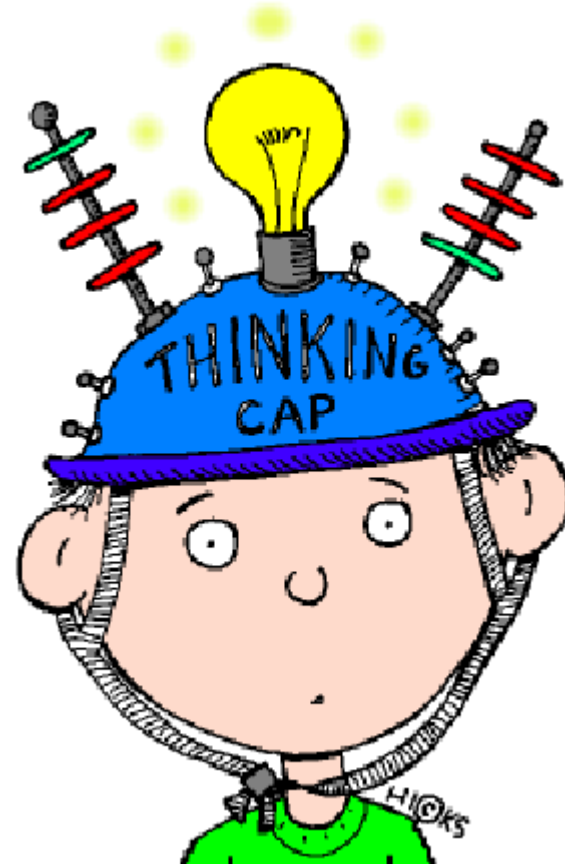


# Maths strategies

Wednesday 9<sup>th</sup> October 2019

# Purpose

- Review methods of calculation for :
  - Addition
  - Subtraction
  - Multiplication
  - Division



# Buzzword Bingo

- Array
- Grid method
- Bar method
- Formal method
- Cuisinaire
- Numicon
- Prosecco
- Hundreds
- Tens
- Ones
- Borrow
- Bus stop
- Pay back
- Units
- partitioning
- Decomposition
- chunking
- Multiples
- Factors
- Dienes
- Exchange
- Prime numbers

# Choose 9 mathematical words

<b>prime</b>	cuisinaire	chunking
partitioning	grid method	
bar method		

- Any 3 in a line = BINGO Full House = BINGO BINGO

# Buzzword Bingo

- Array
- Grid m
- Bar met
- Formal m
- Cuisinaire
- Numicon
- Prosecco

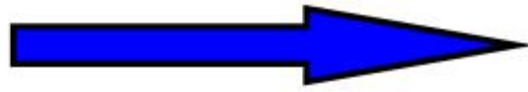


ationing

- Decomposition
- chunking
- Multiples
- Factors
- Dienes
- Exchange
- Prime numbers

# Buzzword Bingo

- Array
- Grid method
- Bar method
- Formal method
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- Bus stop
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- chunking
- Multiples
- Factors
- Dienes
- Exchange
- Prime numbers



concrete - pictorial - abstract



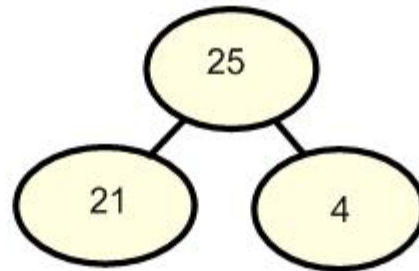
$$| \cdot = \square$$

11


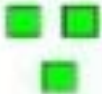


$$| \cdot \cdot = \square$$

24 + 34

$$| \cdot \cdot \cdot = \square$$



# Addition

<u>hundreds</u>	<u>tens</u>	<u>ones</u>
		
		

$$\begin{array}{r} 43 \\ + 26 \\ \hline \\ \hline \end{array}$$

DIENES



Numicon  
Numbers  
0-10

0



1



2



3



4



5



6



7



8

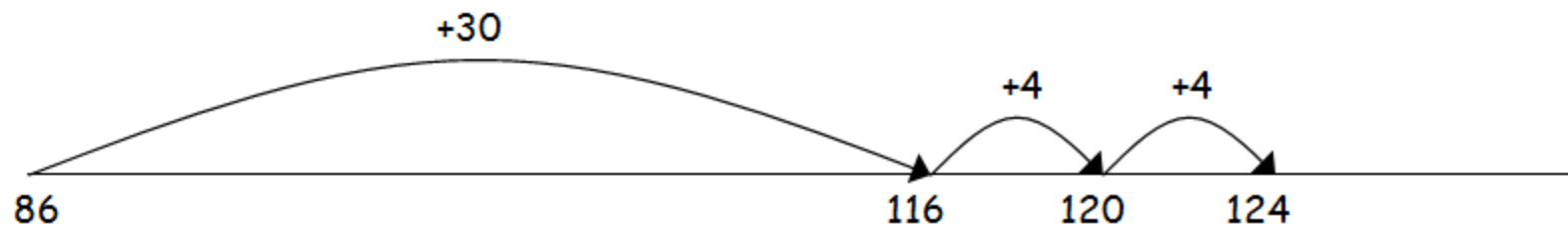


9



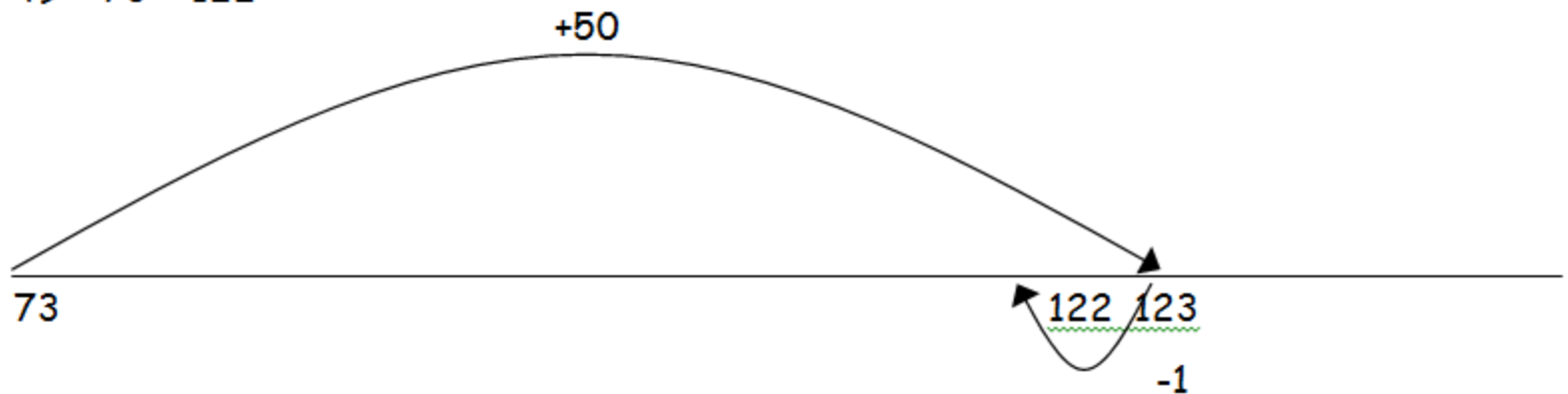
10

$$38 + 86 = 124$$

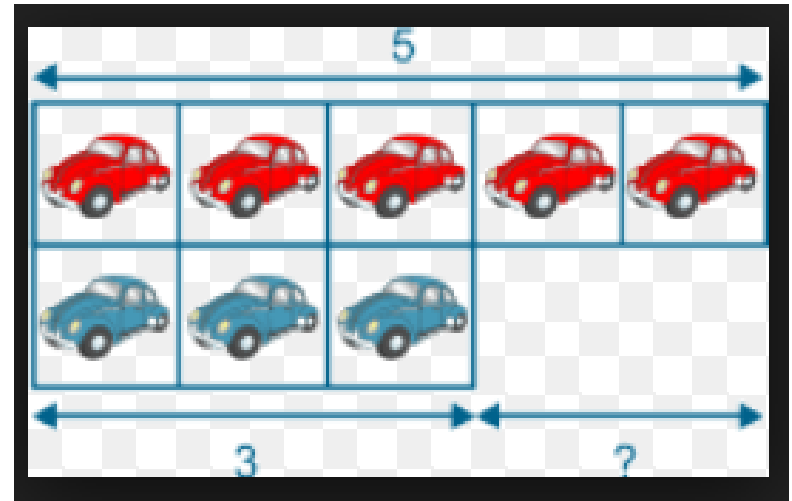


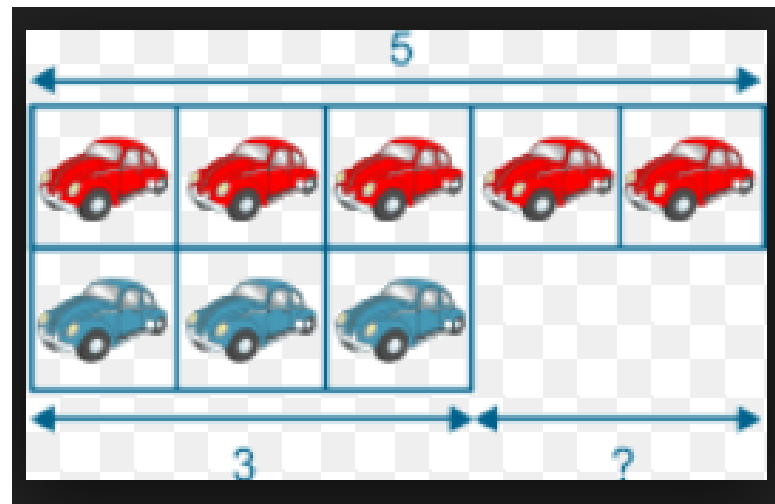
✓ Compensation

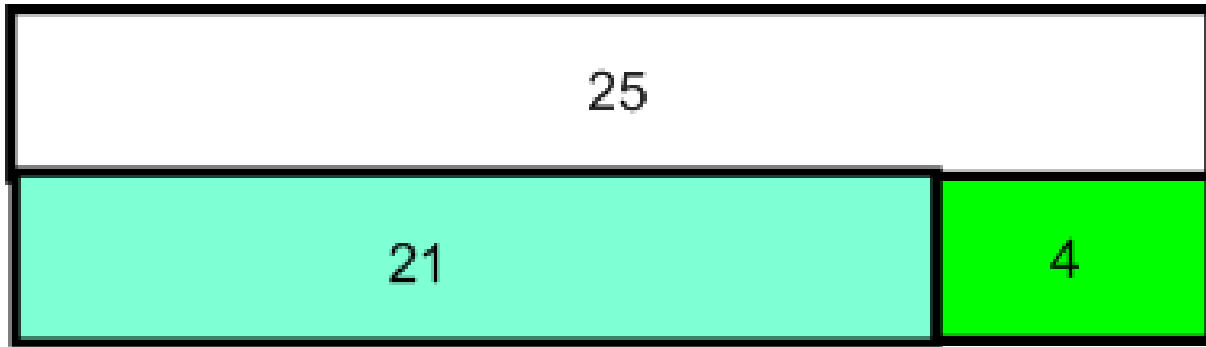
$$49 + 73 = 122$$



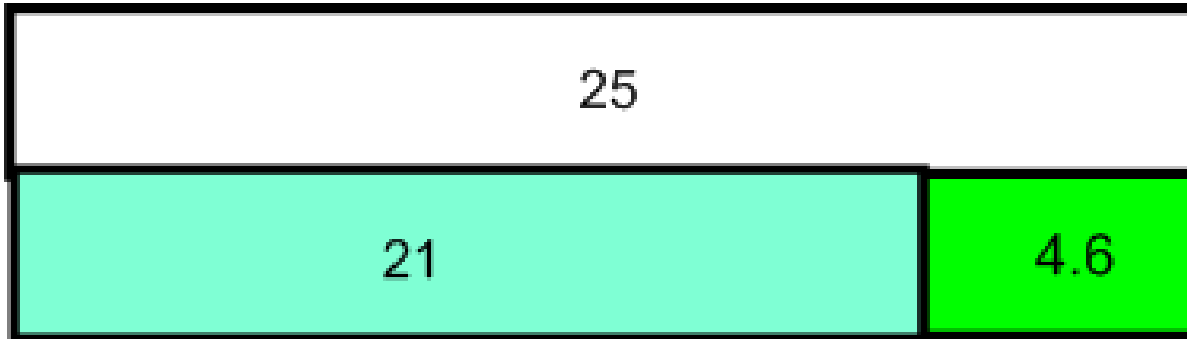
# Singapore bar method



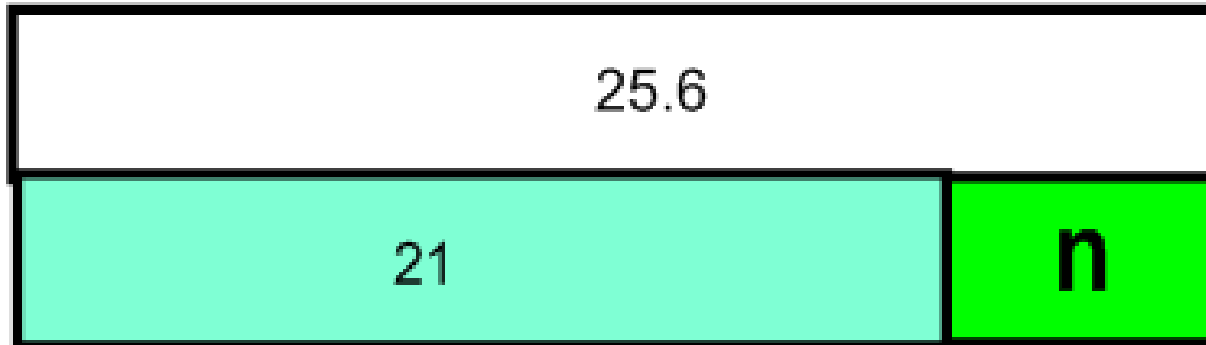




$$\begin{aligned} 25 &= 21 + 4 \\ 25 &= 4 + 21 \\ 25 - 4 &= 21 \\ 25 - 21 &= 4 \end{aligned}$$



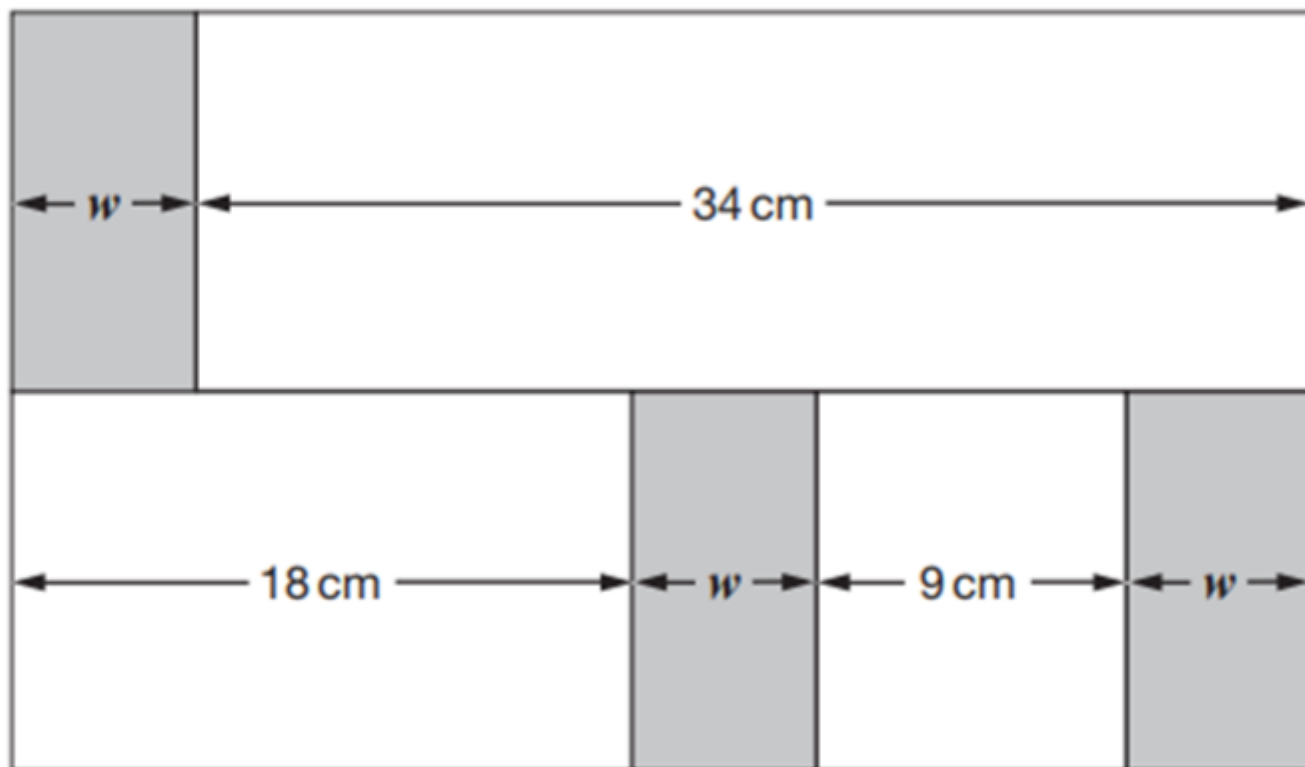
$$\begin{aligned} 25.6 &= 21 + 4.6 \\ 25.6 &= 4.6 + 21 \\ 25.6 - 4.6 &= 21 \\ 25.6 - 21.6 &= 4.6 \end{aligned}$$



$$\begin{aligned} 25.6 &= 21 + n \\ 25.6 &= n + 21 \\ 25.6 - n &= 21 \\ 25.6 - 21.6 &= n \end{aligned}$$

22

In this diagram, the shaded rectangles are all of equal width ( $w$ ).

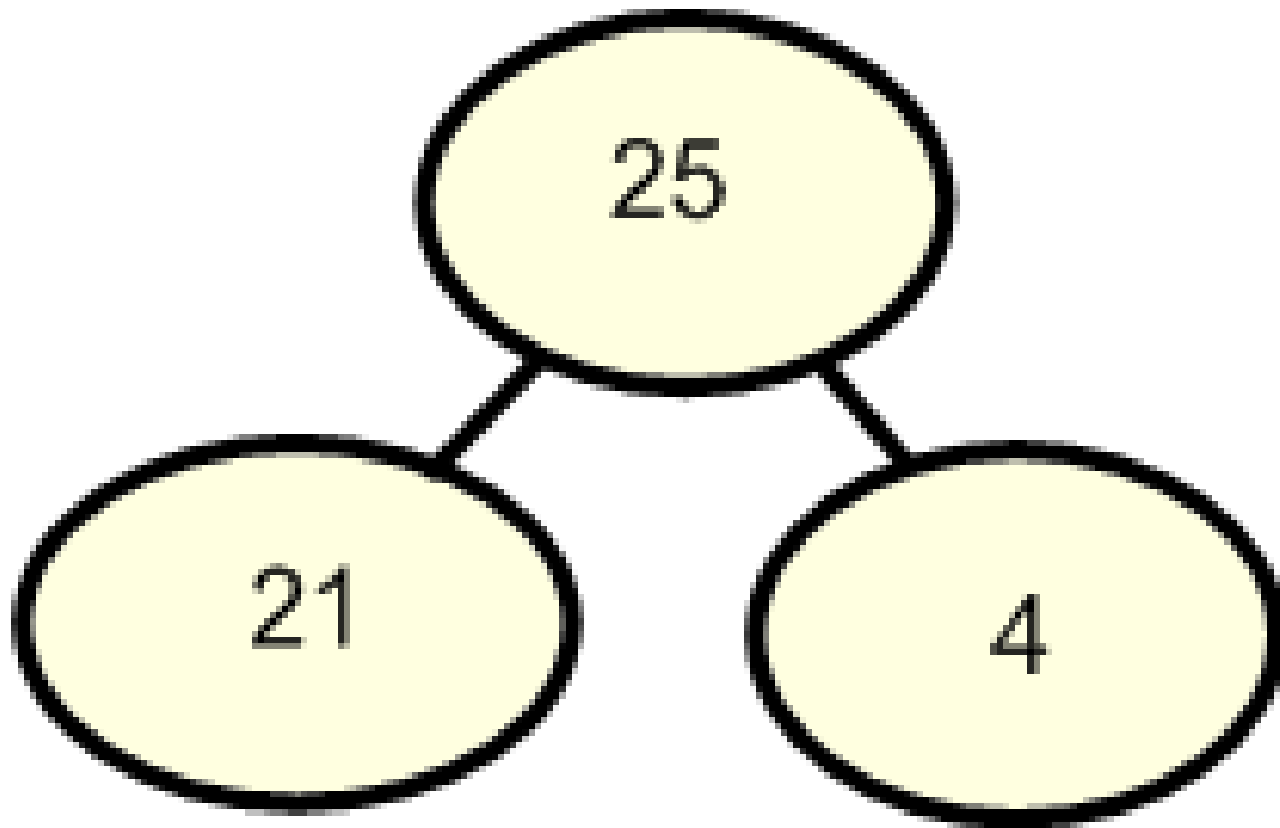


Not to  
scale

Calculate the width ( $w$ ) of one shaded rectangle.

Ac  
Go

Part – part - whole



# partitioning

$$56 + 62$$

$$50 + 60 = 110$$

$$\underline{6 + 2 = 8}$$

$$56 + 62 = 118$$

$$56$$

$$\underline{+62}$$

$$\underline{118}$$

1

$$42$$

$$6432$$

$$786$$

$$3$$

$$\underline{+ 4681}$$

$$\underline{11944}$$

$$121$$



**YOUR GO!  
TALK FOR LEARNING**

$$23.4 + 45.34 + 73.1 + 99.87$$

	23.4	23.40	23.04
	45.34	45.34	45.34
+	73.1	+ 73.10	+ 73.01
	<u>99.87</u>	<u>99.87</u>	<u>99.87</u>

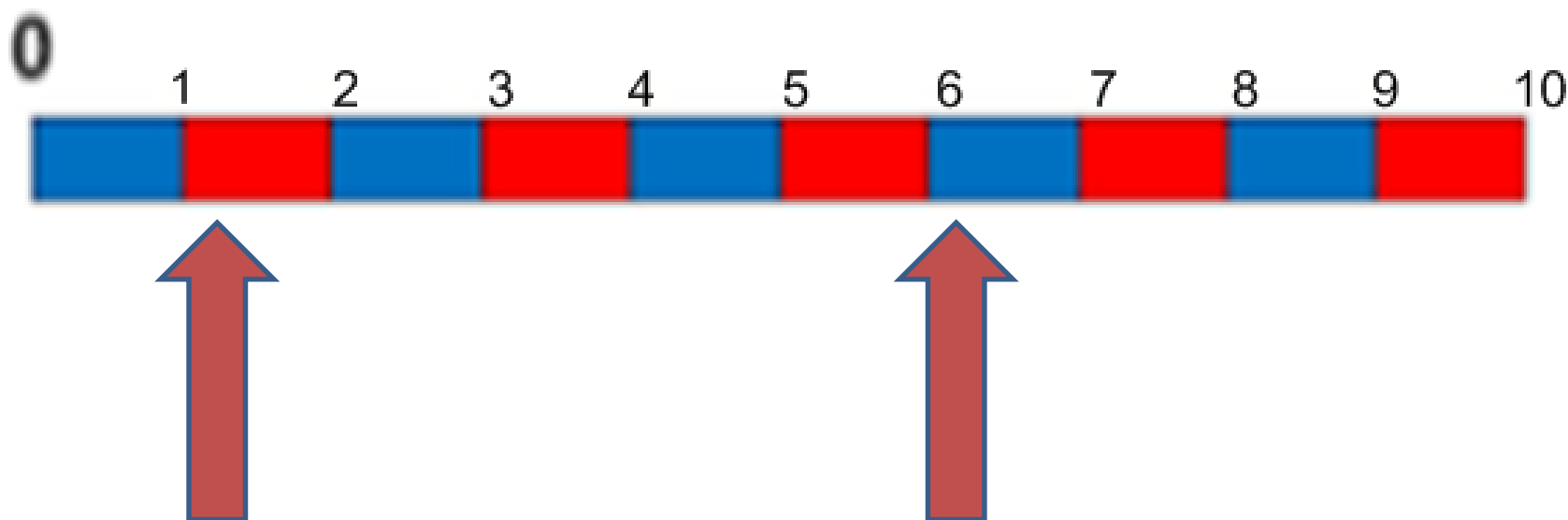
- What's the same and what's different?

$$23.4 + 45.34 + 73.1 + 99.87$$

	23.4	23.40	23.04
	45.34	45.34	45.34
+	73.1	+ 73.10	+ 73.01
	<u>99.87</u>	<u>99.87</u>	<u>99.87</u>

- What's the same and what's different?

Pick a number between 1 and 2



# Subtraction

- Learning buddies

- 82-47

- 102-89

**YOUR GO!  
EXPLAIN TO YOUR LEARNING  
BUDDY YOUR METHOD**

- Number sense
- Use Jim's method

left side of the room A  
right side of the room B

What is the same ?

- **Set a**
- **120-90**
- **235-180**
- **502-367**
- **122-92**
- **119-89**
- **237-182**

**Variety**

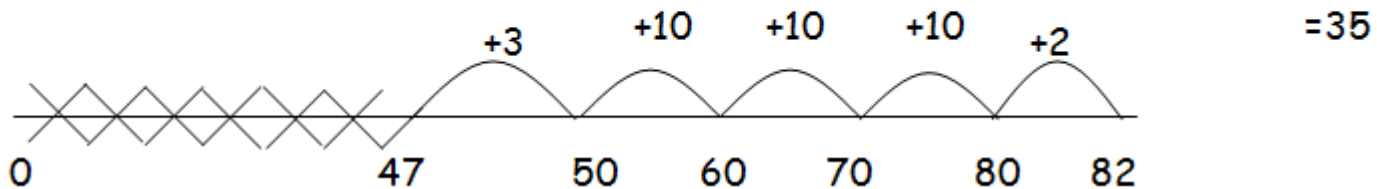
What is different ?

- **Set b**
- **120-90**
- **122-92**
- **119-89**
- **235-180**
- **237-182**
- **502-367**

**Variation**

# Subtraction

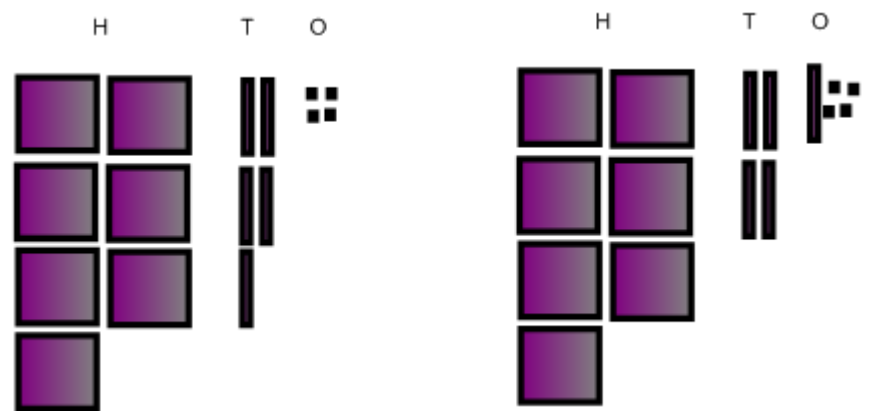
$$82 - 47$$



$$102 - 89 = 13$$



$$\begin{array}{r} 754 \\ - 86 \\ \hline \end{array}$$



dienes

Step 1

$$\begin{array}{r} 700 + 50 + 4 \\ - \quad \quad 80 + 6 \\ \hline \end{array}$$

Step 2

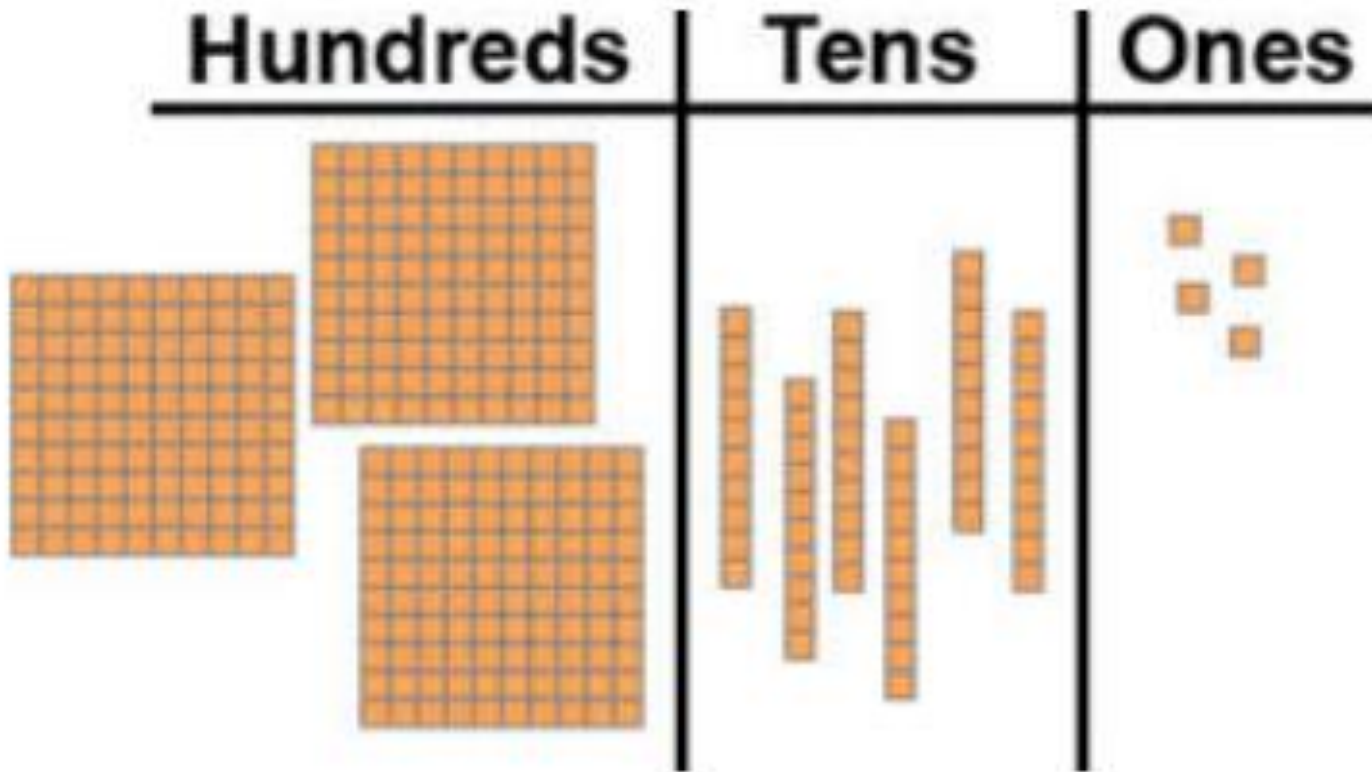
$$\begin{array}{r} 700 + 40 + 14 \\ - \quad \quad 80 + 6 \\ \hline \end{array} \quad (\text{adjust from } T \text{ to } O)$$

Step 3

$$\begin{array}{r} 600 + \underline{140} + 14 \\ - \quad \quad 80 + 6 \\ \hline 600 + 60 + 8 = 668 \end{array} \quad (\text{adjust from } H \text{ to } T)$$



# Subtraction



Exchange from the next column

$$\begin{array}{r} 7 \overset{3}{\cancel{4}} 5 \\ - 1 2 7 \\ \hline 6 1 8 \\ \hline \end{array}$$

$$\begin{array}{r} \overset{3}{\cancel{4}} \overset{9}{\cancel{0}} 5 \\ - 1 2 7 \\ \hline 3 7 8 \\ \hline \end{array}$$

JIM

$$\begin{array}{r} 725 \\ -147 \\ \hline 622 \\ \hline \end{array}$$

reasoning

Jim has made a mistake because you cannot do 5-7 in the ones column. He needs to exchange in the tens column. Also the tens column you cannot subtract 4 from 2. It should be 2 minus 4. He should have exchanged and used a hundred from the next column to make 12 tens minus 4 tens.

H

6

T

2

O

5

**YOUR GO!**  
**EXPLAIN TO YOUR LEARNING**  
**BUDDY YOUR METHOD AND**  
**WHAT IS WRONG HERE**

-1 1 7

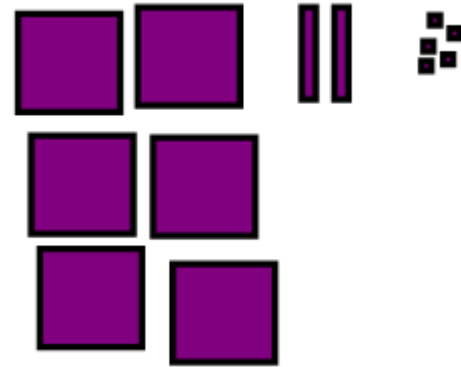
---

5 1 2

---

useful vocabulary

ones  
 tens  
 hundreds  
 exchange



How would you explain this to your child?



$$- 100 = 1,059$$

$$37.8 - 14.671 =$$

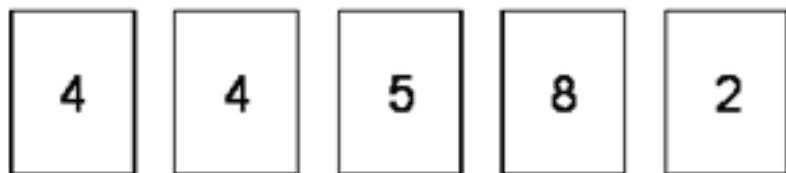
$$707 + 1,818 =$$

Q3. Write in the missing numbers.

(a)  $3.42 + 12.7 = \boxed{\phantom{000}}$

(b)  $32.62 \div 10 = \boxed{\phantom{000}}$

Q4. Here are five number cards.



Use all five cards to make an addition that has the **answer 500**

+		
5	0	0

Q1. Circle the **two** numbers which add up to 1.



**0.1**

**0.65**

**0.99**

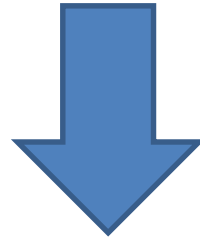
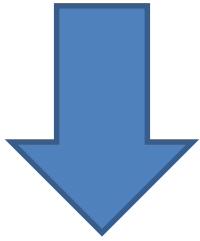
**0.45**

**0.35**

Q2. Write in what the missing numbers could be.



$$170 + \boxed{\phantom{000}} = 220 - \boxed{\phantom{000}}$$



Q1. Circle the **two** numbers which add up to 1.

*قوله*

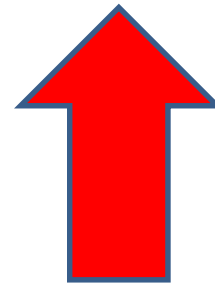
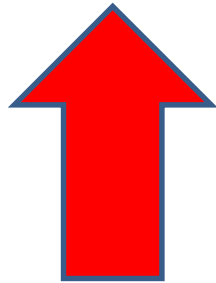
0.1

0.65

0.99

0.45

0.35





Q2. Write in what the missing numbers could be.

*Handwritten mark*

$$170 + \boxed{40} = 220 - \boxed{10}$$

# Multiplication

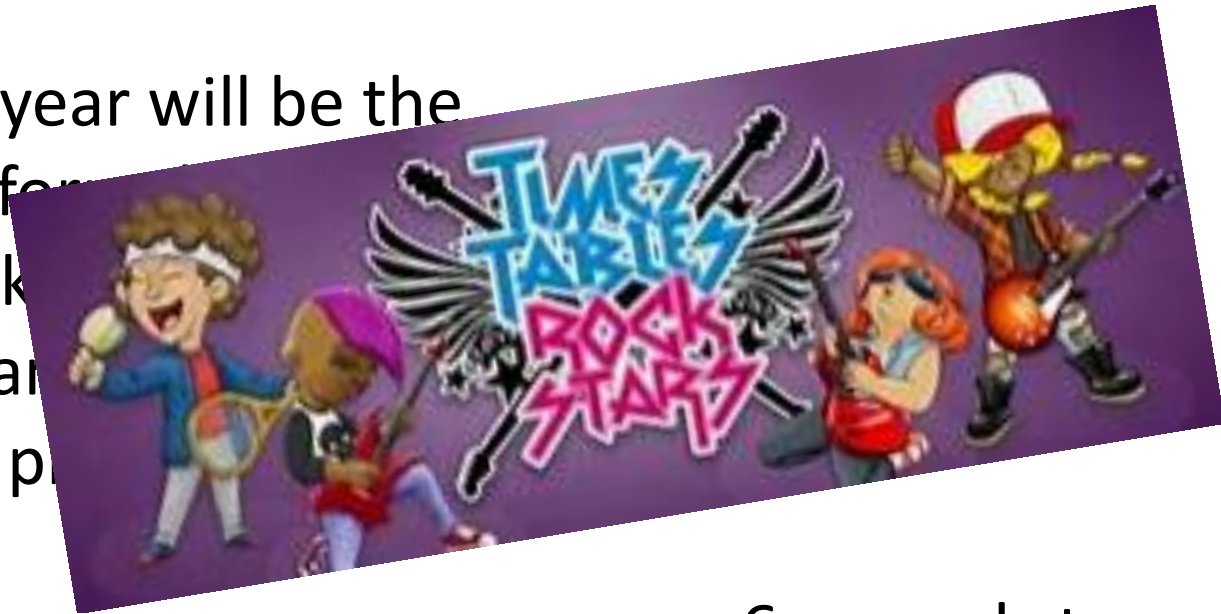


X6=

Even more 'great and unmatched wisdom'

# Year 4 times tables test

- This year will be the first for check English best p



- 6 seconds to answer and type it in

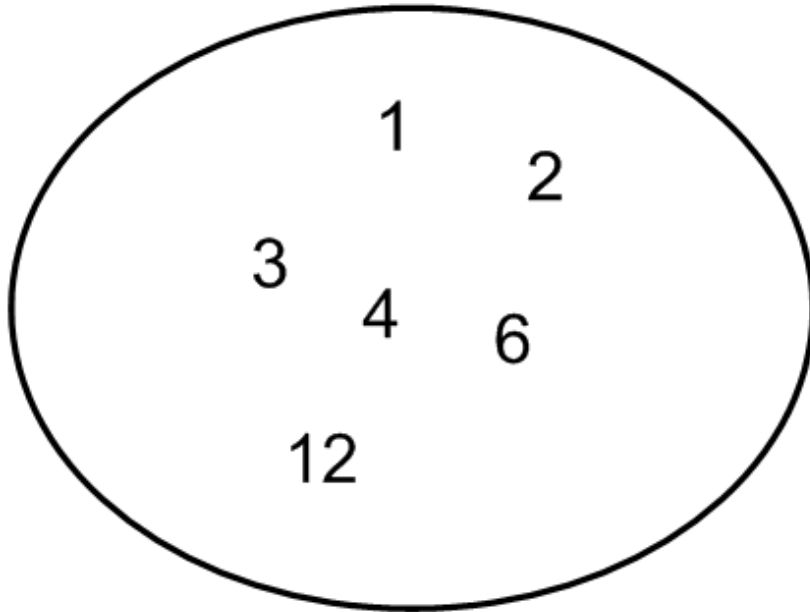
# Sharing methods

Your go!

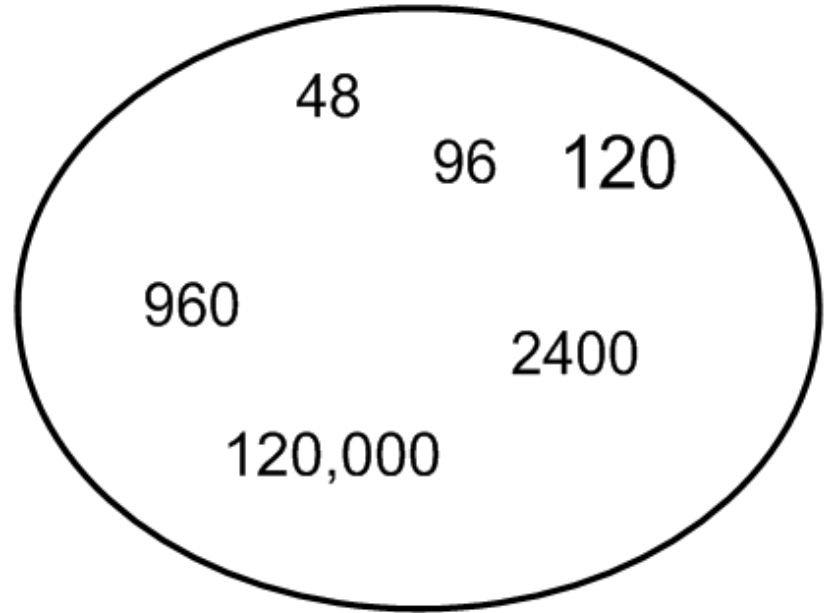
- $22 \times 8$
- $(20 \times 8) + (2 \times 8)$
- $22 \times 2 \times 2 \times 2$
- $44 \times 4$
- $(8 \times 20) + (8 \times 2)$
- $44 \times 19$
- $(44 \times 20) - (44 \times 1)$
- $(10 \times 44) + (9 \times 44)$

# Multiplication

factors of 24

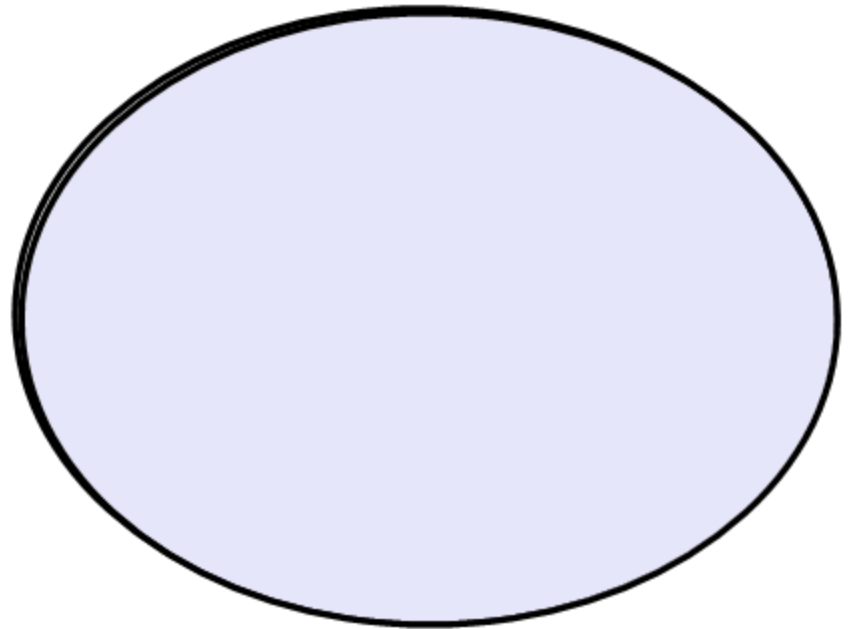
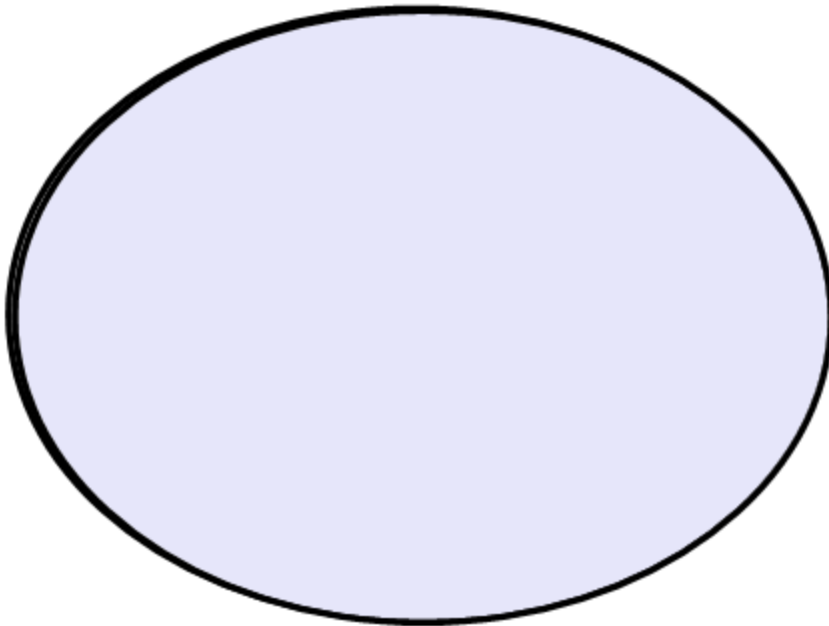


multiples of 24



factors of 16

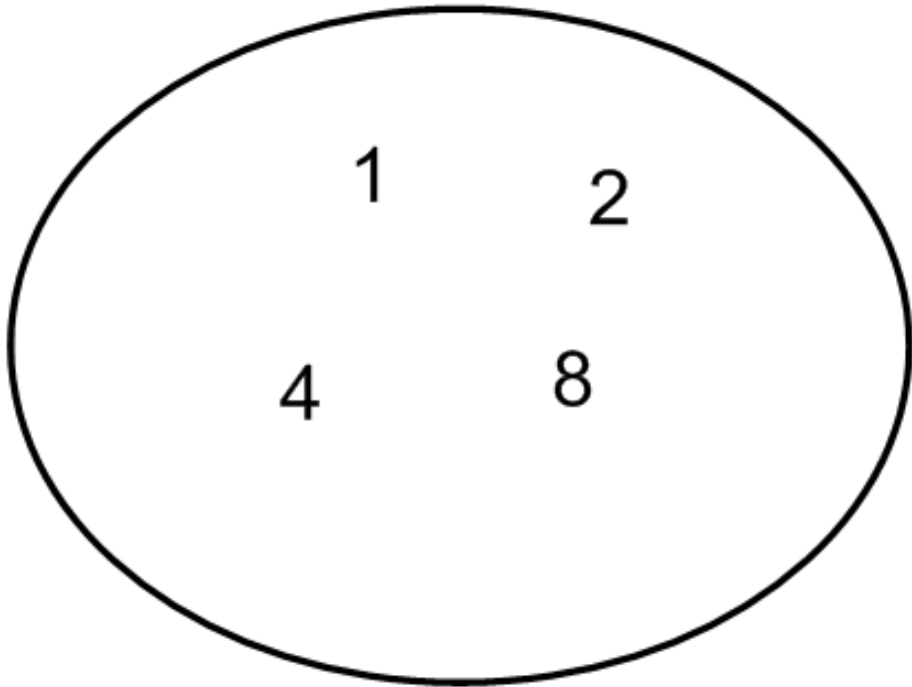
multiples of 16



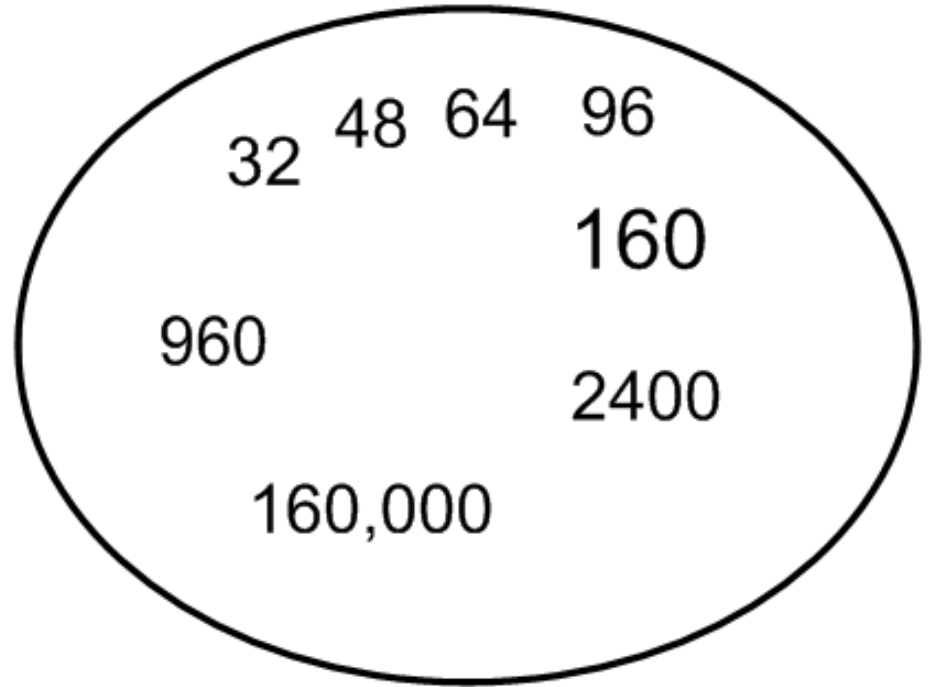
**YOUR GO!**  
**WITH YOUR LEARNING BUDDY FILL IN**  
**THE GAPS**

# Multiplication

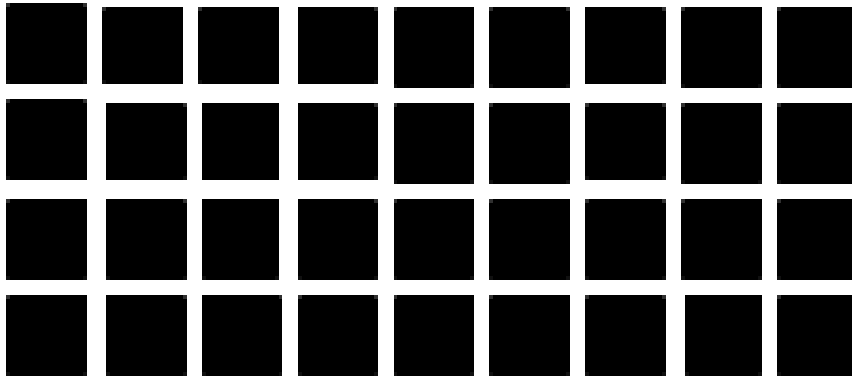
factors of 16



multiples of 16



# Multiplication



$$4 \times 9 = 36$$

$$9 \times 4 = 36$$

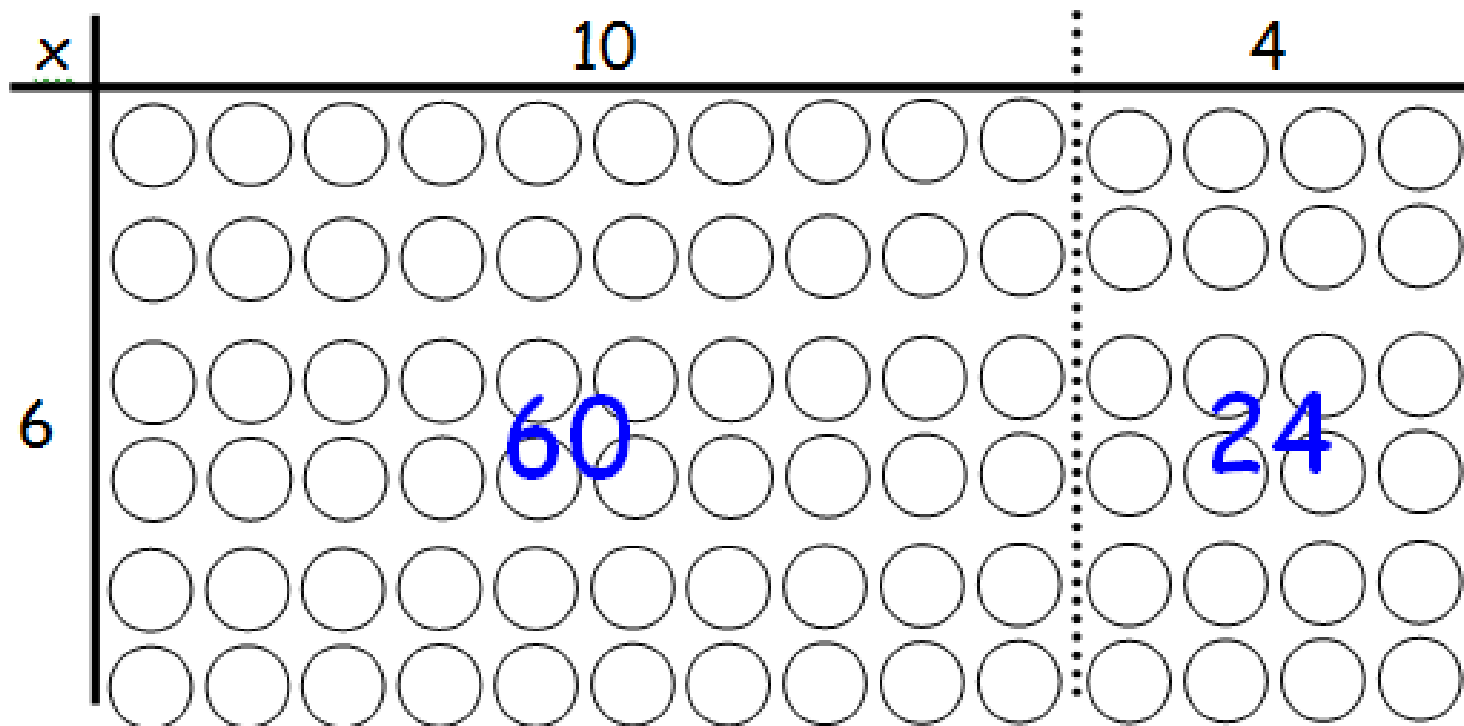
ARRAYS

$$\square \times 5 = 20$$

$$3 \times \triangle = 18$$

$$\square \times \bigcirc = 32$$





Y3

$$\begin{array}{r} \times \quad 20 \quad 3 \\ 8 \quad \boxed{160} \quad \boxed{24} \end{array}$$

GRID METHOD

$$\begin{array}{r} 160 \\ + 24 \\ \hline 184 \end{array}$$

$$\begin{array}{r} 23 \\ \times 8 \\ \hline 184 \\ \hline \end{array}$$

1 2

$$\begin{array}{r} 23 \\ \times 8 \\ \hline 24 \quad (8 \times 3) \\ 160 \quad (8 \times 20) \\ \hline 184 \end{array}$$

Y5

1346 X 9

GRID METHOD

x	1000	300	40	6
9	9000	2700	360	54

$$\begin{array}{r} 9000 \\ + 2700 \\ + 360 \\ + 54 \\ \hline 12114 \\ \hline 11 \end{array}$$

$$\begin{array}{r} 1346 \\ \times 9 \\ \hline 12114 \\ \hline 345 \end{array}$$

$$\begin{array}{r} 1346 \\ \times 9 \\ \hline 54 \quad (9 \times 6) \\ 360 \quad (9 \times 40) \\ 2700 \quad (9 \times 300) \\ 9000 \quad (9 \times 1000) \\ \hline 12114 \\ \hline 345 \end{array}$$

24 X 16

	20	4
10	200	40
6	120	24

$$\begin{array}{r}
 200 \\
 120 \\
 40 \\
 + \\
 \hline
 24 \\
 \hline
 384
 \end{array}$$

$$\begin{array}{r}
 24 \\
 \times 16 \\
 \hline
 24 \quad (6 \times 4) \\
 120 \quad (6 \times 20) \\
 40 \quad (10 \times 4) \\
 \hline
 200 \quad (10 \times 20) \\
 \hline
 384
 \end{array}$$

$$\begin{array}{r}
 24 \\
 \times 16 \\
 \hline
 144 \quad (6 \times 24) \\
 \hline
 240 \quad (10 \times 24) \\
 \hline
 384
 \end{array}$$

GRID METHOD

$23 \times 13$


**HAVE A GO AT  
THE GRID  
METHOD**

23 X 13

	20	3
10		
3		

- PARTITION FIRST

23 X 13

	20	3
10	200	30
3	60	9

$$\begin{array}{r} 200 \\ 60 \\ 30 \\ 9 \\ \hline 299 \\ \hline \end{array}$$

$$24 \times 56$$

$$\begin{array}{r} 56 \\ \times 24 \\ \hline \phantom{00} (4 \times 56) \\ \underline{\phantom{000}} (20 \times 56) \\ \phantom{0000} \\ \hline \end{array}$$



1 2 4

X 5 6

---

1 2  
7 4 4

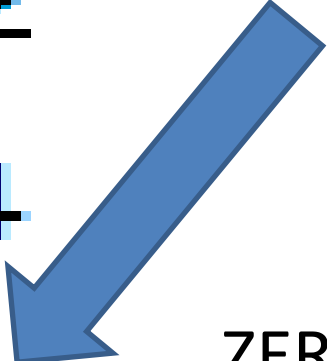
1 2  
7 4 4 0

---

8 1 8 4

---

1



ZERO PLACE HOLDER

$30 \times 40 =$

$0.04 \div 10 =$

$0.9 \times 200 =$

$2,345 \times 1,000 =$

			4	7	8	1
x					2	3
<hr/>						

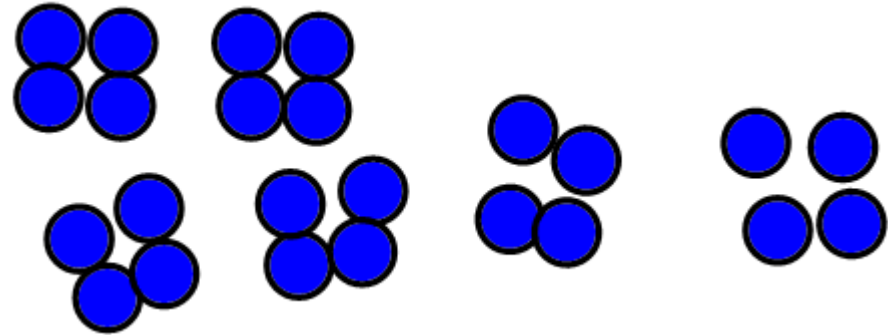
			4	1	8
x				4	6
<hr/>					

3

Write the missing numbers to make this **multiplication** grid correct.

	x	<input type="text"/>	<input type="text"/>
<input type="text"/>	9	63	54
<input type="text"/>		56	48

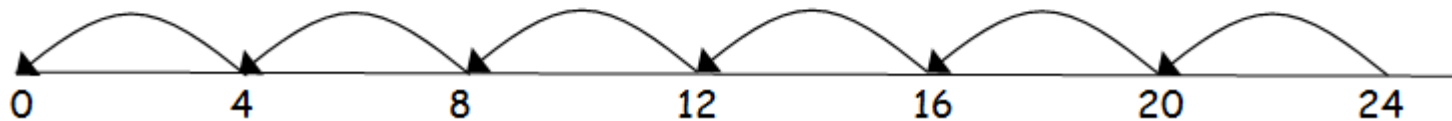
# Division

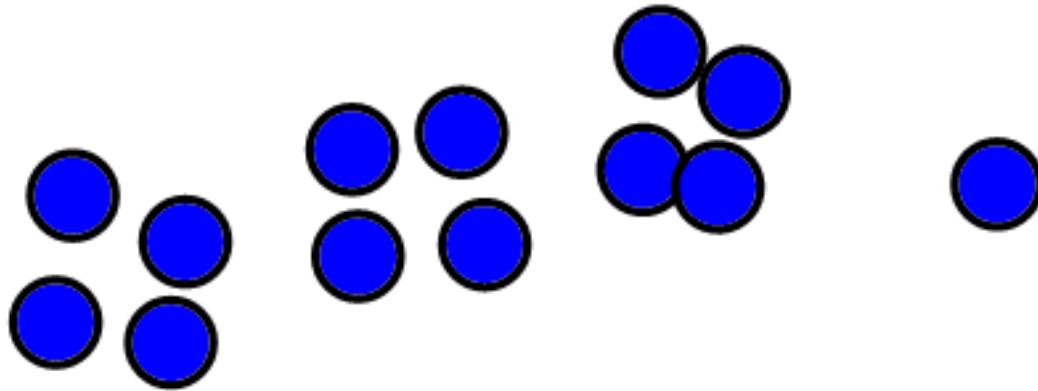


- ✓ Repeated subtraction using a number line

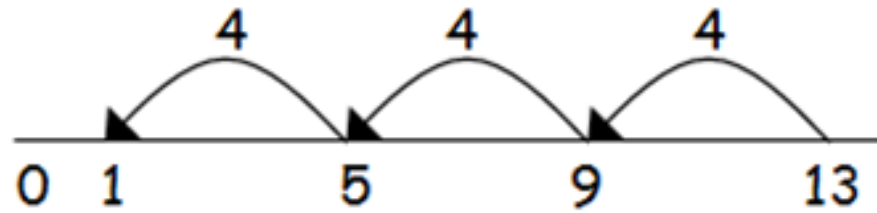
Children will use an empty number line to support their calculation.

$$24 \div 4 = 6$$



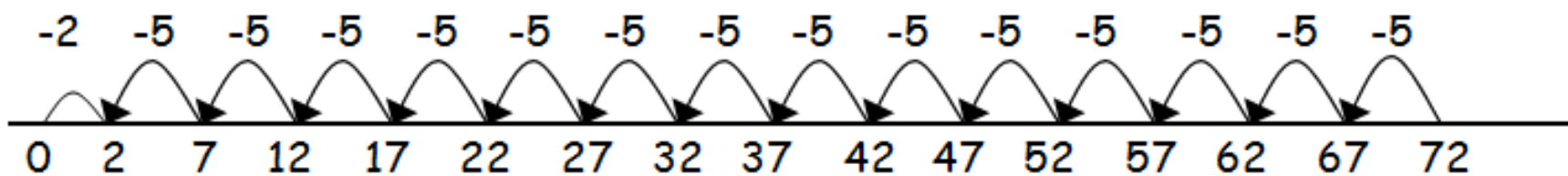


$$13 \div 4 = 3 \text{ r } 1$$

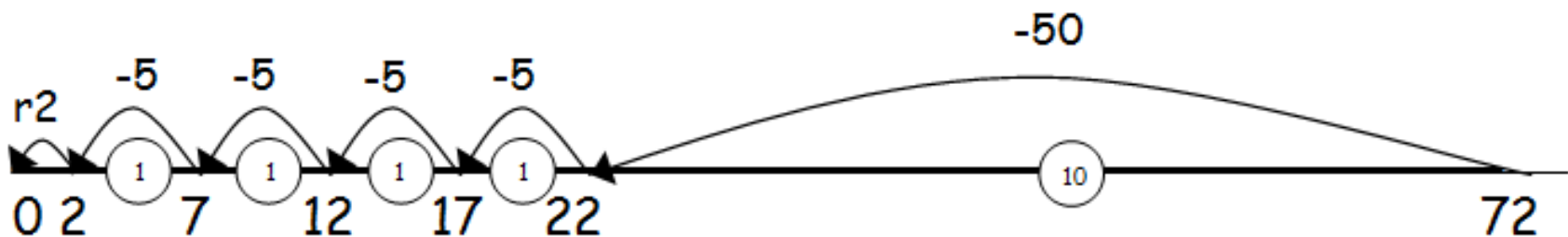


- This is fine for smaller numbers...

$$72 \div 5$$



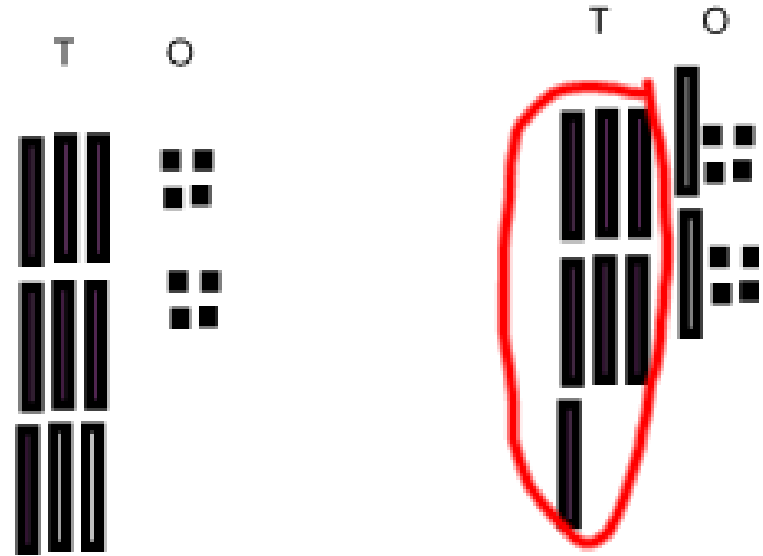
Moving onto chunking on a number line:



# FORMAL DIVISION

$$\begin{array}{r} 14 \\ 7 \overline{) 98} \end{array}$$

FORMAL DIVISION



- Using or drawing dienes

# REPEATED SUBTRACTION/ CHUNKING

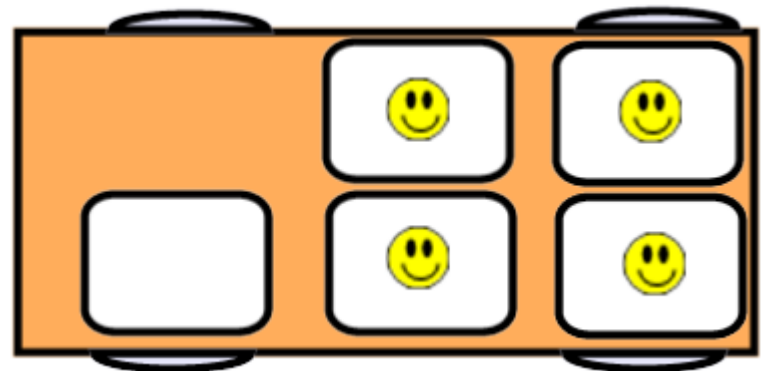
$$\begin{array}{r} 3 \overline{) 72} \\ \underline{-30} \quad (10 \times 3) \\ 42 \\ \underline{30} \quad (10 \times 3) \\ 12 \\ \underline{12} \quad (4 \times 3) \\ 0 \end{array}$$

$$3 \overline{) 24.8} \\ \underline{74} \phantom{4} \\ 744$$

- Using decimals to deal with remainders

$$5 \overline{) 12 \frac{4}{5}} \\ \underline{64} \phantom{\frac{4}{5}}$$

- Expressing the remainder as a fraction





# REPEATED SUBTRACTION/ CHUNKING

$$\begin{array}{r} 45r5 \\ 13 \overline{) 7620} \\ \underline{-130} \quad (10 \times 13) \\ 590 \\ \underline{-260} \quad (20 \times 13) \\ 230 \\ \underline{-260} \quad (20 \times 13) \\ 70 \\ \underline{-65} \quad (5 \times 13) \\ 5 \end{array}$$

The diagram illustrates the repeated subtraction method for dividing 7620 by 13. The quotient is shown as 45r5, where the 'r' indicates a remainder. Red annotations highlight the adjustments: a red '6' is written above the first '2' in 7620, and a red '2' is written above the first '3' in 230. A red arrow points from the '5' in the quotient to the final remainder '5'.

# Formal long division

$$\begin{array}{r} 0123 \\ \hline 24 \overline{) 2952} \\ \underline{-24} \phantom{2} \phantom{2} \phantom{2} \\ 05 \phantom{2} \phantom{2} \phantom{2} \\ \underline{-48} \phantom{2} \phantom{2} \\ 72 \phantom{2} \\ \underline{-72} \\ 0 \end{array}$$

The diagram illustrates the formal long division of 2952 by 24. The quotient is 123. The process shows the following steps:

- 24 goes into 29 one time (1), with a remainder of 5.
- Bring down the next digit (5) to form 55.
- 24 goes into 55 two times (2), with a remainder of 7.
- Bring down the next digit (2) to form 72.
- 24 goes into 72 three times (3), with a remainder of 0.

Annotations in the diagram include a green checkmark over the '5' in the second row, a red '5' in the third row, and a dashed line with arrows indicating the downward movement of the remainder and the next digit.

# Addition

Year 3

Number line, bridging through tens, then hundreds

Composing one number line

$$43 + 49 = ?$$

Expanded part-whole method

$$\begin{array}{l} 20 + 20 = 40 \\ 3 + 3 = 6 \\ 40 + 6 = 46 \end{array}$$

Column addition up to 3 digits

$$\begin{array}{r} 367 \\ + 85 \\ \hline 452 \end{array}$$

Column addition up to 4 digits

# Subtraction

Year 3

Counting back on a number line

Counting on method

Partitioning and decomposition

$$\begin{array}{l} 11 - 7 \\ 10 - 7 = 3 \\ 10 - 3 = 7 \\ 10 - 2 = 8 \end{array}$$

Formal column method

$$\begin{array}{r} 831 \\ - 754 \\ \hline 77 \end{array}$$

3d column method up to 4 digits

$$\begin{array}{r} 6341 \\ - 7745 \end{array}$$

# Multiplication

Year 3

Repeated addition

Arrays

Grid Method TU x U, 22 x 8

$$\begin{array}{r} 20 \quad 2 \\ \times 8 \\ \hline 160 \quad 16 \\ \hline 176 \end{array}$$

Partition to Short multiplication

$$\begin{array}{r} 24 \quad 342 \\ \times 4 \quad \times 7 \\ \hline 96 \quad 2394 \end{array}$$

Grid Method (TU x U), TU x T

Short Multiplication 2 Adigits

# Division

Year 3

Repeated subtraction using a number line

with remainders

Remainder = 2, Quotient = 3

Thinking one number line

Vertical chunking

# Busbridge Junior School Calculations Guidance

## Contents

Introduction  
Addition  
Subtraction  
Multiplication  
Division

p.1  
p.2  
p.4  
p.8  
p.15

A flow chart, summarising the progression in calculation, can be found in the accompanying document 'Calculations Guidance Annex'.

## Introduction

Curriculum 2014 is based on the principles of **FLUENCY** (rapid and accurate recall and sound conceptual understanding), **PROFICIENCY** (the ability to develop a line of inquiry, generalise and justify/prove their solution using mathematical language) and **SOLVING PROBLEMS** with an ability to break problems down into simple steps.

The ability to use appropriate, written methods to add, subtract, multiply and divide, are fundamental to achieving these goals and underpin a sound knowledge of mathematics. This document sets out the progression of methods taught in our school to assist children in developing these skills.

The guidance reflects standards that we would expect the majority of children to achieve at various stages of their school life. However, the transition between stages should not be hurried as not all children will be ready to move on to the next stage at the same time. For those children requiring greater challenge, complete mastery of a concept will support deeper learning and an ability to manage more complex problems, rather than rapidly progressing through the stages.

The progression outlined in this guidance is aimed at providing children with an in-depth knowledge of the four operations, helping them to identify the relationships between them, and ways in which they relate to other mathematical concepts. It is essential that children develop an understanding of how each operation works, as opposed to merely learning methods by rote. The use of representational equipment (such as Cuisenaire rods and Numicon) and images (such as arrays and number lines) greatly assist in reinforcing and deepening such understanding.

Cuisenaire Rods



Numicon



Dienes

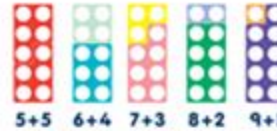


# ANSWERS

Cuisinaire Rods



Numicon



Dienes



partitioning

$$37 + 46$$

$$\begin{array}{r} 30 + 40 = 70 \\ 7 + 6 = 13 \\ \hline 37 + 46 = 83 \end{array}$$

array



grid method

x	70	2
30	2100	60
8	560	16

prosecco



chunking

Chunking TU + U

$$\begin{array}{r} 24 \\ 3 \overline{) 72} \\ - 30 \\ \hline 42 \\ - 30 \\ \hline 12 \\ - 6 \\ \hline 6 \\ - 6 \\ \hline 0 \end{array}$$

Answer: 24

Annotations: 10x (circled around 30), 10x (circled around 30), 2x (circled around 6). Arrows point from these circles to the final answer 24.

exchanging

$$\begin{array}{r} 3 \\ 7 \overline{) 245} \\ - 21 \\ \hline 35 \\ - 30 \\ \hline 5 \\ - 4 \\ \hline 1 \\ - 0 \\ \hline 1 \end{array}$$

partitioning

exchanging

numicon

prosecco

grid method

cuisinaire rods

dienes

chunking

array

Thank you for coming