



Multiplication as scaling

Compare without calculating

- Today: multiplying does NOT always make things bigger.

Why you believed it

- $8 \times 2 = 16$. $8 \times 3 = 24$. $8 \times 10 = 80$.
- Every multiplication you have ever done.

The belief fits all of your evidence.

Multiply by exactly 1

• $8 \times 1 = 8.$

Unchanged. So 1 is the dividing line.

And $4/4$ is 1

- $8 \times 4/4 = 8$.
- $3/4$ is LESS than $4/4$.

So $8 \times 3/4$ is less than 8. No multiplying needed.

Above and below the line

- Multiplier more than 1 $\rightarrow$ bigger.
- Multiplier exactly 1 $\rightarrow$ the same.
- Multiplier less than 1 $\rightarrow$ smaller.

Look at the MULTIPLIER. Never calculate.

Bigger than WHICH?

- $\frac{2}{3} \times 6 = 4$.
- Bigger than $\frac{2}{3}$. Smaller than 6.

The OTHER factor decides. Always ask: than which?

Dividing can make things bigger

- $6 \times \frac{1}{2} = 3.$
- $6 \div \frac{1}{2} = 12.$

How many halves in 6? Twelve of them.

Your turn

- Is $20 \times \frac{7}{8}$ more or less than 20? Do not calculate.
- Is $\frac{3}{5} \times 9$ more or less than 9? Than $\frac{3}{5}$?

Compare the multiplier with 1. That is all.