Listen for a named reference group and a clear event in every explanation. Require a before/after probability comparison to justify independence. Accept everyday wording without symbols when its meaning is exact; separately note reversals, causal claims and sample-generalization errors.

Closure: Ask learners to state one feature they verified and one check they used. Use the worked key for M28 to compare all alternatives after evidence is collected.

MULTIPLE-CHOICE BANK

M01 / M02 • Select and justify**M01 | Warm-up | T1**

What does the chance that a visitor buys a snack, given that the visitor stays after noon mean?

- A. The chance of staying after noon among snack buyers
- B. The chance of buying no snack before noon
- C. The snack-buying chance among visitors who stay after noon
- D. The chance that a visitor both stays after noon and buys a snack

Reasoning: _____

M02 | Warm-up | T2

A fair coin is tossed independently of a fair die roll. You learn that the die shows 6. What happens to the chance of heads?

- A. It becomes 1.
- B. It becomes $\frac{1}{6}$.
- C. It becomes 0.
- D. It stays $\frac{1}{2}$.

Reasoning: _____

WARM-UP

001 • Show your reasoning

T1: Recognize and explain conditional probability by naming the known group and the event of interest.

Translate $P(\text{brings lunch} \mid \text{rides bus}) = 0.60$ into an everyday sentence. Name the reference group and explain one statement it does not imply.

Representation / calculation

Explanation / check

WARM-UP

002 • Show your reasoning

T2: Explain independence as unchanged likelihood in everyday situations and justified random models.

A fair coin toss and an independently spun fair three-color spinner with equal sectors are recorded. List the possible ordered outcomes and explain in everyday language why learning the spinner color does not change the chance of heads.

Representation / calculation

Explanation / check

WORKED TEACHER KEYS

M01

M01 • T1: Recognize and explain conditional probability by naming the known group and the event of interest.

Answer: C. The snack-buying chance among visitors who stay after noon

Given that narrows the reference group to visitors who stay after noon; within that group, ask about buying a snack.

Check each alternative

- A. This reverses the condition and outcome.
- B. This changes both the requested outcome and the condition.
- C. Given that narrows the reference group to visitors who stay after noon; within that group, ask about buying a snack.
- D. This asks about both events among all visitors rather than restricting the group.

Evidence to assess

Require the after-noon reference group and snack outcome.

WORKED TEACHER KEYS

M02

M02 • T2: Explain independence as unchanged likelihood in everyday situations and justified random models.

Answer: D. It stays $\frac{1}{2}$.

Under the stated independent model, learning the die result gives no information that changes the coin-head probability.

Check each alternative

- A. A 6 on the die does not guarantee heads.
- B. $\frac{1}{6}$ is the chance of the die result, not of heads.
- C. A 6 on the die does not rule out heads.
- D. Under the stated independent model, learning the die result gives no information that changes the coin-head probability.

Evidence to assess

Require unchanged coin probability tied to the stated model.

WORKED TEACHER KEYS

001**001 • T1: Recognize and explain conditional probability by naming the known group and the event of interest.**

Among bus riders, 60% bring lunch. The reference group is bus riders. It does not imply 60% of lunch-bringers ride buses, nor that 60% of all students do both; those use different denominators.

Evidence to assess

Item evidence: correct sentence; bus reference group; valid nonimplication; denominator explanation. Award one point per named requirement, up to 4. Accept other logically valid everyday examples and wording.

WORKED TEACHER KEYS

002

002 • T2: Explain independence as unchanged likelihood in everyday situations and justified random models.

With colors R, G, B, outcomes are HR, HG, HB, TR, TG, TB, each equally likely. Within any known color there are two outcomes, one head and one tail. Thus the head chance remains 1/2, just as before the color was known.

	Red	Green	Blue
Heads	HR	HG	HB
Tails	TR	TG	TB

Each cell represents one outcome.

Evidence to assess

Item evidence: six-outcome space; equal-likelihood assumption; one-of-two conditional reasoning; unchanged 1/2 explanation. Award one point per named requirement, up to 4. Accept other logically valid everyday examples and wording.