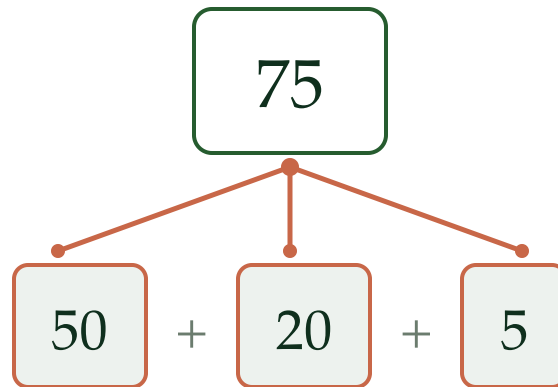




# What Is Chunking?

A quantity can be broken into pieces **without changing its value**.



*still 75. nothing gained, nothing lost.*

## more honest ways to chunk 75

$$75 = 70 + 5$$

*tens and ones*

$$75 = 25 + 25 + 25$$

*equal pieces*

$$75 = 80 - 5$$

*overshoot, then back off*

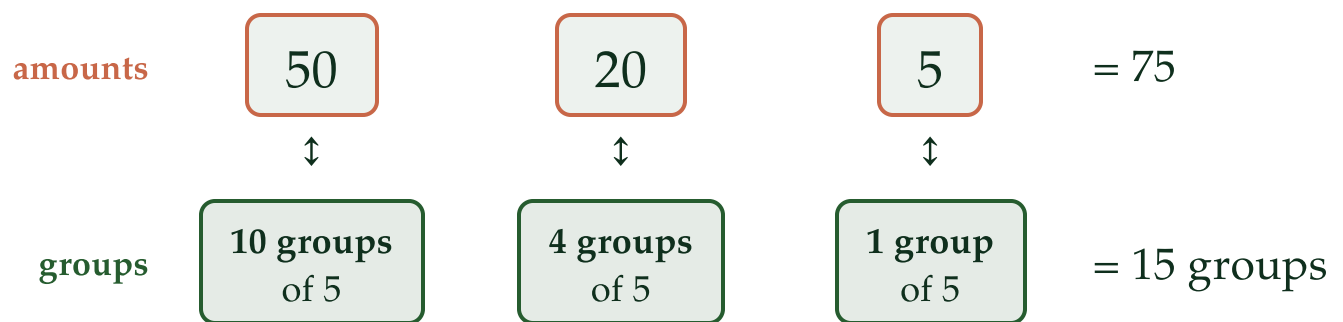
Many ways to chunk. The question is which pieces make your problem **easier**.



Roots of Reason

# How Many Groups?

How many groups of 5 make 75?



Every chunk of **amount** has a matching chunk of **groups**.

## 1 Make groups you know

10 groups of 5 = 50  
4 groups of 5 = 20  
1 group of 5 = 5

## 2 Check the amount

$$50 + 20 + 5 = 75 \checkmark$$

## 3 Count the groups

$$10 + 4 + 1 = 15$$

**So,  $75 \div 5 = 15$ .** *division asks: how many fit?*



Roots of Reason

# Choose Useful Chunks

$$175 \div 7$$

valid, but slow

$$100 + 70 + 5$$

$100 \div 7 = 14$  and change

$$70 \div 7 = 10 \checkmark$$

$$5 \div 7 = \text{less than } 1$$

*the pieces don't fit groups of 7*

The chunks equal 175, so nothing is *wrong*.  
They are just **inconvenient**.

useful

$$140 + 35$$

140 is **20 groups** of 7  $\checkmark$

35 is **5 groups** of 7  $\checkmark$

*every piece divides evenly*

Both chunks are **multiples of 7**. That is what  
"useful" means in division.

Before you cut, ask: **what multiples of the divisor do I already know?**



Roots of Reason

## Division in Chunks

The group reasoning from chart 2, written as equations.

groups, in  
words

140 holds **20 groups** of 7

35 holds **5 groups** of 7

↓ same thinking, shorter to write ↓

groups, as  
equations

$$140 \div 7 = 20$$

$$35 \div 7 = 5$$

↓

$$175 \div 7 = 20 + 5 = 25$$

*the answers add because the groups add*

140  $\div$  7 = 20 is not a trick. It **means** 140 contains 20 groups of 7.



Roots of Reason

# Partial Quotients

partial quotient: *one chunk of the total number of groups*

$252 \div 7$ , subtracting groups

$$\begin{array}{r}
 252 \quad \text{start} \\
 - 210 \quad \text{30 groups of 7} \\
 \hline
 42 \\
 - 42 \quad \text{6 groups of 7} \\
 \hline
 0 \quad \quad 30 + 6 = 36
 \end{array}$$

Pull out easy groups until nothing is left. The quotient is the **groups removed**.

## It is the same chart as before

Each subtraction line is one **amount** chunk leaving, and each note on the right is its matching **groups** chunk. The stack is just charts 2 and 4 written vertically.

## Any honest chunks work

$70 + 70 + 70 + 42$  takes more steps and still lands on 36. Fewer chunks is faster, not more correct.

Choose chunks that are easy multiples of the divisor. Any size chunk is allowed.