

TEACHER AND STUDENT RESOURCE

Count the overlap once



NC Math 2 • NC.M2.S-CP.7

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.7 | NC Math 2 mathematics

This sample contains 23 complete selected pages from the 125-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-17, 33-34, 63-64, 93-94

Representative activities

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

M02: sample PDF page(s) 18; original page(s) 17

O01: sample PDF page(s) 19; original page(s) 33

O02: sample PDF page(s) 20; original page(s) 34

Selected teacher prompts and keys: original page(s) 63-64, 93-94

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

Apply the Addition Rule, $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$, and interpret the answer in context.

T1 Apply and rearrange the Addition Rule using counts, fractions, decimals and visual representations.

T2 Interpret inclusive union probabilities in context and distinguish both, exactly one and neither.

T3 Justify the overlap correction, test feasibility and compare or construct models with specified coverage.

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, M03, M04, M05, M06, M09, M12, M16, M22, M23, M24, M28, O01, O05, O07, O13, O14, O20, O26, O27, O29

T2: M07, M11, M17, M19, M25, M30, O02, O06, O09, O15, O17, O18, O23, O24, O30

T3: M08, M10, M13, M14, M15, M18, M20, M21, M26, M27, M29, O03, O04, O08, O10, O11, O12, O16, O19, O21, O22, O25, O28

DAILY LEARNING TARGETS

A multi-session teaching path

Session 1 Identify and represent

Learning target: Apply and rearrange the Addition Rule using counts, fractions, decimals and visual representations.

Learning target: Interpret inclusive union probabilities in context and distinguish both, exactly one and neither.

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: Interpret inclusive union probabilities in context and distinguish both, exactly one and neither.

Learning target: Justify the overlap correction, test feasibility and compare or construct models with specified coverage.

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

Session 3 Transfer independently

Learning target: Apply and rearrange the Addition Rule using counts, fractions, decimals and visual representations.

Learning target: Interpret inclusive union probabilities in context and distinguish both, exactly one and neither.

Learning target: Justify the overlap correction, test feasibility and compare or construct models with specified coverage.

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

Use fractions and percentages, set membership, two-way tables and complements. Distinguish a count of memberships from a count of distinct people or outcomes.

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.

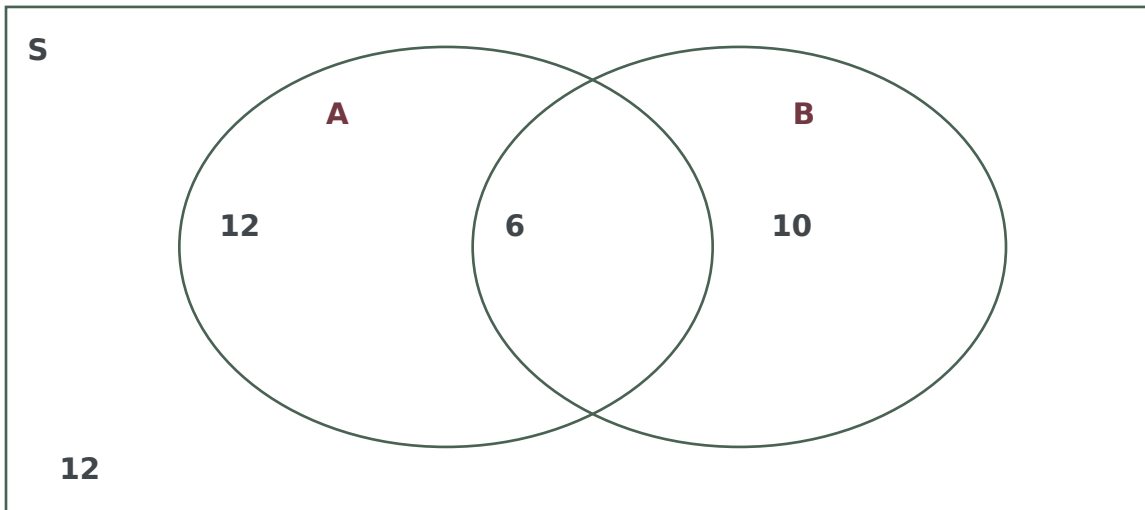
Review convention

All count-based probability models select individual outcomes uniformly. Or means inclusive or unless the prompt explicitly says exactly one or but not both. A standard deck has 52 cards, 13 per suit, 26 red and 26 black, and four cards of each rank. The Addition Rule requires events defined in one probability model, but does not require independence.

TEACHER MODEL

One shared group two initial counts

A 40-record uniform group contains 18 A records, 16 B records and 6 shared records. Find the chance of A or B.



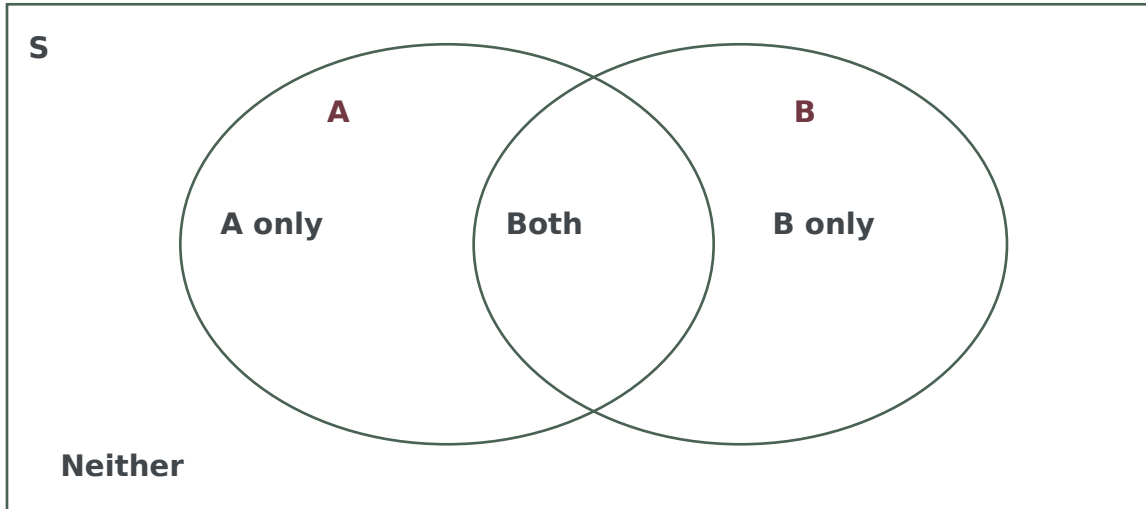
Region labels count equally likely individual outcomes; circle areas are schematic.

The marginals count the shared 6 twice: $18+16=34$ memberships. Subtract the duplicate 6 once to get 28 distinct included records. Thus $P(A \text{ or } B) = 18/40 + 16/40 - 6/40 = 28/40 = 7/10$. The shared records stay inside the inclusive union; they are not removed entirely.

VISUAL ANCHOR

Three inside regions one union

Each outcome belongs to exactly one of four membership regions. The union contains A-only, both and B-only.



A and B count their shared region twice; A or B counts it once.

Using region counts x for A-only, y for both and z for B-only, the two marginal counts are $x+y$ and $y+z$. Their sum is $x+2y+z$. Subtract y to obtain $x+y+z$, the count in the union. Divide by the common total for the probability rule.

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: Apply and rearrange the Addition Rule using counts, fractions, decimals and visual representations.

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 whether the word or permits both. Sort outcomes into four regions before calculating. Point to the shared region and ask how often it appears in the two marginal counts.

Core task

Choose an integer uniformly from 1 through 12. Find the chance it is divisible by 2 or 3 by listing the sets and applying the Addition Rule. Draw the four Venn region counts as a check.

Teacher solution and discussion

$A = \{2, 4, 6, 8, 10, 12\}$, $B = \{3, 6, 9, 12\}$, $\text{overlap} = \{6, 12\}$. The union is $\{2, 3, 4, 6, 8, 9, 10, 12\}$, so $(6+4-2)/12 = 8/12 = 2/3$. Region counts are A-only 4, both 2, B-only 2, neither 4.

Evidence and response

Assess the reference population, both event counts, the actual overlap and a sentence interpreting the union. Construction tasks must preserve the specified margins and use nonnegative region counts summing to the full population. Treat a calculation above 1 as a signal to inspect data or assumptions, not to round the answer down.

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: Apply and rearrange the Addition Rule using counts, fractions, decimals and visual representations.

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 the addition as a membership count, not a distinct-person count. Cross out only one duplicate copy of the overlap. Contrast union with intersection and exactly one.

Core task

A card is drawn uniformly from a standard 52-card deck. Find black or ace, then contrast it with black and ace. Identify the shared cards explicitly.

Teacher solution and discussion

There are 26 black cards and 4 aces. The overlap is the ace of clubs and ace of spades, 2 cards. The union count is $26 + 4 - 2 = 28$, giving $28/52 = 7/13$. The intersection is $2/52 = 1/26$. Or includes all black cards plus the two red aces; and includes only the two black aces.

Evidence and response

Assess the reference population, both event counts, the actual overlap and a sentence interpreting the union. Construction tasks must preserve the specified margins and use nonnegative region counts summing to the full population. Treat a calculation above 1 as a signal to inspect data or assumptions, not to round the answer down.

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: O09 • T2: Interpret inclusive union probabilities in context and distinguish both, exactly one and neither.

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. Move between tables, diagrams and lists. Require the same probability from a three-region sum and from the Addition Rule. Check the result lies between the larger marginal and 1.

Core task

Use the table to find A or B, neither, and exactly one. Interpret each fraction and check that exactly one plus both equals the union.

Teacher solution and discussion

A or B has $8+12+4=24$ of 40 records, or $3/5$. Neither is $16/40=2/5$. Exactly one is $(12+4)/40=2/5$. Both is $8/40=1/5$, and $2/5+1/5=3/5$. These respectively mean at least one, none, only one, and both properties.

Evidence and response

Assess the reference population, both event counts, the actual overlap and a sentence interpreting the union. Construction tasks must preserve the specified margins and use nonnegative region counts summing to the full population. Treat a calculation above 1 as a signal to inspect data or assumptions, not to round the answer down.

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 • T1: Apply and rearrange the Addition Rule using counts, fractions, decimals and visual representations.

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 a model constructor, overlap auditor, feasibility checker and context interpreter. Compare models with the same marginal rates but different duplicated coverage.

Core task

A numbered ticket 1–100 is chosen uniformly. Find the chance its number is a multiple of 4 or 10. List the shared multiples and show the four Venn region counts.

Teacher solution and discussion

There are 25 multiples of 4 and 10 multiples of 10. Shared multiples are 20, 40, 60, 80, 100, five numbers. The union count is $25 + 10 - 5 = 30$, so its probability is $30/100 = 3/10$. The regions are 20, 5, 5, 70.

Evidence and response

Assess the reference population, both event counts, the actual overlap and a sentence interpreting the union. Construction tasks must preserve the specified margins and use nonnegative region counts summing to the full population. Treat a calculation above 1 as a signal to inspect data or assumptions, not to round the answer down.

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 • T3: Justify the overlap correction, test feasibility and compare or construct models with specified coverage.

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 complete solution before hinting. Use policies, incomplete records and model comparisons to assess whether students know what information is actually needed.

Core task

Use the Addition Rule to explain why A or not A has probability 1. State the overlap and show why this result agrees with the meaning of a complement. Include an example with $P(A)=0.37$.

Teacher solution and discussion

An outcome cannot be in A and not A , so their overlap has probability 0. Since $P(\text{not } A)=1-P(A)$, the union is $P(A)+[1-P(A)]-0=1$. Numerically $0.37+0.63-0=1$. Every outcome belongs to one of the two complementary groups.

Evidence and response

Assess the reference population, both event counts, the actual overlap and a sentence interpreting the union. Construction tasks must preserve the specified margins and use nonnegative region counts summing to the full population. Treat a calculation above 1 as a signal to inspect data or assumptions, not to round the answer down.

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 • T2: Interpret inclusive union probabilities in context and distinguish both, exactly one and neither.

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 labeled cards or names to make duplicates visible. Contrast disjoint, contained and identical events, then return to the general rule rather than memorizing special cases.

Core task

A 60-person group has 30 readers of newsletter A, 25 of B and 10 of both. One question asks for A or B; another asks for A or B but not both. Calculate both probabilities and write sentences distinguishing them.

Teacher solution and discussion

The inclusive union has $30+25-10=45$ people, giving $45/60=3/4$. The exclusive event has $30+25-2(10)=35$, giving $35/60=7/12$. Three quarters read at least one newsletter; seven twelfths read exactly one. The ten shared readers belong only to the inclusive count.

Evidence and response

Assess the reference population, both event counts, the actual overlap and a sentence interpreting the union. Construction tasks must preserve the specified margins and use nonnegative region counts summing to the full population. Treat a calculation above 1 as a signal to inspect data or assumptions, not to round the answer down.

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: Justify the overlap correction, test feasibility and compare or construct models with specified coverage.

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 an equation, a valid model and a plain-language interpretation. Include a limit on what the result predicts about future random samples.

Core task

For $P(A)=0.35$, $P(B)=0.45$ and $P(A \text{ and } B)=0.15$, find the union and neither probability. Then explain why $P(A \text{ or } B)=1-P(\text{not } A \text{ and not } B)$ by reasoning about membership, not only by subtracting numbers.

Teacher solution and discussion

The union is $0.35+0.45-0.15=0.65$ and neither is 0.35. An outcome fails A or B exactly when it is outside A and outside B simultaneously. Thus the union and not A-and-not-B are complementary events whose probabilities sum to 1.

Evidence and response

Assess the reference population, both event counts, the actual overlap and a sentence interpreting the union. Construction tasks must preserve the specified margins and use nonnegative region counts summing to the full population. Treat a calculation above 1 as a signal to inspect data or assumptions, not to round the answer down.

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 • Select and justify**M01 | Warm-up | T1** **$P(A)=0.40$, $P(B)=0.30$ and $P(A \text{ and } B)=0.10$. Find $P(A \text{ or } B)$.**

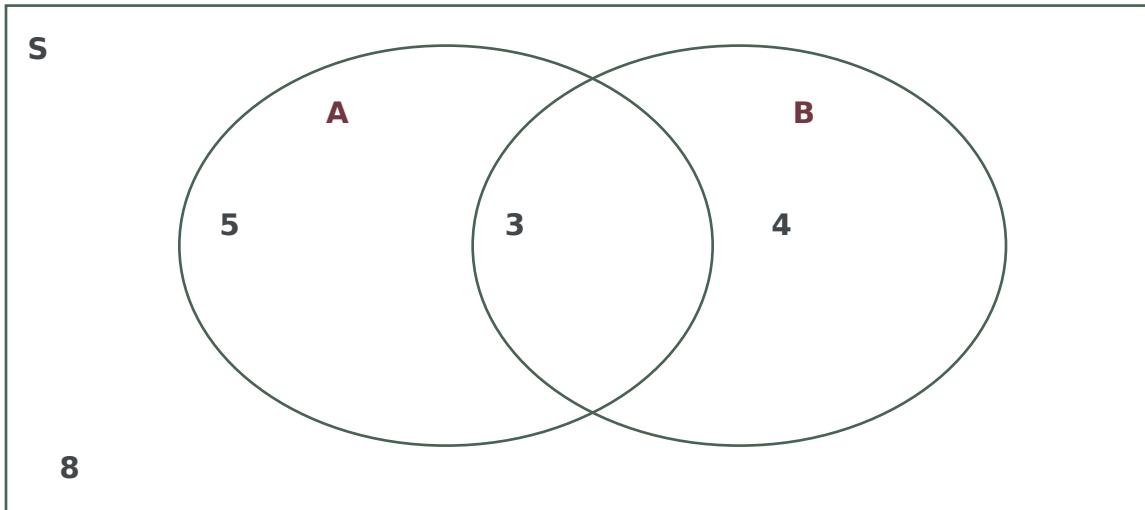
- A. 0.12
- B. 0.70
- C. 0.60
- D. 0.50

Reasoning: _____

MULTIPLE-CHOICE BANK

M02 • Select and justify

M02 | Warm-up | T1

Find the chance of A or B from the uniform population in the diagram.

Region labels count equally likely individual outcomes; circle areas are schematic.

- A. $\frac{2}{5}$
- B. $\frac{3}{5}$
- C. $\frac{3}{20}$
- D. $\frac{3}{4}$

Reasoning: _____

WARM-UP

001 • Show your reasoning

T1: Apply and rearrange the Addition Rule using counts, fractions, decimals and visual representations.

Choose an integer uniformly from 1 through 12. Find the chance it is divisible by 2 or 3 by listing the sets and applying the Addition Rule. Draw the four Venn region counts as a check.

Representation / calculation

Explanation / check

WARM-UP

002 • Show your reasoning

T2: Interpret inclusive union probabilities in context and distinguish both, exactly one and neither.

In a 40-person survey, 18 selected art, 16 selected music and 7 selected both. Each person could select either, both or neither. Construct a Venn count diagram, find the probability of art or music for a uniform selection, and interpret it.

Representation / calculation

Explanation / check

WORKED TEACHER KEYS

M01

M01 • T1: Apply and rearrange the Addition Rule using counts, fractions, decimals and visual representations.

Answer: C. 0.60

Apply the Addition Rule: $0.40 + 0.30 - 0.10 = 0.60$. The overlap is removed once because adding the marginals counts it twice.

Check each alternative

- A. 0.12 multiplies marginals rather than finding the union.
- B. 0.70 omits the overlap correction.
- C. Apply the Addition Rule: $0.40 + 0.30 - 0.10 = 0.60$. The overlap is removed once because adding the marginals counts it twice.
- D. 0.50 subtracts the overlap twice and counts exactly one event.

Evidence to assess

Require the correct substitution and one overlap subtraction.

WORKED TEACHER KEYS

M02

M02 • T1: Apply and rearrange the Addition Rule using counts, fractions, decimals and visual representations.

Answer: B. $\frac{3}{5}$

A or B contains $5+3+4=12$ of 20 outcomes, so $\frac{12}{20}=\frac{3}{5}$.

Check each alternative

A. $\frac{2}{5}=\frac{8}{20}$ counts neither event.

B. A or B contains $5+3+4=12$ of 20 outcomes, so $\frac{12}{20}=\frac{3}{5}$.

C. $\frac{3}{20}$ counts only the shared region.

D. $\frac{3}{4}$ would use a denominator of 16, not all 20 outcomes.

Evidence to assess

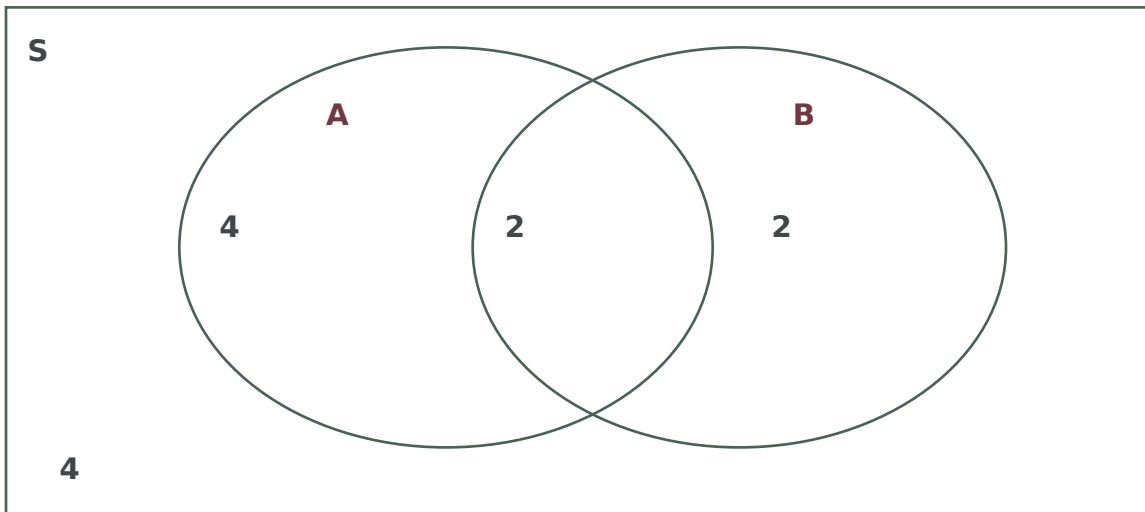
Require all three inside regions counted once.

WORKED TEACHER KEYS

001

001 • T1: Apply and rearrange the Addition Rule using counts, fractions, decimals and visual representations.

$A = \{2, 4, 6, 8, 10, 12\}$, $B = \{3, 6, 9, 12\}$, $\text{overlap} = \{6, 12\}$. The union is $\{2, 3, 4, 6, 8, 9, 10, 12\}$, so $(6+4-2)/12 = 8/12 = 2/3$. Region counts are A-only 4, both 2, B-only 2, neither 4.



Region labels count equally likely individual outcomes; circle areas are schematic.

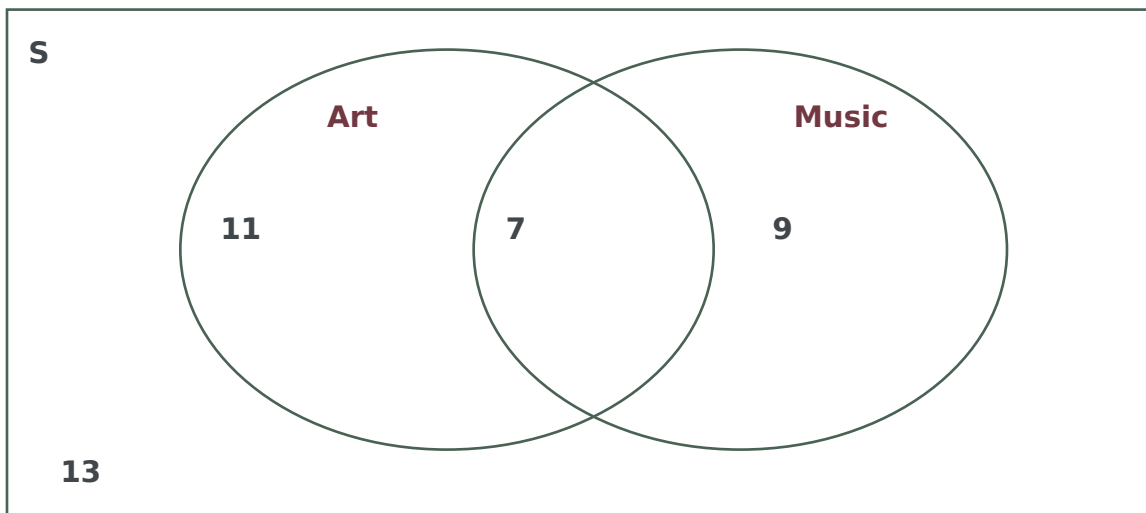
Evidence to assess

Item evidence: two sets and overlap; eight-member union; $2/3$ rule calculation; complete Venn check. Award one point per named requirement, up to 4; accept equivalent fractions and valid alternative constructions.

WORKED TEACHER KEYS

002**002 • T2: Interpret inclusive union probabilities in context and distinguish both, exactly one and neither.**

Art-only = $18 - 7 = 11$; both = 7; music-only = $16 - 7 = 9$; neither = $40 - (11 + 7 + 9) = 13$. The union has $18 + 16 - 7 = 27$ people, giving $27/40$. A uniformly selected respondent has a $27/40$ chance of having selected at least one of the two options.



Respondents may belong to both event groups, but each is counted once in their union.

Evidence to assess

Item evidence: four region counts; 27 union count; $27/40$; inclusive interpretation. Award one point per named requirement, up to 4; accept equivalent fractions and valid alternative constructions.