

TEACHER + STUDENT RESOURCE

Grade 6 | The Number System

Prime factors and useful relationships



NC.6.NS.4

Current North Carolina Standard Course of Study

Aligned for 2026-27 and 2027-28; 2026-adopted standards start in 2028-29.

Seven instructional sections • 30 multiple-choice tasks • 30 open / performance tasks •
Worked visual and algorithm keys • Reusable organizers and evidence records

Choose a short core across several sessions. This resource bank is not a 60-item test or a
timed-fluency requirement.

Free sample | Contents

NC.6.NS.4 | Sixth Grade mathematics

This sample contains 19 complete selected pages from the 107-page resource, plus this sample contents page. Original printed page numbers are retained. Gaps are intentional.

Included original pages: 1-14, 29-30, 59, 74-75

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, 74-75

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

Plan the learning

Navigation: exact standard and targets follow on page 3, access and prerequisites on page 4, then worked teaching models and seven lesson scripts. Student organizers come next, followed by the 30-item choice bank and the 30-item open/performance bank.

Teacher-only worked keys, evidence records, and source notes complete the packet. Each page is labelled by its function.

A flexible 4-session core

Session 1: warm-up and I Do, about 20 minutes. Session 2: We Do and collaborative practice, about 25 minutes. Session 3: independent work and a responsive small group, about 25 minutes. Session 4: exit conference and transfer, about 15 minutes. Adjust time and item selection to observed needs; these are planning estimates, not student speed cutoffs.

Each section offers M and O item ranges of 4 / 4 / 5 / 5 / 5 / 4 / 3. Begin with the selected pair in its script. Use the remaining items for later practice, alternate examples, or conferences. A coached response is not an independent assessment sample.

Materials: pencils, plain paper, ruler for organizing work, and optional full paper strips. All essential blank organizers and model examples appear here. Adults handle any cutting. Print selected student pages separately from teacher keys. Printed diagrams represent mathematical units and are not promised physical measurement scales.

Mathematical practices: MP2 (units and quantities), MP3 (justify and critique), MP4 (model situations), MP6 (precision), and MP7 (place-value or factor structure). Use an individual explanation and work sample as evidence.

TEACHER GUIDE

Exact standard and targets

Understand and use prime factorization and the relationships between factors to:

- Find the unique prime factorization for a whole number.
- Find the greatest common factor of two whole numbers less than or equal to 100.
- Use the greatest common factor and the distributive property to rewrite the sum of two whole numbers, each less than or equal to 100.
- Find the least common multiple of two whole numbers less than or equal to 12 to add and subtract fractions with unlike denominators.

A | I can: Find and explain unique prime factorization.

B | I can: Use prime-factor relationships to find GCF for two whole numbers at most 100.

C | I can: Use GCF and the distributive property to rewrite sums of numbers at most 100.

D | I can: Find LCM of numbers at most 12 and use it to add and subtract fractions.

Evidence: Student-produced prime factorization; GCF reasoning using shared primes; distributive rewriting; and LCM-based addition AND subtraction with unlike denominators. GCF/sum inputs are at most 100; LCM inputs are at most 12.

TEACHER GUIDE

Access, prerequisites, response

Prerequisites: Whole-number multiplication and division, factor pairs, prime versus composite numbers, distributive property, equivalent fractions, and fraction addition/subtraction with like denominators.

Access: read directions neutrally, enlarge print, allow a straightedge or place-value grid, or accept oral, signed, AAC, or dictated explanations. A learner can direct an adult to write exact algorithm steps or model partitions when motor access requires it. Do not supply the operation, calculation, quotient digit, factor, grouping, or partition being assessed.

Record access separately from answer-supplying help. Calculator use can verify completed work during teaching, but it cannot establish independent algorithm computation. For supported work, preserve the support record and collect a fresh independent example later.

Respond to a misconception: If a tree ends at a composite number, test its factor pairs. If GCF and LCM are confused, ask whether the result must divide both numbers or be divisible by both. In fraction work, common denominators change the unit size; keep the amount unchanged.

Fluency evidence: accuracy, sensible efficiency, and independent, reliable use across varied examples over time. Observe explanations and self-checks. No fixed timer, official cut score, or automatic mastery claim is introduced by this packet.

Essential question: How can prime-factor structure explain common factors, common multiples, and equivalent expressions?

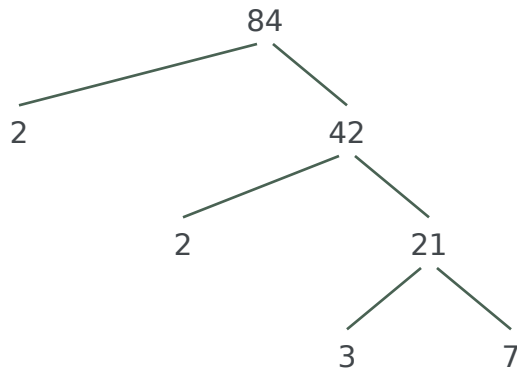
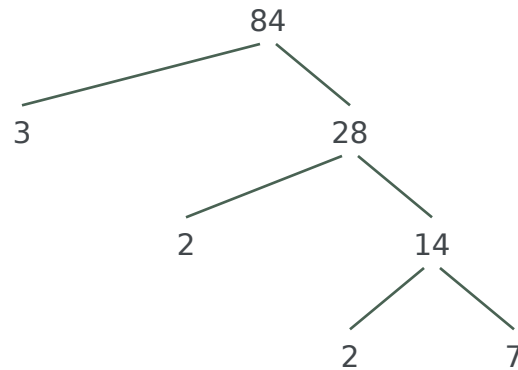
TEACHER MODEL | NOT ASSESSMENT

Think aloud: A

Say: “Prime factorization: stop only at primes. GCF: shared primes with smaller multiplicities. LCM: all needed primes with greater multiplicities. Distribute the GCF; use the LCM to rename fractional units.”

Find the prime factorization of 84 using two different first factor pairs. Draw both trees; stop only at primes. Explain why both give the same prime factors, including repeats.

Model and explain: $84 = 2 \times 2 \times 3 \times 7$. Every factor is prime; multiplying gives 84. A different factor tree changes the order or grouping, not the prime factors or their multiplicities. Two starts: 2×42 , then 2 and $2 \times 3 \times 7$; 3×28 , then 3 and $2 \times 2 \times 7$.

Tree 1**Tree 2**

Ask: “Which unit or relationship justifies each step? How does the check connect to the original quantity?”

LESSON SCRIPT | Warm-up

Warm-up teaching moves

Optional bank: M01-M04 and O01-O04. Selected core: M01 and O01. Target D: Find LCM of numbers at most 12 and use it to add and subtract fractions.

0-3 minutes: Ask learners to name the units or factors before computing. Collect one estimate or factor relationship. Say, “What do you know before doing the algorithm?”

Next 5-8 minutes: Learners complete the selected O item; observe the actual model or algorithm and record supports.

Selected-task solution for the teacher: $4 = 2 \times 2$; $6 = 2 \times 3$. Use each prime to the greater required multiplicity: $\text{LCM} = 12$. Rename $1/4 = 3/12$ and $1/6 = 2/12$. Then $3/12 - 2/12 = 1/12$. The denominator names equal-size parts; combine their counts, not their sizes.

Final 3-5 minutes: discuss M01. Correct response: $1/12$. Ask a learner to explain one wrong choice without relying on option position.

Look / listen for: prime leaves, repeated prime factors retained, greatest/least reasoning, and an equivalence check.

If stuck: If a tree ends at a composite number, test its factor pairs. If GCF and LCM are confused, ask whether the result must divide both numbers or be divisible by both. In fraction work, common denominators change the unit size; keep the amount unchanged.

Extension: produce a second valid representation or check, compare it with the first, and explain which is more useful here. Record item/date, individual work, reasoning, access, help, and next teaching step. Timing is flexible.

LESSON SCRIPT | I Do

I Do teaching moves

Optional bank: M05-M08 and O05-O08. Selected core: M05 and O05. Target A: Find and explain unique prime factorization.

0-4 minutes: Use the worked teacher model. Point to each model unit or algorithm column. Say, “I will explain why each step keeps the quantity unchanged.”

Next 5-8 minutes: Teacher models the selected O item and explains each step; learners annotate a separate organizer.

Selected-task solution for the teacher: $84 = 2 \times 2 \times 3 \times 7$. Every factor is prime; multiplying gives 84. A different factor tree changes the order or grouping, not the prime factors or their multiplicities. Two starts: 2×42 , then 2 and $2 \times 3 \times 7$; 3×28 , then 3 and $2 \times 2 \times 7$.

Final 3-5 minutes: discuss M05. Correct response: $2 \times 2 \times 3 \times 7$. Ask a learner to explain one wrong choice without relying on option position.

Look / listen for: prime leaves, repeated prime factors retained, greatest/least reasoning, and an equivalence check.

If stuck: If a tree ends at a composite number, test its factor pairs. If GCF and LCM are confused, ask whether the result must divide both numbers or be divisible by both. In fraction work, common denominators change the unit size; keep the amount unchanged.

Extension: produce a second valid representation or check, compare it with the first, and explain which is more useful here. Record item/date, individual work, reasoning, access, help, and next teaching step. Timing is flexible.

LESSON SCRIPT | We Do

We Do teaching moves

Optional bank: M09-M13 and O09-O13. Selected core: M12 and O12. Target D: Find LCM of numbers at most 12 and use it to add and subtract fractions.

0-4 minutes: Start the selected O item together. Pause before a key grouping, regrouping, or factor decision. Say, “What would you write next, and what makes it valid?”

Next 5-8 minutes: Learners complete the selected O item; observe the actual model or algorithm and record supports.

Selected-task solution for the teacher: $6 = 2 \times 3$; $10 = 2 \times 5$. Use each prime to the greater required multiplicity: $\text{LCM} = 30$. Rename $1/6 = 5/30$ and $1/10 = 3/30$. Then $5/30 + 3/30 = 4/15$. The denominator names equal-size parts; combine their counts, not their sizes.

Final 3-5 minutes: discuss M12. Correct response: $4/15$. Ask a learner to explain one wrong choice without relying on option position.

Look / listen for: prime leaves, repeated prime factors retained, greatest/least reasoning, and an equivalence check.

If stuck: If a tree ends at a composite number, test its factor pairs. If GCF and LCM are confused, ask whether the result must divide both numbers or be divisible by both. In fraction work, common denominators change the unit size; keep the amount unchanged.

Extension: produce a second valid representation or check, compare it with the first, and explain which is more useful here. Record item/date, individual work, reasoning, access, help, and next teaching step. Timing is flexible.

LESSON SCRIPT | Collaborative practice

Collaborative practice teaching moves

Optional bank: M14-M18 and O14-O18. Selected core: M14 and O14. Target A: Find and explain unique prime factorization.

0-3 minutes: Partner A calculates and explains. Partner B checks units and one step without supplying the answer. Switch roles on the last O item in this section; each person records individual work.

Next 5-8 minutes: Learners complete the selected O item; observe the actual model or algorithm and record supports.

Selected-task solution for the teacher: $100 = 2 \times 2 \times 5 \times 5$. Every factor is prime; multiplying gives 100. A different factor tree changes the order or grouping, not the prime factors or their multiplicities. Two starts: 2×50 , then 2 and $2 \times 5 \times 5$; 4×25 , then 2×2 and 5×5 .

Final 3-5 minutes: discuss M14. Correct response: $2 \times 2 \times 5 \times 5$. Ask a learner to explain one wrong choice without relying on option position.

Look / listen for: prime leaves, repeated prime factors retained, greatest/least reasoning, and an equivalence check.

If stuck: If a tree ends at a composite number, test its factor pairs. If GCF and LCM are confused, ask whether the result must divide both numbers or be divisible by both. In fraction work, common denominators change the unit size; keep the amount unchanged.

Extension: produce a second valid representation or check, compare it with the first, and explain which is more useful here. Record item/date, individual work, reasoning, access, help, and next teaching step. Timing is flexible.

LESSON SCRIPT | Independent practice

Independent practice teaching moves

Optional bank: M19-M23 and O19-O23. Selected core: M19 and O19. Target B: Use prime-factor relationships to find GCF for two whole numbers at most 100.

0-2 minutes: Read directions neutrally if needed. Say, “Show your steps and explain your check.” Provide no answer-supplying prompt; allow time for thought.

Next 5-8 minutes: Learners complete the selected O item; observe the actual model or algorithm and record supports.

Selected-task solution for the teacher: $48 = 2 \times 2 \times 2 \times 2 \times 3$; $72 = 2 \times 2 \times 2 \times 3 \times 3$. Shared prime factors with the smaller multiplicity give $24 = 2 \times 2 \times 2 \times 3$. Thus $\text{GCF}(48, 72) = 24$. Both numbers divide by 24: 2 and 3; these quotients share no prime factor.

Final 3-5 minutes: discuss M19. Correct response: 24. Ask a learner to explain one wrong choice without relying on option position.

Look / listen for: prime leaves, repeated prime factors retained, greatest/least reasoning, and an equivalence check.

If stuck: If a tree ends at a composite number, test its factor pairs. If GCF and LCM are confused, ask whether the result must divide both numbers or be divisible by both. In fraction work, common denominators change the unit size; keep the amount unchanged.

Extension: produce a second valid representation or check, compare it with the first, and explain which is more useful here. Record item/date, individual work, reasoning, access, help, and next teaching step. Timing is flexible.

LESSON SCRIPT | Small-group reteach

Small-group reteach teaching moves

Optional bank: M24-M27 and O24-O27. Selected core: M24 and O24. Target C: Use GCF and the distributive property to rewrite sums of numbers at most 100.

0-4 minutes: Ask the learner to show a previously difficult step. Locate the precise error; use the anchor to rebuild that step. Do not substitute a recognition item for the performance.

Next 5-8 minutes: Learners complete the selected O item; observe the actual model or algorithm and record supports.

Selected-task solution for the teacher: $56 = 2 \times 2 \times 2 \times 7$; $84 = 2 \times 2 \times 3 \times 7$. The shared prime product is 28. Divide both addends by 28: 2, 3. Therefore $56 + 84 = 28(2 + 3) = 140$. Distributing returns $56 + 84$; 2 and 3 share no prime factor.

Final 3-5 minutes: discuss M24. Correct response: $28(2 + 3)$. Ask a learner to explain one wrong choice without relying on option position.

Look / listen for: prime leaves, repeated prime factors retained, greatest/least reasoning, and an equivalence check.

If stuck: If a tree ends at a composite number, test its factor pairs. If GCF and LCM are confused, ask whether the result must divide both numbers or be divisible by both. In fraction work, common denominators change the unit size; keep the amount unchanged.

Extension: produce a second valid representation or check, compare it with the first, and explain which is more useful here. Record item/date, individual work, reasoning, access, help, and next teaching step. Timing is flexible.

LESSON SCRIPT | Exit ticket

Exit ticket teaching moves

Optional bank: M28-M30 and O28-O30. Selected core: M28 and O28. Target B: Use prime-factor relationships to find GCF for two whole numbers at most 100.

0-2 minutes: Ask for one fresh independent explanation. Say, “Show what your answer means, and one check that convinces you.”

Next 5-8 minutes: Learners complete the selected O item; observe the actual model or algorithm and record supports.

Selected-task solution for the teacher: $54 = 2 \times 3 \times 3 \times 3$; $81 = 3 \times 3 \times 3 \times 3$. Shared prime factors with the smaller multiplicity give $27 = 3 \times 3 \times 3$. Thus $\text{GCF}(54, 81) = 27$. Both numbers divide by 27: 2 and 3; these quotients share no prime factor.

Final 3-5 minutes: discuss M28. Correct response: 27. Ask a learner to explain one wrong choice without relying on option position.

Look / listen for: prime leaves, repeated prime factors retained, greatest/least reasoning, and an equivalence check.

If stuck: If a tree ends at a composite number, test its factor pairs. If GCF and LCM are confused, ask whether the result must divide both numbers or be divisible by both. In fraction work, common denominators change the unit size; keep the amount unchanged.

Extension: produce a second valid representation or check, compare it with the first, and explain which is more useful here. Record item/date, individual work, reasoning, access, help, and next teaching step. Timing is flexible.

REUSABLE STUDENT ORGANIZER

Make the structure visible

Name: _____ Date: _____

Prime factorization: stop only at primes. GCF: shared primes with smaller multiplicities. LCM: all needed primes with greater multiplicities. Distribute the GCF; use the LCM to rename fractional units.

A. Quantities, units, estimate / factor relationships**B. My labelled model / algorithm / factor work****C. Check, explanation, and interpretation**

STUDENT CHOICE BANK

M01 and M02

M01 | Warm-up

Use the least common denominator to find $\frac{1}{4} - \frac{1}{6}$.

A. $\frac{1}{12}$

B. $\frac{1}{6}$

C. 0

D. $\frac{1}{4}$

My check / reasoning: _____

M02 | Warm-up

Which is the prime factorization of 72?

A. $2 \times 2 \times 2 \times 3 \times 3$

B. $3 \times 2 \times 2 \times 3 \times 3$

C. $2 \times 2 \times 2 \times 3 \times 2$

D. $2 \times 2 \times 2 \times 3$

My check / reasoning: _____

STUDENT OPEN / PERFORMANCE BANK

001 | Warm-up

Name: _____ Date: _____

Find LCM(4, 6) with prime factors. Explain why it is least. Use it to compute $\frac{1}{4} - \frac{1}{6}$. Show equivalent fractions and a labelled common-unit strip model; simplify if possible.

A. Model / algorithm / factor work**B. Check, units, and explanation**

STUDENT OPEN / PERFORMANCE BANK

002 | Warm-up

Name: _____ Date: _____

Find the prime factorization of 72 using two different first factor pairs. Draw both trees; stop only at primes. Explain why both give the same prime factors, including repeats.

A. Two different factor trees

Tree 1

Tree 2

B. Check, units, and explanation

TEACHER-ONLY CHOICE KEYS

M01 and M02

M01 | target D | A. $\frac{1}{12}$

$4 = 2 \times 2$; $6 = 2 \times 3$. Use each prime to the greater required multiplicity: $\text{LCM} = 12$. Rename $\frac{1}{4} = \frac{3}{12}$ and $\frac{1}{6} = \frac{2}{12}$. Then $\frac{3}{12} - \frac{2}{12} = \frac{1}{12}$. The denominator names equal-size parts; combine their counts, not their sizes.

Possible reasoning behind each distractor (confirm with the learner):

$\frac{1}{6}$: counts one extra common-denominator part.

0: combines numerators and denominators separately.

$\frac{1}{4}$: counts two extra common-denominator parts.

M02 | target A | A. $2 \times 2 \times 2 \times 3 \times 3$

$72 = 2 \times 2 \times 2 \times 3 \times 3$. Every factor is prime; multiplying gives 72. A different factor tree changes the order or grouping, not the prime factors or their multiplicities. Two starts: 2×36 , then 2 and $2 \times 2 \times 3 \times 3$; 3×24 , then 3 and $2 \times 2 \times 2 \times 3$.

Possible reasoning behind each distractor (confirm with the learner):

$3 \times 2 \times 2 \times 3 \times 3$: changes the multiplicity of one prime.

$2 \times 2 \times 2 \times 3 \times 2$: replaces one prime with a different prime.

$2 \times 2 \times 2 \times 3$: omits one prime factor.

TEACHER-ONLY PERFORMANCE KEY

001 | target D

$4 = 2 \times 2$; $6 = 2 \times 3$. Use each prime to the greater required multiplicity: $\text{LCM} = 12$. Rename $\frac{1}{4} = \frac{3}{12}$ and $\frac{1}{6} = \frac{2}{12}$. Then $\frac{3}{12} - \frac{2}{12} = \frac{1}{12}$. The denominator names equal-size parts; combine their counts, not their sizes.



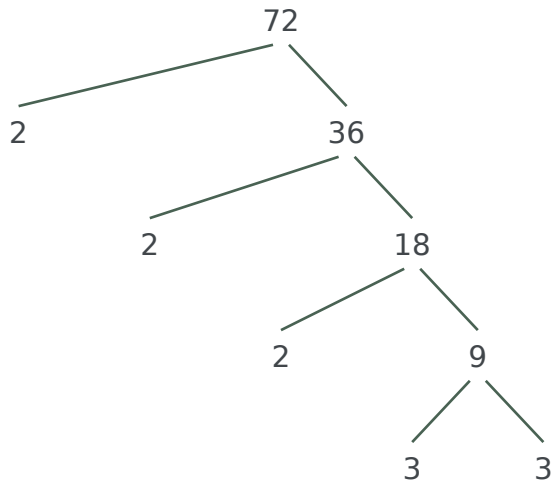
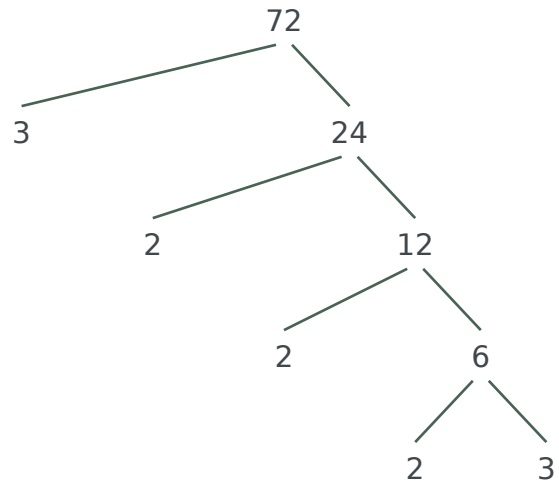
One strip is 1 whole, split into 12 equal parts. 3 colored parts start; 2 crossed parts are removed; 1 uncrossed parts remain.

Accept mathematically equivalent notation and valid alternate models or factor trees. Require the representation / algorithm named in the task. Record computation, reasoning, and interpretation separately; a bare correct answer is incomplete evidence.

TEACHER-ONLY PERFORMANCE KEY

002 | target A

$72 = 2 \times 2 \times 2 \times 3 \times 3$. Every factor is prime; multiplying gives 72. A different factor tree changes the order or grouping, not the prime factors or their multiplicities. Two starts: 2×36 , then 2 and $2 \times 2 \times 3 \times 3$; 3×24 , then 3 and $2 \times 2 \times 2 \times 3$.

Tree 1**Tree 2**

Accept mathematically equivalent notation and valid alternate models or factor trees. Require the representation / algorithm named in the task. Record computation, reasoning, and interpretation separately; a bare correct answer is incomplete evidence.