

TEACHER AND STUDENT RESOURCE

Describe events and sample spaces



NC Math 2 • NC.M2.S-CP.1

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.1 | NC Math 2 mathematics

This sample contains 22 complete selected pages from the 124-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-16, 32-33, 62-63, 92-93

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) 32

O02: sample PDF page(s) 19; original page(s) 33

Selected teacher prompts and keys: original page(s) 62-63, 92-93

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

Describe events as subsets of the outcomes in a sample space using characteristics of the outcomes or as unions, intersections and complements of other events.

T1 Describe a sample space and define events by outcome characteristics.

T2 Represent and compare unions, intersections, containment and event differences.

T3 Use complements relative to a sample space and justify compound event descriptions.

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, M02, M05, M17, M18, M19, M25, M29, O01, O02, O05, O17, O18, O19, O25, O29

T2: M03, M06, M07, M09, M11, M12, M16, M20, M21, M26, M30, O03, O06, O07, O09, O12, O16, O20, O21, O26, O30

T3: M04, M08, M10, M13, M14, M15, M22, M23, M24, M27, M28, O04, O08, O10, O11, O13, O14, O15, O22, O23, O24, O27, O28

DAILY LEARNING TARGETS

A multi-session teaching path

Session 1 Identify and represent

Learning target: Describe a sample space and define events by outcome characteristics.

Learning target: Represent and compare unions, intersections, containment and event differences.

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: Represent and compare unions, intersections, containment and event differences.

Learning target: Use complements relative to a sample space and justify compound event descriptions.

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

Session 3 Transfer independently

Learning target: Describe a sample space and define events by outcome characteristics.

Learning target: Represent and compare unions, intersections, containment and event differences.

Learning target: Use complements relative to a sample space and justify compound event descriptions.

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

Read sets, ordered pairs and inequalities; identify simple number characteristics. No probability formula is required.

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.

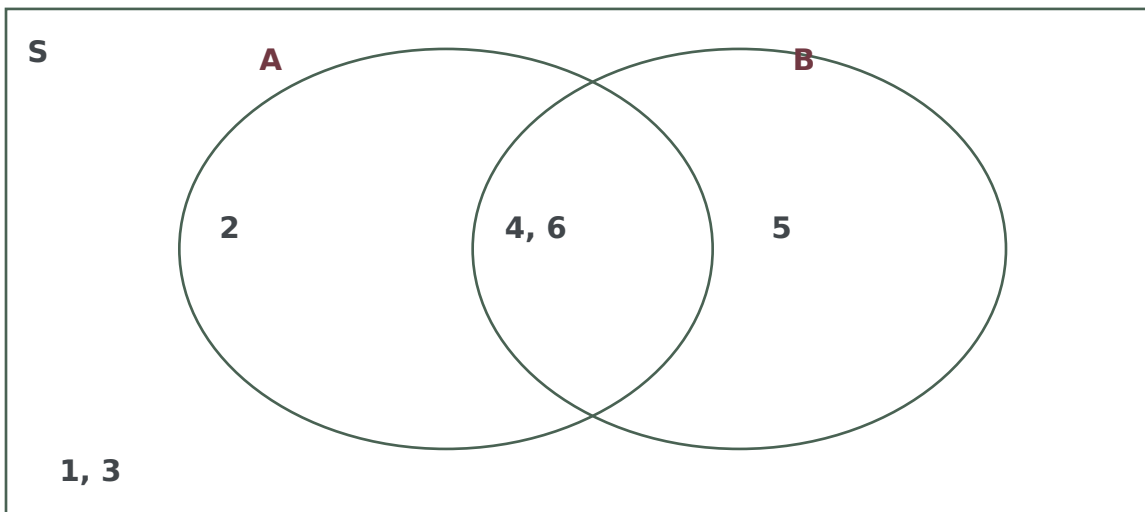
Review convention

An event is a subset of a specified sample space. Or means inclusive or unless exactly one is stated. S is nonempty; $\emptyset$ denotes the empty event. A^c means complement within S ; $A \setminus B$ means in A but not B . Listing outcomes does not itself prove they are equally likely.

TEACHER MODEL

From an outcome list to four event regions

$S = \{1, 2, 3, 4, 5, 6\}$. Let A be even and B be greater than 3. Organize all outcomes and describe union, intersection and neither.



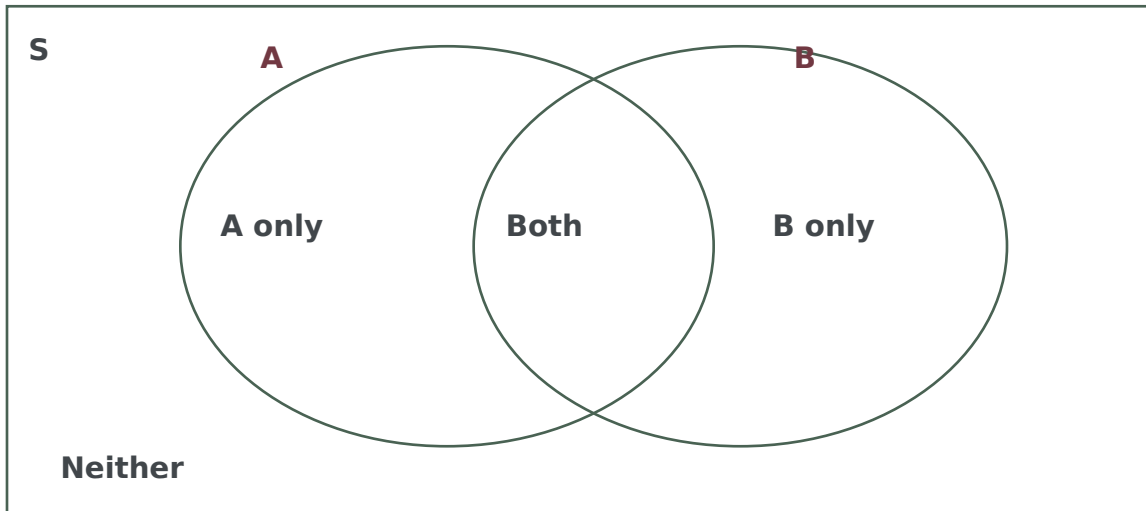
Regions are schematic; circle size does not encode probability.

Say: I first name the universe, because a complement depends on it. $A = \{2, 4, 6\}$; $B = \{4, 5, 6\}$. A -only is $\{2\}$, both is $\{4, 6\}$, B -only is $\{5\}$, neither is $\{1, 3\}$. $A \cup B = \{2, 4, 5, 6\}$; $A \cap B = \{4, 6\}$; $(A \cup B)^c = \{1, 3\}$. Check that each of the six outcomes appears exactly once in the four regions.

VISUAL ANCHOR

Read the four regions

Every outcome belongs to exactly one membership category, even when A and B overlap.



Regions are schematic; circle size does not encode probability.

$A \cup B$ contains the three inside regions. $A \cap B$ contains only Both. A^c includes B only and Neither. $(A \cup B)^c$ includes only Neither. This organizer records membership, not equally likely areas.

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: Describe a sample space and define events by outcome characteristics.

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 learners to distinguish an outcome from an event. Keep the recorded outcome format fixed. Ask, “Which characteristic selects this subset?”

Core task

A bag contains four distinct tiles labeled R1, R2, B1 and B2. One tile is drawn. List S, the event of a red tile, and the event of a tile labeled 2. Explain why a tile can belong to both events.

Teacher solution and discussion

$S = \{R1, R2, B1, B2\}$; $R = \{R1, R2\}$; $N = \{R2, B2\}$. R2 belongs to both because it is red and carries the number 2. Outcomes are tile identities, not just colors.

Evidence and response

Ask learners to name a witness for each claimed membership and a counterexample to an incorrect claim. Distinguish a set-definition error from a notation error; use an unrehearsed event with different characteristics after reteaching.

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: Describe a sample space and define events by outcome characteristics.

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 systematic enumeration before classification. Say, “I will list each ordered result once, then test the characteristic on every result.” Leave student tables blank until a first attempt.

Core task

Two distinguishable spinners each show 1, 2 or 3. Construct all nine ordered outcomes. Define E as an even sum and list E. Explain why (1, 2) and (2, 1) are different outcomes.

Teacher solution and discussion

$S = \{(1, 1), (1, 2), (1, 3), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3)\}$. $E = \{(1, 1), (1, 3), (2, 2), (3, 1), (3, 3)\}$ because their sums are 2, 4, 4, 4, 6. Ordered coordinates specify different spinner results, so swapping unequal coordinates changes the outcome.

Evidence and response

Ask learners to name a witness for each claimed membership and a counterexample to an incorrect claim. Distinguish a set-definition error from a notation error; use an unrehearsed event with different characteristics after reteaching.

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: Represent and compare unions, intersections, containment and event differences.

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. Build four disjoint regions together. Ask whether an outcome satisfies both characteristics, one, or neither; verify the region counts sum to the size of S .

Core task

A shelf has 10 distinct books. Four are mysteries only, two are hardcovers only, three are both, and one is neither. Draw a Venn diagram with region counts. Determine the counts in mystery, hardcover, and their union.

Teacher solution and discussion

The regions are 4, 3, 2, 1. Mystery has $4+3=7$; hardcover has $2+3=5$; the union has $4+3+2=9$. The shared three are members of both events but counted once in the union.

Evidence and response

Ask learners to name a witness for each claimed membership and a counterexample to an incorrect claim. Distinguish a set-definition error from a notation error; use an unrehearsed event with different characteristics after reteaching.

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: Use complements relative to a sample space and justify compound event descriptions.

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 enumerator, membership checker, counterexample finder and explainer. Require private predictions first. Compare sets, not just their sizes.

Core task

Use $S = \{1, 2, 3, 4, 5, 6\}$, $A = \{1, 2, 3\}$ and $B = \{3, 4, 5\}$. Compute $(A \cup B)^c$ and $A^c \cap B^c$ separately. Then explain why the equality should hold for any two events.

Teacher solution and discussion

$A \cup B = \{1, 2, 3, 4, 5\}$, so its complement is $\{6\}$. $A^c = \{4, 5, 6\}$ and $B^c = \{1, 2, 6\}$; their intersection is $\{6\}$. In general, being outside the union means being in neither event, which is being outside A and outside B.

Evidence and response

Ask learners to name a witness for each claimed membership and a counterexample to an incorrect claim. Distinguish a set-definition error from a notation error; use an unrehearsed event with different characteristics after reteaching.

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 • T1: Describe a sample space and define events by outcome characteristics.

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 an unaided event construction and a justification. Do not supply a completed Venn region or resolve inclusive versus exclusive or for the learner.

Core task

A learner writes $S = \{\text{red, blue}\}$ for a uniformly random draw from distinct tiles $R1, R2, B1$, with each tile equally likely, and concludes there are only two equally likely outcomes. Explain what information the color-only space loses. Give a tile-identity sample space and the red event.

Teacher solution and discussion

The physical equally likely outcomes are the three tiles: $S = \{R1, R2, B1\}$; $\text{red} = \{R1, R2\}$. A color-only sample space can describe observed colors, but its two outcomes are not equally likely under an equally likely tile draw. It hides the two red identities.

Evidence and response

Ask learners to name a witness for each claimed membership and a counterexample to an incorrect claim. Distinguish a set-definition error from a notation error; use an unrehearsed event with different characteristics after reteaching.

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: Use complements relative to a sample space and justify compound event descriptions.

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 one boundary or overlap counterexample to expose the error. Rebuild the event from the stated universe, then change the characteristic for a fresh check.

Core task

$S = \{1, 2, 3, 4, 5, 6, 7, 8\}$. A learner says the complement of at least 5 is at most 5. Repair the statement, list both correct events, and use one outcome to diagnose the error.

Teacher solution and discussion

$A = \{5, 6, 7, 8\}$; $A^c = \{1, 2, 3, 4\}$, described as below 5 or at most 4 for integer outcomes. The proposed complement includes 5, which is already in A , violating disjointness.

Evidence and response

Ask learners to name a witness for each claimed membership and a counterexample to an incorrect claim. Distinguish a set-definition error from a notation error; use an unrehearsed event with different characteristics after reteaching.

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 • T3: Use complements relative to a sample space and justify compound event descriptions.

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 both a set expression and an explanation of membership. Use a contrasting outcome to test whether the meaning, not just notation, transfers.

Core task

A means a device has a charged battery; B means it has a network connection. Express charged with no connection, not charged or no connection, and neither charged nor connected using set operations. Give a situation that distinguishes the last two.

Teacher solution and discussion

Charged with no connection is $A \cap B^c$. Not charged or no connection is $A^c \cup B^c = (A \cap B)^c$. Neither is $A^c \cap B^c$. A charged but disconnected device is in the second event but not the third.

Evidence and response

Ask learners to name a witness for each claimed membership and a counterexample to an incorrect claim. Distinguish a set-definition error from a notation error; use an unrehearsed event with different characteristics after reteaching.

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**

A six-sided die has outcome set $S=\{1, 2, 3, 4, 5, 6\}$. Let P mean the result is prime. Which set is P?

- A. $\{3, 5\}$
- B. $\{1, 2, 3, 5\}$
- C. $\{2, 3, 5\}$
- D. $\{2, 4, 6\}$

Reasoning: _____

M02 | Warm-up | T1

Two coins are tossed in order. H means heads and T means tails. Which is the complete ordered sample space?

- A. $\{HH, HT, TH, TT\}$
- B. $\{H, T\}$
- C. $\{HH, HT, TT\}$
- D. $\{HH, TT\}$

Reasoning: _____

WARM-UP

001 • Show your reasoning

T1: Describe a sample space and define events by outcome characteristics.

A bag contains four distinct tiles labeled R1, R2, B1 and B2. One tile is drawn. List S, the event of a red tile, and the event of a tile labeled 2. Explain why a tile can belong to both events.

Representation / calculation

Explanation / check

WARM-UP

002 • Show your reasoning

T1: Describe a sample space and define events by outcome characteristics.

A coin is tossed and then a spinner selects 1, 2 or 3. Construct the ordered sample space with a table or tree. List the event of tails with a number greater than 1.

	1	2	3
Heads			
Tails			

Fill each cell with one ordered outcome.

Representation / calculation

Explanation / check

WORKED TEACHER KEYS

M01**M01 • T1: Describe a sample space and define events by outcome characteristics.****Answer: C. {2, 3, 5}**

A prime has exactly two positive divisors. The prime outcomes are 2, 3 and 5; 1 is not prime.

Check each alternative

- A. This omits the prime outcome 2.
- B. 1 has only one positive divisor and is not prime.
- C. A prime has exactly two positive divisors. The prime outcomes are 2, 3 and 5; 1 is not prime.
- D. These are even outcomes; 4 and 6 are not prime.

Evidence to assess

Require all three prime outcomes and an explanation for excluding 1.

WORKED TEACHER KEYS

M02**M02 • T1: Describe a sample space and define events by outcome characteristics.****Answer: A. {HH, HT, TH, TT}**

Each of the two positions can be H or T, so there are four ordered outcomes. HT and TH describe different first tosses.

Check each alternative

- A. Each of the two positions can be H or T, so there are four ordered outcomes. HT and TH describe different first tosses.
- B. These are single-toss outcomes, not two-toss outcomes.
- C. This merges HT and TH even though order is recorded.
- D. This omits both outcomes with one head.

Evidence to assess

Require four outcomes with first and second toss distinguished.

WORKED TEACHER KEYS

001**001 • T1: Describe a sample space and define events by outcome characteristics.**

$S = \{R1, R2, B1, B2\}$; $R = \{R1, R2\}$; $N = \{R2, B2\}$. R2 belongs to both because it is red and carries the number 2. Outcomes are tile identities, not just colors.

Evidence to assess

Item evidence: four-outcome S; correct red event; correct number-2 event; overlap explanation. Award one point for each named requirement, up to 4. Accept equivalent sets or justified representations.

WORKED TEACHER KEYS

002

002 • T1: Describe a sample space and define events by outcome characteristics.

$S=\{H1, H2, H3, T1, T2, T3\}$. A two-row, three-column grid or six-leaf tree records all outcomes once. Tails with number greater than 1 is $\{T2, T3\}$.

	1	2	3
Heads	H1	H2	H3
Tails	T1	T2	T3

Each cell represents one outcome.

Evidence to assess

Item evidence: six distinct ordered outcomes; systematic representation; event $\{T2, T3\}$; explanation of both restrictions. Award one point for each named requirement, up to 4. Accept equivalent sets or justified representations.