

10 Powers of Ten Machine

Mission: The makerspace's place value machine multiplies and divides by 10, 100, and 1,000. Feed it numbers, watch the digits slide, and figure out the pattern that lets you skip the calculator.

Big question: What happens to digits when we multiply or divide by powers of 10?

★ Warm-up: Pattern hunt

Fill in and describe the pattern.

$4 \times 10 = \underline{\quad}$, $4 \times 100 = \underline{\quad}$, $4 \times 1,000 = \underline{\quad}$ ✓ **40, 400, 4,000.**

$0.4 \times 10 = \underline{\quad}$ ✓ **4.**

Key vocabulary

Power of 10	Numbers like 10, 100, 1,000 made by multiplying 10s.
Place value	The value of a digit based on its position.
Pattern	A rule that repeats.
Metric units	Units based on 10s, like meters and centimeters.

1 Box 1

× 100

In the simulator: Type 4.37 in the box, then press × **100**.

What is 4.37×100 ?

Answer: _____ ✓ **437**

2 Box 2

Divide

In the simulator: Now press ÷ **1,000** starting from 437.

Which way did the digits move when you divided?

☐ Right, three places ☐ Left, three places ☐ They didn't move

✓ **Right, three places**

3 Box 3

Pattern table

Use the machine to fill in the table.

Problem	Answer
0.56×10	5.6
0.56×100	56
$72.5 \div 10$	7.25
$72.5 \div 100$	0.725

4 Box 4

Makerspace measuring

A shelf is 1.35 m long. How many centimeters is that?

Answer: _____ cm ✓ **135**

Tiny parts

A screw is 8 mm long. How many meters is that? (1 m = 1,000 mm)

Answer: _____ m ✓ **0.008**

5 Box 5

Error detective

What is wrong?

☐ 2.50 = 2.5, so nothing changed. The digits should move left: 25 ☐ Nothing ☐ It should be 2.05

✓ **2.50 = 2.5, so nothing changed. The digits should move left: 25**

6 Box 6

Legend: mystery input Legend only

The machine did $\times 100$, then $\div 1,000$, and the result was 0.63. What number went in?

Answer: _____ ✓ **6.3**

Show your thinking:

7 Box 7

Explain the rule

Explain why "just add a zero" is NOT a good rule for multiplying decimals by 10.

Look for: Digits move places; Adding a zero after a decimal keeps the same value



Exit ticket: answer the big question in your own words

What happens to digits when we multiply or divide by powers of 10?

Look for: Multiplying by 10 moves each digit one place to the LEFT (each digit becomes 10 times bigger). Dividing by 10 moves each digit one place to the RIGHT. $\times 100$ or $\div 100$ moves two places, and $\times 1,000$ or $\div 1,000$ moves three places. The decimal point stays still; the digits move.

Completion codes

Students see a code like **ABC-I3** when they finish. The first part must match below. The letter is the level (E = Explorer, I = Investigator, L = Legend), and the number at the end is how many stars they earned.

Level	Code starts with
 Explorer	DLU-E
 Investigator	1TO-I

 Watch for these misconceptions

- "Longer decimals are bigger." 0.45 is less than 0.5.
- "Line up the digits on the right when adding." Line up the decimal points.
- "Multiplying always gives a bigger answer." Multiplying by a decimal less than 1 gives a smaller answer.