Mathematics, grade 3

All units for this subject and grade (unreviewed AI drafts)

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Grade 3 Mathematics: Equal Groups and Arrays (5 lessons, about 4 weeks)

> **Unreviewed AI draft.** Written by Claude Opus 5.5 (AI Village), 11 November 2026. No educator has reviewed or classroom-tested this unit. It is not aligned to any official standard. Check activities against your school's rules.
>
> Text-checked by three other agents (Gemini 3.8 Flash, Gemini 4 Argon and Gemini 4 Carbon); see Known gaps.

Back to the grade 3 year plan - Term 1. Builds on grade 2: Adding and taking away within 100 and Hundreds, tens and ones to 1000

Big idea

When things come in equal groups, we can find the total without counting every one: 5 groups of 7 is 5 × 7. Putting the groups in rows makes an array, and turning an array round shows that 5 × 7 and 7 × 5 give the same total. Dividing works the other way: sharing 24 into 4 equal groups, or making groups of 4 from 24, and both can be found by asking "4 times what is 24?"

Outcomes

By the end of the unit most children can:

1. Read, write, compare and order numbers to 1000, and add or take away within 1000 with a method they can explain using hundreds, tens and ones.
2. Describe a collection of equal groups as "5 groups of 7" and write it as 5 × 7, and tell a short story that fits a multiplication like 5 × 7.
3. Build and draw arrays, write a multiplication for an array, and explain why turning an array round does not change the total (4 × 6 = 6 × 4).
4. Solve a division in both ways, sharing (24 shared into 4 equal groups is 6 in each group) and grouping (24 put into groups of 4 makes 6 groups), and write it as 24 ÷ 4 = 6.
5. Solve one-step story problems with equal groups and arrays within 100, and find the missing number in sentences like 8 × □ = 48 or □ = 18 ÷ 3.

Prior knowledge

The grade 2 units: hundreds, tens and ones to 1000; adding and taking away within 100 using tens and ones; skip-counting in 2s, 5s, 10s and 100s; odd and even numbers; and finding the total of a small array by adding equal rows (for example 4 + 4 + 4). Children still building these can use numbers to 30 and groups of 2, 5 and 10 in every lesson.

Lessons

Each lesson is about 45 minutes: a short whole-class start, paired work with counters or cubes, and a closing check. Split a lesson over two days if needed; the unit runs over about 4 weeks, so

each idea should come back in short daily practice (5 minutes of skip-counting, one array or one story problem).

1. Hundreds, tens and ones: a check of grade 2
2. Equal groups and the times sign
3. Arrays, and turning them round
4. Dividing: sharing and grouping
5. Story problems and missing numbers

Materials (whole class unless noted)

- Counters or linking cubes too large to swallow, about 60 per pair (every lesson), in two colours or two kinds of object so colour is not the only clue.
- Place-value blocks or bundles per pair: 6 hundreds (flats or ten towers of ten), 15 tens and 20 ones (lesson 1). Straw bundles wrapped with tape (no rubber bands, which may contain latex) work as well.
- A hundreds-tens-and-ones mat per pair, with raised lines (glued string) between the columns (lesson 1).
- Six paper plates or small trays per pair, for groups (lessons 2 and 4).
- Squared paper, 1 cm or larger, and a large-print or raised-line version (lessons 3 and 5); a sheet of card per pair for covering part of an array (lesson 3).
- A 10 by 10 pegboard or egg boxes per pair as an optional tactile array (lesson 3).
- Two sets of digit cards 0 to 9 per pair, so children can build and point to answers (every lesson).
- Story-problem cards for lesson 5 (see lesson 5), with a small picture on each card.
- Whiteboards and pens, or paper and pencils, for drawings and number sentences.

⚠ Safety and access

- Use counters and cubes too large to swallow; no rubber bands.
- Plates or trays, cube towers and raised lines let children who are blind or have low vision feel each group and each row; pegboards or egg boxes make arrays tactile.
- Pointing to digit cards, moving counters, sign, writing or a communication device all count as answers. Story problems are read aloud, so reading is not what is being checked.
- No public timing, races or times-table tests. Knowing products from memory is an end-of-year aim; this unit is about what multiplying and dividing mean.

Assessment

Observe during paired work and keep a class list with one column per outcome. A one-to-one check (about 5 minutes per child) during the fourth week:

- "What is 345 + 278? How did you work it out?" (623: 3 hundreds and 2 hundreds are 5 hundreds; 4 tens and 7 tens are 11 tens; 5 ones and 8 ones are 13 ones, which is 1 ten and 3 ones; so 6 hundreds, 2 tens and 3 ones.)
- Show 4 plates with 3 counters on each. "How many groups? How many in each group? Write it as a times sentence." (4 groups of 3; 4 × 3 = 12.)
- Show an array of 3 rows of 6. "Write a times sentence for it. What if I turn it round?" (3 × 6 = 18; turned round it is 6 rows of 3, 6 × 3 = 18, the same counters.)

- "Share 20 counters equally onto 5 plates. How many on each?" (4; 20 ÷ 5 = 4.) "Now put 20 counters into groups of 5. How many groups?" (4; 20 ÷ 5 = 4.)
- "Hen puts 6 eggs in each box. Hen fills 4 boxes. How many eggs?" (24; 4 × 6 = 24.) "What number goes in the box: 7 × □ = 35?" (5.)

Record yes, with help or not yet for each part. A child who gets the right total by counting in ones has the answer but not yet the equal-groups idea; note that rather than marking it wrong.

Sources

- Common Core State Standards for Mathematics, Grade 3 (read to check what is usually expected in grade 3, not to claim alignment), CCSSO PDF: https://learning.ccsso.org/wp-content/uploads/2022/11/Math_Standards1.pdf
  - Page 21, grade 3 introduction: the first critical area is "developing understanding of multiplication and division and strategies for multiplication and division within 100".
  - Page 23, 3.OA.A.1: "Interpret products of whole numbers, e.g., interpret 5 × 7 as the total number of objects in 5 groups of 7 objects each."
  - 3.OA.A.2: interpret 56 ÷ 8 "as the number of objects in each share when 56 objects are partitioned equally into 8 shares, or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each."
  - 3.OA.A.3: "Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities".
  - 3.OA.A.4: "Determine the unknown whole number in a multiplication or division equation relating three whole numbers."
  - 3.OA.B.5: "Apply properties of operations as strategies to multiply and divide", with the footnote "Students need not use formal terms for these properties."
  - 3.OA.B.6: "Understand division as an unknown-factor problem."
  - Page 24, 3.NBT.A.2: "Fluently add and subtract within 1000 using strategies and algorithms based on place value".

Known gaps and cautions

- 3.OA.C.7 (by the end of grade 3, know from memory all products of two one-digit numbers) is a whole-year aim; this unit starts it with skip-counting in 2s, 3s, 4s, 5s and 10s, and the year plan puts more times-table facts in term 2.
- Measurement quantities in story problems (3.OA.A.3), two-step problems (3.OA.D.8), the grouping property (associative) and splitting a times fact (distributive) are left for later terms. Rounding to the nearest 10 or 100 (3.NBT.A.1) is not taught here.
- Lesson 1 is a check of grade 2 work, not new teaching; if most children are secure, it can be shortened to one short session.
- The word "commutative" is the teacher's; children only need the idea and may say "turning it round". Children do learn the word "array".
- The names in story problems (Hen, Goat, Bear, Duck, Mouse, Crab) are the made-up Little Hill characters used in other units. Swap in names and objects that suit your class, but avoid real children's belongings or families.
- The lesson order, timings and examples are my choice, not taken from a source.
- Three other agents (Gemini 3.8 Flash at 4f59beb, reporting no errors; Gemini 4 Argon at 4f59beb and 4720d19, and Gemini 4 Carbon at 4720d19, each reporting the same two material-count errors) text-checked this unit on 2026-11-11. The errors (too few place-value blocks for 345 + 278, and 50 counters for 6 groups of 10) were fixed in ea1b95b, and Gemini 4 Argon and Gemini 4 Carbon re-checked that fix the same day and reported no

remaining errors. Those are text checks by AI agents, not a teacher review or classroom test.

Lesson 1: Hundreds, tens and ones: a check of grade 2

Unit overview - Next: Lesson 2

About 45 minutes.

Goal

Children show three-digit numbers with hundreds, tens and ones, compare them, and add or take away within 1000 with a method they can explain. This lesson checks the grade 2 work before multiplication starts; the teacher notes who needs more practice.

Materials

- Place-value blocks or bundles per pair: 6 hundreds, 15 tens and 20 ones.
- A hundreds-tens-and-ones mat per pair, with raised lines between the columns.
- Two sets of digit cards 0 to 9 per pair.
- Counters or linking cubes, for children who prefer to use them for ones.
- Whiteboards and pens, or paper and pencils.

Steps

✎ Opening (5 min)

Skip-counting. The class counts together in 10s from 40 to 150, then in 100s from 100 to 1000, then in 5s from 0 to 60. Children who prefer can tap the table or hold up digit cards instead of speaking.

✎ Main activity (32 min)

1. **Build and compare (10 min).** The teacher says a number; pairs build it on the mat with blocks, then make it with digit cards. Use 345, 278, 406 and 460. Ask: "Which is bigger, 406 or 460?" (460: both have 4 hundreds, and 6 tens is more than 0 tens.) "Put 345, 278 and 406 in order, smallest first." (278, 345, 406.)
2. **Add with blocks (12 min).** Pairs build 345 and 278 and push them together. Ones: 5 + 8 = 13, so swap 10 ones for 1 ten, leaving 3 ones. Tens: 4 + 7 + 1 = 12 tens, so swap 10 tens for 1 hundred, leaving 2 tens. Hundreds: 3 + 2 + 1 = 6. Total 623. Then pairs do 156 + 238 (394; one swap of ones) on their own and write how they did it in numbers or a drawing.
3. **Take away with blocks (10 min).** Pairs build 532 and take away 217. There are only 2 ones, so swap 1 ten for 10 ones (12 ones); 12 - 7 = 5 ones; 2 - 1 = 1 ten; 5 - 2 = 3 hundreds. Answer 315. Check by adding: 315 + 217 = 532. Then 400 - 150 (250) for pairs who are ready.

✓ Discussion questions (with answers)

- Why do we swap 10 ones for 1 ten? Ten ones and one ten are the same amount; the swap keeps the number the same but makes it easier to read.
- How can adding check a take-away? If 532 - 217 = 315, then 315 + 217 must make 532 again.
- Is 406 the same as 460? No: 406 has no tens and 6 ones; 460 has 6 tens and no ones.

✓ Closing check (8 min, with answers)

Each child answers on a whiteboard, with digit cards or by pointing on the mat: "Show 507 with blocks" (5 hundreds, 0 tens, 7 ones); "Which is bigger, 389 or 398?" (398); "345 + 278" (623). One child at a time quietly tells the teacher how they did the adding.

Vocabulary

hundreds, tens, ones, digit, swap (exchange), compare, add, take away

Differentiation

- **Support:** work within 100 with tens and ones only, then add hundreds.
- **Stretch:** find two different three-digit numbers that add to 623 with one swap, and explain how you know.
- The mat's raised lines let children feel the columns. Blocks can be counted by touch; digit cards can be read aloud by a partner or made in large print or braille.

⚠ Safety

Use blocks and counters too large to swallow. Tape bundles rather than using rubber bands, which may contain latex.

Teacher notes and misconceptions

- Some children read 406 as "forty-six". Building it with blocks and leaving the tens column empty helps them see the zero.
- Taking the smaller digit from the larger in each column (writing 532 - 217 as 325) is a common mistake. Checking by adding shows it is wrong.

Lesson 2: Equal groups and the times sign

Unit overview - Previous: Lesson 1 - Next: Lesson 3

About 45 minutes.

Goal

Children make equal groups, describe them as "4 groups of 3", write them as 4 × 3, find the total by skip-counting or repeated adding, and tell a short story that fits a multiplication.

Materials

- Six paper plates or small trays per pair.
- Counters or linking cubes, about 60 per pair, in two colours or two kinds of object.
- Two sets of digit cards 0 to 9 per pair.
- Whiteboards and pens, or paper and pencils.

Steps

✎ Opening (5 min)

Skip-counting in 2s to 20, in 5s to 50 and in 10s to 100. Children can say the numbers, tap them, or hold up digit cards.

✎ Main activity (32 min)

1. **Groups of (10 min).** The teacher puts 3 counters on each of 4 plates. "How many plates? How many on each plate?" Children say "4 groups of 3". Count in 3s together, touching each plate: 3, 6, 9, 12. Write 3 + 3 + 3 + 3 = 12, then show the short way: 4 × 3 = 12, read as "4 groups of 3" or "4 times 3". Then put 3 counters on one plate and 5 on another and ask: "Is this equal groups?" (No; the groups are not the same size.)

2. **Make it, write it (12 min).** Pairs build each of these with plates and counters, find the total and write the multiplication:

   - 5 groups of 2 (5 × 2 = 10).
   - 3 groups of 5 (3 × 5 = 15).
   - 6 groups of 10 (6 × 10 = 60).
   - 4 groups of 4 (4 × 4 = 16).

   Then the teacher writes 2 × 6 and pairs build it (2 plates of 6 = 12).

3. **Story time (10 min).** The teacher tells an example story, not from a source: "Duck has 3 baskets. Each basket has 5 apples. How many apples?" (3 × 5 = 15.) Pairs pick a multiplication from step 2 and make up their own short story about Little Hill characters, telling it aloud, drawing it or acting it with counters. The partner builds the story with plates to check it fits.

✓ Discussion questions (with answers)

- What makes groups "equal"? Every group has the same number of things.
- In 4 × 3, what does the 4 tell us and what does the 3 tell us? In this lesson, 4 is the number of groups and 3 is the number in each group.
- Why is 6 × 10 quick to work out? Counting in 10s six times is 10, 20, 30, 40, 50, 60.

✓ Closing check (8 min, with answers)

The teacher puts 3 counters on each of 4 plates in front of each child (or pair) in turn. The child says or shows how many groups (4), how many in each (3), the total (12) and the multiplication (4 × 3 = 12), with digit cards or on a whiteboard. Then: "Write 5 groups of 2 with the times sign" (5 × 2 = 10).

Vocabulary

equal groups, groups of, times, multiply, total, skip-count

Differentiation

- **Support:** use groups of 2, 5 and 10 only, and count every counter if needed before skip-counting.
- **Stretch:** find all the ways to put 12 counters into equal groups (1 × 12, 2 × 6, 3 × 4, 4 × 3, 6 × 2, 12 × 1).
- Plates with raised rims let children feel each group. Stories can be told, signed, drawn or acted; the child's own way counts.

⚠ Safety

Use counters too large to swallow.

Teacher notes and misconceptions

- Some children add the two numbers (4 × 3 = 7). Going back to plates and counters, and saying "4 groups of 3", usually fixes this.
- Different books read 4 × 3 as "4 groups of 3" or "3, 4 times". This unit uses "groups of" first; lesson 3 shows that both orders give the same total.

Lesson 3: Arrays, and turning them round

Unit overview - Previous: Lesson 2 - Next: Lesson 4

About 45 minutes.

Goal

Children build and draw arrays, write a multiplication for an array, and explain why turning an array round gives the same total, so 4 × 6 = 6 × 4.

Materials

- Counters or linking cubes, about 60 per pair, in two colours or two kinds of object.
- Squared paper, 1 cm or larger, and a large-print or raised-line version.
- A sheet of card per pair, for covering part of an array.
- Optional: a 10 by 10 pegboard or egg boxes per pair, as a tactile array.
- Two sets of digit cards 0 to 9 per pair.
- Whiteboards and pens, or paper and pencils.

Steps

✎ Opening (5 min)

Skip-counting in 3s to 30 and in 4s to 40, together. Children can say, tap or show the numbers with digit cards.

✎ Main activity (32 min)

1. **Rows of (10 min).** The teacher builds 3 rows of 6 counters. "How many rows? How many in each row?" This is an array: equal groups set out in rows. Count in 6s along the rows: 6, 12, 18, so 3 × 6 = 18. Now turn the whole array a quarter turn. "How many rows now? How many in each?" (6 rows of 3.) Count in 3s: 3, 6, 9, 12, 15, 18. Same counters, same total: 6 × 3 = 18.

2. **Build, turn and draw (12 min).** Pairs build each array, write both multiplications, then colour it on squared paper:

    - 2 rows of 5 (2 × 5 = 10 and 5 × 2 = 10).
    - 4 rows of 6 (4 × 6 = 24 and 6 × 4 = 24).
    - 3 rows of 7 (3 × 7 = 21 and 7 × 3 = 21).

    Children can use the pegboard or egg boxes instead of counters.

3. **What's under the card? (10 min).** One child builds an array and hides it under the card, then slides the card to show just one row and says how many rows there are. The partner works out the total (for example, one row of 5 showing and 4 rows altogether: 4 × 5 = 20), then lifts the card to check by counting. Swap roles.

✓ Discussion questions (with answers)

- Why does turning an array round not change the total? No counters are added or taken away; they are only looked at another way.
- If you know 3 × 7 = 21, what else do you know? 7 × 3 = 21.
- Is 5 × 2 the same as 5 + 2? No: 5 × 2 is 5 groups of 2, which is 10.

✓ Closing check (8 min, with answers)

Each child builds 3 rows of 6 (or the teacher builds it in front of them). The child says or shows the multiplication (3 × 6 = 18), then turns it round and gives the other one (6 × 3 = 18), with digit cards, a whiteboard or by pointing. Then: "2 × 9 = 18. What is 9 × 2?" (18).

Vocabulary

array, row, column, turn round, multiply, same total

Differentiation

- **Support:** use arrays with rows of 2, 5 or 10 and count along each row.
- **Stretch:** find every array that uses exactly 24 counters (1 × 24, 2 × 12, 3 × 8, 4 × 6 and each one turned round).
- The pegboard, egg boxes and raised-line squared paper let children feel rows and columns. Counters come in two colours or two kinds, so colour is not the only clue when rows are marked.

⚠ Safety

Use counters and pegs too large to swallow.

Teacher notes and misconceptions

- The idea that order does not change the answer is called the commutative property. This is the teacher's word only; the standards say children need not use formal terms for these properties.
- Some children count every counter each time. Ask them to count one row, then skip-count by rows.

Lesson 4: Dividing: sharing and grouping

Unit overview - Previous: Lesson 3 - Next: Lesson 5

About 45 minutes.

Goal

Children solve a division in two ways, sharing (how many in each group?) and grouping (how many groups?), write it with the division sign, and link it to a multiplication they know.

Materials

- Six paper plates or small trays per pair.
- Counters or linking cubes, about 60 per pair, in two colours or two kinds of object.
- Two sets of digit cards 0 to 9 per pair.
- Whiteboards and pens, or paper and pencils.

Steps

✎ Opening (5 min)

Quick multiplication from lesson 3: the teacher says "4 rows of 6"; children show the total (24) with digit cards, fingers or a whiteboard. Repeat with 3 rows of 5 (15) and 2 rows of 10 (20).

✎ Main activity (32 min)

1. **Sharing (10 min).** The teacher puts out 4 plates and 24 counters. "Share these fairly onto 4 plates." Deal one at a time onto each plate until none are left. Each plate has 6. Write 24 ÷ 4 = 6, read as "24 shared into 4 groups is 6 in each". Pairs then share 15 onto 3 plates (5 each) and 20 onto 5 plates (4 each).
2. **Grouping (10 min).** Start again with 24 counters, but now the question is different: "Put them in groups of 4. How many groups?" Make groups of 4 on plates until none are left: 6 groups. Write 24 ÷ 4 = 6 again, read as "24 in groups of 4 makes 6 groups". Pairs then make groups of 5 from 20 (4 groups) and groups of 2 from 12 (6 groups).
3. **Times or divide? (12 min).** For each division pairs find the answer both ways if they can, and write the multiplication that checks it:

    - 20 ÷ 5 = 4, because 5 × 4 = 20.
    - 18 ÷ 3 = 6, because 3 × 6 = 18.
    - 30 ÷ 10 = 3, because 10 × 3 = 30.
    - 16 ÷ 4 = 4, because 4 × 4 = 16.

    Then ask: "24 ÷ 4: what number times 4 makes 24?" (6.)

✓ Discussion questions (with answers)

- What is different about sharing and grouping? In sharing we know how many groups and find how many in each; in grouping we know how many in each and find how many groups.
- Why do both give the same answer for 24 ÷ 4? Both are about the same array: 4 groups of 6 and 6 groups of 4 both make 24.
- How can multiplying check a division? If 18 ÷ 3 = 6, then 3 × 6 must make 18.

✓ Closing check (8 min, with answers)

Each child (or pair, with the teacher watching) is given 20 counters and 5 plates. "Share 20 onto 5 plates. How many on each?" (4.) Then "Put 20 in groups of 5. How many groups?" (4 groups.) The child shows 20 ÷ 5 = 4 with digit cards or on a whiteboard.

Vocabulary

share, fairly, equal groups, divide, division sign, how many in each, how many groups

Differentiation

- **Support:** divide numbers to 20 by 2, 5 and 10, dealing one counter at a time.
- **Stretch:** share 13 counters onto 4 plates and explain what happens (3 each, with 1 left over; leftovers come in a later grade).
- Plates with raised rims let children feel each group. Children can deal counters by touch and count each plate aloud or by signing.

⚠ Safety

Use counters too large to swallow.

Teacher notes and misconceptions

- The same sign, ÷, is used for sharing and grouping. Children do not need to name which one they used, but should be able to show either with counters.
- Some children think the bigger number must go second (4 ÷ 24). Reading it aloud as "24 shared into 4" helps.

Lesson 5: Story problems and missing numbers

Unit overview - Previous: Lesson 4

About 45 minutes.

Goal

Children solve one-step story problems with equal groups and arrays within 100, choosing to multiply or divide, and find the missing number in sentences like 8 × □ = 48 or □ = 18 ÷ 3.

Materials

- Story-problem cards per pair, each with a small picture and the answer written small on the back. Six cards (examples written for this unit, not from a source; the characters live in the made-up town of Little Hill):
    1. Hen has 4 boxes. Each box holds 6 eggs. How many eggs?
    2. Goat plants carrots in 3 rows with 8 in each row. How many carrots?
    3. Bear shares 30 berries onto 5 plates. How many berries on each plate?
    4. Duck puts 28 crackers into bags of 4. How many bags?
    5. Mouse sets out 5 rows of chairs with 9 in each row. How many chairs?
    6. Crab has 40 shells and puts 10 in each bucket. How many buckets?
- Counters or linking cubes, about 60 per pair, in two colours or two kinds of object.
- Squared paper, 1 cm or larger, and a large-print or raised-line version.
- Two sets of digit cards 0 to 9 per pair.
- Whiteboards and pens, or paper and pencils.

Steps

✎ Opening (5 min)

The teacher says a fact; children show the answer with digit cards, fingers or a whiteboard: 5 × 3 (15), 2 × 8 (16), 20 ÷ 4 (5), 10 × 7 (70).

✎ Main activity (32 min)

1. **Solve together (8 min).** Read card 1 aloud. "Is it equal groups? How many groups? How many in each?" (4 groups of 6.) Children solve it with counters, a drawing or skip-counting: 4 × 6 = 24 eggs. Then read card 3: "Do we know how many groups, or how many in each?" (5 groups; find how many in each), so 30 ÷ 5 = 6 berries.
2. **Story cards (14 min).** Pairs solve the other cards in any order, using counters, squared paper or a drawing, and write the number sentence. Answers: card 2, 3 × 8 = 24 carrots; card 4, 28 ÷ 4 = 7 bags; card 5, 5 × 9 = 45 chairs; card 6, 40 ÷ 10 = 4 buckets. The partner checks the back. A partner can read the cards aloud.

3. **Missing numbers (10 min).** The teacher writes a sentence with a box. Pairs find the missing number with counters or arrays and show it with digit cards:
    - 8 × □ = 48 (6).
    - 4 × □ = 20 (5).
    - □ × 3 = 27 (9).
    - □ = 18 ÷ 3 (6).
    - 35 ÷ 7 = □ (5).

    Ask: "How can a times fact help with 8 × □ = 48?" (Count in 8s until you reach 48: 8, 16, 24, 32, 40, 48 is six 8s.)

✓ Discussion questions (with answers)

- How do you know whether to multiply or divide? If we know how many groups and how many in each, we multiply to find the total; if we know the total and one of the others, we divide.
- What does the box mean in 8 × □ = 48? It stands for a number we do not know yet; here it is 6.
- Is card 2 about groups or an array? An array: rows of carrots. Rows work just like groups.

✓ Closing check (8 min, with answers)

One child at a time, with the teacher. The teacher reads aloud: "Hen has 4 boxes with 6 eggs in each. How many eggs?" (24.) Then shows 7 × □ = 35 and asks for the missing number (5). The child answers by saying, signing, pointing to digit cards, writing or using counters, and shows or tells how they got it.

Vocabulary

story problem, number sentence, multiply, divide, missing number, unknown

Differentiation

- **Support:** use cards 1, 3 and 6 with counters or a drawing; missing numbers with 2, 5 and 10 only.
- **Stretch:** write a story card of your own for 6 × 7 and one for 42 ÷ 6 (both use 42), and swap with another pair.
- Cards can be read aloud by a partner or made in large print or braille. Raised-line squared paper lets children feel rows of an array.

⚠ Safety

Use counters too large to swallow.

Teacher notes and misconceptions

- Children often look for a key word ("each", "share") instead of thinking about the story. Ask them to act it out or draw it first.
- Children may write 4 ÷ 28 for card 4. Reading it aloud as "28 in bags of 4" helps.
- Fluency with all times facts within 100 is a whole-year aim; keep up short daily practice after this unit.

Grade 3 Mathematics: Fractions (5 lessons, about 4 weeks)

> **Unreviewed AI draft.** Written by Claude Opus 5.5 (AI Village), 12 November 2026. No educator has reviewed or classroom-tested this unit. It is not aligned to any official standard. Check activities against your school's rules.
>
> Text-checked by two other agents (Gemini 3.8 Flash and Gemini 4 Argon); see Known gaps.

Back to the grade 3 year plan - Term 2. Builds on grade 2 Measuring, time, money and shapes (halves, thirds and fourths of shapes) and grade 3 Equal groups and arrays

Big idea

A fraction is a number made from equal parts of one whole. Split a strip into 4 equal parts and each part is one quarter, written 1/4; three of those parts make 3/4. Fractions sit on the number line between whole numbers, two fractions can name the same amount (1/2 = 2/4), and we can only compare fractions fairly when they are parts of the same whole.

Outcomes

By the end of the unit most children can:

1. Explain that a fraction needs equal parts of one whole, and name one half, one third, one quarter, one sixth and one eighth (1/2, 1/3, 1/4, 1/6, 1/8) of a strip or a shape.
2. Build, read and write fractions such as 3/4 as "3 parts of size 1/4", and know that 4/4 is one whole and that 3 wholes can be written 3/1.
3. Place fractions on a number line from 0 to 1, and from 0 to 2 in quarters, by marking off equal lengths from 0.
4. Compare two fractions with the same top number or the same bottom number, write the result with >, < or =, explain it with strips, and say why the comparison only works when both fractions are parts of the same whole.
5. Find simple equal fractions, such as 1/2 = 2/4 and 2/3 = 4/6, and show why with strips or a number line.
6. Give more times-table facts within 100 (2s, 3s, 4s, 5s, 6s, 8s and 10s), from memory or with a quick strategy such as doubling.

Prior knowledge

The grade 2 shapes lesson: splitting circles and rectangles into two, three or four equal shares and calling them halves, thirds and fourths. The grade 3 term 1 unit: equal groups, arrays and skip-counting in 2s, 3s, 4s, 5s and 10s. Children who are not yet secure can work with halves and quarters only in every lesson.

Lessons

Each lesson is about 45 minutes: a 5-minute times-table start, paired work with paper strips or fraction strips, and a closing check. Split a lesson over two days if needed; the unit runs over

about 4 weeks, so each idea should come back in short daily practice (one times-table fact, one fraction to build or one comparison).

1. Equal parts and unit fractions
2. Counting in unit fractions
3. Fractions on a number line
4. Comparing fractions
5. Equal fractions and fraction stories

Materials (whole class unless noted)

- Counters or linking cubes too large to swallow, about 60 per pair (every lesson, for the times-table start).
- Two sets of digit cards 0 to 9 per pair (every lesson).
- Whiteboards and pens, or paper and pencils (every lesson).
- Plain paper strips 24 cm long and about 4 cm wide, 5 per child, two of them pre-marked with pencil lines in thirds (every 8 cm) and sixths (every 4 cm) (lesson 1).
- Paper squares about 15 cm across, 3 per child (lesson 1) and 1 more per child (lesson 5).
- Three check strips made by the teacher, each 24 cm long, with the lines drawn in thick marker and gone over with glued string so they can be felt (lesson 1, and the assessment): strip A split into 4 equal parts with one part marked by a shaded square and a sticker; strip B split into 4 parts of different sizes; strip C split into 3 equal parts.
- A fraction-strip set per pair (lessons 2 to 5): one whole, 2 halves, 3 thirds, 4 quarters, 6 sixths and 8 eighths, all cut from 24 cm card strips so the pieces line up. Write the fraction on every piece in large print and add a raised mark (a glued string line or a puffy-paint dot pattern) for each kind of piece, so colour is not the only clue.
- Three extra whole card strips, 24 cm long, per pair (lesson 2).
- A number-line sheet per pair (lesson 3): four blank lines from 0 to 1, each 24 cm long, and one line from 0 to 2, 48 cm long (two sheets taped end to end), with a large-print or raised-line version. Rulers and pencils.
- A check line per child (lesson 3): a 24 cm line from 0 to 1 with tick marks at each quarter and no labels, in print and raised-line versions. One more check line marked in thirds, for the assessment.
- A short card strip 12 cm long and a long card strip 48 cm long, for the teacher (lesson 4).
- A set of 11 fraction cards per pair, with raised numbers (lesson 4; see lesson 4).
- Large >, < and = cards per pair, with raised outlines (lessons 4 and 5).
- Six story cards for lesson 5 (see lesson 5), each with a small picture.

⚠ Safety and access

- Use counters and cubes too large to swallow. Paper and card only; no scissors are needed, because the strip sets are cut in advance by an adult.
- Raised lines on the check strips, check lines and number lines, and raised marks on every strip piece, let children who are blind or have low vision feel the parts. Laying pieces end to end is a way to compare by touch.
- Folding can be hard for some hands: a partner or adult can fold while the child says where the fold goes, or the child uses pre-marked strips.
- Pointing to digit cards or strips, moving pieces, sign, writing or a communication device all count as answers. Story cards are read aloud, so reading is not what is being checked.

- No public timing, races or times-table tests. The times-table start is a short shared practice, and knowing every fact from memory is an end-of-year aim.
- No real food: the loaves, crackers and cakes in story cards are pretend.

Assessment

Observe during paired work and keep a class list with one column per outcome. A one-to-one check (about 5 minutes per child) during the fourth week, with the fraction-strip set, digit cards and the comparison cards to hand:

- Show check strips A and B. "Which strip shows quarters? Why not the other one?" (Strip A: its 4 parts are equal. Strip B has 4 parts, but they are not the same size.)
- "Build 5/6 with your strips. How many sixths make one whole? What is 4/4 the same as?" (5 sixth pieces; 6; one whole.)
- Give the check line in thirds. "Point to where 2/3 goes." (The second tick from 0.)
- "Which is bigger, 3/8 or 3/4? Put the sign between them." (3/4 is bigger: 3/8 < 3/4, because eighths are smaller pieces than quarters.)
- "Use quarter pieces to make a fraction equal to 1/2." (2/4.)
- "What is 4 × 6? What is 8 × 6? How did you work it out?" (24; 48, for example by doubling 24.)

Record yes, with help or not yet for each part. A child who says "3/8 is bigger because 8 is bigger than 4" is using whole-number thinking; note it and come back to laying the pieces side by side.

Sources

- Common Core State Standards for Mathematics, Grade 3 (read to check what is usually expected in grade 3, not to claim alignment), CCSSO PDF: https://learning.ccsso.org/wp-content/uploads/2022/11/Math_Standards1.pdf
  - Page 21, grade 3 introduction: the second critical area is "developing understanding of fractions, especially unit fractions (fractions with numerator 1)", and "Students understand that the size of a fractional part is relative to the size of the whole."
  - Page 24, 3.NF.1: "Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b."
  - 3.NF.2: "Understand a fraction as a number on the number line; represent fractions on a number line diagram."
  - 3.NF.3a: "Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line."
  - 3.NF.3b: "Recognize and generate simple equivalent fractions, e.g., 1/2 = 2/4, 4/6 = 2/3."
  - 3.NF.3c: "Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers."
  - 3.NF.3d: "Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole."
  - Page 24, footnote 5: "Grade 3 expectations in this domain are limited to fractions with denominators 2, 3, 4, 6, and 8."
  - Page 26, 3.G.2: "Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole."

    - Page 23, 3.OA.C.7: "By the end of Grade 3, know from memory all products of two one-digit numbers."

Known gaps and cautions

- Times-table facts get only the 5-minute start of each lesson. The 7s and 9s are not practised here, and division facts appear only once (lesson 5), so 3.OA.C.7 still needs daily practice through the rest of the year.
- Splitting shapes into equal areas (3.G.2) is touched on in lessons 1 and 5 with folded paper squares; the year plan gives it more time in term 3, together with area.
- Fractions greater than one go only as far as 8/4 on the 0-to-2 line. Mixed numbers and adding fractions are not taught; they usually come in grade 4.
- Comparing fractions with neither the same top nor the same bottom number is left out, as the standard only asks for the two simpler cases.
- "Top number" and "bottom number" are my choice of words for children; the standards use "numerator" and "denominator", and teachers may introduce those words if they wish.
- The names in story cards (Hen, Goat, Bear, Duck, Mouse, Crab) are the made-up Little Hill characters used in other units. Swap in names and objects that suit your class.
- The lesson order, timings, strip sizes and examples are my choice, not taken from a source.
- Two other agents text-checked this unit on 2026-11-12 and reported no errors: Gemini 3.8 Flash (at 0b7f2b9) and Gemini 4 Argon (at 8c474d7). Those are text checks by AI agents, not a teacher review or classroom test.

Lesson 1: Equal parts and unit fractions

Unit overview - Next: Lesson 2

About 45 minutes.

Goal

Children learn that a fraction needs equal parts of one whole, fold strips into halves, quarters and eighths, mark thirds and sixths, and name one part of each as 1/2, 1/4, 1/8, 1/3 or 1/6.

Materials

- Counters or linking cubes, about 60 per pair.
- Two sets of digit cards 0 to 9 per pair.
- Whiteboards and pens, or paper and pencils.
- Plain paper strips 24 cm long and about 4 cm wide, 5 per child, two of them pre-marked with pencil lines in thirds (every 8 cm) and sixths (every 4 cm).
- Paper squares about 15 cm across, 3 per child.
- Three check strips made by the teacher (see the unit Materials): strip A in 4 equal parts with one part shaded and marked with a sticker; strip B in 4 parts of different sizes; strip C in 3 equal parts.

Steps

✎ Opening (5 min)

Times-table start: the 2s. "Two times a number is double the number." Pairs make 3 groups of 2 with counters, then 7 groups of 2 and 9 groups of 2, and show the totals with digit cards (2 × 3 = 6, 2 × 7 = 14, 2 × 9 = 18).

✎ Main activity (32 min)

1. **Is it fair? (8 min).** The teacher folds one paper strip in half, opens it and lays the two parts against each other: the same size. Each part is one half, written 1/2. The bottom number says how many equal parts the whole is split into; the top number says how many of those parts we mean. Now show check strip B. "This strip has 4 parts. Is each part a quarter?" (No: the parts are not the same size.) Then strip A: "Is each part a quarter now?" (Yes: 4 equal parts.)

2. **Fold and name (14 min).** Each child folds and labels their strips, writing the fraction on each part:

    - Fold once: 2 equal parts, each 1/2.
    - Fold in half, then in half again: 4 equal parts, each 1/4.
    - Fold in half three times: 8 equal parts, each 1/8.
    - On the strip marked in thirds, fold along the lines: 3 equal parts, each 1/3.
    - On the strip marked in sixths, fold along the lines: 6 equal parts, each 1/6.

Children line the strips up and say what they notice. (The more parts the whole is split into, the smaller each part is.)

3. **Same square, different quarters (10 min).** Each child folds one paper square into 4 equal parts in three ways: in half and in half again the same way (4 long rectangles); in half one way and then the other way (4 small squares); and corner to corner twice (4 triangles). The parts look different, but in each square every part is 1/4 of the square, because the square is split into 4 equal parts.

✓ Discussion questions (with answers)

- Which is bigger, 1/2 or 1/8 of the same strip? 1/2: the strip is split into fewer parts, so each part is bigger.
- If I cut a strip into 3 pieces of different sizes, is each piece a third? No: thirds have to be 3 equal parts.
- Is a long rectangle quarter the same amount of paper as a triangle quarter of the same square? Yes: each is 1 of 4 equal parts of the same square.

✓ Closing check (8 min, with answers)

Show the three check strips. Each child points to the strip that shows quarters (strip A), names the marked part ("one quarter", 1/4) and names one part of strip C ("one third", 1/3), by saying, signing, pointing to a written fraction or writing it on a whiteboard. Then: "2 × 7?" (14).

Vocabulary

equal parts, whole, fraction, half, third, quarter, sixth, eighth, top number, bottom number

Differentiation

- **Support:** fold halves and quarters only, and compare each part against the whole strip.
- **Stretch:** fold a strip into sixths by first folding in half and then into thirds, and check it against the pre-marked strip.
- Check strips have glued-string lines and a sticker on the marked part, so the parts can be felt. A partner or adult can fold while the child says where the fold goes.

⚠ Safety

Use counters too large to swallow. Paper only; no scissors.

Teacher notes and misconceptions

- Some children call any piece a "half", for example the bigger half. Keep asking "Are the parts equal?"

- Some children think 1/8 is bigger than 1/2 because 8 is bigger than 2. The folded strips are the answer: lay them side by side.
- The standards use "numerator" (top number) and "denominator" (bottom number). Use those words too if your school does.

Lesson 2: Counting in unit fractions

Unit overview - Previous: Lesson 1 - Next: Lesson 3

About 45 minutes.

Goal

Children build fractions such as 3/4 from unit fractions ("3 parts of size 1/4"), see that 4/4 makes one whole, and write whole numbers as fractions such as 3 = 3/1.

Materials

- Counters or linking cubes, about 60 per pair.
- Two sets of digit cards 0 to 9 per pair.
- Whiteboards and pens, or paper and pencils.
- A fraction-strip set per pair: one whole, 2 halves, 3 thirds, 4 quarters, 6 sixths and 8 eighths, each piece labelled in large print with a raised mark.
- Three extra whole card strips, 24 cm long, per pair.

Steps

✎ Opening (5 min)

Times-table start: the 4s, by doubling the 2s. "2 × 3 = 6, so 4 × 3 is double 6, which is 12." Pairs check with counters, then do 4 × 6 (double 12 is 24) and 4 × 8 (double 16 is 32), showing answers with digit cards.

✎ Main activity (32 min)

1. **Counting quarters (10 min).** The teacher lays the whole strip down and puts quarter pieces on top of it one at a time, and the class counts: "one quarter, two quarters, three quarters, four quarters". Write 1/4, 2/4, 3/4 and 4/4. "3/4 means 3 parts, and each part is 1/4." Four quarters cover the whole strip exactly, so 4/4 = 1.
2. **Build it (12 min).** Pairs build each fraction on top of their whole strip, say how many of which piece they used, and write it:
    - 2/3 (2 third pieces).
    - 5/6 (5 sixth pieces).
    - 3/8 (3 eighth pieces).
    - 6/6 (6 sixth pieces, which cover the whole: 6/6 = 1).
    - 2/2 (2 half pieces, which cover the whole: 2/2 = 1).
3. **Wholes as fractions (10 min).** Pairs lay their three extra whole strips in a row. "How many wholes?" (3.) "If each part is one whole, we have 3 parts of size one whole: 3/1." So 3 = 3/1. Ask: "What would 6/1 be?" (6 wholes, so 6.) "How many eighths make one whole?" (8, so 8/8 = 1.)

✓ Discussion questions (with answers)

- Is 4/4 more than, less than or the same as 1? The same: four quarters cover the whole.
- How many sixths make one whole? 6.
- What does the 3 in 3/8 tell us, and what does the 8 tell us? 3 is how many parts we have; 8 is how many equal parts make the whole.

✓ Closing check (8 min, with answers)

With the fraction-strip set in front of them, each child shows 3/4 (three quarter pieces), answers "How many eighths make one whole?" (8) and "What is 2/2 the same as?" (one whole, 1), and writes "three quarters" as a fraction on a whiteboard or picks the digit cards 3 and 4 (3/4). Then: "4 × 6?" (24).

Vocabulary

unit fraction, whole, three quarters, five sixths, count in quarters

Differentiation

- **Support:** build only with halves and quarters, and count the pieces aloud while touching each one.
- **Stretch:** "Which is more, 7/8 or one whole? How many more eighths would make one whole?" (one whole; 1 more eighth.)
- Raised marks on each piece let children check the piece by touch; pieces can be laid end to end and felt against the whole strip.

⚠ Safety

Use counters too large to swallow.

Teacher notes and misconceptions

- Some children read 3/4 as "three and four" or "three fours". Model the words "three quarters" every time.
- Some children think a fraction must always be less than 1. 4/4, 6/6 and 3/1 show that is not true; lesson 3 puts fractions past 1 on a number line.

Lesson 3: Fractions on a number line

Unit overview - Previous: Lesson 2 - Next: Lesson 4

About 45 minutes.

Goal

Children place fractions on a number line by treating the length from 0 to 1 as the whole and marking off equal lengths from 0, go past 1 in quarters, and see that two fractions at the same point are equal.

Materials

- Counters or linking cubes, about 60 per pair.
- Two sets of digit cards 0 to 9 per pair.
- Whiteboards and pens, or paper and pencils.
- A fraction-strip set per pair: one whole, 2 halves, 3 thirds, 4 quarters, 6 sixths and 8 eighths, each piece labelled in large print with a raised mark.
- A number-line sheet per pair: four blank lines from 0 to 1, each 24 cm long, and one line from 0 to 2, 48 cm long, in print and raised-line versions.
- Rulers and pencils.
- A check line per child: a 24 cm line from 0 to 1 with tick marks at each quarter and no labels, in print and raised-line versions.

Steps

✎ Opening (5 min)

Times-table start: the 10s and 5s. "5 times a number is half of 10 times it." 10 × 7 = 70, so 5 × 7 = 35; 10 × 4 = 40, so 5 × 4 = 20; then 6 × 5 = 30. Pairs show answers with digit cards and can check 5 × 4 with counters.

✎ Main activity (32 min)

1. **From strip to line (10 min).** The teacher lays the whole strip along a 0-to-1 line: 0 at the start, 1 at the end. "The whole is the distance from 0 to 1." Lay quarter pieces along the line from 0 and make a tick at the end of each one: 1/4, 2/4, 3/4 and 4/4, which lands on 1. "The number 1/4 is the point at the end of the first quarter: it is 1/4 of the way from 0 to 1."

2. **Make your own lines (14 min).** Pairs mark their four 0-to-1 lines by laying pieces from 0 and ticking the end of each piece:

    - Line 1 in halves: 1/2, 2/2.
    - Line 2 in quarters: 1/4, 2/4, 3/4, 4/4.
    - Line 3 in thirds: 1/3, 2/3, 3/3.
    - Line 4 in eighths: 1/8 to 8/8.

Then the 0-to-2 line in quarters: lay the 4 quarter pieces from 0 to 1, tick each end, then move them along to go from 1 to 2. Label 0, 1/4, 2/4, 3/4, 4/4 (also 1), 5/4, 6/4, 7/4, 8/4 (also 2). "5/4 is one quarter more than 1."

3. **Same point (8 min).** Pairs put the halves line under the quarters line with the 0s lined up. "What is at the same point as 1/2?" (2/4.) So 1/2 and 2/4 are equal: the same point on the line. Do the same with the quarters and eighths lines (1/4 and 2/8; 2/4 and 4/8). Also 4/4, 3/3 and 1 are all at the same point.

✓ Discussion questions (with answers)

- Where is 4/4 on the line? At 1.
- Is 5/4 more or less than 1? More: it is one quarter past 1.
- Which is further from 0, 1/3 or 1/8? 1/3, because thirds are longer pieces than eighths.

✓ Closing check (8 min, with answers)

Give each child a check line. The child points to where 3/4 goes (the third tick from 0) and where 1/4 goes (the first tick), then answers "What other fraction is at the same point as 1?" (4/4), by pointing, saying, signing or writing on a whiteboard. Then: "5 × 7?" (35).

Vocabulary

number line, point, tick mark, distance from 0, past 1, equal, same point

Differentiation

- **Support:** mark only halves and quarters, laying each piece from 0 every time.
- **Stretch:** on the 0-to-2 line, where would 3/2 go? (At 6/4, half way between 1 and 2.)
- Raised-line sheets let children feel each line and tick. Laying the strip pieces along the line works by touch as well as by sight.

⚠ Safety

Use counters too large to swallow. Rulers and pencils stay on the desk.

Teacher notes and misconceptions

- Some children write 1/4 at 0. Remind them that 0 is the start and 1/4 is the end of the first piece.
- Some children count tick marks including 0, so they put 3/4 at the second tick. Count the pieces (spaces), not the marks.
- The lines must all be the same length as the whole strip, or the pieces will not fit; this is the "same whole" idea that lesson 4 comes back to.

Lesson 4: Comparing fractions

Unit overview - Previous: Lesson 3 - Next: Lesson 5

About 45 minutes.

Goal

Children compare two fractions with the same bottom number or the same top number by reasoning about the size of the pieces, record the result with >, < or =, and explain why the comparison only works for parts of the same whole.

Materials

- Counters or linking cubes, about 60 per pair.
- Two sets of digit cards 0 to 9 per pair.
- Whiteboards and pens, or paper and pencils.
- A fraction-strip set per pair: one whole, 2 halves, 3 thirds, 4 quarters, 6 sixths and 8 eighths, each piece labelled in large print with a raised mark.
- Large >, < and = cards per pair, with raised outlines.
- A short card strip 12 cm long and a long card strip 48 cm long, for the teacher.
- A set of 11 fraction cards per pair, in large print with the numbers also raised (glued string or puffy paint): 1/2, 1/3, 1/4, 1/6, 1/8, 2/3, 2/8, 3/4, 3/8, 5/6, 5/8.

Steps

✎ Opening (5 min)

Times-table start: the 3s and 6s. "6 times a number is double 3 times it." 3 × 4 = 12, so 6 × 4 = 24; 3 × 7 = 21, so 6 × 7 = 42. Pairs show answers with digit cards and can build 3 × 4 and 6 × 4 with counters.

✎ Main activity (32 min)

1. **Same bottom number (8 min).** Pairs build 3/8 and 5/8 side by side. "The pieces are the same size, so more pieces is more." 5/8 is bigger than 3/8, written 5/8 > 3/8, and 3/8 < 5/8. Children place the > or < card between the two rows of pieces. Recall the signs from grade 1: the open side faces the bigger number.
2. **Same top number (10 min).** Pairs build 1/3 and 1/6 side by side. "Which piece is longer?" (1/3.) "The bigger the bottom number, the more pieces the whole is cut into, so the smaller each piece is." 1/3 > 1/6. Then 2/3 and 2/8: two pieces each, but thirds are longer, so 2/3 > 2/8.
3. **Same whole? (4 min).** The teacher folds the short strip in half and the long strip into quarters, and holds up one half of the short strip next to one quarter of the long strip. "1/2 is bigger than 1/4, isn't it? So why is this quarter longer?" (The wholes are different sizes: half of 12 cm is 6 cm, a quarter of 48 cm is 12 cm.) We can only compare fractions fairly when they are parts of the same whole.

4. **Compare game (10 min).** The fraction cards go face down. A child turns over two cards. If the two fractions share a top number or a bottom number, the pair builds both with their strips, puts the right sign card between the two fraction cards and says why. If they share neither, put one card back, mix the cards and turn over another. Swap turns.

✓ Discussion questions (with answers)

- Why is 1/6 smaller than 1/3 when 6 is bigger than 3? The whole is cut into 6 pieces instead of 3, so each piece is smaller.
- 3/4 or 3/8: which is bigger, and why? 3/4: both have 3 pieces, and quarters are bigger pieces than eighths.
- Is half always bigger than a quarter? Only when both are parts of the same whole.

✓ Closing check (8 min, with answers)

Each child may use their strips. "Which is bigger, 1/6 or 5/6?" (5/6.) "Put the sign card between 1/4 and 1/8." (1/4 > 1/8.) "Hen eats half of a small pretend cake and Goat eats a quarter of a very big pretend cake. Hen says, 'I ate more, because 1/2 is more than 1/4.' Is Hen sure to be right?" (No: the cakes are different sizes, so we cannot tell without seeing them.) Answers can be said, signed, pointed to or written. Then: "6 × 4?" (24).

Vocabulary

compare, bigger, smaller, greater than, less than, equal to, same whole, same top number, same bottom number

Differentiation

- **Support:** compare only unit fractions (1/2, 1/3, 1/4, 1/6, 1/8), always building both.
- **Stretch:** "Put 1/2, 1/3, 1/4, 1/6 and 1/8 in order from smallest to biggest and explain the pattern." (1/8, 1/6, 1/4, 1/3, 1/2: the bigger the bottom number, the smaller the piece.)
- Fraction cards and sign cards have raised numbers and outlines. Pieces laid side by side from the same starting edge can be compared by touch.

⚠ Safety

Use counters too large to swallow.

Teacher notes and misconceptions

- The most common error is "1/8 is bigger than 1/3 because 8 is bigger than 3". Building both is the answer, every time.
- The 11 fraction cards were chosen so that any allowed pair can be built with one strip set (for example 5/8 and 3/8 need exactly 8 eighths).

- Comparing fractions with different top and bottom numbers, such as 2/3 and 3/4, is left for later grades.

Lesson 5: Equal fractions and fraction stories

Unit overview - Previous: Lesson 4

About 45 minutes.

Goal

Children find simple equal fractions, such as 1/2 = 2/4 = 4/8 and 2/3 = 4/6, by matching lengths, and use fractions to solve short story problems.

Materials

- Counters or linking cubes, about 60 per pair.
- Two sets of digit cards 0 to 9 per pair.
- Whiteboards and pens, or paper and pencils.
- A fraction-strip set per pair: one whole, 2 halves, 3 thirds, 4 quarters, 6 sixths and 8 eighths, each piece labelled in large print with a raised mark.
- Large >, < and = cards per pair, with raised outlines.
- Six story cards (below), each with a small picture.
- Paper squares about 15 cm across, 1 per child.

Steps

✎ Opening (5 min)

Times-table start: the 8s, by doubling the 4s. 4 × 6 = 24, so 8 × 6 = 48; 4 × 7 = 28, so 8 × 7 = 56. Then one division from a fact: "8 × 5 = 40, so what is 40 ÷ 5?" (8.) Pairs show answers with digit cards and can check 8 × 5 with counters.

✎ Main activity (32 min)

1. **Same length, different names (12 min).** Pairs lay one half piece on the table, then find other pieces that make exactly the same length: 2 quarters, then 4 eighths. They put = cards between them and write 1/2 = 2/4 = 4/8. Then:

    - 1/3 = 2/6 (2 sixth pieces match 1 third piece).
    - 2/3 = 4/6.
    - 3/4 = 6/8.

    "Equal fractions are the same size, even though the numbers are different."

2. **Fraction stories (14 min).** The teacher reads each story card aloud. Pairs build it with strips or draw it, then answer:

    - Card 1: Hen cuts a long pretend loaf into 4 equal pieces. Goat eats 1 piece. What fraction of the loaf did Goat eat? How much is left? (1/4; 3/4.)
    - Card 2: Bear's fence has 8 equal parts. Bear paints 5 parts. What fraction is painted? What fraction is not painted yet? (5/8; 3/8.)

- Card 3: Duck and Mouse have two ribbons the same length. Duck cuts one ribbon into 3 equal pieces, and Mouse cuts the other into 6 equal pieces. Each gives away 1 piece. Who gave away more ribbon? (Duck: 1/3 > 1/6.)
- Card 4: Crab walks 2/4 of the way along the path. Goat walks 1/2 of the way along the same path. Who walked further? (Neither: 2/4 = 1/2.)
- Card 5: The school garden has 6 equal beds, and all 6 beds have flowers. What fraction of the garden has flowers? (6/6, which is one whole garden.)
- Card 6: Mouse has 3 whole pretend crackers. Write 3 as a fraction. (3/1.)

3. **Half of a square (6 min).** Each child folds a paper square in half, then in half again. "The first fold made halves. What are the parts now?" (Quarters.) "How many quarters cover one half?" (2.) So 1/2 of the square = 2/4 of the square.

✓ Discussion questions (with answers)

- Is 1/2 equal to 2/4 even though the numbers are different? Yes: they are the same length, and the same point on the number line.
- How many eighths are the same as 3/4? 6.
- Card 4: why is it fair to compare Crab and Goat? They walk along the same path, so it is the same whole.

✓ Closing check (8 min, with answers)

With the fraction-strip set, each child shows a fraction equal to 1/3 (2/6) and shows 1/2 using eighths (4/8). The teacher then lays 3 quarter pieces on the whole strip: "What fraction of the strip is covered?" (3/4.) Answers can be shown with pieces, said, signed, pointed to or written. Then: "40 ÷ 5?" (8).

Vocabulary

equal fractions, same size, same length, the same as, story problem

Differentiation

- **Support:** find only 1/2 = 2/4, and use cards 1, 4 and 6 with an adult reading each step.
- **Stretch:** find every fraction in the strip set that is equal to 1/2 (2/4, 3/6, 4/8), and explain why there is no number of thirds equal to 1/2. (Thirds do not line up with the half mark: one third is too short and two thirds are too long.)
- Matching lengths works by touch: lay the pieces from the same starting edge and feel whether the ends line up.

⚠ Safety

Use counters too large to swallow. The loaf, crackers and garden are pretend; no real food.

Teacher notes and misconceptions

- Some children think equal fractions must use the same numbers. Keep going back to "Is it the same length?"
- Avoid rules such as "multiply top and bottom by the same number" at this stage; the standards ask children to explain equal fractions with a model.
- Story names are the made-up Little Hill characters used in other units.

Grade 3 Mathematics: Area and Shapes (5 lessons, about 4 weeks)

> **Unreviewed AI draft.** Written by Claude Opus 5.5 (AI Village), 12 November 2026. No educator has reviewed or classroom-tested this unit. It is not aligned to any official standard. Check activities against your school's rules.
>
> Text-checked by four other agents (Gemini 3.5 Flash, Gemini 3.8 Flash, Gemini 4 Argon and Gemini 4 Carbon); see Known gaps.

Back to the grade 3 year plan - Term 3. Builds on grade 2 Measuring, time, money and shapes (measuring in centimetres and metres; naming flat shapes) and grade 3 Equal groups and arrays and Fractions

Big idea

Area is how much flat space a shape covers. We measure it by covering the shape with equal squares, with no gaps and no overlaps, and counting them. When the squares sit in rows, as in a rectangle, we do not need to count them one by one: 4 rows of 6 squares is 4 × 6 = 24 squares. A shape can be split into rectangles and the areas added. Shapes can also be sorted by what they have in common, and a shape can be split into parts with equal areas, each part a fraction of the whole.

Outcomes

By the end of the unit most children can:

1. Explain area as the amount of flat space a shape covers, and measure it by covering the shape with equal squares, with no gaps and no overlaps.
2. Find areas by counting square centimetres on squared paper, and use the words "square centimetres" and "square metres".
3. Find the area of a rectangle by tiling it, explain why it is the same as multiplying the two side lengths, and multiply side lengths to solve story problems.
4. Find the area of a shape made of rectangles (such as an L shape) by splitting it into rectangles and adding their areas, and show that a 6 by 7 rectangle can be split into a 6 by 5 and a 6 by 2 rectangle.
5. Sort four-sided shapes, explain that squares, rectangles and rhombuses are all quadrilaterals, and draw a quadrilateral that is none of these.
6. Split a shape into parts with equal areas and name each part as a unit fraction of the whole, such as 1/4.

Prior knowledge

Grade 2: measuring lengths with a ruler in centimetres, and naming triangles, squares, rectangles, pentagons and hexagons. Grade 3 term 1: arrays, rows and columns, and multiplication as equal groups. Grade 3 term 2: unit fractions as equal parts of one whole. Children who are not yet secure with multiplication can count the squares in rows (skip-counting) in every lesson; the tiles are always there.

Lessons

Each lesson is about 45 minutes: a 5-minute times-table start, paired work with paper squares, tiles or squared paper (32 minutes, ending with a short class discussion), and an 8-minute closing check. Split a lesson over two days if needed; the unit runs over about 4 weeks, so each idea should come back in short daily practice (one rectangle to tile, one area to work out, or one shape to sort).

1. Covering a shape: what is area?
2. Square centimetres and square metres
3. Rows of squares: area and multiplying
4. Splitting shapes and adding areas
5. Sorting four-sided shapes and sharing areas fairly

Materials (whole class unless noted)

- Counters or linking cubes too large to swallow, about 60 per pair (every lesson, for the times-table start).
- Whiteboards and pens, or paper and pencils (every lesson).
- Three card rectangles per pair, cut in advance by an adult and labelled on the back (lesson 1): A, 16 cm by 12 cm; B, 24 cm by 8 cm; C, 20 cm by 12 cm.
- 20 paper squares per pair, each 4 cm by 4 cm, cut in advance (lesson 1).
- 10 paper circles per pair, each 4 cm across, cut in advance (lesson 1).
- Centimetre squared paper, 2 sheets per child (lessons 2 and 4), and a shape sheet per pair with five shapes drawn on centimetre squared paper (lesson 2; see lesson 2).
- One 4 cm paper square from lesson 1 per pair (lesson 2).
- Four metre sticks and masking tape to stick down a 1 m by 1 m square on the floor (lesson 2).
- Square tiles 2 cm across (plastic or card, too large to swallow), about 50 per pair (lessons 3 and 4).
- A set of four rectangle cards per pair, each the right size to be covered by the 2 cm tiles (lesson 3; see lesson 3).
- Six Little Hill garden cards (lesson 3; see lesson 3).
- Coloured pencils, two colours per child (lesson 4).
- An L-shape sheet per pair, drawn on centimetre squared paper with the side lengths written along the edges (lesson 4; see lesson 4).
- A set of twelve shape cards per pair, cut in advance (lesson 5; see lesson 5).
- Two sorting hoops or two large loops of string per pair, and two label cards: "4 square corners" and "4 sides the same length" (lesson 5).
- For the assessment: a card 6 cm by 10 cm, and two check shapes drawn on centimetre squared paper (see Assessment).
- Paper squares 15 cm across, 3 per child, and rulers (lesson 5).
- For blind or low-vision children (all lessons): squares, tiles and circles that can be felt; raised-line squared paper (or a grid of glued string lines) with large-print numbers; shape cards with raised outlines and a Braille or large-print label.

⚠ Safety and access

- Tiles, counters and cubes must be too large to swallow. All cards, squares and circles are cut in advance by an adult, so no scissors are needed.

- The 1 m square in lesson 2 is made with masking tape stuck down flat on the floor, so nobody trips on loose sticks. Metre sticks are carried upright and put down, never waved.
- Nobody measures a person, and nobody's body, desk space or home is used as an example. The stories use made-up Little Hill gardens.
- Raised-line squared paper, tactile tiles and raised shape outlines let children who are blind or have low vision count squares and sides by touch. Laying tiles in rows is a way to "see" a rectangle's area with the hands.
- Placing tiles can be hard for some hands: a partner or adult can place them while the child says where they go, or the child counts squares already drawn on paper.
- Pointing, placing tiles, sign, writing or a communication device all count as answers. Story cards are read aloud, so reading is not what is being checked.
- No public timing, races or times-table tests. The times-table start is a short shared practice.

Assessment

Observe during paired work and keep a class list with one column per outcome. A one-to-one check (about 5 minutes per child) during the fourth week, with tiles, a 4 cm paper square and a 4 cm paper circle from lesson 1, a card 6 cm by 10 cm (3 by 5 tiles), two check shapes drawn on centimetre squared paper (described below), a 15 cm paper square and the shape cards to hand:

- Show a 4 cm paper square and a 4 cm paper circle. "Which shape is better for measuring area by covering? Why?" (The square: squares fit together with no gaps; circles leave gaps.)
- Show a shape on centimetre squared paper made of a 4 by 3 rectangle with one more square joined to one side. "What is its area?" (13 square centimetres.)
- Give a card 3 tiles wide and 5 tiles long. "Cover it with tiles. How many? How could you know without counting every tile?" (15; there are 3 rows of 5, and $3 \times 5 = 15$.)
- "A Little Hill garden is a rectangle 8 metres long and 4 metres wide. What is its area?" (32 square metres.)
- Show an L shape drawn on squared paper: a 5 by 4 rectangle with a 2 by 2 square missing from one corner. "What is its area? Show how you split it." (16 square centimetres, for example $5 \times 2 = 10$ and $3 \times 2 = 6$, and $10 + 6 = 16$.)
- Show shape cards for a square, a rhombus and a kite. "Which of these are quadrilaterals? Is the square a rectangle too?" (All three; yes, a square has four square corners.) Then: "Fold this paper square into 4 parts with equal areas. What fraction is one part?" (1/4.)

Record yes, with help or not yet for each part. A child who counts the squares along the edges of a rectangle and adds them (for example $4 + 3 + 4 + 3$) is measuring the distance round the edge, not the area; note it and come back to covering the shape with tiles.

Sources

- Common Core State Standards for Mathematics, Grade 3 (read to check what is usually expected in grade 3, not to claim alignment), CCSSO PDF: https://learning.ccsso.org/wp-content/uploads/2022/11/Math_Standards1.pdf
  - Page 25, 3.MD.5: "Recognize area as an attribute of plane figures and understand concepts of area measurement."

    - 3.MD.5a: "A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area."
    - 3.MD.5b: "A plane figure which can be covered without gaps or overlaps by n unit squares is said to have an area of n square units."
    - 3.MD.6: "Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units)."
    - 3.MD.7a: "Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths."
    - 3.MD.7b: "Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning."
    - 3.MD.7c: "Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning."
    - 3.MD.7d: "Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems."
    - Page 26, 3.G.1: "Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories."
    - 3.G.2: "Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole."

Known gaps and cautions

- Four other agents (Gemini 3.5 Flash, Gemini 3.8 Flash, Gemini 4 Argon and Gemini 4 Carbon, at ab10d5c) text-checked this unit on 2026-11-12. The two Flash agents and Argon reported no errors; Carbon reported three small items (a quote missing its inner quotation marks, too few tiles in lesson 3, and the lesson 5 label cards missing from this materials list), all fixed. Those are text checks by AI agents, not a teacher review or classroom test. No teacher has reviewed or tried it.
- Perimeter (3.MD.8) is not taught here, apart from one misconception note. The grade 3 year plan does not include it yet; it still needs a unit or short practice later in the year.
- Square inches and square feet are named only in a teacher note; the unit uses square centimetres and square metres. Schools that use inches and feet can swap the squared paper and the floor square.
- The multiplication sign in the 3.MD.7c quote is lost in the CCSSO PDF's text layer; I read it as "a × b and a × c" from the rendered page.
- The times-table start covers the 7s, 9s, 6s and 8s with counters; it does not replace daily practice of all facts.
- "Trapezoid" is the US word; many other countries say "trapezium". The standards do not ask children to name kites or trapezoids; they are on the shape cards only as examples of other quadrilaterals.
- The names in story cards (Hen, Goat, Bear, Duck, Mouse) are the made-up Little Hill characters used in other units. Swap in names that suit your class.
- The lesson order, timings, card sizes and examples are my choice, not taken from a source.

Lesson 1: Covering a shape: what is area?

Unit overview - Next: Lesson 2

About 45 minutes.

Goal

Children compare how much flat space three rectangles cover by covering each one with equal paper squares, find that a long thin rectangle can cover the same space as a shorter, wider one, and learn the word "area".

Materials

- Counters or linking cubes, about 60 per pair.
- Whiteboards and pens, or paper and pencils.
- Three card rectangles per pair (cut in advance by an adult, letter on the back): A, 16 cm by 12 cm; B, 24 cm by 8 cm; C, 20 cm by 12 cm. One large set for the board.
- 20 paper squares per pair, each 4 cm by 4 cm, cut in advance.
- 10 paper circles per pair, each 4 cm across, cut in advance.
- For blind or low-vision children: card rectangles with a raised edge (a glued string line round the outside) and thick card squares and circles that are easy to feel.

Steps

✎ Opening (5 min)

Times-table start: the 7s. Pairs make 3 groups of 7 with counters, then 5 groups of 7, then 7 groups of 7, and write each fact: 3 × 7 = 21, 5 × 7 = 35, 7 × 7 = 49. "How could 5 × 7 help you find 6 × 7?" (Add one more group of 7: 35 + 7 = 42.)

✎ Main activity (32 min)

1. Which covers more? (5 min). Hold up rectangles A and B. "If these were two rugs for the Little Hill library floor, which rug would cover more of the floor?" Pairs talk and write A or B on their whiteboard. Many children choose B because it is longer. Do not give the answer yet.

2. Covering with squares (10 min). Give each pair their rectangles and the 4 cm squares. "Cover rectangle A with squares. The squares must not overlap, and there must be no gaps. Then count them." (12 squares, in 3 rows of 4.) Then cover B. (12 squares, in 2 rows of 6.) "A and B cover the same amount of space, even though B is longer." Now give each pair the circles. "Try covering A with circles. What happens?" (There are gaps between the circles, so some of the card is not covered.) Show on the board what an overlap looks like (one square lying partly on another) and why it counts some space twice.

3. Rectangle C (10 min). Pairs cover C and count. (15 squares, in 3 rows of 5.) They put A, B and C in order from the one that covers the least space to the one that covers the most (A

and B are equal with 12 squares; C is the largest with 15) and write it on the whiteboard. Introduce the word: "The amount of flat space a shape covers is its **area**. The area of A is 12 squares. The area of C is 15 squares."

4. Talk together (7 min). Use the discussion questions below.

✓ Discussion questions (with answers)

- "Was your first guess about A and B right? Why might the longer one look bigger?" (Many people look only at length. Covering shows that A and B have the same area, 12 squares each.)
- "Why are squares better than circles for measuring area?" (Squares fit together with no gaps; circles always leave gaps.)
- "Why must the squares all be the same size?" (If some were bigger, the count would not be fair. It is like measuring length with sticks of different lengths.)
- "Did anyone notice the squares were in rows? How could rows help you count?" (A has 3 rows of 4, so 4 + 4 + 4 = 12. This comes back in lesson 3.)

✓ Closing check (8 min, with answers)

Draw two shapes on the board made of equal squares: shape X is 6 squares in one line; shape Y is 2 rows of 4 squares. Children answer on whiteboards or by pointing:

1. "What is the area of X? Of Y?" (6 squares; 8 squares.)
2. "Which has the larger area?" (Y, even though X is longer.)
3. Show A covered with squares but with one square missing in the middle. "Is this area measured properly? Why not?" (No: there is a gap.)

Vocabulary

- **area**: the amount of flat space a shape covers.
- **gap**: a space that is not covered.
- **overlap**: when one piece lies partly on top of another.

Differentiation

- **Support:** cover only A and B; an adult draws pencil lines on the back of the card in 4 cm squares, so the child can match squares to lines.
- **Stretch:** "Without covering it, how many 4 cm squares would cover a rectangle 12 cm by 8 cm?" (3 rows of 2, so 6 squares.) Then check by covering.
- **Tactile:** raised-edge rectangles and thick squares let children feel when the card is fully covered; running a fingertip over the circles shows the gaps.

⚠ Safety

- All cards, squares and circles are cut in advance by an adult; no scissors. Counters and cubes must be too large to swallow.

Teacher notes and misconceptions

- "Longer means bigger." Rectangle B is there to show that a long thin shape can have the same area as a shorter, wider one.
- Some children overlap squares to "fit" the edge, or leave small gaps. Ask them to slide the squares together until the edges touch.
- The squares here are "our squares" (an improvised unit). Lesson 2 moves to standard square centimetres and square metres.

Lesson 2: Square centimetres and square metres

Unit overview - Previous: Lesson 1 - Next: Lesson 3

About 45 minutes.

Goal

Children learn that a square with sides of 1 centimetre is a **square centimetre**, find the areas of shapes by counting square centimetres on squared paper, draw two different shapes with the same area, and see how big a **square metre** is.

Materials

- Counters or linking cubes, about 60 per pair.
- Whiteboards and pens, or paper and pencils.
- Centimetre squared paper, 1 sheet per child, and pencils.
- A shape sheet per pair (below), drawn on centimetre squared paper.
- One 4 cm paper square from lesson 1 per pair.
- Four metre sticks and masking tape. Before the lesson, an adult lays the sticks in a 1 m by 1 m square on the floor, marks the edges with masking tape stuck down flat, and puts the sticks away.
- For blind or low-vision children: raised-line squared paper (or a grid of glued string lines 1 cm apart) with the shape sheet shapes outlined in thicker raised lines; a thick card 4 cm square.

The shape sheet (each shape is made of whole centimetre squares joined edge to edge; the area is in brackets for the teacher and is not on the sheet):

Shape	What it looks like	Area
P	a rectangle 4 squares long and 3 squares wide	12 square cm
Q	a rectangle 5 squares long and 2 squares wide	10 square cm
R	a row of 4 squares, another row of 4 under it, and 1 more square under the left end	9 square cm
S	a plus sign: 1 square in the middle with 1 square on each of its 4 sides	5 square cm
T	a row of 5 squares with 2 more squares going down from the middle one	7 square cm

Steps

✎ Opening (5 min)

Times-table start: the 9s. Pairs make 2 groups of 9 with counters, then 5 groups of 9, then 6 groups of 9, and write each fact: 2 × 9 = 18, 5 × 9 = 45, 6 × 9 = 54. "How could 10 × 9 help you find 9 × 9?" (Take one group of 9 away: 90 - 9 = 81.)

✎ Main activity (32 min)

1. A square centimetre (5 min). Show one square on the squared paper. "Each side of this square is 1 centimetre long. A square like this is called a **square centimetre**. It is a standard square, the same everywhere, so everyone's measurements can be compared." Pairs put their 4 cm square from lesson 1 on the squared paper, lined up with the lines, and count the square centimetres it covers. (16: 4 rows of 4.)

2. The shape sheet (12 min). Pairs find the area of each shape P to T by counting squares, and write it with its unit, for example "P: 12 square cm". They tick each square lightly with a pencil as they count it, so no square is counted twice. Then: "Which shape has the largest area? Which has the smallest?" (P, 12 square cm; S, 5 square cm.)

3. Same area, different shape (7 min). Each child draws two different shapes on their own squared paper, each with an area of exactly 10 square centimetres. Squares must join edge to edge, not just at a corner. Partners check each other's count.

4. A square metre (4 min). Gather round the taped square on the floor, standing outside the tape. "Each side is 1 metre long, so this is a **square metre**. How many square centimetres do you think would cover it?" (Take a few guesses. The answer is 100 rows of 100, which is 10,000; children do not need to work this out.) "We use square metres for big things like floors and gardens, and square centimetres for small things like a card or a page."

5. Talk together (4 min). Use the discussion questions below.

✓ Discussion questions (with answers)

- "Were everyone's 10-square-centimetre shapes the same shape? Did they have the same area?" (Different shapes; the same area, 10 square cm.)
- "Shape Q is 5 squares long and shape P is only 4 squares long. Which has the larger area?" (P: 12 square cm, more than Q's 10. A longer shape does not always cover more space; we count the squares, not just the length.)
- "Why do we say 'square centimetres' and not just 'centimetres'?" (Centimetres measure length along a line; square centimetres measure the space a shape covers.)

✓ Closing check (8 min, with answers)

Draw on a squared grid on the board a rectangle 3 squares long and 2 squares wide with 1 more square joined to the end of the top row. Children answer on whiteboards or by pointing:

1. "What is the area of this shape?" (7 square cm.)
2. "Would you measure the area of the hall floor in square centimetres or square metres?" (Square metres.)
3. "Mouse says shape S has an area of 9 because the plus sign is 3 squares across and 3 squares down. Is Mouse right?" (No: S covers 5 squares. 3 × 3 = 9 would be right only if the whole 3 by 3 square were filled in; the four corner squares are empty.)

Vocabulary

- **square centimetre**: a square with sides 1 cm long; a unit of area.
- **square metre**: a square with sides 1 m long; a unit of area.
- **unit**: the thing we count when we measure.

Differentiation

- **Support:** start with shapes P and Q only; an adult draws a dot in each square to be counted.
- **Stretch:** draw a shape with an area of 10 square centimetres that is not a rectangle, and a rectangle with an area of 12 square centimetres in two different ways (for example 3 by 4 and 2 by 6).
- **Tactile:** count squares on raised-line paper with a fingertip, putting a small counter on each square once it is counted.

⚠ Safety

- The floor square is marked with masking tape stuck down flat; the metre sticks are put away before children come near it. Children stand outside the tape.

Teacher notes and misconceptions

- Some children count the lines or the corners instead of the squares. Ticking each square as it is counted helps.
- Some children say "centimetres" for area. Ask: "Are you measuring along a line, or the space inside?"
- The written short form cm² (and m²) can be shown if your school uses it; this unit writes the words, "square cm".
- Schools that use inches and feet can use inch squared paper and a 1 foot by 1 foot square on the floor instead of a square metre.

Lesson 3: Rows of squares: area and multiplying

Unit overview - Previous: Lesson 2 - Next: Lesson 4

About 45 minutes.

Goal

Children tile rectangles with square tiles, see the tiles as rows like an array, find that the area is the same as multiplying the two side lengths, and multiply side lengths to find the areas of made-up Little Hill gardens.

Materials

- Counters or linking cubes, about 60 per pair.
- Whiteboards and pens, or paper and pencils.
- Square tiles 2 cm across, about 50 per pair (enough to build Bear's 48-square-metre garden, one tile per square metre).
- A set of four rectangle cards per pair (below), cut in advance by an adult, blank on the front, with the letter on the back.
- Six Little Hill garden cards (below): one large set for the board and one small set per pair, each with a simple drawing of a rectangle with its two side lengths written on the sides.
- For blind or low-vision children: rectangle cards with a raised edge; tactile tiles; garden cards with raised outlines and large-print or Braille numbers.

The rectangle cards (each side is a whole number of 2 cm tiles):

Card	Size	Tiles along each side	Area in tiles
W	6 cm by 8 cm	3 and 4	12
X	10 cm by 4 cm	5 and 2	10
Y	8 cm by 12 cm	4 and 6	24
Z	6 cm by 14 cm	3 and 7	21

The Little Hill garden cards (made up; answers in brackets, not on the cards):

1. Hen's vegetable bed is 7 metres long and 3 metres wide. (21 square metres.)
2. Goat's grass patch is 5 metres long and 6 metres wide. (30 square metres.)
3. Mouse's flower bed is 4 metres long and 4 metres wide. (16 square metres.)
4. Duck's pond deck is 9 metres long and 2 metres wide. (18 square metres.)
5. Bear's berry patch is 8 metres long and 6 metres wide. (48 square metres.)
6. Bear wants a new rectangle patch with an area of 24 square metres. How long and how wide could it be? (Any of 1 by 24, 2 by 12, 3 by 8 or 4 by 6 metres.)

Steps

✎ Opening (5 min)

Times-table start: the 6s. Pairs make 4 groups of 6 with counters, then 6 groups of 6, then 8 groups of 6, and write each fact: 4 × 6 = 24, 6 × 6 = 36, 8 × 6 = 48. "How could 4 × 6 help you find 8 × 6?" (8 is double 4, so double 24: 48.)

✎ Main activity (32 min)

1. Tiling the cards (12 min). Pairs cover each card W, X, Y and Z with tiles, with no gaps and no overlaps, and fill in a table on their whiteboard: card, number of rows, tiles in each row, total tiles. (W: 3 rows of 4, 12; X: 2 rows of 5, 10; Y: 4 rows of 6, 24; Z: 3 rows of 7, 21. Children may turn a card, so "4 rows of 3" for W is also right.)

2. Rows and multiplying (6 min). Ask: "Where have you seen rows like this before?" (Arrays, in term 1.) Write W as 3 × 4 = 12. "The tiles along one side tell us how many rows. The tiles along the other side tell us how many in each row. So we can multiply the two side lengths instead of counting every tile." Check with Y: 4 × 6 = 24. Then: "A card is 5 tiles along one side and 3 tiles along the other. What is its area, without tiling it?" (15 tiles.) Pairs check by building it.

3. Little Hill gardens (10 min). Read the garden cards aloud. Pairs work out each area by multiplying the side lengths, writing the answer with the unit, for example "Hen: 7 × 3 = 21 square metres". Children who are not yet sure of a fact can draw a quick grid or build the rectangle with tiles, one tile for each square metre. Then: "Whose garden has the largest area?" (Bear's berry patch, 48 square metres.) Card 6 is for pairs who finish early; take every answer that multiplies to 24.

4. Talk together (4 min). Use the discussion questions below.

✓ Discussion questions (with answers)

- "Why can we multiply instead of counting every tile?" (The tiles are in equal rows, so it is like an array: rows × tiles in each row.)
- "Goat's patch is 5 by 6. Would a patch 6 by 5 have the same area?" (Yes, 30 square metres; it is the same rectangle turned round.)
- "Bear's new patch could be 4 by 6 or 3 by 8. Do they look the same?" (No, but both have an area of 24 square metres.)

✓ Closing check (8 min, with answers)

Children answer on whiteboards or by pointing:

1. "A card is 6 tiles along one side and 3 tiles along the other. What is its area?" (18 tiles.)
2. Draw a rectangle on the board split into 4 rows of 7 squares. "What multiplication tells us the area? What is it?" (4 × 7 = 28 squares, or 7 × 4.)

3. "A garden is 10 metres long and 5 metres wide. What is its area?" (50 square metres.)

Vocabulary

- **row**: a line of tiles going across.
- **side length**: how long one side of a shape is.
- **square metre**: the unit used for the gardens, from lesson 2.

Differentiation

- **Support:** tile W, X and Y only; say each row aloud as you skip-count (4, 8, 12). Use tiles for the garden cards as well.
- **Stretch:** card 6, then: "Find every rectangle with whole-number sides and an area of 36 square metres." (1 by 36, 2 by 18, 3 by 12, 4 by 9, 6 by 6.)
- **Tactile:** feel each row of tiles and count the rows, then the tiles in one row.

⚠ Safety

- Tiles, counters and cubes must be too large to swallow. Cards are cut in advance by an adult.

Teacher notes and misconceptions

- Some children add the two side lengths (5 + 6 = 11 for Goat). Build the rectangle with tiles and count to show the area is 30.
- Multiplying side lengths works because the squares are the same size as the units along the sides: here, tiles along tile-long sides, or square metres along metre-long sides.
- The garden sizes and names are made up; they are not real data.

Lesson 4: Splitting shapes and adding areas

Unit overview - Previous: Lesson 3 - Next: Lesson 5

About 45 minutes.

Goal

Children split a rectangle into two smaller rectangles and see that the two areas add up to the whole (6 × 7 = 6 × 5 + 6 × 2), then find the areas of L shapes by splitting them into rectangles and adding.

Materials

- Counters or linking cubes, about 60 per pair.
- Whiteboards and pens, or paper and pencils.
- Centimetre squared paper, 1 sheet per child, and pencils.
- Coloured pencils, two colours per child.
- An L-shape sheet per pair (below), drawn on centimetre squared paper with the side lengths written along the edges.
- Square tiles 2 cm across, about 30 per pair, for children who want to build a shape.
- For blind or low-vision children: raised-line squared paper; L shapes cut from thick card with raised grid lines, so the two parts can be felt; tactile tiles.

The L-shape sheet (areas in brackets for the teacher, not on the sheet):

- **Shape 1:** start with a rectangle 6 squares long and 4 squares tall, and take away a block 3 squares long and 2 squares tall from the top right corner. (18 square cm: for example 6 × 2 = 12 along the bottom and 3 × 2 = 6 on top, and 12 + 6 = 18.)
- **Shape 2, the Little Hill park plan:** a rectangle 8 squares long and 5 squares tall, with a rectangle 3 squares long and 2 squares tall joined to the top, at the left end. (46 square cm: 8 × 5 = 40 and 3 × 2 = 6, and 40 + 6 = 46.)
- **Shape 3 (stretch), the steps:** a row of 6 squares, with a row of 4 squares on top of it at the left end, and a row of 2 squares on top of that at the left end. (12 square cm: 6 + 4 + 2.)

Steps

✎ Opening (5 min)

Times-table start: the 8s. Pairs make 3 groups of 8 with counters, then 5 groups of 8, then 7 groups of 8, and write each fact: 3 × 8 = 24, 5 × 8 = 40, 7 × 8 = 56. "How could 5 × 8 and 2 × 8 help you find 7 × 8?" (40 + 16 = 56.)

✎ Main activity (32 min)

1. Splitting a rectangle (8 min). Each child draws a rectangle on squared paper, 6 rows of 7 squares. "What is its area?" (6 × 7 = 42 square cm; children unsure of 6 × 7 can count in

rows.) Now colour the first 5 squares of every row in one colour and the last 2 squares of every row in the other colour. "What is the area of each coloured part?" (6 × 5 = 30 and 6 × 2 = 12.) "What do they add up to?" (42, the same as the whole rectangle.) Write on the board: 6 × 7 = 6 × 5 + 6 × 2.

2. Splitting to help with a hard fact (6 min). Pairs draw a rectangle 4 rows of 9 squares and split it into 4 rows of 5 and 4 rows of 4. (4 × 5 = 20 and 4 × 4 = 16, and 20 + 16 = 36, so 4 × 9 = 36.) "Could you split it a different way?" (Yes, for example 4 × 3 three times: 12 + 12 + 12 = 36.)

3. L shapes (12 min). Give out the L-shape sheet. "These shapes are not rectangles, so we cannot just multiply. But we can split them into rectangles that do not overlap, find each area, and add." Pairs draw a pencil line to split shape 1 into two rectangles, colour each part, and work out each area. (For example 6 × 2 = 12 and 3 × 2 = 6, total 18 square cm. Splitting the other way gives 3 × 4 = 12 and 3 × 2 = 6, also 18.) Then shape 2, the park plan. (40 + 6 = 46 square cm.) Pairs check one shape by counting squares. Shape 3 is for pairs who finish early.

4. Talk together (6 min). Use the discussion questions below.

✓ Discussion questions (with answers)

- "Did everyone split shape 1 the same way? Did everyone get the same area?" (No; yes, 18 square cm. Any split into rectangles that do not overlap gives the same total.)
- "Why must the two parts not overlap?" (The squares in the overlap would be counted twice and the total would be too big.)
- "How does splitting help with a times-table fact you do not know yet?" (Split it into facts you do know and add, like 4 × 9 = 4 × 5 + 4 × 4.)

✓ Closing check (8 min, with answers)

Children answer on whiteboards or by pointing:

1. "A rectangle is 3 rows of 8 squares. Split it into 3 rows of 5 and 3 rows of 3. What are the two areas, and the total?" (15 and 9; 24 square cm.)
2. Draw on a squared grid on the board a rectangle 5 squares long and 3 squares tall with a block 2 squares long and 1 square tall missing from the top right corner. "What is its area?" (13 square cm: for example 5 × 2 = 10 and 3 × 1 = 3.)
3. "Hen cuts her rectangle into two pieces. Is the total area of the pieces bigger, smaller or the same?" (The same.)

Vocabulary

- **split**: cut a shape into parts (here, with a pencil line).
- **L shape**: a shape like the letter L, made of two rectangles.

Differentiation

- **Support:** split only the 6 by 7 rectangle and shape 1; count the squares in each part instead of multiplying.
- **Stretch:** shape 3; then draw your own shape made of two rectangles with an area of exactly 30 square cm.
- **Tactile:** feel the two parts of a card L shape, build each part with tiles if it is small enough, and count the rows.

⚠ Safety

- Tiles, counters and cubes must be too large to swallow. Card L shapes are cut in advance by an adult.

Teacher notes and misconceptions

- Some children add up the side lengths written on the sheet. Ask: "Are you measuring round the edge, or the space inside?" Going round the edge is called the perimeter; it is not part of this unit.
- Some children split an L shape so that the parts overlap and then count the overlap twice. Colouring each part in a different colour shows any overlap.
- The 6 × 7 split is the area model of the distributive property; children do not need the name.

Lesson 5: Sorting four-sided shapes and sharing areas fairly

Unit overview - Previous: Lesson 4

About 45 minutes.

Goal

Children sort shape cards by their sides and corners, learn that squares, rectangles and rhombuses all belong to a bigger group called **quadrilaterals**, draw a quadrilateral that is none of these, and fold paper squares into parts with equal areas, naming each part as a fraction.

Materials

- Counters or linking cubes, about 60 per pair.
- Whiteboards and pens, or paper and pencils.
- A set of twelve shape cards per pair (below), cut in advance by an adult, each shape drawn large with a thick outline and its square corners marked with a small square.
- Two sorting hoops or two large loops of string per pair, and two label cards: "4 square corners" and "4 sides the same length".
- Paper squares 15 cm across, 3 per child, and rulers.
- For blind or low-vision children: shape cards with raised outlines and a raised mark in each square corner; thick paper squares with the fold lines pressed in firmly so they can be felt.

The twelve shape cards (names in brackets for the teacher; the cards have no names on them):

1. A square.
2. A long thin rectangle (not a square).
3. A wide rectangle (not a square).
4. A rhombus that is not a square (four equal sides, no square corners).
5. A parallelogram with two long sides and two short sides and no square corners.
6. A trapezoid (in some countries called a trapezium): one pair of sides going the same way, the other pair not.
7. A kite: two short sides next to each other and two long sides next to each other.
8. A four-sided shape with no equal sides and no square corners.
9. A triangle with a square corner.
10. A triangle with three equal sides.
11. A pentagon.
12. A hexagon.

Steps

✎ Opening (5 min)

Times-table start: mixed facts. "Lesson 4 showed that 6 × 7 = 42. What is 7 × 6?" (42.) Pairs make 4 groups of 9 with counters and say the fact (36), then use it: "What is 9 × 4?" (36.) "What is 8 × 7?" (56; from lesson 4.)

✎ Main activity (32 min)

1. Sorting shape cards (12 min). First sort: pairs put every shape with 4 sides inside one hoop. (Cards 1 to 8 go inside; 9 to 12 stay outside.) "Shapes with 4 sides are called **quadrilaterals**." Second sort: take the 8 quadrilaterals, overlap the two hoops, and put the label cards "4 square corners" and "4 sides the same length" on them. Pairs place each quadrilateral. (Square corners only: cards 2 and 3, the rectangles. Equal sides only: card 4, the rhombus. In both hoops, in the overlap: card 1, the square. In neither hoop: cards 5, 6, 7 and 8.) Name them together: "A shape with 4 square corners is a **rectangle**. A shape with 4 sides the same length is a **rhombus**. The square is in both, so a square is a rectangle and a rhombus too."

2. Draw one that is different (6 min). "Draw a quadrilateral that is not a square, not a rectangle and not a rhombus." Each child draws one on a whiteboard or paper, and a partner checks: 4 sides? Not 4 square corners? Not 4 equal sides? (Any four-sided shape that passes all three checks is right, such as a kite or a trapezoid.)

3. Sharing a square fairly (10 min). Each child folds a paper square into 4 parts with equal areas, then folds a second square into 4 equal parts a different way. (For example: in half and in half again the same way, to make 4 strips; in half one way and then the other, to make 4 small squares; or along both corner-to-corner lines, to make 4 triangles.) "What fraction of the whole square is one part?" (1/4.) Then, on the third square, children use a ruler to mark 3 equal strips 5 cm wide. (Each strip is 1/3 of the square.)

4. Talk together (4 min). Use the discussion questions below.

✓ Discussion questions (with answers)

- "Is a square a rectangle?" (Yes: it has 4 square corners. It is a special rectangle with all sides the same length.)
- "A triangle quarter and a strip quarter look different. Can they both be 1/4?" (Yes: each is one of 4 equal parts of the same square, so each has a quarter of its area. Equal area does not need the same shape.)
- "What do all the shapes in the big hoop have in common?" (4 sides; they are all quadrilaterals.)

✓ Closing check (8 min, with answers)

Children answer on whiteboards or by pointing:

1. Hold up card 4. "Is this a quadrilateral? Is it a rectangle?" (Yes, it has 4 sides; no, it has no square corners.)
2. Hold up card 1. "Name two groups this shape belongs to." (Any two of: quadrilateral, rectangle, rhombus, square.)
3. Draw a square split by lines into 4 parts of different sizes. "Is each part 1/4 of the square?" (No: the parts must have equal areas.)

Vocabulary

- **quadrilateral**: a flat shape with 4 straight sides.
- **rectangle**: a quadrilateral with 4 square corners.
- **rhombus**: a quadrilateral with 4 sides the same length.
- **square corner**: a corner like the corner of a page (a right angle).
- **equal area**: covering the same amount of space.

Differentiation

- **Support:** do the first sort only, and fold one square into 4 equal parts one way; an adult or partner can fold while the child says where the fold goes.
- **Stretch:** "Can you fold or draw a square into 8 parts with equal areas? What fraction is one part?" (1/8.) "Is there a shape that has 4 equal sides but is not a square?" (Yes, a rhombus like card 4.)
- **Tactile:** check square corners by fitting the corner of a page into them; count sides by running a finger round the raised outline.

⚠ Safety

- Shape cards and paper squares are cut in advance by an adult; no scissors. Counters and cubes must be too large to swallow.

Teacher notes and misconceptions

- Many children say "a square is not a rectangle". Go back to the rule: a rectangle has 4 square corners; the square passes that rule.
- A rhombus turned on its point is still a rhombus; turning a shape does not change its group.
- Children do not need the names parallelogram, trapezoid or kite; those cards are there as other quadrilaterals.
- "Square corner" is my choice of word for a right angle; teachers may use "right angle" if the class knows it.