

Layers, Products and Sums



Grade 5 | NC.5.MD.5

Teacher scripts • Original visual models
30 choice + 30 open/performance tasks
Student organizers • Worked keys • Evidence record

Current NC standards for 2026-27 and 2027-28. Use selected tasks across several sessions; the bank is not a single test.

Free sample | Contents

NC.5.MD.5 | Fifth Grade mathematics

This sample contains 18 complete selected pages from the 91-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-14, 29-30, 59, 74

Representative activities

M01: sample PDF page(s) 15; original page(s) 14

M02: sample PDF page(s) 15; original page(s) 14

O01: sample PDF page(s) 16; original page(s) 29

O02: sample PDF page(s) 17; original page(s) 30

Selected teacher prompts and keys: original page(s) 59, 74

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.

TEACHER GUIDE

Standard and targets

Relate volume to the operations of multiplication and addition.

- Find the volume of a rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths.
- Build understanding of the volume formula for rectangular prisms with whole-number edge lengths in the context of solving problems.
- Find volume of solid figures with one-digit dimensions composed of two non-overlapping rectangular prisms.

I can...

- Pack a whole-number prism and connect the cube count to $\text{length} \times \text{width} \times \text{height}$.
- Use $V = l \times w \times h$ and $V = B \times h$ in a problem, with cubic units.
- Add volumes of two non-overlapping prisms with one-digit dimensions.

Essential question: How do the properties of a model justify its measurement or classification? Mathematical practices: MP2 connects quantities and symbols; MP3 explains and critiques; MP5 selects tools; MP7 uses structure.

TEACHER GUIDE

Plan and coverage

Use four sessions of about 25-35 minutes: 1, warm-up and I Do; 2, We Do and collaborative practice; 3, independent work; 4, reteach and exit. Select one choice and one open task per section initially; save remaining tasks for spaced practice or individual conferences.

Seven sections allocate the bank as follows. Task targets and worked solutions are printed in the teacher keys. Actual construction and classification evidence cannot be inferred from choice items.

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

Navigation: guide and model -> seven scripts -> choice bank -> open/performance bank -> teacher keys -> scoring and evidence -> sources. Print only selected student pages and keep worked references out of view for independent checks.

TEACHER GUIDE

Materials and access

Prerequisites: count equal groups; distinguish length and area; multiply whole numbers; recognize a cube and a rectangular prism.

Materials: pencil, supplied grid organizer, and up to 60 identical classroom cubes for construction. Use actual centimeter cubes when available; otherwise name your improvised block-cube unit. Feet/inch contexts may be represented by models; do not claim the model is full size. Adults handle cutting.

Neutral read-aloud, enlarged pages, AAC, signing, dictated explanations and breaks are access supports. Record them separately. Do not score handwriting, accent or reading skill.

Answer-supplying cues include announcing a layer subtotal or formula step, naming a category, drawing a completed hierarchy or marking a defining property for the learner. Record the original response before giving such instruction.

Vocabulary: solid, cube, unit cube, cubic unit, volume, layer, base area, prism, length, width, height, non-overlap.

Observe each learner individually before partner comparison. N/O means inaccessible, unobserved or insufficient evidence, not an incorrect response. No fixed speed cutoffs or official mastery claims are used.

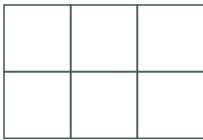
All figures are original and illustrative. Printed lengths are not intended for ruler measurement; use stated dimensions/properties. For construction, students verify their own lengths and angles.

WORKED TEACHER MODEL

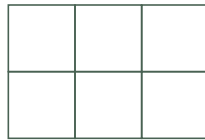
Model the structure

A prism has 3 cubes along its length, 2 along its width and 2 layers in height. Each cube has 1-centimeter edges.

Layer 1



Layer 2



These are top views of separate layers. Restack them without gaps. Every square represents the top of one cube, including cubes hidden after stacking.

Count: $6 + 6 = 12$ cubes. Volume = 12 cubic centimeters.

One cube occupies 1 cubic centimeter, not 1 square centimeter. Turning the prism changes the view, not its volume.

Multiply: $V = l \times w \times h = 3 \times 2 \times 2 = 12 \text{ cm}^3$.

The base area is $B = 3 \times 2 = 6 \text{ cm}^2$, so $V = B \times h$.

Join another $2 \times 2 \times 1$ prism without overlap:

$12 + 4 = 16 \text{ cm}^3$. Add component volumes, not edges.

TEACHER GUIDE

Warm-up script

Core selection: M01 and O01. Optional bank: through M04/O04. Adjust time to evidence, not speed.

1-3 minutes | Launch

Build equal layers of cubes. Ask: "What stays the same in each layer?" Count rows and cubes per row before introducing a volume formula.

4-8 minutes | Model or elicit

During I Do, use the worked example and demonstrate the complete solution. During We Do, pause for each next step. For independent and exit tasks, keep the explanation neutral. Use the open task first when collecting performance evidence.

3-6 minutes | Examine

Listen for: Pack and count unit cubes, multiply all three edge lengths, and explain why the count and product agree. Ask: "What in your model proves that? How can you check it another way?" Do not supply a category or subtotal.

2-4 minutes | Respond

After documenting the first response, revisit the model or organizer. A visible-face count needs separated layers; a unit error needs comparison of an edge, a square face and a cube.

1-3 minutes | Close

Ask for a different example and an explanation of what stays true. Record the exact response, access support, any mathematical cue and a fresh item for a later check. Early finishers invent a valid challenge and explain why their key is unique.

TEACHER GUIDE

I Do script

Core selection: M05 and O05. Optional bank: through M08/O08. Adjust time to evidence, not speed.

1-3 minutes | Launch

Pack a 3-by-2-by-2 prism with centimeter cubes. Say: " 3×2 gives 6 cubes in a layer; two layers make $6 \times 2 = 12$ cubic centimeters. So $V = l \times w \times h$." Connect each factor to an edge.

4-8 minutes | Model or elicit

During I Do, use the worked example and demonstrate the complete solution. During We Do, pause for each next step. For independent and exit tasks, keep the explanation neutral. Use the open task first when collecting performance evidence.

3-6 minutes | Examine

Listen for: Add volumes of two non-overlapping prisms with one-digit dimensions. Ask: "What in your model proves that? How can you check it another way?" Do not supply a category or subtotal.

2-4 minutes | Respond

After documenting the first response, revisit the model or organizer. A visible-face count needs separated layers; a unit error needs comparison of an edge, a square face and a cube.

1-3 minutes | Close

Ask for a different example and an explanation of what stays true. Record the exact response, access support, any mathematical cue and a fresh item for a later check. Early finishers invent a valid challenge and explain why their key is unique.

TEACHER GUIDE

We Do script

Core selection: M09 and O09. Optional bank: through M13/O13. Adjust time to evidence, not speed.

1-3 minutes | Launch

Draw two prisms, $3 \times 2 \times 2$ and $2 \times 2 \times 1$, joined side by side. Ask for each volume, then the total: $12 + 4 = 16$ cubic centimeters. A touching face does not contain shared cubes.

4-8 minutes | Model or elicit

During I Do, use the worked example and demonstrate the complete solution. During We Do, pause for each next step. For independent and exit tasks, keep the explanation neutral. Use the open task first when collecting performance evidence.

3-6 minutes | Examine

Listen for: Add volumes of two non-overlapping prisms with one-digit dimensions. Ask: "What in your model proves that? How can you check it another way?" Do not supply a category or subtotal.

2-4 minutes | Respond

After documenting the first response, revisit the model or organizer. A visible-face count needs separated layers; a unit error needs comparison of an edge, a square face and a cube.

1-3 minutes | Close

Ask for a different example and an explanation of what stays true. Record the exact response, access support, any mathematical cue and a fresh item for a later check. Early finishers invent a valid challenge and explain why their key is unique.

TEACHER GUIDE

Collaborative practice script

Core selection: M14 and O14. Optional bank: through M18/O18. Adjust time to evidence, not speed.

1-3 minutes | Launch

Partners build a joined solid and agree where one prism ends and the other begins. Each independently labels all dimensions and computes the two volumes before comparing sums.

4-8 minutes | Model or elicit

During I Do, use the worked example and demonstrate the complete solution. During We Do, pause for each next step. For independent and exit tasks, keep the explanation neutral. Use the open task first when collecting performance evidence.

3-6 minutes | Examine

Listen for: Add volumes of two non-overlapping prisms with one-digit dimensions. Ask: "What in your model proves that? How can you check it another way?" Do not supply a category or subtotal.

2-4 minutes | Respond

After documenting the first response, revisit the model or organizer. A visible-face count needs separated layers; a unit error needs comparison of an edge, a square face and a cube.

1-3 minutes | Close

Ask for a different example and an explanation of what stays true. Record the exact response, access support, any mathematical cue and a fresh item for a later check. Early finishers invent a valid challenge and explain why their key is unique.

TEACHER GUIDE

Independent practice script

Core selection: M19 and O19. Optional bank: through M23/O23. Adjust time to evidence, not speed.

1-3 minutes | Launch

Collect a labeled model, equation and cubic-unit answer. In packing tasks, separately observe the independent cube count, three-edge product and explanation of their equality. On a composite task require an explicit non-overlap explanation; multiplying the bounding box dimensions may include empty space.

4-8 minutes | Model or elicit

During I Do, use the worked example and demonstrate the complete solution. During We Do, pause for each next step. For independent and exit tasks, keep the explanation neutral. Use the open task first when collecting performance evidence.

3-6 minutes | Examine

Listen for: Add volumes of two non-overlapping prisms with one-digit dimensions. Ask: "What in your model proves that? How can you check it another way?" Do not supply a category or subtotal.

2-4 minutes | Respond

After documenting the first response, revisit the model or organizer. A visible-face count needs separated layers; a unit error needs comparison of an edge, a square face and a cube.

1-3 minutes | Close

Ask for a different example and an explanation of what stays true. Record the exact response, access support, any mathematical cue and a fresh item for a later check. Early finishers invent a valid challenge and explain why their key is unique.

TEACHER GUIDE

Small-group reteach script

Core selection: M24 and O24. Optional bank: through M27/O27. Adjust time to evidence, not speed.

1-3 minutes | Launch

If a learner adds three edge lengths, return to a single layer and count rows. If using square units, stack a second layer. If multiplying all six component dimensions, separate the two prisms and calculate each first.

4-8 minutes | Model or elicit

During I Do, use the worked example and demonstrate the complete solution. During We Do, pause for each next step. For independent and exit tasks, keep the explanation neutral. Use the open task first when collecting performance evidence.

3-6 minutes | Examine

Listen for: Add volumes of two non-overlapping prisms with one-digit dimensions. Ask: "What in your model proves that? How can you check it another way?" Do not supply a category or subtotal.

2-4 minutes | Respond

After documenting the first response, revisit the model or organizer. A visible-face count needs separated layers; a unit error needs comparison of an edge, a square face and a cube.

1-3 minutes | Close

Ask for a different example and an explanation of what stays true. Record the exact response, access support, any mathematical cue and a fresh item for a later check. Early finishers invent a valid challenge and explain why their key is unique.

TEACHER GUIDE

Exit ticket script

Core selection: M28 and O28. Optional bank: through M30/O30. Adjust time to evidence, not speed.

1-3 minutes | Launch

Ask for a new prism or joined-solid solution. Have the learner explain what each factor and addition sign represents; record computation separately from the model connection.

4-8 minutes | Model or elicit

During I Do, use the worked example and demonstrate the complete solution. During We Do, pause for each next step. For independent and exit tasks, keep the explanation neutral. Use the open task first when collecting performance evidence.

3-6 minutes | Examine

Listen for: Use $V = l \times w \times h$ and $V = B \times h$ in a problem, with cubic units. Ask: "What in your model proves that? How can you check it another way?" Do not supply a category or subtotal.

2-4 minutes | Respond

After documenting the first response, revisit the model or organizer. A visible-face count needs separated layers; a unit error needs comparison of an edge, a square face and a cube.

1-3 minutes | Close

Ask for a different example and an explanation of what stays true. Record the exact response, access support, any mathematical cue and a fresh item for a later check. Early finishers invent a valid challenge and explain why their key is unique.

STUDENT BANK

Choice practice 1-2

M01 A joined solid joins prism A ($2 \times 2 \times 3$ cm) and prism B ($1 \times 2 \times 1$ cm). They stand side by side and touch along a face, with NO overlapping volume. What is the total volume?

- A. 5
- B. 11
- C. 14
- D. 3

M02 A joined solid joins prism A ($4 \times 3 \times 3$ cm) and prism B ($3 \times 3 \times 3$ cm). They stand side by side and touch along a face, with NO overlapping volume. What is the total volume?

- A. 60
- B. 52
- C. 63
- D. 36

STUDENT PERFORMANCE

001 | Warm-up

Every cube has edges of 1 identical block edge. The solid has 2 full layers of 4 by 2 cubes. What is its volume? Show a labeled layer drawing and explain your unit. Physically build this prism with identical cubes. Show every layer to a partner, then count independently. Explain how you included hidden cubes. Record your independent cube count. Then multiply the three edge lengths and explain why that product equals your cube count.

Layer 1



Layer 2



Each square is the top of ONE cube. Layers are separated here; stack without gaps or overlaps.

Your layer drawing / construction record / equation

Answer with unit / explanation / check

STUDENT PERFORMANCE

002 | Warm-up

Every cube has edges of 1 identical block edge. The solid has 3 full layers of 4 by 2 cubes. What is its volume? Show a labeled layer drawing, a count or equation, and explain your unit.

Layer 1

Layer 2

Layer 3

Each square is the top of ONE cube. Layers are separated here; stack without gaps or overlaps.

Your layer drawing / construction record / equation

Answer with unit / explanation / check

TEACHER ONLY

M worked keys 1-2

M01: C. 14

Target: Add volumes of two non-overlapping prisms with one-digit dimensions.

Volume A = $2 \times 2 \times 3 = 12$. Volume B = $1 \times 2 \times 1 = 2$. Add the non-overlapping interiors: $12 + 2 = 14$ cubic centimeters. A shared boundary face has no volume, so no cubes are subtracted.

Distractor checks: 5: Differs from the required cube count by 9; recount equal layers and apply the stated change. A counting or arithmetic slip is possible, not proven. 11: Differs from the required cube count by 3; recount equal layers and apply the stated change. A counting or arithmetic slip is possible, not proven. 3: Differs from the required cube count by 11; recount equal layers and apply the stated change. A counting or arithmetic slip is possible, not proven. Ask for reasoning before assigning a misconception.

M02: C. 63

Target: Add volumes of two non-overlapping prisms with one-digit dimensions.

Volume A = $4 \times 3 \times 3 = 36$. Volume B = $3 \times 3 \times 3 = 27$. Add the non-overlapping interiors: $36 + 27 = 63$ cubic centimeters. A shared boundary face has no volume, so no cubes are subtracted. The heights match, so the joined solid has a flat top and is one larger rectangular prism; no step should be drawn.

Distractor checks: 60: Differs from the required cube count by 3; recount equal layers and apply the stated change. A counting or arithmetic slip is possible, not proven. 52: Differs from the required cube count by 11; recount equal layers and apply the stated change. A counting or arithmetic slip is possible, not proven. 36: Counts the unchanged full prism, ignoring the requested comparison/removal/component. Ask for reasoning before assigning a misconception.

TEACHER ONLY

O worked keys 1-2

001: 16

Target: Pack and count unit cubes, multiply all three edge lengths, and explain why the count and product agree.

Each layer has $4 \times 2 = 8$ cubes. Count $8 + 8 = 16$ cubes: 16 block-cube units. The packing matches $V = 4 \times 2 \times 2 = 16$; base area 8 square units $\times$ height 2 units gives 16 cubic units. Observe the actual construction: equal cubes, full layers, no gaps or overlaps; do not replace this evidence with the written answer. Required separate evidence: independently count the packed cubes; multiply the three edge lengths; explain that length times width counts one layer and height counts equal layers, so both methods count every cube once.

Accept equivalent correct drawings, equations and explanations. For construction tasks, record the observed build separately; a correct written answer alone does not establish the performance.

002: 24

Target: Use $V = l \times w \times h$ and $V = B \times h$ in a problem, with cubic units.

Each layer has $4 \times 2 = 8$ cubes. Count $8 + 8 + 8 = 24$ cubes: 24 block-cube units. The packing matches $V = 4 \times 2 \times 3 = 24$; base area 8 square units $\times$ height 3 units gives 24 cubic units.

Accept equivalent correct drawings, equations and explanations. For construction tasks, record the observed build separately; a correct written answer alone does not establish the performance.