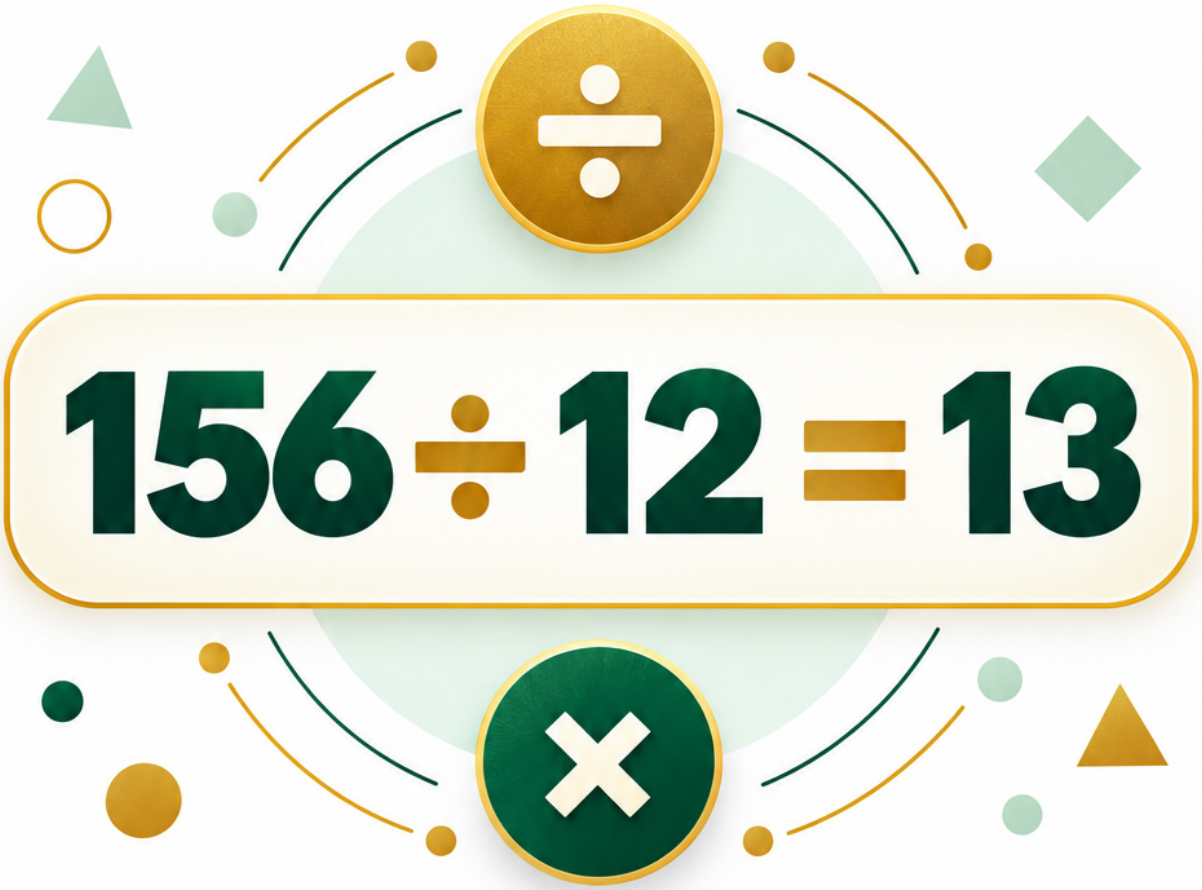
SCHOOL OF MATH

KID EINSTEINS

CLASS 18

LONG DIVISION

Introducing Two-Digit Divisors



Estimate • Divide • Check

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1. Understanding Two-Digit Divisors

Know the parts before you divide.

$$156 \div 12 = 13$$

Dividend — The total being divided.

Divisor — The number in each group.

Quotient — The number of groups.

156 pencils packed in boxes of 12 make 13 boxes.



A two-digit divisor is a whole number from 10 to 99.

Understanding two-digit divisors

Q1. In 132 ÷ 11 = 12, name the dividend, the divisor, and the quotient.

Q2. A store packs 144 crayons into boxes of 12. Write the division sentence and tell how many boxes are filled.

Q3. Which of these numbers can be a two-digit divisor: 9, 10, 45, 99, 100? Explain.

Q4. Ninety stickers are shared so that each pack gets 15 stickers, and exactly 6 packs are filled. Write the division sentence and label each part.

Q5. A student says that in 195 ÷ 13 = 15 the divisor is 195. Correct the student and explain what each number means.

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2. Using Multiples to Prepare for Division

Multiplication helps you divide.

Build a list of multiples of 12.

Multiply	Multiple
12 × 1	12
12 × 2	24
12 × 3	36
12 × 4	48
12 × 5	60
12 × 6	72
12 × 7	**84**
12 × 8	96
12 × 9	108

Example: 84 ÷ 12

Which multiple of 12 equals 84?

$$12 \times 7 = 84$$

$$84 \div 12 = 7$$

Add 12 each time to find the next multiple.

Try it: 60 ÷ 12 = ? 96 ÷ 12 = ?

Using multiples to prepare for division

Q6. List the first six multiples of 15.

Q7. Use multiples of 11 to find 77 ÷ 11.

Q8. Which multiple of 14 equals 98? Then write the matching division sentence.

Q9. Use multiples of 13 to find 65 ÷ 13 and 117 ÷ 13.

Q10. Build multiples of 12 to find the greatest multiple of 12 that is not more than 100. Then give the quotient and remainder for 100 ÷ 12.

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3. Estimating Quotient Digits

Round, estimate, then check.

1 **1. Round to friendly numbers.**

$156 \approx 160$ $24 \approx 20$

2 **2. Make an estimate.**

$$160 \div 20 = 8$$

Start by trying 8.

3 **3. Check with the original divisor.**

$24 \times 8 = 192$	→	Too large.
$24 \times 7 = 168$	→	Too large.
$24 \times 6 = 144$	→	**Fits!**

Estimate $156 \div 24$.

$$156 \div 24 = 6 \text{ R}12$$

$156 - 144 = 12$



Choose the largest digit whose product does not exceed the number you are dividing.

Try it: Estimate $182 \div 31$. Then check.

Estimating quotient digits

Q11. Round 189 and 31 to friendly numbers, estimate 189 ÷ 31, and then check your estimate.

Q12. Estimate 248 ÷ 42 with friendly numbers. Then check, and adjust if needed.

Q13. Estimate 136 ÷ 19 and check with the original divisor.

Q14. Estimate 232 ÷ 38 and check with the original divisor.

Q15. A student tries 9 for 158 ÷ 21. Explain why 9 does not work, then find the correct quotient digit and remainder.

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4. Setting Up Long Division

Put each number in the right place.

156 ÷ 12

1. Arrange the numbers.

$$12\overline{)156}$$

12: divisor — outside

156: dividend — inside

2. Find where to start.

$$12\overline{)156}$$

12 does not fit into 1.
Use the first two digits: **15**.

3. Place the first quotient digit.

$$\begin{array}{r} 1 \\ 12\overline{)156} \end{array}$$

12 fits into 15 once.
Write **1** above the tens digit, **5**.

Completed quotient.

$$\begin{array}{r} 13 \\ 12\overline{)156} \end{array}$$

156 ÷ 12 = 13

Keep quotient digits aligned with the dividend's place values.

Setting up long division

Q16. Write 182 ÷ 14 in long-division form. Which number goes outside the bracket, which digits do you start with, and where does the first quotient digit go? Then finish the division.

Q17. In 225 ÷ 15, which digits do you use first, and what is the first quotient digit? Complete the division.

Q18. For 96 ÷ 16, does 16 fit into 9? Explain where the quotient digit goes, then solve.

Q19. Set up 364 ÷ 26 and find the first quotient digit. Then complete the division.

Q20. A student writes the first quotient digit of 168 ÷ 12 above the hundreds digit, 1. Explain the mistake and give the correct quotient.

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5. Divide, Multiply, Subtract, Bring Down

Repeat the steps until every digit is used.

156 ÷ 12

1 First round: use 15.

1	DIVIDE:	12 fits into 15 once.
2	MULTIPLY:	1 × 12 = 12
3	SUBTRACT:	15 − 12 = 3
4	BRING DOWN:	Bring down the 6 to make 36.

→ Write **1** in the tens place of the quotient.

2 Second round: use 36.

1	DIVIDE:	12 fits into 36 three times.
2	MULTIPLY:	3 × 12 = 36
3	SUBTRACT:	36 − 36 = 0
4	FINISH:	No digits remain to bring down.

→ Write **3** in the ones place of the quotient.

Final result.

156 ÷ 12 = 13

Check: 13 × 12 = 156

Divide → Multiply → Subtract → Bring Down → Repeat.

Divide, multiply, subtract, bring down

Q21. Solve 192 ÷ 16 using divide, multiply, subtract, and bring down. Check your answer.

Q22. Solve 221 ÷ 13 and check with multiplication.

Q23. Solve 345 ÷ 15. Show both rounds of the steps.

Q24. Solve 374 ÷ 22 and check your answer.

Q25. Solve 468 ÷ 18. Which digit do you bring down, and what number does it make?

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6. Checking and Adjusting Estimates

Multiply to test. Adjust until it fits.

Find 175 ÷ 24

1 Too large: try 8.

1	MULTIPLY:	24 × 8 = 192
2	COMPARE:	192 > 175
3	ADJUST:	Decrease the quotient digit.

2 Too small: try 6.

1	MULTIPLY:	24 × 6 = 144
2	SUBTRACT:	175 − 144 = 31
3	CHECK:	31 ≥ 24: another group still fits.
4	ADJUST:	Increase the quotient digit.

3 Just right: try 7.

1	MULTIPLY:	24 × 7 = 168
2	SUBTRACT:	175 − 168 = 7
3	CHECK:	7 < 24: the remainder is smaller than the divisor.

Final result.

175 ÷ 24 = 7 R7

Check: 24 × 7 + 7 = 175

The product must fit, and the remainder must be smaller than the divisor.

Checking and adjusting estimates

Q26. Try 8 for 183 ÷ 23. Is 8 too large, too small, or just right? Adjust until it fits.

Q27. A student tries 5 for 207 ÷ 32 and writes 5 R 47. What is wrong? Fix the answer.

Q28. Estimate 250 ÷ 41, test your digit, and adjust if needed.

Q29. Try 9 for 143 ÷ 17. Adjust until the digit fits, then state the quotient and remainder.

Q30. Estimate 170 ÷ 28 by rounding 28 to 30. Test the estimate and adjust.

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7. Solving Problems with Remainders

A remainder tells us what is left over.

173 ÷ 12

1 Divide the first two digits.

1	LOOK:	12 fits into 17 once.
2	MULTIPLY:	1 × 12 = 12
3	SUBTRACT:	17 − 12 = 5
4	BRING DOWN:	Bring down 3 to make 53.
5	PLACE THE DIGIT:	Write 1 in the tens place.

2 Divide again.

1	LOOK:	12 fits into 53 four times.
2	MULTIPLY:	4 × 12 = 48
3	SUBTRACT:	53 − 48 = 5
4	CHECK:	No more digits: 5 is the remainder.
5	PLACE THE DIGIT:	Write 4 in the ones place.

Final result.

173 ÷ 12 = 14 R5

14 = quotient

5 = remainder

Check the remainder.

0 ≤ remainder < divisor

5 < 12 ✓

Verify the result.

Divisor × Quotient + Remainder = Dividend

12 × 14 + 5 = 173

If the remainder is 12 or more, another group still fits!

Solving problems with remainders

Q31. Solve 185 ÷ 12. State the quotient and the remainder, and verify your answer.

Q32. Solve 230 ÷ 14 and check that the remainder is smaller than the divisor.

Q33. Solve 347 ÷ 21 and verify with divisor × quotient + remainder.

Q34. Solve 509 ÷ 25. Be careful with the ones place of the quotient.

Q35. A student writes 200 ÷ 15 = 12 R 20. Explain why the answer is not finished, then correct it.

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8. Applying Division to Word Problems

Read, model, solve, and check.

A teacher has 168 pencils. Each box holds 12 pencils. How many full boxes can the teacher fill?



1 Identify the information.

1. **Total:** 168 pencils
2. **Each group:** 12 pencils
3. **Unknown:** number of boxes

2 Write the division.

$$168 \div 12 = ?$$

3 Solve.

1. 12 fits into 16 once.
2. 16 − 12 = 4; bring down 8 to make 48.
3. 12 fits into 48 four times.
4. 48 − 48 = 0.

$$168 \div 12 = 14$$

4 Check with multiplication.

$$14 \times 12 = 168$$

14 boxes × 12 pencils per box = 168 pencils.

Final answer.

The teacher can fill 14 boxes.

Always include the correct unit in your answer.

Try it: 192 stickers, 16 per pack. How many packs?

Applying division to word problems

Q36. A craft store has 204 stickers and puts 17 stickers in each pack. How many packs can be made?

Q37. There are 150 students going on a trip. Each bus seats 12 students. How many buses are needed so that everyone has a seat?

Q38. A bakery has 196 cookies and packs exactly 15 in each bag. How many full bags can be packed, and how many cookies are left over?

Q39. A gym sets up 288 chairs in rows of 24. How many rows are there?

Q40. A class earns $250 and shares it equally among 18 students, giving whole dollars only. How many dollars does each student receive, and how much money is left over?

Homework review

R1. In 169 ÷ 13 = 13, name the dividend, the divisor, and the quotient.

R2. Use multiples of 16 to find 112 ÷ 16.

R3. Estimate 215 ÷ 34 with friendly numbers, then check and adjust.

R4. Set up 198 ÷ 11. Which digits do you start with, and where does the first quotient digit go? Then finish the division.

R5. Solve 352 ÷ 16 using divide, multiply, subtract, and bring down.

Homework review (continued)

R6. Try 4 for 165 ÷ 33. Test the digit and adjust until it fits.

R7. Solve 275 ÷ 13. Check that the remainder is valid and verify with multiplication.

R8. A teacher has 180 markers and puts 14 markers in each box. How many full boxes can be filled, and how many markers are left over?

Homework word problems

W1. A farm packs 132 eggs into cartons of 12. How many cartons are filled?

W2. A grocer has 125 apples and puts 11 apples in each bag. How many full bags can be made, and how many apples are left?

W3. A coach divides 210 students into teams of 15. How many teams are there?

W4. There are 190 passengers. Each van carries 12 passengers. How many vans are needed for everyone?

W5. A book has 364 pages. If Maya reads 14 pages each day, how many days will it take to finish the book?

Homework word problems (continued)

W6. A class raised $255 and shares it equally among 17 students. How many dollars does each student receive?

W7. A photographer has 300 photos and fills albums that hold 24 photos each. How many albums are completely full, and how many photos are left over?

W8. An auditorium has 416 seats arranged in rows of 32. How many rows are there?

W9. Lena has 126 blue beads and 54 white beads. She uses 15 beads for each bracelet. How many bracelets can she make?

W10. A toy shop receives 3 boxes with 85 marbles in each box. The marbles are repacked into bags of 20. How many full bags are made, and how many marbles are left over?

Homework word problems (continued)

W11. A theater prints 500 tickets and staples them into booklets of 24. How many full booklets are made, and how many tickets are left over?

W12. A school orders 648 pencils packed in boxes of 24. The boxes are then shared equally among 9 classrooms. How many boxes does each classroom receive?