

Long Division with Multi-Digit Divisors

Grade 6 math · Lesson · Standards: 6.NS.B.2

Quick answer: Long division splits a dividend into equal groups using the steps divide, multiply, subtract and bring down. It works with multi-digit divisors, and the answer is a quotient with an optional remainder. Estimating first and checking by multiplication catch most mistakes.

Standards: 6.NS.B.2 · **Level:** Grade 6

How does the long division algorithm work?

Vocabulary

In $7,344 \div 24 = 306$, the **dividend** is 7,344, the **divisor** is 24, and the **quotient** is 306. If the divisor does not fit evenly, the leftover amount is the **remainder**.

Method: Divide, Multiply, Subtract, Bring down

1. Divide: how many times does the divisor fit into the leftmost digits?
2. Multiply: quotient digit $\times$ divisor.
3. Subtract from the digits you used.
4. Bring down the next digit and repeat until none are left.

Worked example

Find $7,344 \div 24$. Since 24 does not fit into 7, start with 73: 24 goes in 3 times (72), leaving 1. Bring down 4 to make 14. The divisor does not fit, so write 0. Bring down 4 to make 144, and $24 \times 6 = 144$ leaves 0.

Answer: **306**.

$$\begin{array}{r}
 24 \overline{) 7344} \\
 \underline{72} \\
 14 \\
 \underline{0} \\
 144 \\
 \underline{144} \\
 0
 \end{array}$$

$7,344 \div 24 = 306$. The 0 in the quotient holds the tens place.

How do you estimate a quotient?

Round to compatible numbers, which are easy to divide. Because $24 \times 3 = 72$, the number 7,200 is a friendly stand-in for 7,344, and $7,200 \div 24 = 300$. If your quotient is far from 300, find the mistake.

$7,344 \div 24$		$7,200 \div 24 = 300$
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The quotient should be close to 300

Compatible numbers: 7,200 is a multiple of 24.

What do you do with a remainder?

The question decides what to do with the remainder.

Question asks	Remainder is	Example
How many full groups?	dropped	$350 \div 12 = 29 \text{ R } 2$, so 29 full packs
How many are needed?	rounded up	$250 \div 48 = 5 \text{ R } 10$, so 6 buses
How much is left?	reported	2 pencils left over

48	48	48	48	48	10
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$250 \div 48 = 5 \text{ R } 10$, so 6 buses are needed

The remainder of 10 students needs one more bus.

How do you check the answer?

Check

quotient $\times$ divisor + remainder = dividend. For $875 \div 26 = 33 \text{ R } 17$: $26 \times 33 + 17 = 858 + 17 = 875$.

Common mistake

Forgetting to write 0 in the quotient when the divisor does not fit. That shifts every digit and makes the answer ten times too small.

Mathbot's tip

Write the remainder next to the quotient with an R, and make sure it is smaller than the divisor. If it is not, the quotient digit was too small.

Key points to remember

- Steps: divide, multiply, subtract, bring down, repeat.
- The remainder must be smaller than the divisor.
- Estimate with compatible numbers, such as $7,200 \div 24 = 300$.
- Check: divisor $\times$ quotient + remainder = dividend.
- The question decides whether a remainder is dropped, rounded up, or reported.

Long Division with Multi-Digit Divisors: frequently asked questions

What are the steps of long division?

Divide, multiply, subtract, and bring down the next digit, then repeat. Continue until every digit of the dividend has been used.

How do you estimate a long division answer?

Round the dividend and divisor to compatible numbers that divide easily. For $7,344 \div 24$ you can use $7,200 \div 24 = 300$.

What does the remainder mean?

The remainder is the amount left over after making as many full groups as possible. It must always be smaller than the divisor.

When do you round a remainder up?

Round up when everything must be placed, such as students on buses. If 250 students ride in buses of 48, the 10 extra students need a sixth bus.

How do you check a long division answer?

Multiply the quotient by the divisor and add the remainder. The result must equal the dividend, as in $26 \times 33 + 17 = 875$.