



**SCHOOL
OF MATH**

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CLASS 17

LONG DIVISION

Single-Digit Divisors with Remainders



Divide • Multiply • Subtract • Bring Down

schoolofmath.us

1. Understanding Division

Dividend • Divisor • Quotient • Remainder

$$17 \div 5 = 3 \text{ R } 2$$

Dividend

Divisor

Quotient

Remainder

Dividend:

the number
being divided.

Divisor:

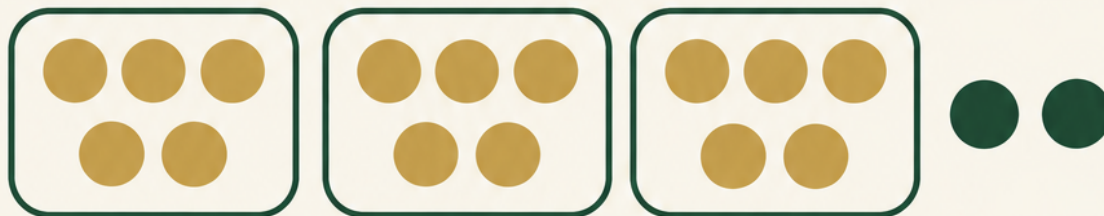
the number
you divide by.

Quotient:

the number of
complete
groups.

Remainder:

the amount
left over.



17 objects make 3 groups of 5, with 2 left over.



The remainder is always smaller than the divisor.

$$2 < 5$$

Understanding division

Q1. In $23 \div 4 = 5 \text{ R } 3$, name the dividend, divisor, quotient, and remainder.

Q2. Make groups of 6 from 19 counters. How many complete groups can you make, and how many counters remain?

Q3. Share 26 whole pencils equally among 4 children. How many does each child receive, and how many remain?

Q4. Can 7 objects make a complete group of 9? Give the quotient and remainder.

Q5. A student writes $33 \div 5 = 5 \text{ R } 8$. Explain why this is not a finished answer, then correct it.

2. Division & Multiplication

Use multiplication facts to find the quotient.

$$24 \div 6 = ?$$

Think: $6 \times ? = 24$

$$6 \times 4 = 24$$

So, $24 \div 6 = 4$



4 groups of 6 make 24.

When there is a remainder

$$29 \div 6 = 4 \text{ R } 5$$

$$6 \times 4 = 24$$

$$6 \times 5 = 30 \text{ — too large}$$

$$29 - 24 = 5 \text{ left over}$$



Key Idea:

Choose the greatest multiple that does not exceed the dividend.

Your turn:

$$35 \div 7 = \underline{\quad}$$

Think: $7 \times \underline{\quad} = 35$

Using multiplication to choose a quotient

Q6. Use a multiplication fact to solve $32 \div 8$.

Q7. Use multiplication to solve $45 \div 5$.

Q8. Use nearby multiples of 6 to solve $34 \div 6$.

Q9. Which two multiples of 7 surround 58? Use them to find the quotient and remainder.

Q10. Find the greatest multiple of 8 that does not exceed 67. Give the quotient and remainder.

3. Long Division Steps

Divide • Multiply • Subtract • Bring Down

$$75 \div 3 = 25$$

$$\begin{array}{r} 25 \\ 3 \overline{) 75} \\ \underline{-6} \\ 15 \\ \underline{-15} \\ 0 \end{array}$$

1. DIVIDE:
 $7 \div 3 = 2$ with 1 left over.
Write 2 in the tens place.

2. MULTIPLY:
 $2 \times 3 = 6$.
Write 6 under 7.

3. SUBTRACT:
 $7 - 6 = 1$.

4. BRING DOWN:
Bring down the 5
to make 15.

Repeat the steps

$$15 \div 3 = 5 \rightarrow 5 \times 3 = 15 \rightarrow 15 - 15 = 0$$

Write 5 in the ones place. The quotient is **25**.



Key Idea:

Work from left to right.
Repeat until no digits
remain to bring down.

Check:

$$3 \times 25 = 75$$

Following the long-division steps

Q11. Solve $68 \div 2$. Name the divide, multiply, subtract, and bring-down steps.

Q12. Solve $78 \div 3$. Explain how the amount left after dividing the tens joins the ones.

Q13. Solve $86 \div 4$, keeping the quotient digits in their correct places.

Q14. Solve $73 \div 5$. Do not stop at the first subtraction.

Q15. In $92 \div 4$, subtracting 8 from the first 9 leaves 1. What number is made when you bring down the 2? Finish the division.

4. Two-Digit Division

Divide evenly — no remainder

$$84 \div 4 = 21$$

$$\begin{array}{r} 21 \\ 4 \overline{) 84} \\ \underline{- 8} \\ 04 \\ \underline{- 4} \\ 0 \end{array}$$

1. START WITH THE TENS:
 $8 \div 4 = 2$.
 Write 2 above the 8.
 $2 \times 4 = 8$; $8 - 8 = 0$.

2. BRING DOWN THE ONES:
 Bring down the 4.
 $4 \div 4 = 1$.
 Write 1 above the 4.
 $1 \times 4 = 4$; $4 - 4 = 0$.

Why it works

$$\begin{aligned} 84 &= 80 + 4 \\ 80 \div 4 &= 20 \quad 4 \div 4 = 1 \\ 20 + 1 &= 21 \end{aligned}$$



Key Idea:
 A final remainder
 of 0 means the
 division is exact.

Check:
 $4 \times 21 = 84$

Your turn:
 $63 \div 3 = \underline{\quad}$
 $96 \div 4 = \underline{\quad}$

Dividing two-digit numbers exactly

Q16. Solve $48 \div 2$ using long division. Check your answer.

Q17. Solve $69 \div 3$ using long division. Check your answer.

Q18. Solve $88 \div 4$ using long division. Check your answer.

Q19. Solve $85 \div 5$. Explain why the last division uses 35, not just 5.

Q20. Solve $98 \div 7$ and check the exact answer by multiplying.

5. Finding Remainders

Sometimes division leaves an amount left over.

$$47 \div 3 = 15 \text{ R } 2$$

$$\begin{array}{r} 15 \\ 3 \overline{) 47} \\ \underline{-3} \\ 17 \\ \underline{-15} \\ 2 \end{array}$$

1. DIVIDE THE TENS.
 $4 \div 3$ gives 1 ten.
 $1 \times 3 = 3$; $4 - 3 = 1$.

2. BRING DOWN AND DIVIDE.
 Bring down 7 to make 17.
 $17 \div 3$ gives 5 ones.
 $5 \times 3 = 15$; $17 - 15 = 2$.

3. WRITE THE REMAINDER.
 No digits remain to bring down.
 2 is smaller than 3, so stop.
Answer: 15 R 2.

What does R 2 mean?



47 objects make 15 groups of 3, with 2 left over.



Key Idea:
 The remainder must be smaller than the divisor.
 $2 < 3$

Check:
 $3 \times 15 + 2 = 47$

Your turn:
 $38 \div 5 = \underline{\quad} \text{ R } \underline{\quad}$
 $59 \div 4 = \underline{\quad} \text{ R } \underline{\quad}$

Finding a valid remainder

Q21. Solve $53 \div 4$ using long division. Check your answer.

Q22. Solve $67 \div 3$ using long division. Check your answer.

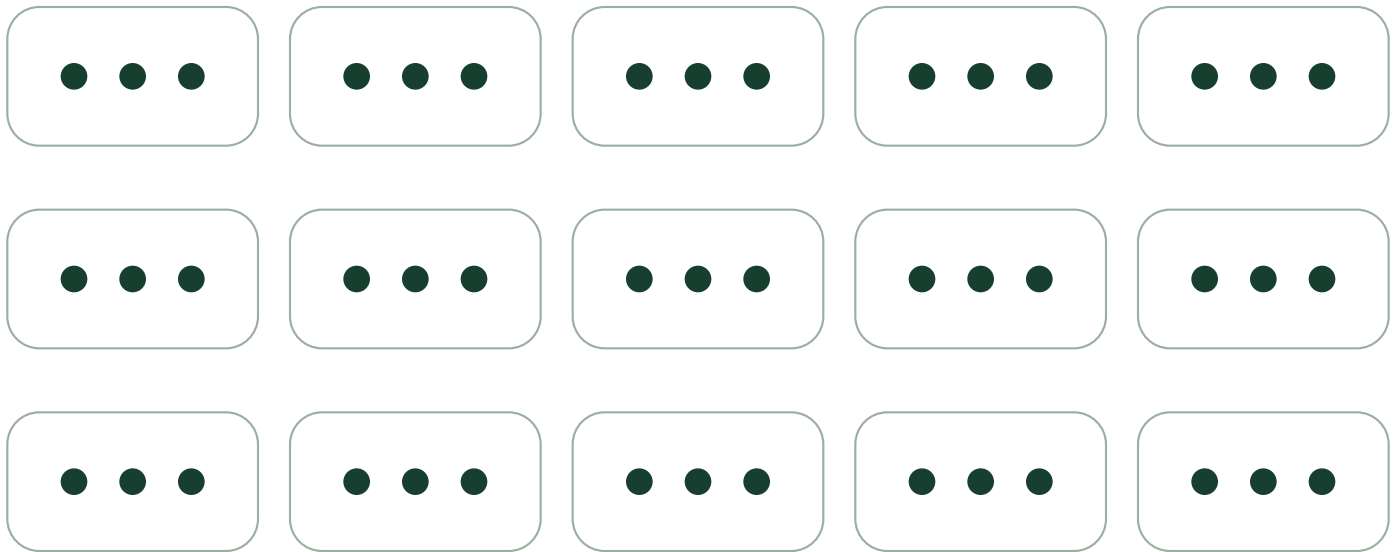
Q23. Solve $82 \div 5$ using long division. Check your answer.

Q24. Solve $97 \div 6$ using long division. Check your answer.

Q25. Solve $94 \div 7$. Show that the next larger quotient would be too large.

The complete model for image 5

The small drawing in the supplied poster shows only five groups of three and two leftovers: 17 objects. The calculation $47 \div 3 = 15 \text{ R } 2$ is correct. A complete model of 47 needs fifteen groups of three and two leftovers.



Leftovers: ● ●

$15 \text{ groups} \times 3 \text{ objects} + 2 \text{ leftover objects} = 47 \text{ objects.}$

The remainder is 2, and 2 is smaller than the divisor 3. The original poster has been kept unchanged; this full model supplies the missing groups.



6. Three-Digit Division

$$487 \div 4 = 121 \text{ R } 3$$

$$\begin{array}{r}
 \textcolor{brown}{1} \text{ } \textcolor{brown}{2} \text{ } \textcolor{brown}{1} \\
 \hline
 4 \overline{) 487} \\
 \underline{-4} \\
 0 \\
 \downarrow \\
 8 \\
 \underline{-8} \\
 0 \\
 \downarrow \\
 7 \\
 \underline{-4} \\
 3
 \end{array}$$

$$4 \div 4 = 1.$$

Write 1 in the hundreds place.

4 - 4 = 0. Bring down 8.

$$8 \div 4 = 2.$$

Write 2 in the tens place.

$8 - 8 = 0$. Bring down 7.

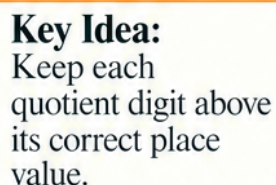
$7 \div 4$ gives 1 with 3 left over.

Write 1 in the ones place.

$$7 - 4 = 3.$$

1 hundred + 2 tens + 1 one = **121**

Quotient: 121 **Remainder:** 3


$$4 \times 121 + 3 = 487$$

$3 < 4$

$$365 \div 3 = \underline{\quad} \text{ R } \underline{\quad}$$

$$758 \div 5 = \underline{\hspace{1cm}} \text{ R } \underline{\hspace{1cm}}$$

Working across three-digit numbers

Q26. Solve $248 \div 2$ using long division. Check your answer.

Q27. Solve $376 \div 3$ using long division. Check your answer.

Q28. Solve $526 \div 4$ using long division. Check your answer.

Q29. Solve $643 \div 5$ using long division. Check your answer.

Q30. Solve $612 \div 3$. Explain why the quotient needs a zero.

7. Checking Your Answer

Multiply, add, and compare.

$$\text{Divisor} \times \text{Quotient} + \text{Remainder} = \text{Dividend}$$

$$157 \div 6 = 26 \text{ R } 1$$

1. MULTIPLY

$$6 \times 26 = 156$$

Multiply the divisor by the quotient.

2. ADD THE REMAINDER

$$156 + 1 = 157$$

The result must equal the dividend.

3. CHECK THE REMAINDER

$$1 < 6$$

The remainder must be smaller than the divisor.

$$6 \times 26 + 1 = 157$$

The answer checks out!

Spot the mistake.



Incorrect: $157 \div 6 = 25 \text{ R } 7$

$6 \times 25 + 7 = 157$, but 7 is not smaller than 6.



Regroup: 25 R 7 becomes 26 R 1.

Your turn: Is $95 \div 4 = 23 \text{ R } 3$ correct?

$$4 \times 23 + 3 = \underline{\quad} \quad \text{and} \quad 3 < 4$$

Checking and repairing an answer

Q31. Is $71 \div 4 = 17 \text{ R } 3$ correct? Show both checks.

Q32. A student writes $86 \div 5 = 16 \text{ R } 6$. It adds back to 86. Is it finished? Correct it.

Q33. Check the claim $137 \div 6 = 22 \text{ R } 5$.

Q34. Repair $254 \div 7 = 35 \text{ R } 9$ and explain what happens to the leftover objects.

Q35. A student writes $409 \div 4 = 12 \text{ R } 1$. Explain the place-value mistake and give the correct answer.

8. Division Word Problems

What does the remainder mean?

$$29 \div 6 = 4 \text{ R } 5$$

The same division can answer different questions.

1.

REPORT THE LEFTOVERS



Share 29 pencils equally among 6 students.
How many does each student receive?

Each gets 4 pencils; 5 pencils remain.

2.

ROUND UP



29 students travel in vans with 6 seats each.
How many vans are needed?

5 vans: the remaining 5 students need another van.

3.

COUNT COMPLETE GROUPS



Pack 29 books into boxes holding 6 books each.
How many full boxes can you make?

4 full boxes, with 5 books left over.

Key idea.

Read the question before deciding what to do with the remainder.

Your turn.

43 visitors ride in cars with 5 seats each.
How many cars are needed? ____

Deciding what a remainder means

Q36. Share 31 whole pencils equally among 6 students. How many does each receive, and how many pencils remain?

Q37. There are 34 passengers. Each van has 5 passenger seats, not counting the driver. How many vans are needed for everyone?

Q38. A baker packs 52 cookies into bags of exactly 8. How many full bags can be sold, and how many cookies remain?

Q39. Divide 65 whole stickers equally among 7 children without cutting stickers. How many does each receive, and how many remain?

Q40. Transport 118 visitors in vans with 9 passenger seats each. How many vans are needed, and how many passenger seats will be empty?

Homework review

R1. In $41 \div 6 = 6 \text{ R } 5$, identify the four division parts and explain the remainder.

R2. Use the greatest multiple of 7 that does not exceed 54 to find the quotient and remainder.

R3. Follow divide, multiply, subtract, and bring down to solve $83 \div 4$.

R4. Solve $72 \div 3$ and explain why there is no remainder.

R5. Solve $91 \div 8$ and verify that the remainder is valid.

Homework review

R6. Solve $457 \div 4$ using place-value columns.

R7. A student reports $173 \div 8 = 20 \text{ R } 13$. Correct the answer and show both checks.

R8. Use 58 blocks to build towers of exactly 9 blocks. How many complete towers can you build, and how many blocks remain?

Homework word problems

W1. Share 22 beads equally among 4 children, without splitting beads. How many beads does each child get, and how many remain?

W2. A florist has 39 flowers and puts exactly 5 in each bouquet. How many full bouquets can be made, and how many flowers remain?

W3. Share 46 snack packets equally among 6 tables. How many packets can each table receive, and how many remain?

W4. There are 57 children to transport. Each minibus has 8 passenger seats, not counting the driver. How many minibuses are needed?

W5. A coach packs 74 balls into bags of exactly 9 balls each. How many full bags are there, and how many balls are unpacked?

Homework word problems

W6. Seat 95 readers at tables with 6 seats each. How many tables are needed, and how many seats will be empty?

W7. Pack 128 eggs into cartons that hold exactly 5 eggs. How many full cartons can you make, and how many more eggs would complete one extra carton?

W8. A club has 146 tickets. Each family pack must contain exactly 7 tickets. How many complete family packs can be sold, and how many tickets remain?

W9. A library must put all 203 books on shelves that hold at most 8 books each. How many shelves are needed, and how many spaces will remain?

W10. Share 287 whole stickers equally among 9 students. How many stickers does each student receive, and how many remain for the teacher?

Homework word problems

W11. A school has 156 snack packets and receives 79 more. It packs exactly 6 packets into each picnic bag. How many full bags can be made, and how many packets remain?

W12. A museum transports 249 visitors in vans with 8 passenger seats each. Each van costs 12 dollars to hire. How many vans are needed, what is the total hire cost, and how many passenger seats will be empty?