

Universidade de São Paulo

EDM0341 – Fundamentos Teórico-Metodológicos do Ensino de
Matemática

Prof^a. Raquel Milani

Sobre as operações e seus algoritmos

Sobre a adição e subtração

O que pode causar equívocos.

- Ensinaamos a tirar o menor do maior.
- Começamos da direita para a esquerda (mas escrevemos da esquerda para a direita): unidades, dezenas, centenas
- Calculamos cada “coluna” separadamente.

Dezenas	Unidades
4	2
2	7
6	9

Dezenas	Unidades
4	2
2	7
6	9

- “Quando o aluno resolve uma operação começando pela direita ele não tem noção do número como um todo. Ele passa a olhar cada coluna como unidade (a parte como um todo) e não como um algarismo do numeral (a parte no todo)” (p. 74).
- $42+27$ é diferente de $4+2$ e $2+7$

ECKHARDT, C. A. Contas de “vai um” e “pedir emprestado”: em busca de um conhecimento-emancipação”. **Revista de Educação Matemática – RS**, ano 5, n. 5, p. 68-78, 2003.

- Formas de ensino reguladoras e não emancipatórias
- Romper com verdades cristalizadas
- Transformar o ensino de matemática em um conhecimento-emancipação.
- Os algoritmos precisam ser estudados como processo, com compreensão.

Poderiam as crianças ser incentivadas a construir seus próprios procedimentos e algoritmos?

(1 1)

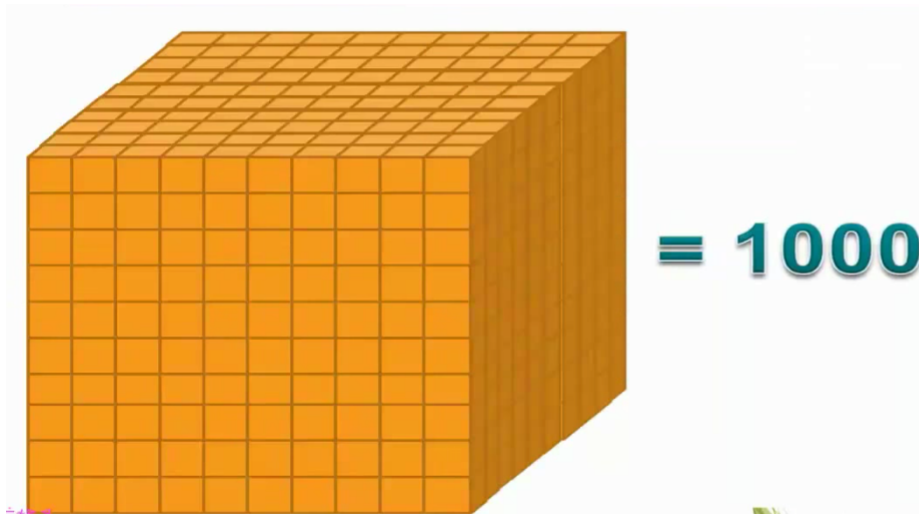
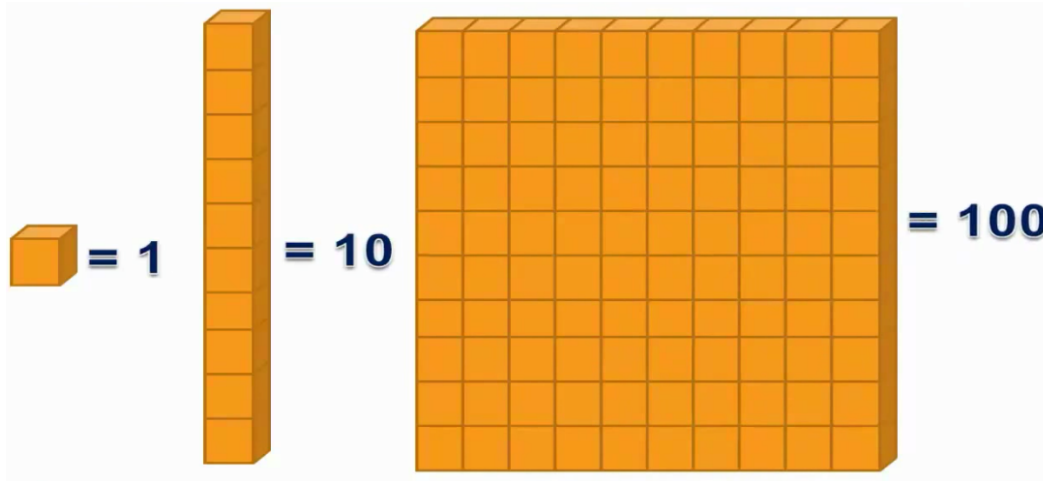
NOME: Bruno
TURMA: B21. DATA: 29/05/03.

- 21 Pense no (20) e tire (10)
12 e daí tira (2) de (10) que
09 sobrou e fica 8 e a 1 que
sobrou também e fica (9)

+ 22 Pense no (20) e pegue a
9 nove e bata no lugar de
31 dois e fica (29) e pegue a
dois que sobrou e bata
junto e fica (31)

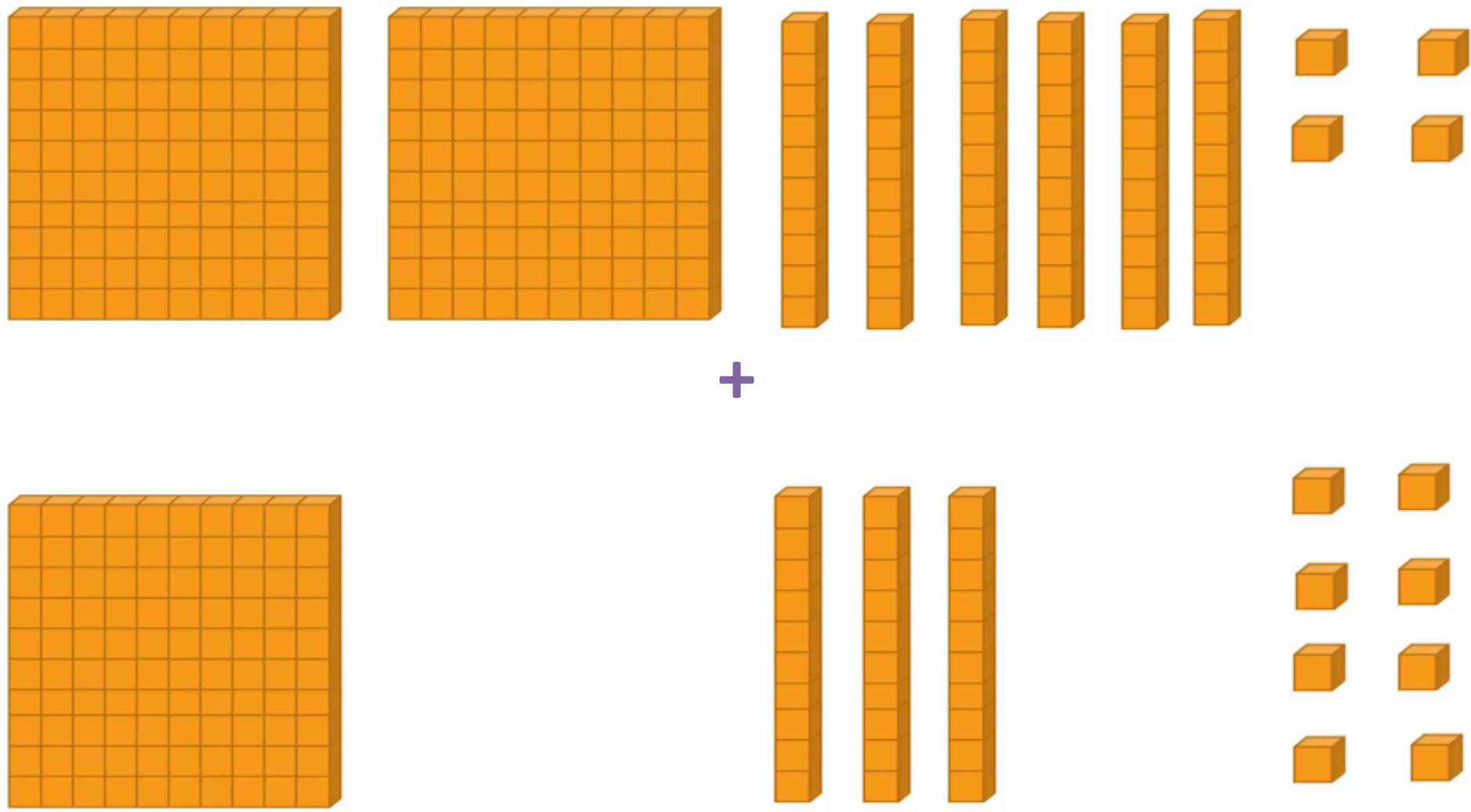
- As propriedades das operações em procedimentos distintos dos algoritmos.

Material Dourado

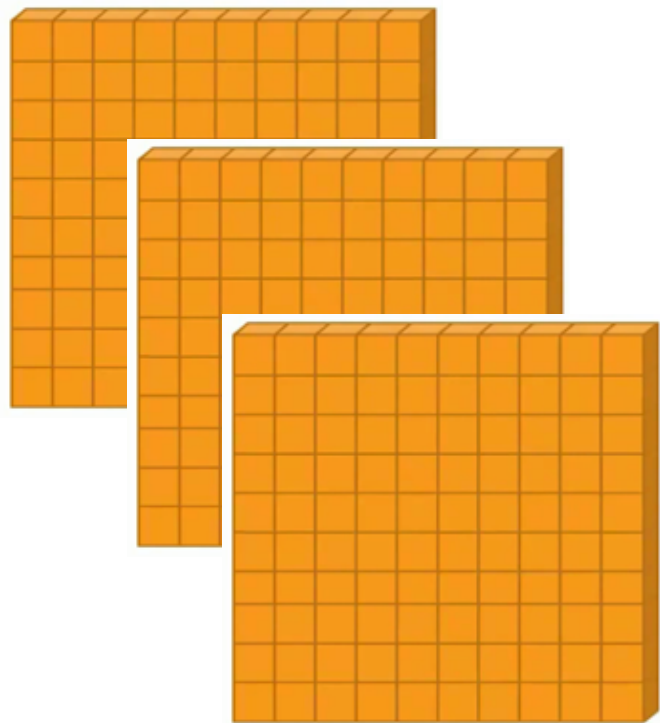


<https://www.youtube.com/watch?v=3IWUVs2UMns>

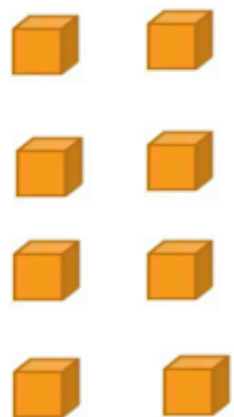
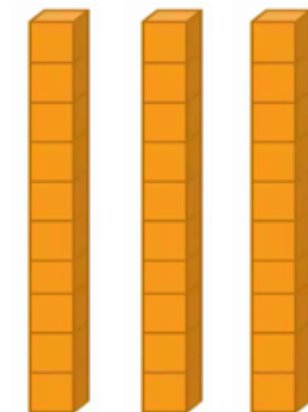
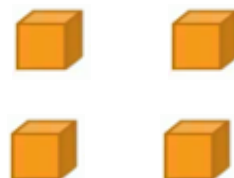
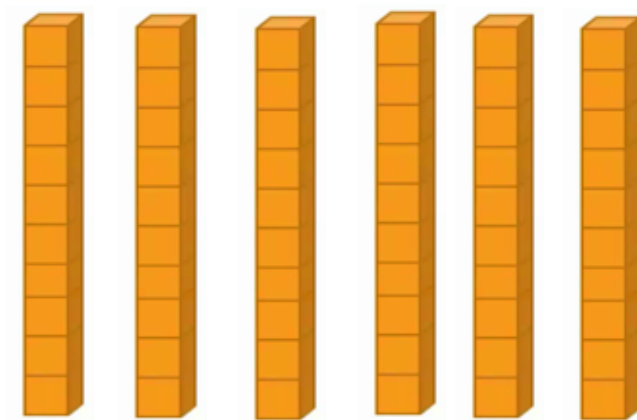
$$264 + 138$$



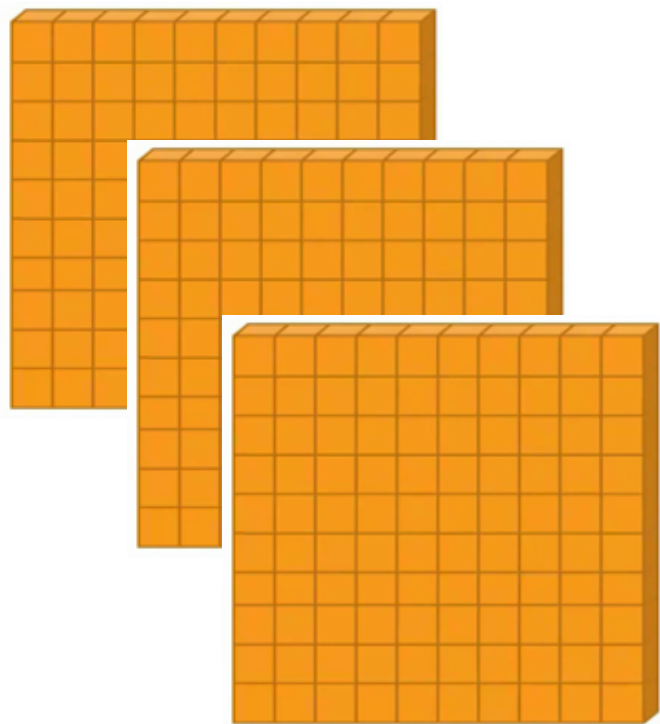
$$264 + 138$$



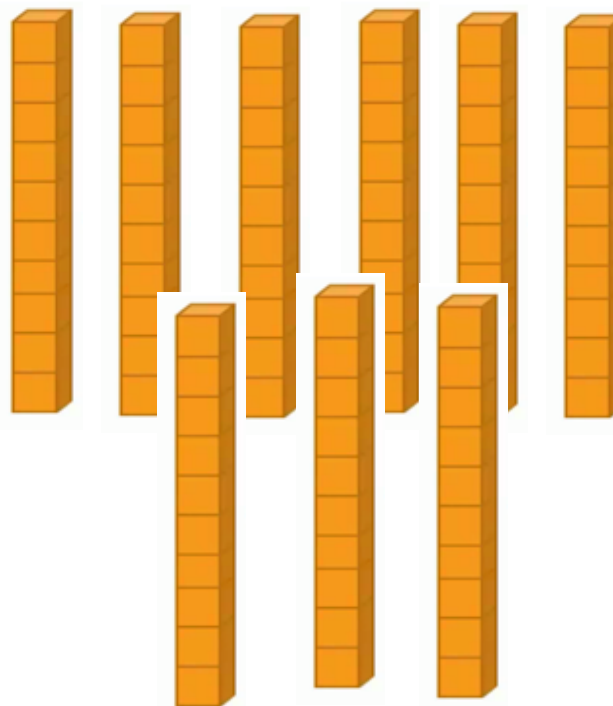
3 centenas



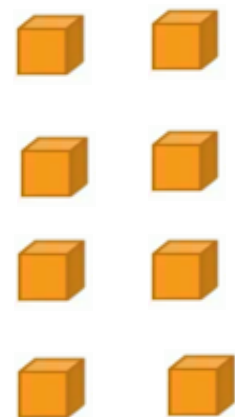
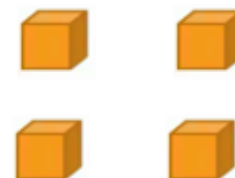
$$264 + 138$$



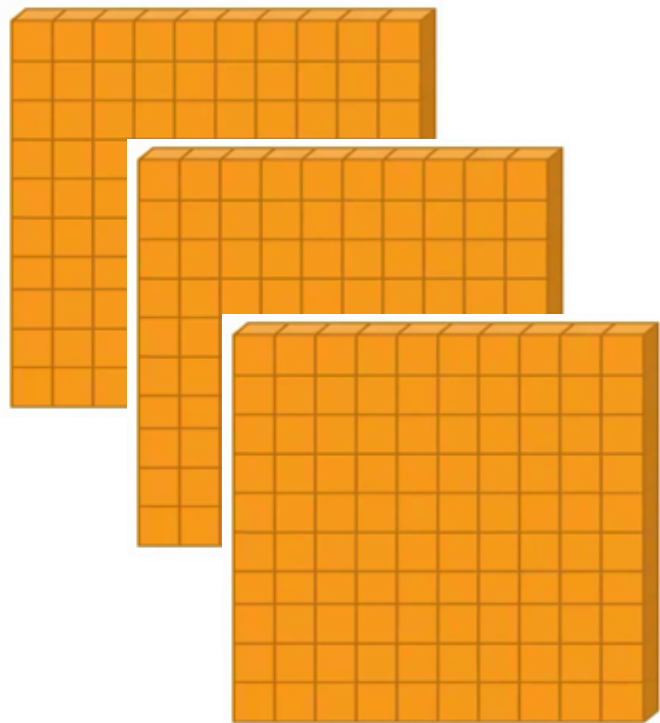
3 centenas



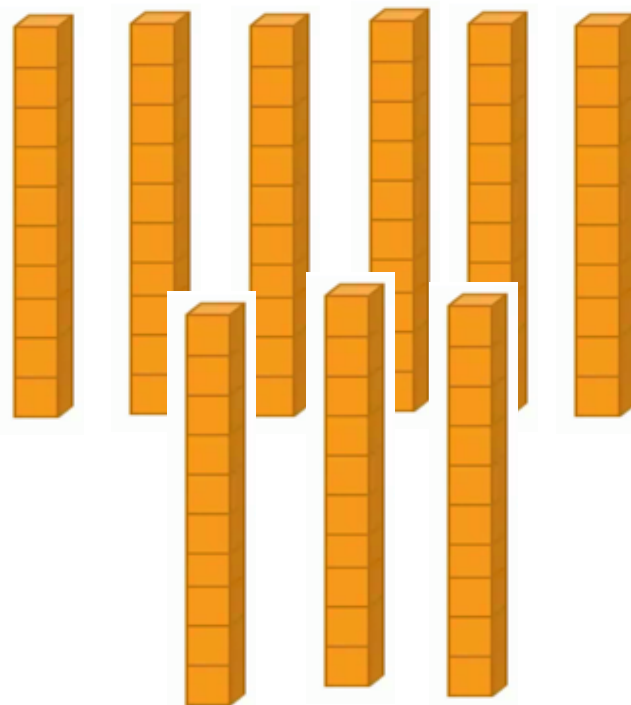
9 dezenas



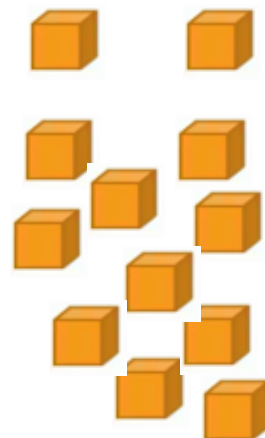
$$264 + 138$$



3 centenas

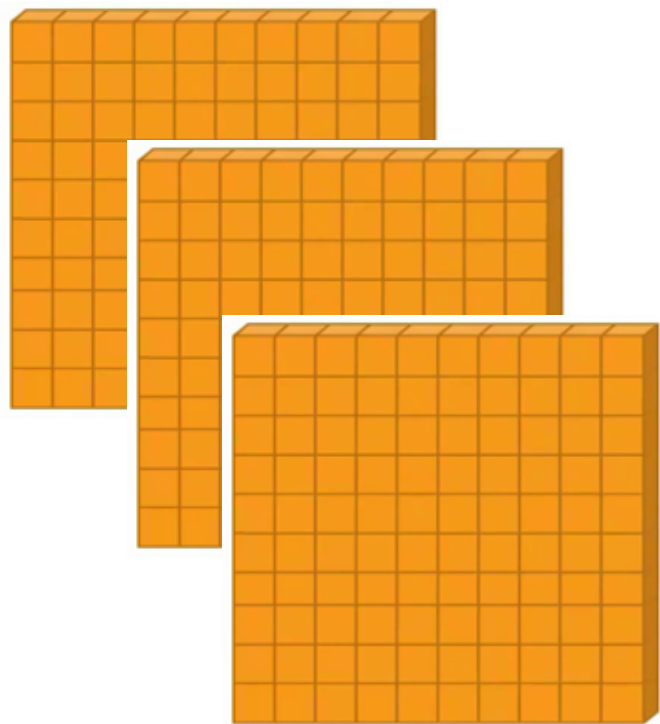


9 dezenas

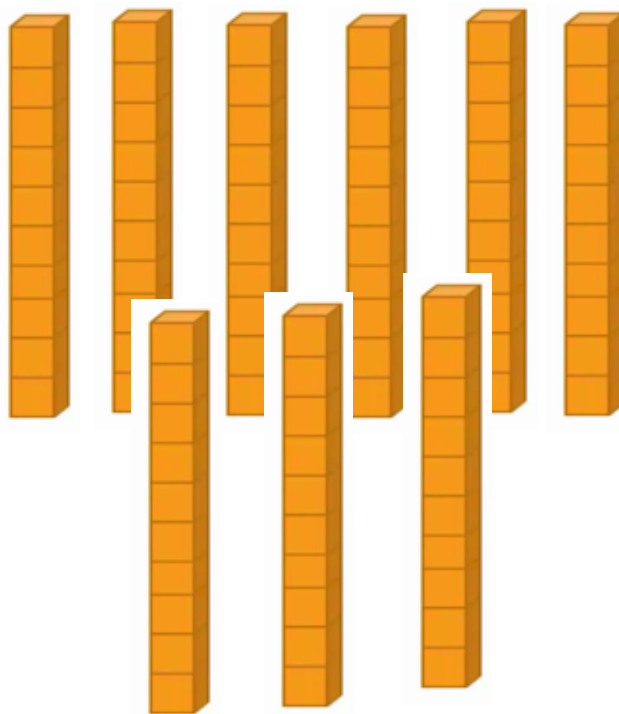


12 unidades

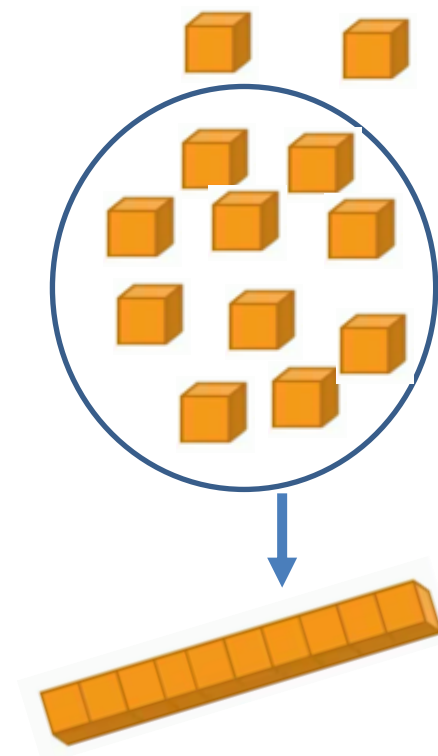
$$264 + 138$$



3 centenas

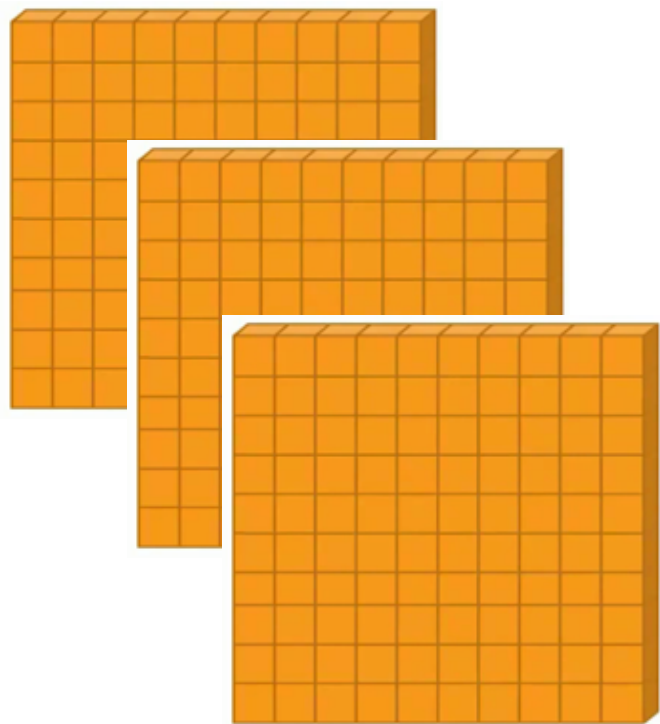


9 dezenas

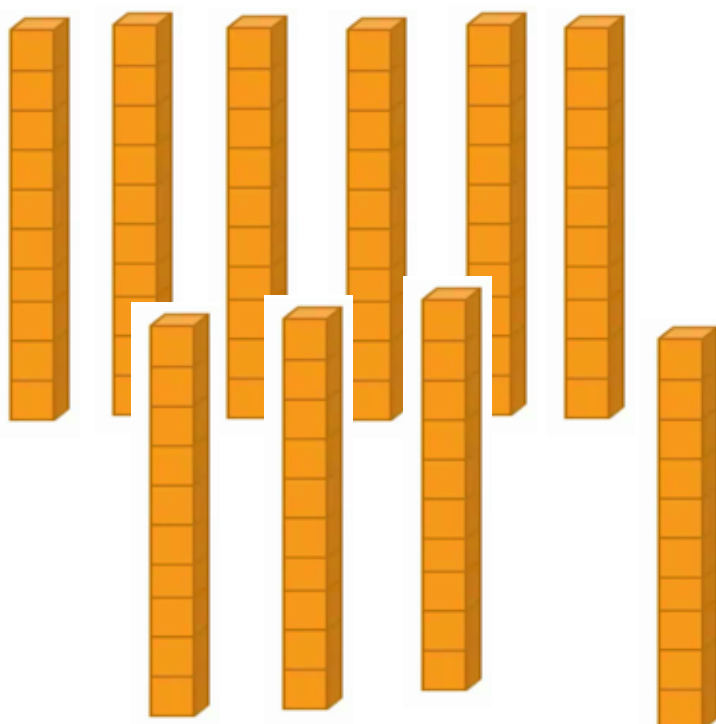


**12 unidades =
10 unidades + 2 unidades**

$$264 + 138$$



3 centenas

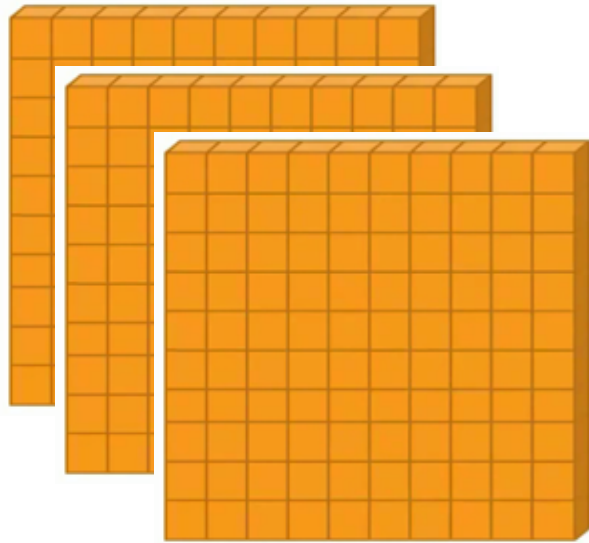


9 dezenas + 1 dezena =
10 dezenas

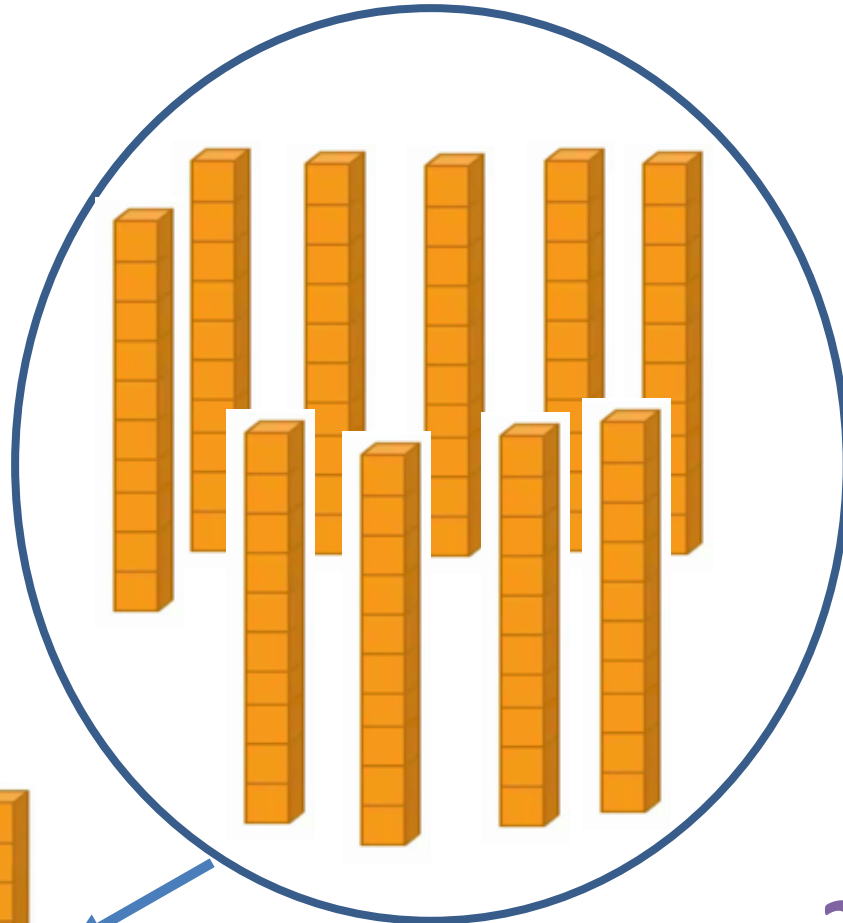
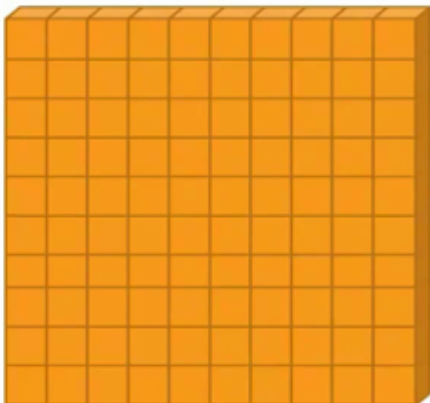


2 unidades

$$264 + 138$$



3 centenas

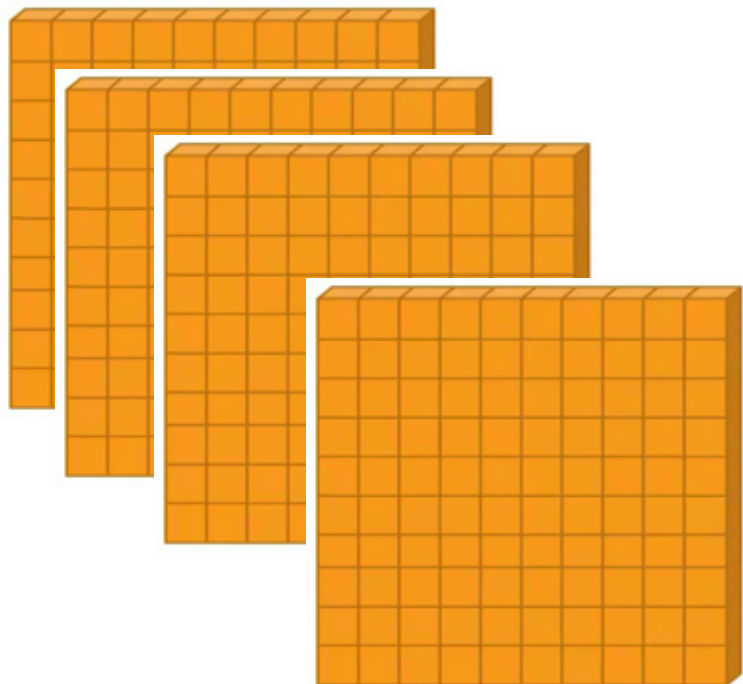


9 dezenas + 1 dezena =
10 dezenas = 1 centena



2 unidades

$$264 + 138$$

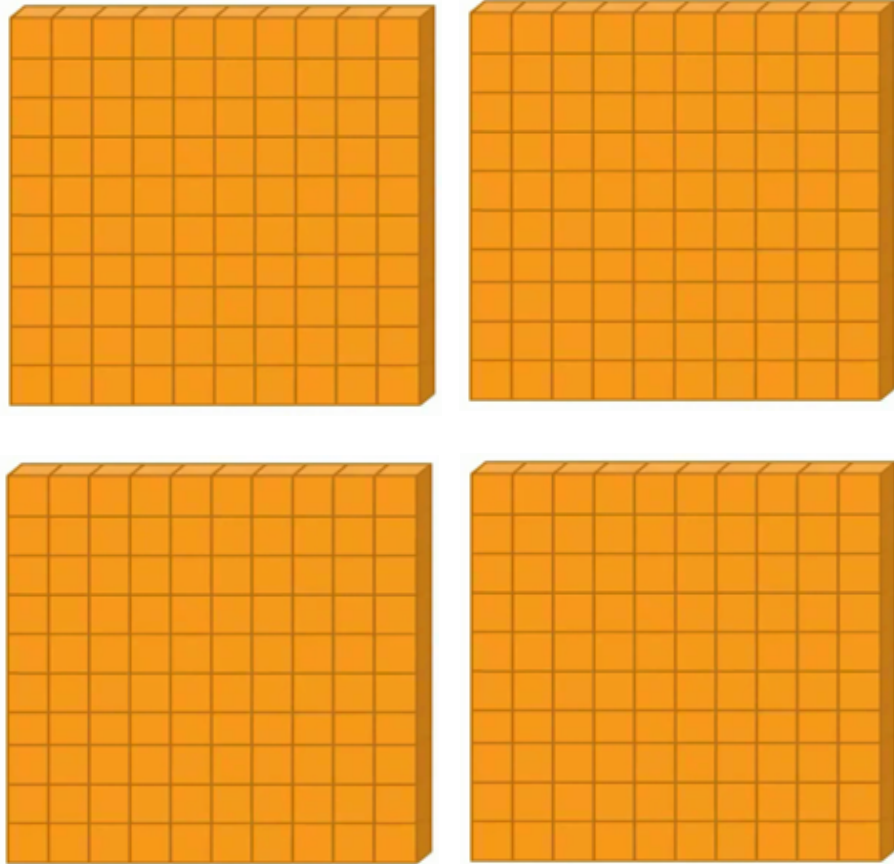


3 centenas + 1 centena =
4 centenas



2 unidades

$$264 + 138$$



4 centenas



2 unidades

$$264 + 138 = 402$$

$$\begin{array}{r} 2 \ 6 \ 4 \\ + 1 \ 3 \ 8 \\ \hline \end{array}$$

Passos:

$$2C+1C=3C$$

$$6D+3D=9D$$

$$4U+8u=12u$$

$$12U=10U+2U=1D+2U$$

$$9D+1D=10D=1C$$

$$3C+1C=4C$$

$$264+138 = 402$$

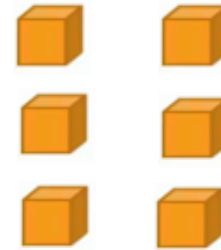
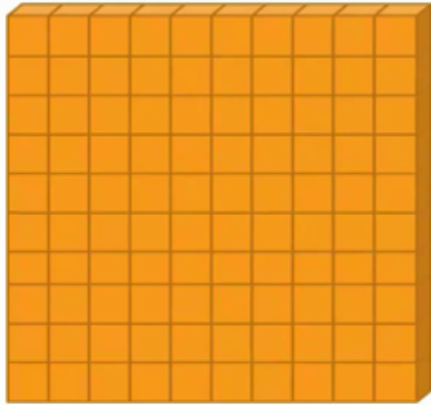
C	D	U
2	6	4
+ 1	+ 3	+ 8
3	9	12
	1	2
	10	
1	0	
4	0	2

C	D	U
2	6	4
+ 1	+ 3	+ 8
3	9	12
	10	2
4	0	2

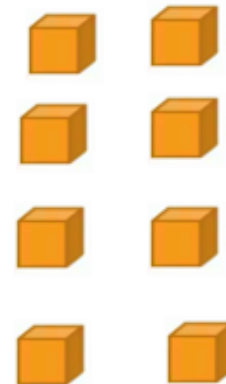
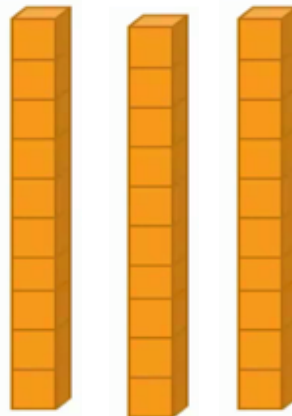
2'	6'	4
+ 1	+ 3	+ 8
4	0	2

O que ganhamos e perdemos com estes algoritmos?

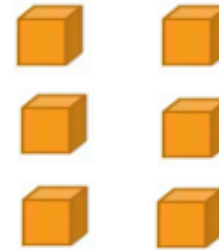
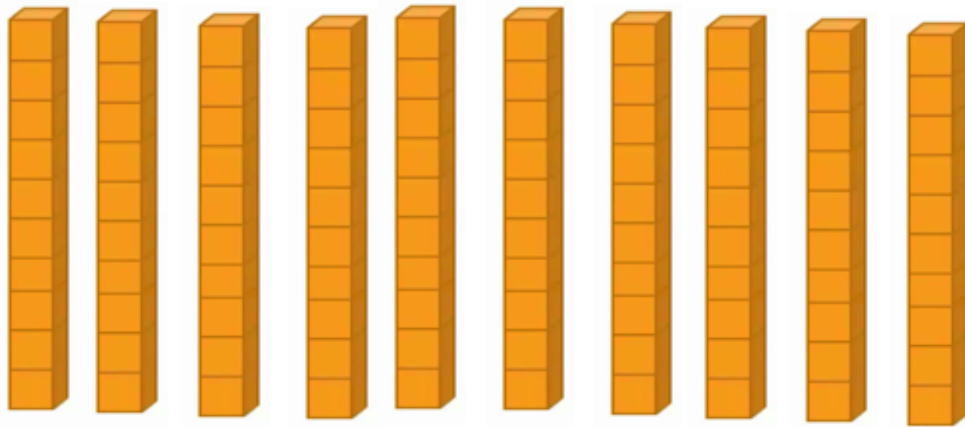
$$106 - 38$$



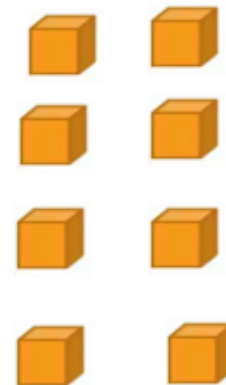
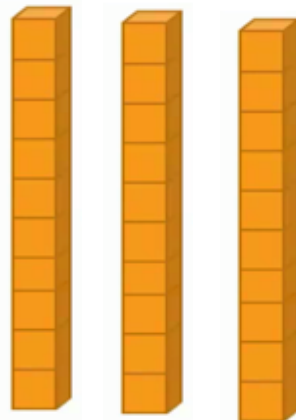
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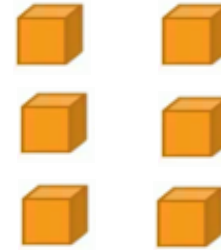
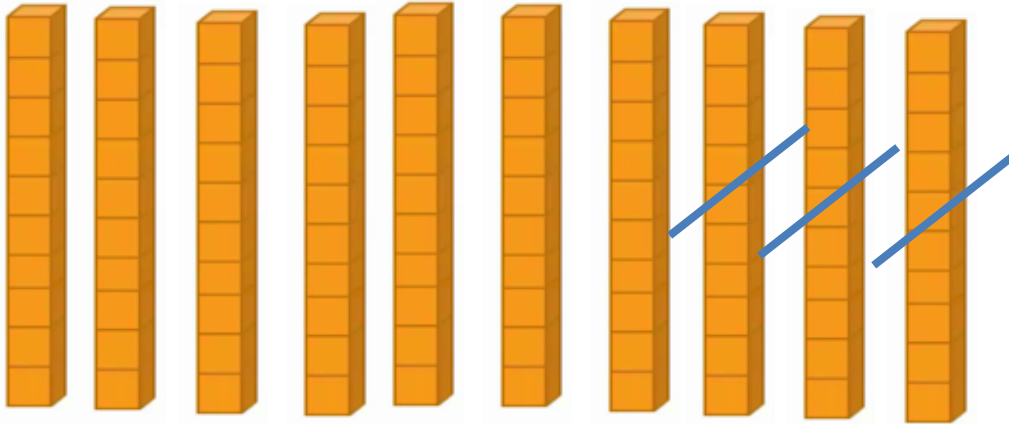
$$106 - 38$$



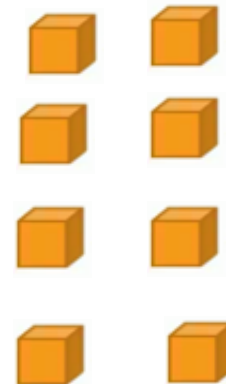
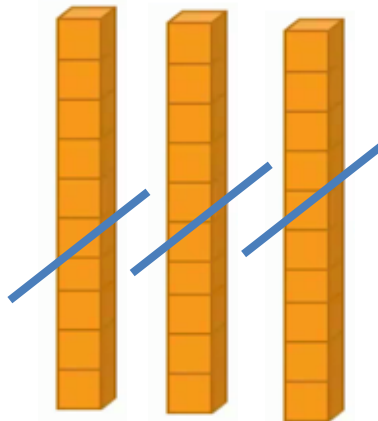
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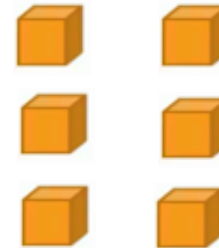
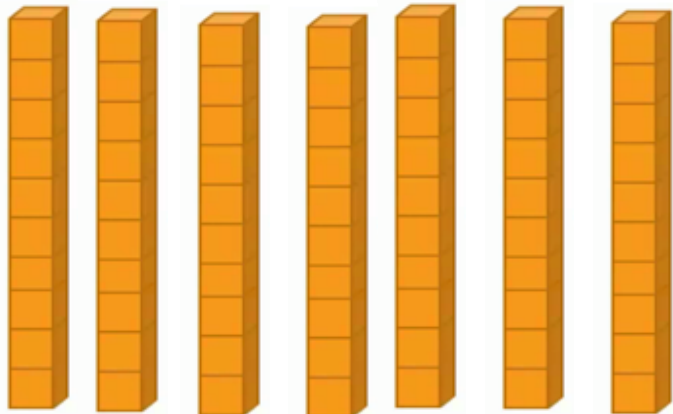
$$106 - 38$$



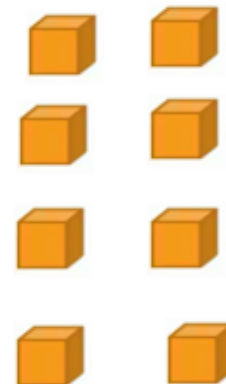
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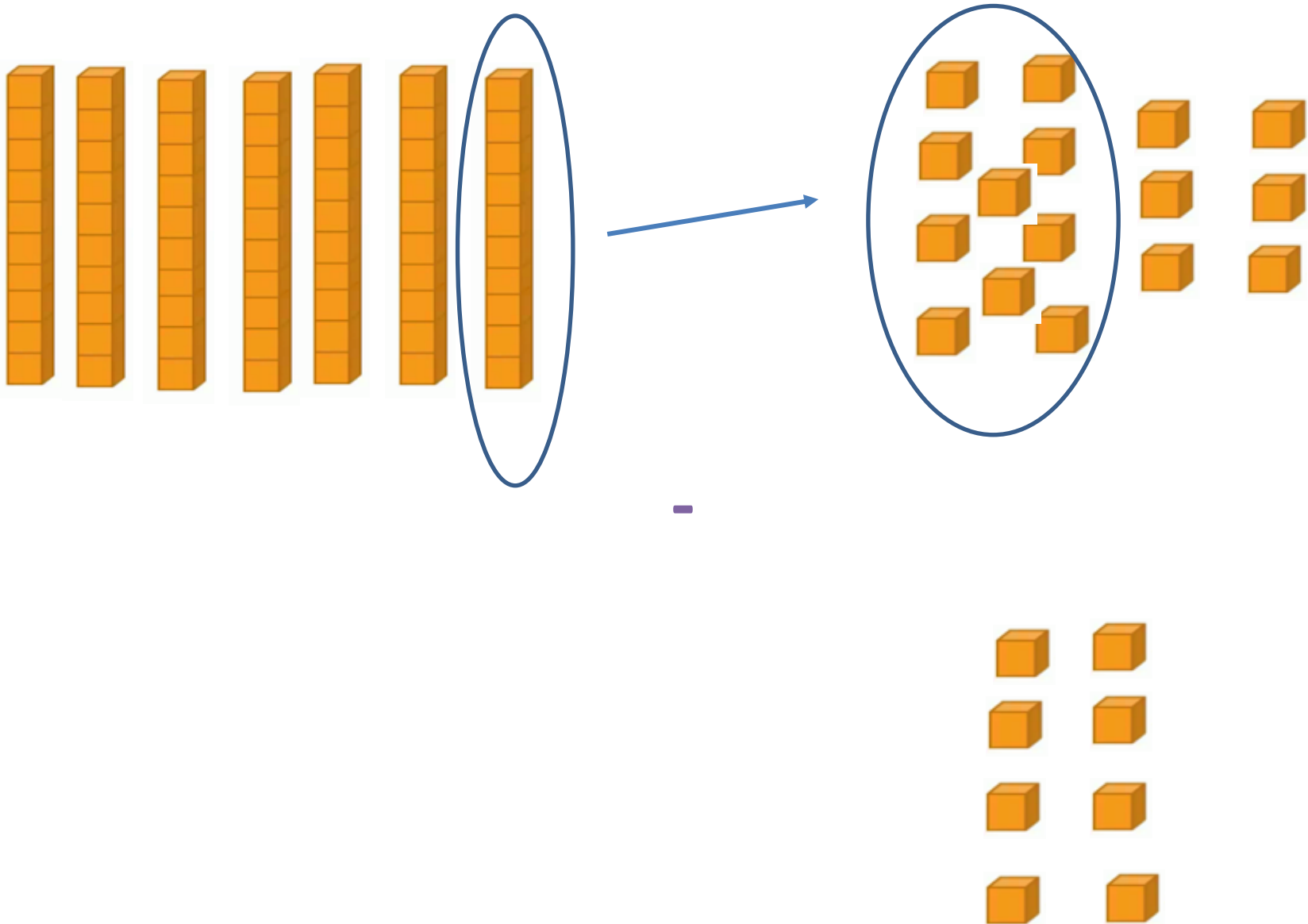
$$106 - 38$$



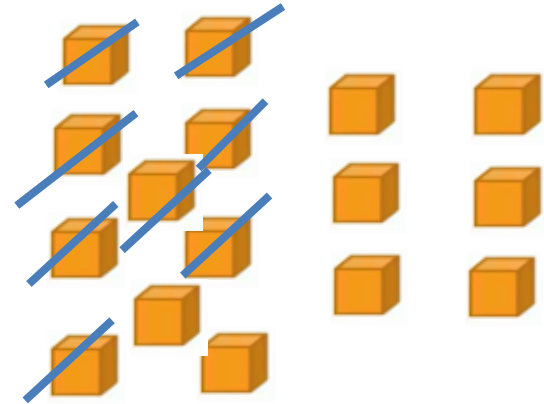
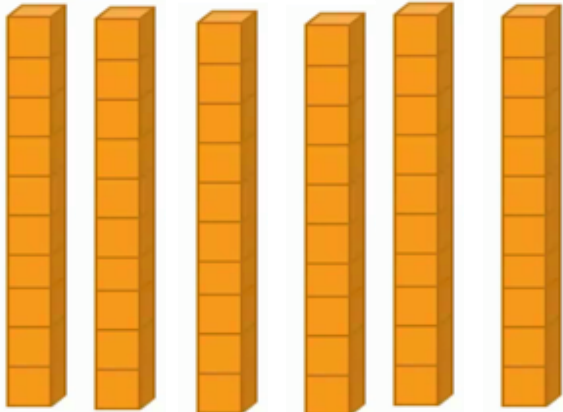
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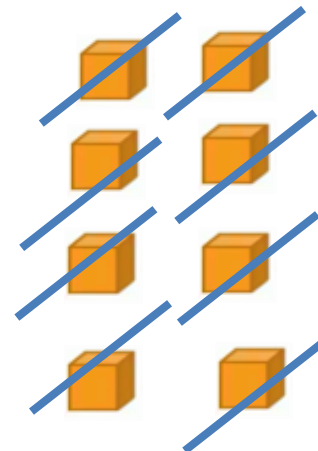
$$106 - 38$$



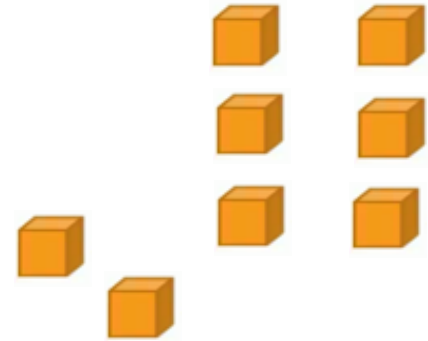
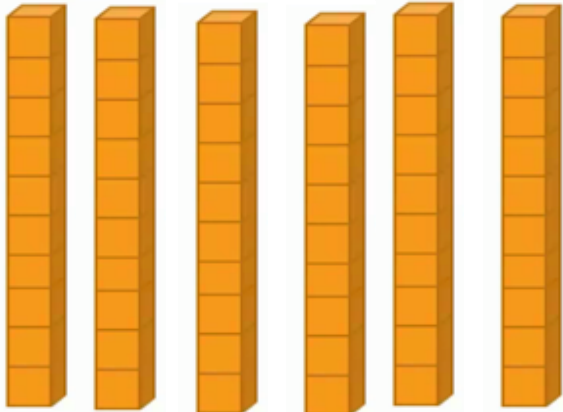
$$106 - 38$$



-



$$106 - 38$$



-

$$106 - 38 = 68$$

$$\begin{array}{r} 1 \ 0 \ 6 \\ - \ 3 \ 8 \\ \hline \end{array}$$

Passos:

$$1C = 10D$$

$$10D - 3D = 7D$$

$$7D = 6D + 1D = 6D + 10U$$

$$10U + 6U = 16U$$

$$16U - 8U = 8U$$

$$106 - 38 = 68$$

C	D	U
1	0	6
-	3	8
	10	6
-	3	8
	7	6
-		8
	6	16
-		8
	6	8

C	D	U
1	0	6
-	3	8
	10	16
-	3	8
	9	16
-	3	8
	6	8

C	D	U
1	⁹ 10	¹ 16
-	3	8
	6	8

C = X 100	D = X 10	U = X 1
		

- Cuidados ao associar QVL e material dourado

C = X 100

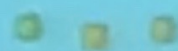
D = X 10

U = X 1

3

3

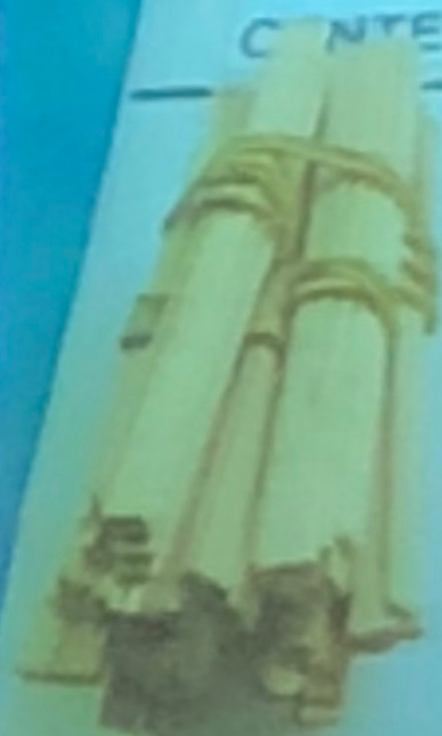
3



CENTENA

DEZENA

UNIDADE



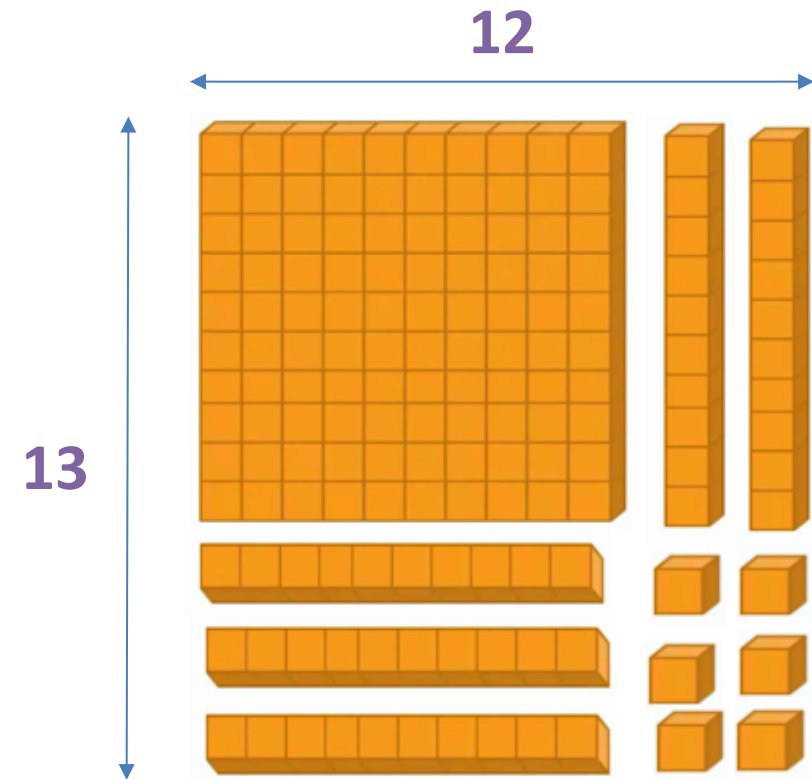
Sobre a operação de multiplicação

Multiplicação como soma de parcelas iguais.

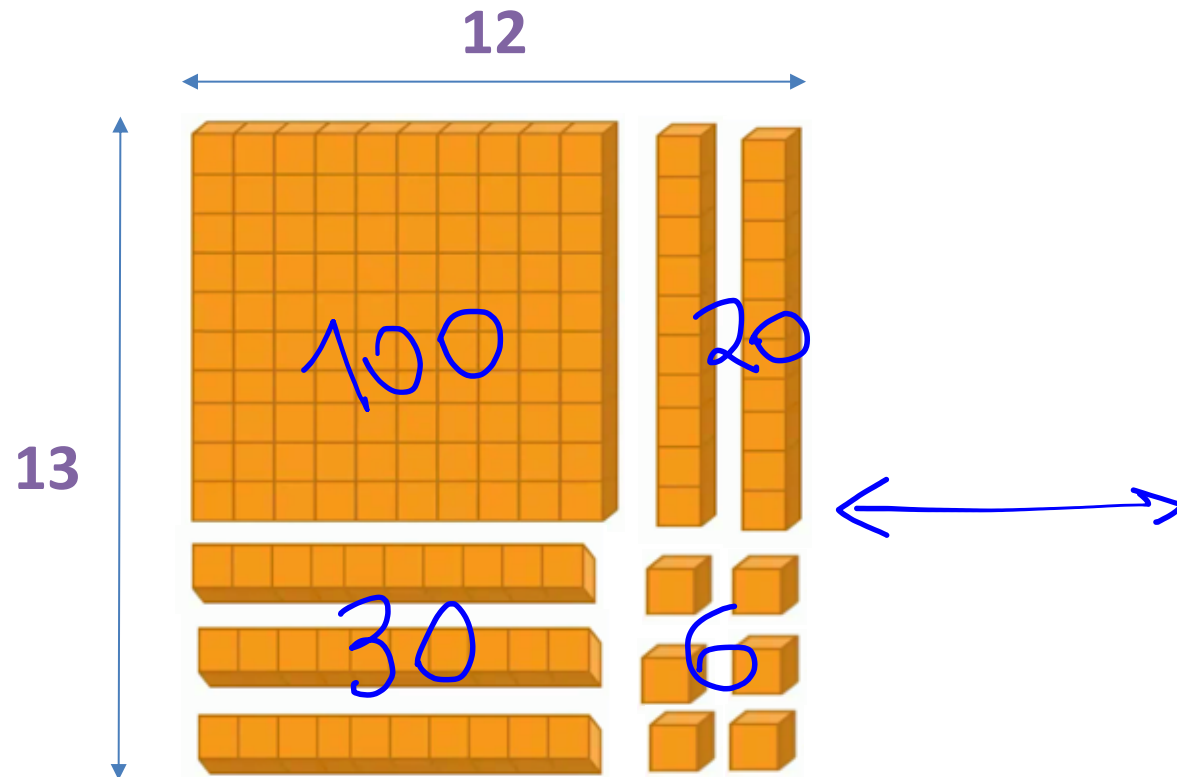
$$12 \times 13 = 13+13+13+13+13+13+13+13+13+13+13+13$$

- Utilizando o material dourado, construa um retângulo (com a região interna) de lados medindo 12 e 13 com o menor número possível de peças.
- Usando o algoritmo da multiplicação, resolva 12×13 .
- Estabeleça relações entre as multiplicações parciais do algoritmo e as peças do material dourado utilizadas para construir o retângulo.

$$12 \times 13$$



$$12 \times 13$$



D U

$$\begin{array}{r} 12 = 10 + 2 \\ \times 13 = 10 + 3 \\ \hline \end{array}$$

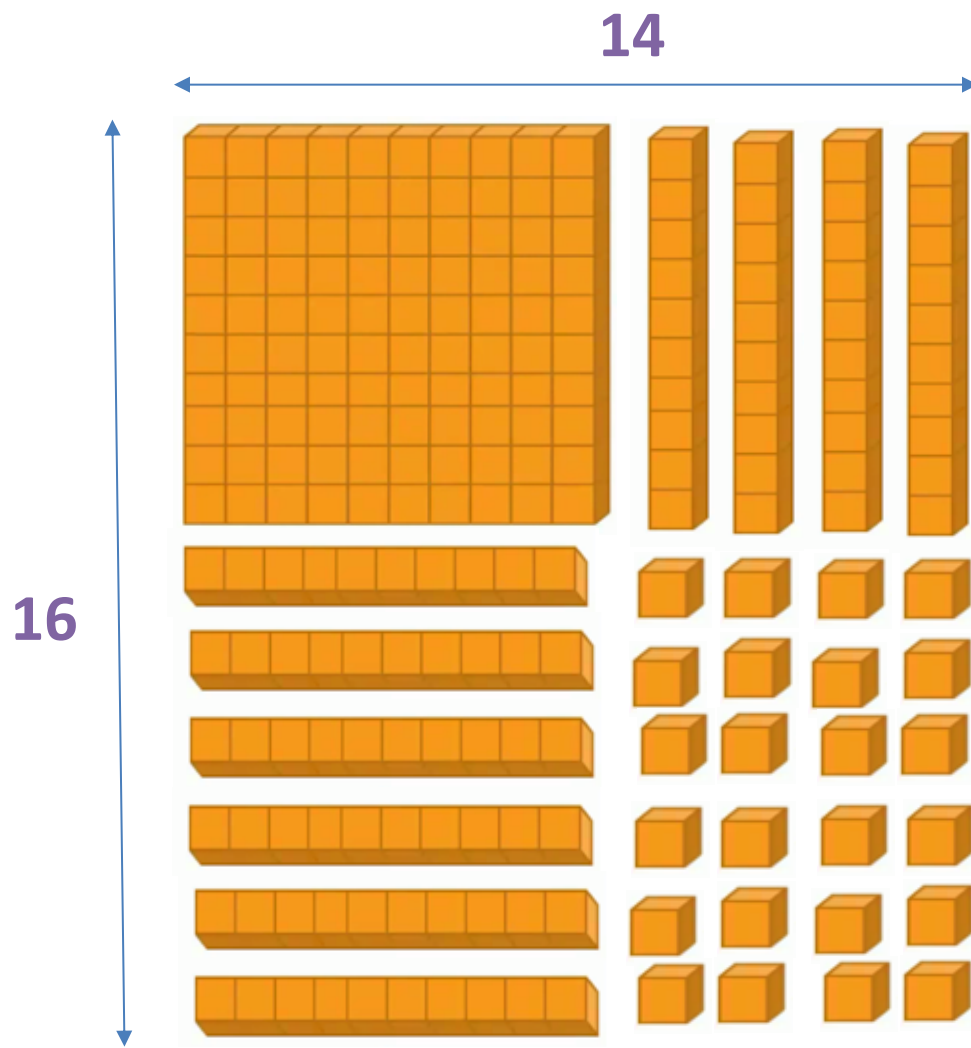
Handwritten calculation showing the distributive property:

$$\begin{array}{r} 12 \\ \times 13 \\ \hline 36 \\ 120 \\ \hline 156 \end{array}$$

Sobre a operação de multiplicação

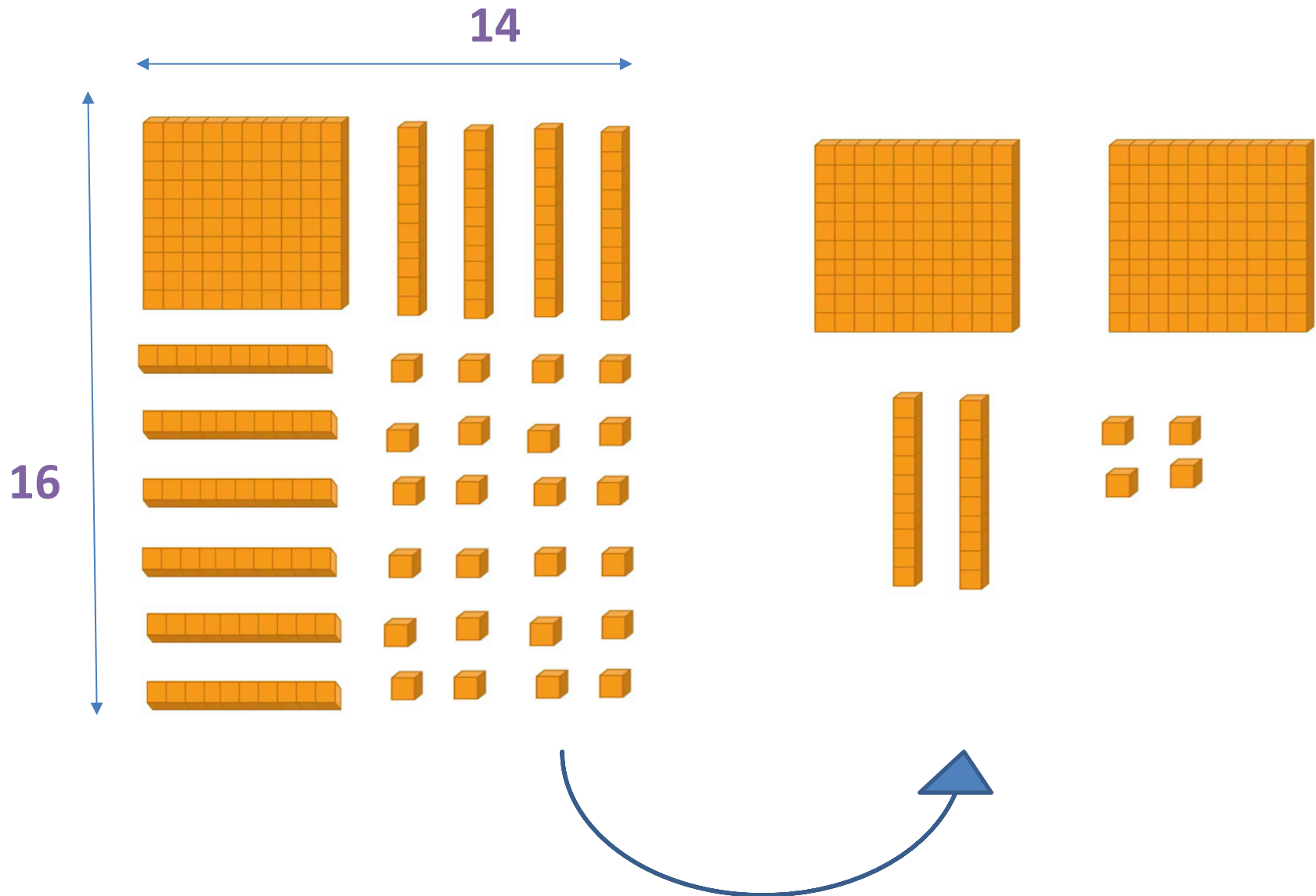
- Represente, no papel quadriculado, o retângulo formado com o material dourado, identificando as peças e valores.
- Repita os passos acima para as operações: **14x16**, 19x15 e 21x14.

14×16

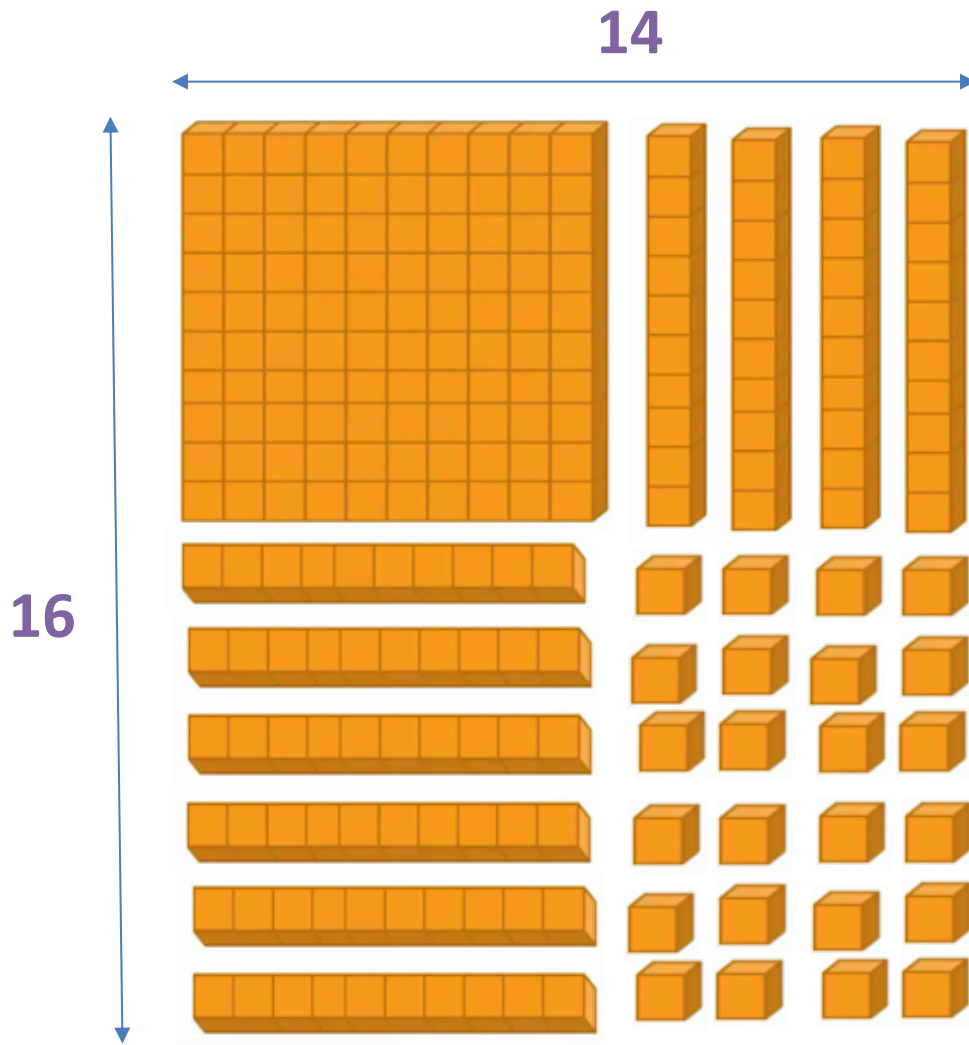


Temos
retângulo, mas
não o menor
número de
peças.
Se fôssemos
fazer as trocas...

14 x 16

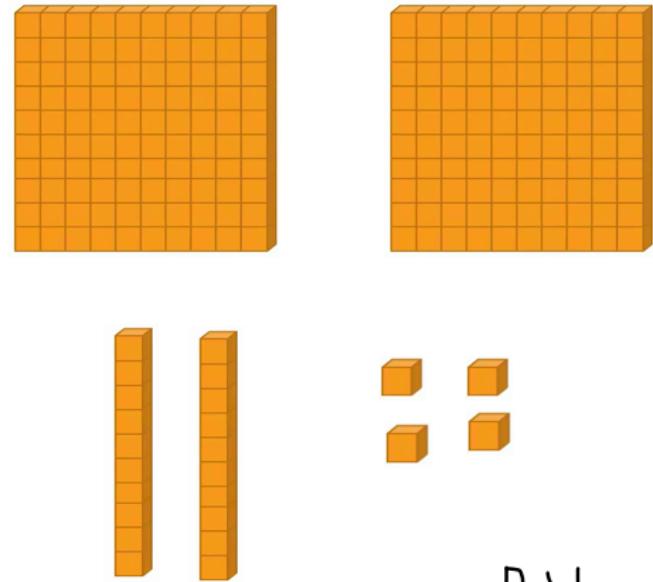
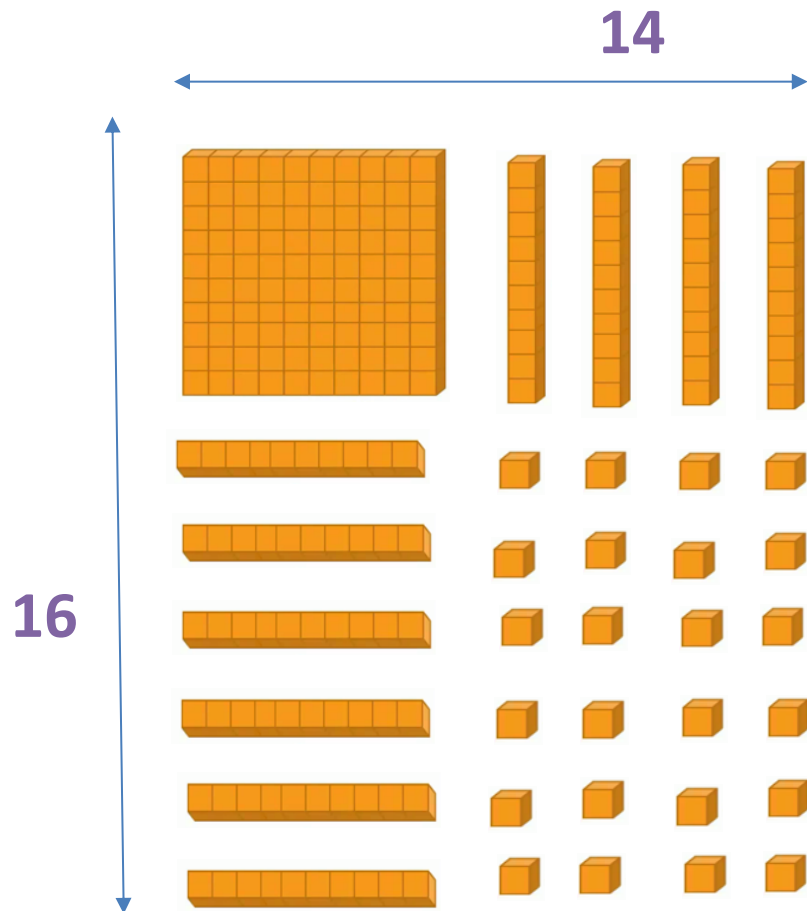


14 x 16



$$\begin{array}{r} 14 \\ \times 16 \\ \hline \end{array}$$

14×16



$$\begin{array}{r} \text{D U} \\ 14 = 10 + 4 \\ \times 16 = 10 + 6 \\ \hline 24 \\ 60 \\ + 40 \\ \hline 100 \\ \hline 224 \end{array}$$

Sobre a operação de divisão

Duas ideias associadas:

- 1) Se temos 42 azulejos para fazer um quadro retangular e colocarmos 6 azulejos em cada fila, quantas filas poderão ser feitas?

Formar um grupo de 6. Quantos grupos de 6 fazemos em 42? Quantas vezes 6 cabe em 42? Usar 6 como unidade de medida para 42.

Divisão ligada à ação de medir.

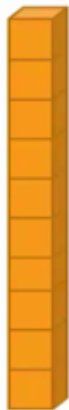
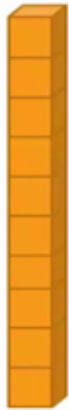
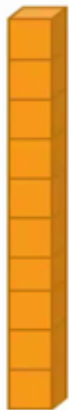
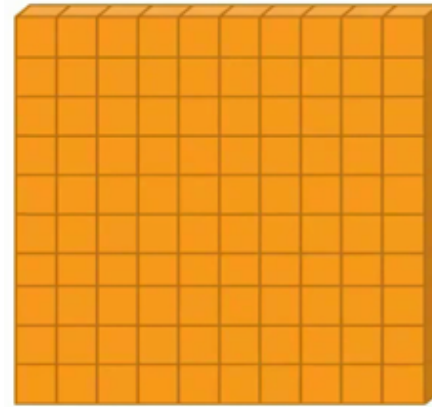
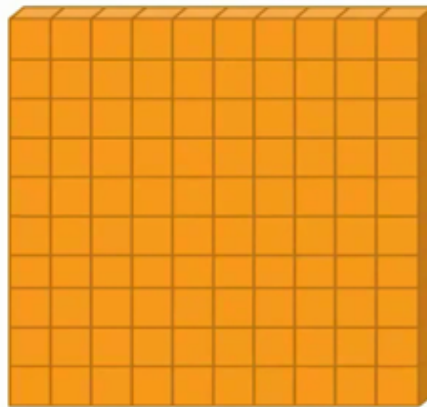
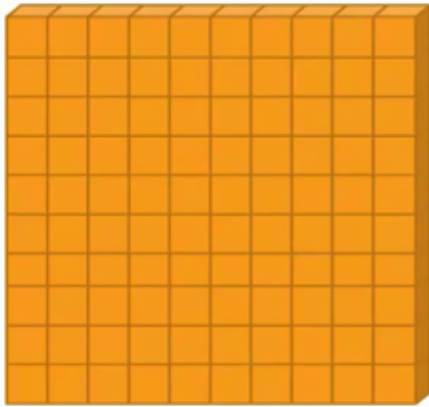
- 2) Um vendedor de vinho quer colocar 1872 garrafas em 104 caixas. Quantas garrafas terá que colocar em cada caixa?

Garrafas e caixas. Distribuir 1872 garrafas em 104 caixas.

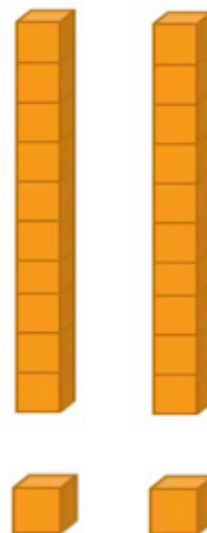
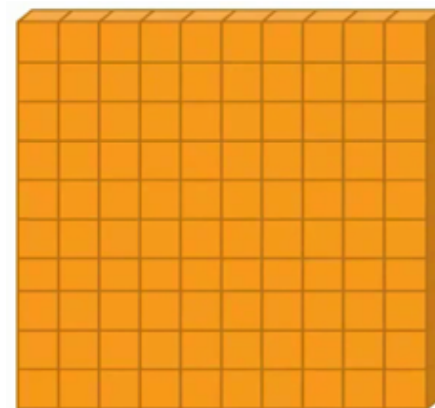
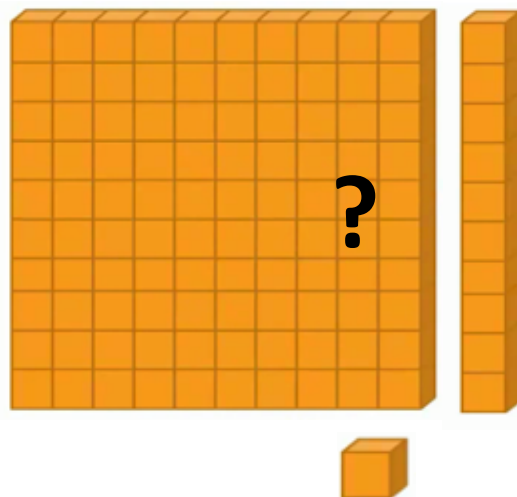
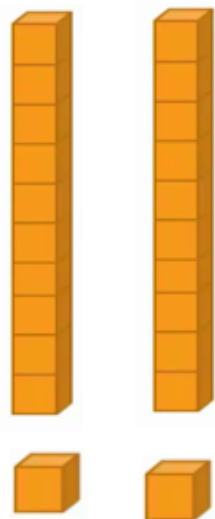
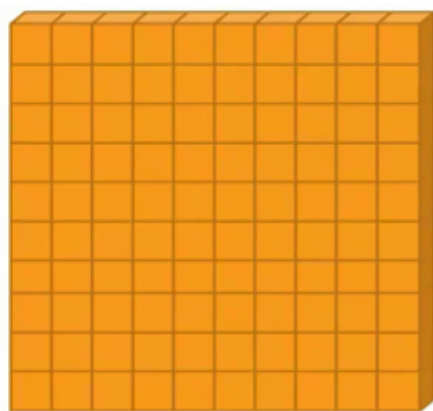
Correspondência 1 a 1 ou, 2 a 1.

Divisão ligada à ação de repartir/distribuir.

$$355 \div 2$$

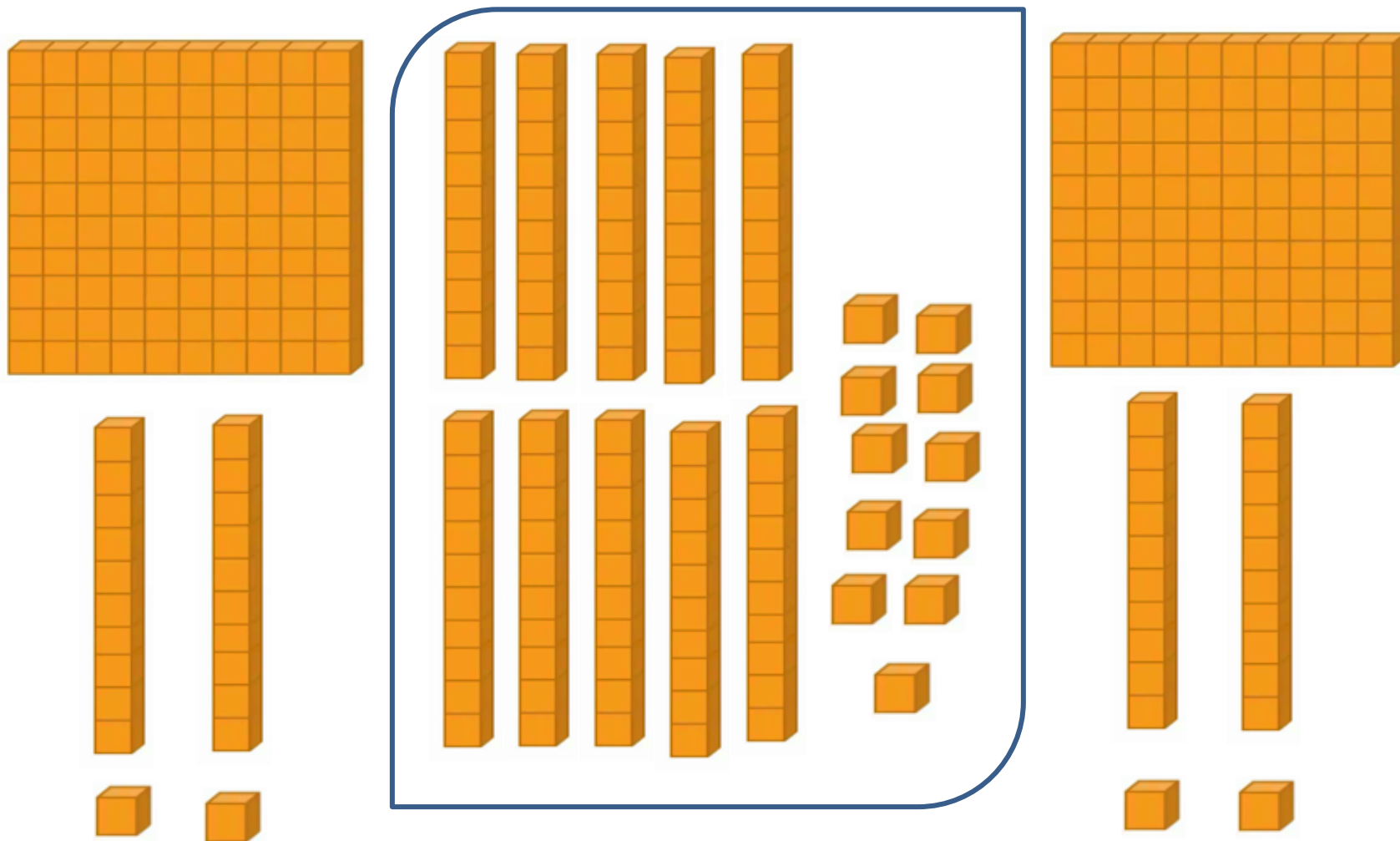


$355 \div 2$ Divisão - repartir



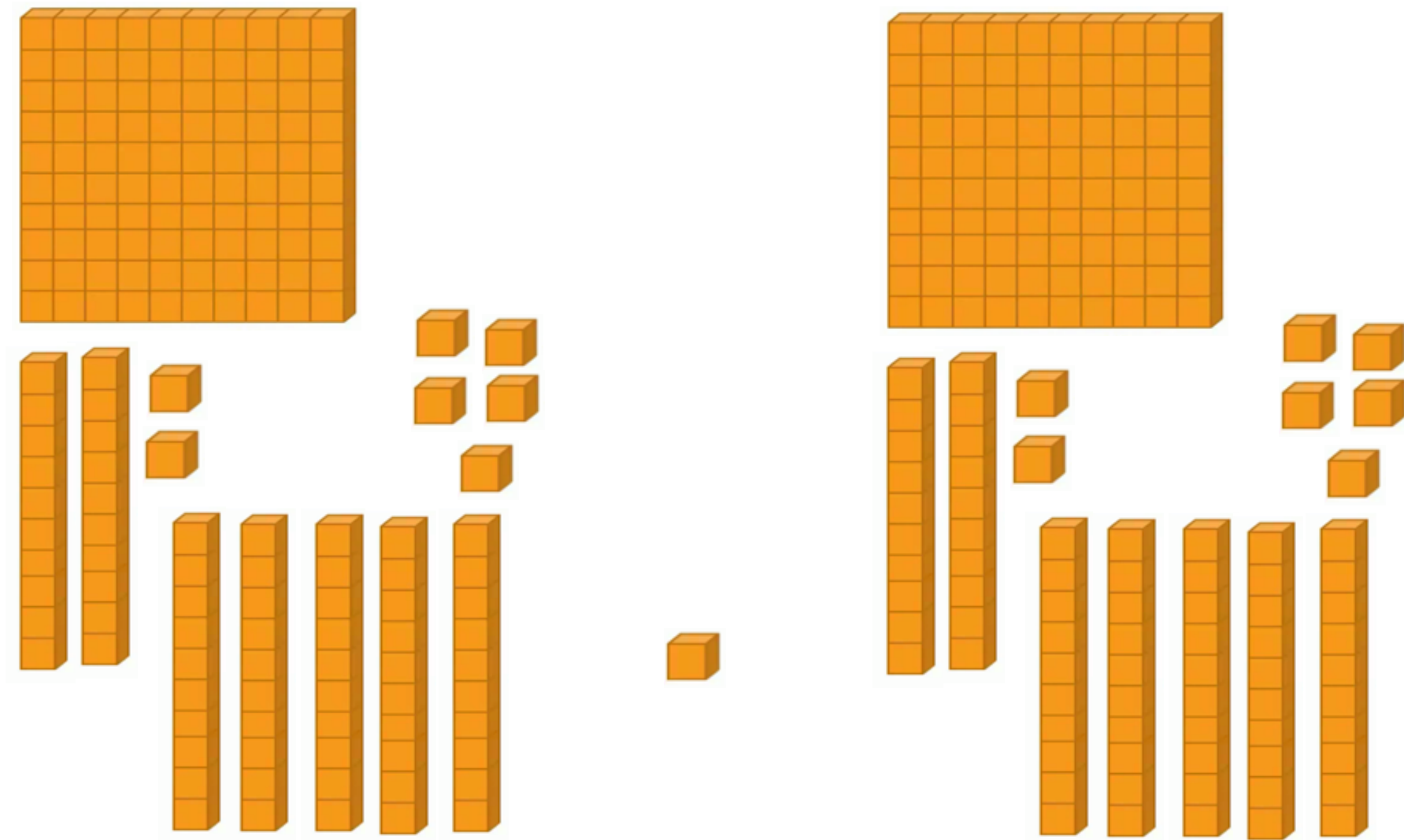
Cada pessoa ficou com 122 para cada. Mas sobrou 111.

$355 \div 2$ Divisão - repartir



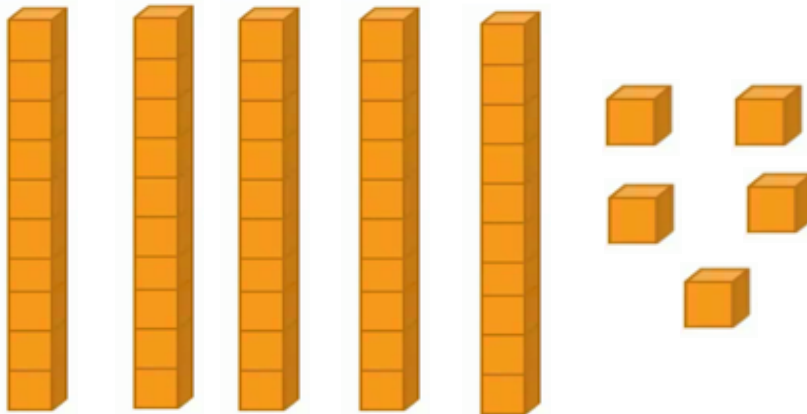
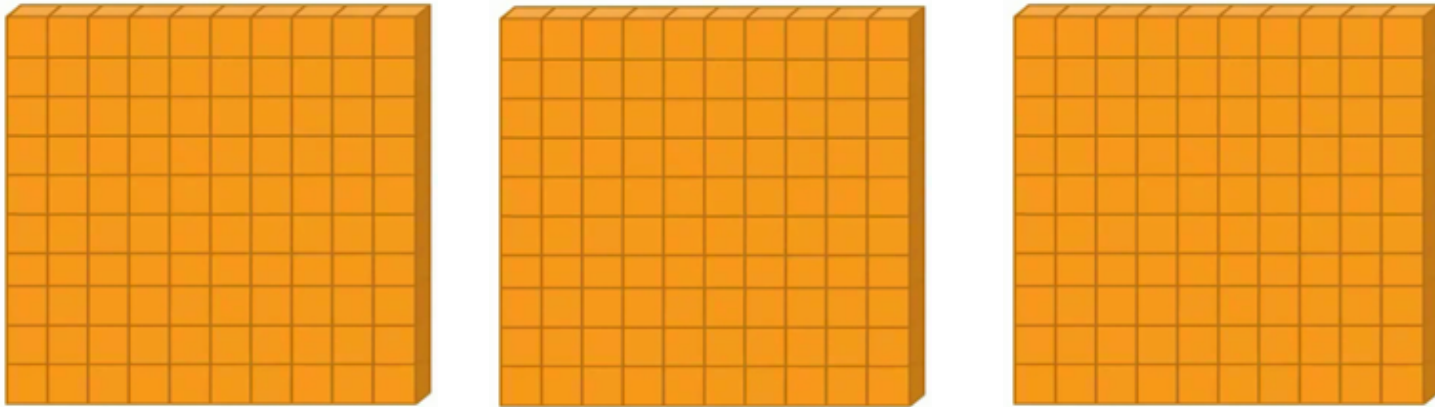
$$1C + 1D + 1U = \\ 10D + 10U + 1U$$

$355 \div 2$ Divisão - repartir



Cada pessoa ficou com 177 para cada. E sobrou 1.

355 ÷ 2 Divisão como repartir



C	D	U	d
3	5	5	
1	1	1	
	10		
	10		
		10	
		10	
			10

2
121
C D U d
55
177,5