Paper Boxes for Big Division

Teacher		**Class**	Grade 4
Subject	Math	**Topic**	Long division with remainders
Date		**Room**	
Lesson length	60 minutes	**Country**	United Kingdom

Students learn to divide up to four-digit numbers by one digit and name the remainder. They draw area models and check answers with multiplication.

Curriculum links

- Use strategies (like rounding, compatible numbers, place value) and algorithms, including the standard algorithm, to estimate and find the quotient of two whole numbers, given a one-digit divisor and a two- or three-digit dividend, with and without remainders [1].
- Estimate, represent, solve, and explain solutions to single-step real-life problems involving division with whole numbers [1].

Learning objectives

- Students will find whole-number quotients and remainders for up to four-digit by one-digit division.
- Students will use place value and multiplication facts to explain each division step.
- Students will illustrate division with equations, arrays and area models.

Success criteria

- I can divide a big number by one digit and name the leftover.
- I can explain my steps using place value and multiplication.
- I can show my work with an equation and an area model.

What students already know

Quick 2-minute check: chant multiples of 4 and 6 to 12 x 12, then ask: if 10 counters are shared into 3 equal groups, how many in each group and what is left?

Key words

dividend	the total amount that is being split up [16]
divisor	the number telling how many equal groups to make [16]
quotient	how many go in each full equal group [16]
remainder	what is left over that cannot make another full group [9]
area model	a big rectangle cut into smaller boxes to show easy parts to divide

Materials

- pencil, paper, ruler
- slides 1-12 with projector
- whiteboard and markers
- Worksheet Task D copies, one per pair
- printed multiples strip to 12 x 12

Before the lesson

- Print Worksheet Task D, one copy per pair, plus extra paper and rulers
- Test Slide 6 Video clip 1 (0:00–5:00) and Slide 8 Video clip 2 (0:00–1:16) for sound and picture

Created with LessonDino.com · AI lesson planner with checkable sources

- pre-drawn large rectangles split into two parts

- Pre-draw a large rectangle for 1,248 ÷ 6 split into 1,200 and 48 with divisor 6 outside
- Set desks for pairs with space to draw models

Lesson outline

0–10 min **Starter** 10 min · Whole class

Activate equal-sharing and multiplication facts and hook students into paper box division.

YOU DO

1. Show Slide 1 and say the hook to frame the lesson.
2. Show Slide 11 mystery and act out 10 counters shared by 3 equal groups.
3. Ask pairs to recall 3 x 3 and 3 x 4 to prove the leftover.
4. Link the leftover to today's work with four-digit dividends.

STUDENTS DO

1. Watch the counter demo and call out multiplication facts.
2. Turn and talk with a partner: how many in each group and what is left?
3. Show 3 fingers for quotient 3 and 1 finger for the leftover.

Say: No computers, no calculators. Just paper. Can we break 1,200 into easy boxes? First let's see what is left when things do not share evenly. We will use only paper boxes to split big numbers.

Worked example: 10 ÷ 3: Make 3 equal groups. 3 x 3 = 9. 10 - 9 = 1. Each group gets 3 and 1 is left. So 10 ÷ 3 = 3 R1. Check: 3 x 3 + 1 = 10 [7].

Ask: 10 counters shared by 3 friends, how many each and what is left? (3 each, 1 left over, so 3 R1 [9].) · How can multiplication prove it? (3 x 3 = 9, plus 1 = 10, so dividend = quotient x divisor + remainder [7].)

Check understanding: Thumbs up if you can say quotient and leftover for 10 ÷ 3. If not, repeat with 7 ÷ 2 using counters.

Support: Give counters to make 3 groups of 3 and see the 1 left that cannot make another full group [9].
Stretch: Ask what 1,000 counters shared by 3 would still need: equal groups plus a leftover smaller than 3.

Use: Slides 1, 11

10–22 min **Teaching** 12 min · Whole class

Model quotient, remainder and long-division steps with place value.

YOU DO

1. Show Slides 2-4 to name quotient, remainder and steps.
2. Play Video clip 1 on Slide 6 to show hundreds, tens and ones being split.
3. Pause to point out multiply-check at the end.
4. Model 346 ÷ 4 on the board with base-ten language and equation.

STUDENTS DO

1. Chant the steps with teacher: divide, multiply, subtract, bring down, repeat [18].
2. Copy the equation 346 = 86 x 4 + 2 and underline quotient and remainder.
3. Tell a partner why 2 can be the remainder.

Say: We divide one place-value part at a time. We multiply to show how much we used, subtract to see what is still left, then bring down the next digit. Anything left at the end must be smaller than the divisor.

Worked example: 346 ÷ 4: 300 ÷ 4 is hard, so think 320 ÷ 4 = 80. 80 x 4 = 320. 346 - 320 = 26. 24 ÷ 4 = 6. 6 x 4 = 24. 26 - 24 = 2. So 86 R2. Check: 86 x 4 + 2 = 344 + 2 = 346 [7]. Remainder 2 is smaller than divisor 4 [9].

Ask: What do quotient and remainder tell us? (Quotient is how many full groups we make, remainder is what is left after sharing [9].) · How do you know the division is finished? (The leftover is smaller than the divisor, so no more full groups can be made [17].) · How does multiplication check division? (Multiply quotient by divisor and add remainder to get the dividend, because they are opposites [16].)

Check understanding: Mini whiteboards: write the check for 346 ÷ 4. If errors, remodel 86 x 4 + 2 step by step.

Support: Keep the divisor multiples strip to 12 x 12 in view for quick recall of facts [1]. **Stretch:** Ask students to predict what would happen if remainder was 4 or more when divisor is 4.

Use: Slides 2–4, 6; Video clip 1 (0:00–5:00)

22–32 min **We do** 10 min · Whole class

Practice splitting by place value and seeing where the remainder appears.

YOU DO

1. Show Slide 7 and split 127 into 100, 25 and 2.
2. Play Video clip 2 on Slide 8 and ask students to listen for divide, multiply, subtract, bring down [18].
3. Solve 85 ÷ 4 together on the board, stopping after final subtraction.
4. Emphasize that 1 is smaller than 4 so it is the remainder [17].

STUDENTS DO

1. Copy the split 127 = 100 + 25 + 2 and the partial quotients 20 + 5.
2. Call out each next step: divide, multiply, subtract, bring down [18].
3. Write the check (quotient x divisor) + remainder = dividend.

Say: We break big numbers first. Easy parts make division fast. When nothing is left to bring down and the leftover is smaller than the divisor, that leftover is your remainder.

Worked example: 127 ÷ 5: 100 ÷ 5 = 20 and 25 ÷ 5 = 5. So far 25. Left with 2, which is smaller than 5. Answer 25 R2. Check: 25 x 5 + 2 = 125 + 2 = 127 [7]. 85 ÷ 4 = 21 R1 because 4 x 21 + 1 = 84 + 1 = 85.

Ask: Why split 127 into 100 and 25? (They are easy place-value and friendly multiples of 5 to divide [1].) · When does the remainder appear? (After the last subtraction when nothing is left to bring down and the leftover is smaller than the divisor [18].)

Check understanding: Show on fingers the remainder for 85 ÷ 4. If mixed, redo 5 - 4 = 1 and compare 1 < 4.

Support: Post the four step words on the board and point to each while solving [18]. **Stretch:** Ask students to show 127 ÷ 5 as a rectangle with 25 full columns and 2 extra squares.

Use: Slides 7–8; Video clip 2 (0:00–1:16)

Created with LessonDino.com · AI lesson planner with checkable sources

32–52 min **Main activity** 20 min · Pairs

Use paper area models to solve four-digit by one-digit division with remainders.

YOU DO

1. Show Slides 9-10 and demo Paper Box Division with 1,248 ÷ 6.
2. Draw the large rectangle split into 1,200 and 48, divide each part, record 200 + 8.
3. Hand out Worksheet Task D and rulers for pairs to draw boxes and equations.
4. Circulate, asking how they split and how they checked.

STUDENTS DO

1. In pairs, draw area boxes, split dividends by place value, divide and record equations [1].
2. Solve Task D problems including 1,234 ÷ 6 and 2,105 ÷ 4, noting quotients and remainders.
3. Check each with (quotient x divisor) + remainder = dividend and show the model.

Say: Draw a large rectangle. Put the divisor outside. Split the inside by place value into easy numbers. Divide each box, add the partial quotients, then prove it with multiplication and addition.

Worked example: 1,248 ÷ 6: Box 1: 1,200 ÷ 6 = 200. Box 2: 48 ÷ 6 = 8. Total 200 + 8 = 208. No leftover, so remainder 0. Check: 208 x 6 = 1,248, using multiplication as the opposite of division [16]. For a remainder case: 1,735 ÷ 4 = 433 R3 because 433 x 4 + 3 = 1,732 + 3 = 1,735 [7]. The 3 shows as 3 extra unit squares outside the full boxes.

Ask: How did you split the dividend to make it easy? (By place value, like 1,200 and 48, using properties of operations [1].) · How do you prove your quotient and remainder are right? (Multiply quotient by divisor and add remainder to get the dividend [7].)

Check understanding: Collect one equation and box per pair on the board. If remainder ≥ divisor, ask for one more group [17].

Support: Give the pre-drawn rectangle split into two parts with divisor outside so students only fill partial quotients [11]. **Stretch:** Try 1,735 ÷ 4 and explain where the remainder 3 shows in the model.

Use: Slides 9–10; Worksheet Task D

52–60 min **Plenary** 8 min · Whole class

Check fluency with quotients, remainders and the remainder rule.

YOU DO

1. Show Slide 5 vote: 85 stickers shared by 4 kids, each gets 21, 1 is left.
2. Show Slide 12 quiz and have pairs write answers on whiteboards.
3. Confirm checks 4 x 21 + 1 = 85 and 5 x 9 + 3 = 48.
4. Return to success criteria and preview next lesson.

STUDENTS DO

1. Vote and explain what is fair with 1 leftover sticker.
2. Answer quiz on whiteboards: 85 ÷ 4 and 48 ÷ 5 with checks.
3. Self-rate against I can statements with thumbs up or sideways.

Say: You found whole-number answers with leftovers. Remember, the leftover must be smaller than the divisor. Show me you can prove it with multiplication.

Worked example: 48 ÷ 5: 5 x 9 = 45. 48 - 45 = 3. 3 < 5, so 9 R3. Check: 5 x 9 + 3 = 48.

Ask: What is 85 ÷ 4 and how do you know? (21 R1, because 4 x 21 + 1 = 85.) · What must be true about a remainder? (It is smaller than the divisor [9].)

Check understanding: Whiteboard quiz: all must show 21 R1 and 9 R3 with multiply-checks. Reteach any group missing the + remainder step.

Support: Let students keep a printed multiples table for the divisor to choose how many times it fits [11].
Stretch: Ask students to make their own four-digit dividend that gives remainder 1 when divided by 8.

Use: Slides 5, 12

Common mistakes

Mistake	How to spot it	How to fix it
Writing a remainder equal to or larger than the divisor	Answer like 17 R10 for divisor 25 is okay, but R26 for divisor 25 is not; leftover still makes another group [17]	Add 1 to quotient and subtract divisor from remainder until remainder is smaller than divisor [9]
Forgetting to bring down the next digit after subtracting	Work stops early or place value is wrong, quotient has missing digit	After every subtraction ask: is there another digit to bring down, then divide again following divide, multiply, subtract, bring down, repeat [18]
Checking with multiplication but forgetting to add the remainder	Dividend does not match quotient x divisor, off by the leftover	Use dividend = quotient x divisor + remainder and add the leftover last to prove the answer [7]

Support

- Pre-draw the rectangle split into two parts and label the divisor outside so students only fill in the partial quotients
- Provide a divisor multiples strip to 12 x 12 and a printed multiples table to choose how many times the divisor fits

Stretch

- Try 1,735 ÷ 4 and explain where the remainder 3 shows in the model
- Create a four-digit dividend that gives a chosen remainder when divided by 7 and prove it with an area model and equation

Created with LessonDino.com · AI lesson planner with checkable sources

For the LSE or teaching assistant

Stay with the main activity pairs who need place value support. Point to each box, read the multiples strip together, and prompt the multiply-check: quotient x divisor + remainder. Keep pre-drawn boxes ready.

Check for understanding

Question	Answer
What is 96 ÷ 5? Show the check.	19 R1, because 19 x 5 + 1 = 95 + 1 = 96.
Solve 1,248 ÷ 6 with an area model. What are the partial quotients?	200 + 8 = 208, remainder 0.
Can the remainder be larger than the divisor? Why?	No, it must be smaller than the divisor, or you could make another group.

Homework

Draw a paper box for 1,324 ÷ 6, record quotient, remainder and multiply-check.

Sources

1. Grade 4 Math Curriculum - Fairfax County Public Schools · fcps.edu · https://www.fcps.edu/academics/elementary/fourth-grade/year-at-a-glance/math
2. Grade 4 Math | SFUSD · sfusd.edu · https://www.sfusd.edu/learning/curriculum/elementary-school/mathematics/grade-4-math
3. Long Division With Remainders - Free Template Download · help.wi.mit.edu · https://help.wi.mit.edu/long-division-with-remainders
4. Long Division - mat112.uncg.edu · mat112.uncg.edu · https://mat112.uncg.edu/HTML/secdivlong.html
5. Polynomial Long Division - Ximera · ximera.osu.edu · https://ximera.osu.edu/precal/PrecWRev1Unit6/6-1RationalFunctions/6-1-3PolynomialLongDivision
6. Long Division with Two Digits - ResourceCenter · resourcecenter.byupathway.edu · https://resourcecenter.byupathway.edu/math/m05-01
7. The Division Algorithm - Trinity University · ramanujan.math.trinity.edu · http://ramanujan.math.trinity.edu/rdaileda/teach/s20/m3326/lectures/division_handout.pdf
8. Flexi answers - How do you do polynomial long division with remainders? | CK-12 Foundation · ck12.org · https://www.ck12.org/flexi/cbse-math/polynomial-division/how-do-you-do-polynomial-long-division-with-remainders/
9. Remainder Facts for Kids · kids.kiddle.co · https://kids.kiddle.co/Remainder
10. Working out division with remainders - KS2 Maths resources ... · bbc.co.uk · https://www.bbc.co.uk/bitesize/articles/z2vtm39
11. Kids Math: Long Division - Ducksters · ducksters.com · https://www.ducksters.com/kidsmath/long_division.php
12. Long division Facts for Kids · kids.kiddle.co · https://kids.kiddle.co/Long_division
13. Kids Math: Long Division - mail.ducksters.com · mail.ducksters.com · https://mail.ducksters.com/kidsmath/long_division.php
14. Long Division Calculator with Remainders · calculatorsoup.com · https://www.calculatorsoup.com/calculators/math/longdivision.php
15. Division with remainders - KS2 Maths resources for Year 4 ... · bbc.co.uk · https://www.bbc.co.uk/bitesize/articles/zcjh8mn
16. Kids Math: Division Basics - Ducksters · ducksters.com · https://www.ducksters.com/kidsmath/division_basics.php
17. Long Division With Remainders · mathsisfun.com · http://www.mathsisfun.com/long_division2.html
18. Long Division with Remainders | Step-by-Step Visual Guide for ... · homeschoolmath.site · https://homeschoolmath.site/long-division-with-remainders