

Sense of Number

Basic Visual Calculation Policy

Written and Mental Strategies Policy

Grange Primary School
October 2017

Graphic Design by Dave Godfrey
Compiled by the Sense of Number Maths Team

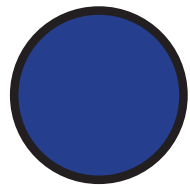
For sole use within Grange Primary School.

'A picture is worth 1000 words!' www.senseofnumber.co.uk

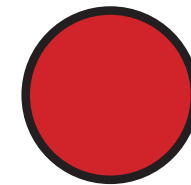


Grange Primary School





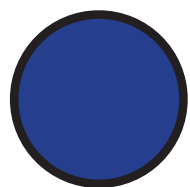
Guide to using a SoN Visual Policy



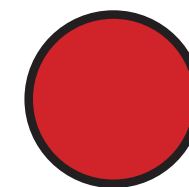
The Sense of Number Basic Visual Calculation Policy provides a visual representation of a school's calculation policy.

Typical uses:

- Classroom:** The slides are printed out (e.g. A4) and the appropriate slides are displayed for continual reference or on a working wall.
- Reference:** The slides are printed out (e.g. 9 slides per A4 page) and inserted in the teacher's planning folder.
- Parents:** The slides are used to communicate to parents the methods being taught and used within school.
- Website:** Screen grabs from the VCP are inserted on a schools' maths webpages. (PLEASE NOTE: the M&VCP should not be placed on school website.)



Poster Guide



Basic Visual Calculation Policy

Code	Section	Written and Mental Strategy Posters (104 Posters)	
		Number of Posters	Poster Numbers
	Policy Guides and Overviews	6	1-6
	Introductory Calculation Posters	9	7-15
A	Addition	10	16-25
MA	Mental Addition	7	26-32
S	Subtraction	14	33-46
MS	Mental Subtraction	9	47-55
M	Multiplication	13	56-68
MM	Mental Multiplication	11	69-79
D	Division	17	80-96
MD	Mental Division	8	97-104
	Alternative Layout Slides	8	105-112

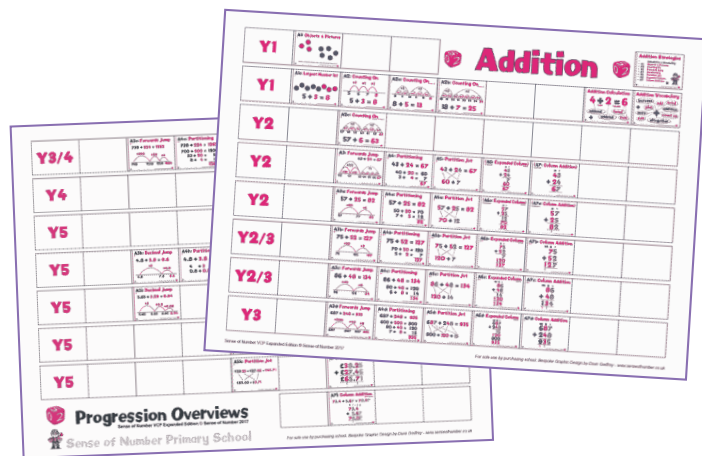
Expanded Visual Calculation Policy

This **Basic Edition** of the Visual Calculation Policy can be upgraded to the **Expanded Visual Calculation Policy**. The **Expanded Edition** helps children and teaching staff achieve mastery of all aspects of calculation and contains the following three documents:

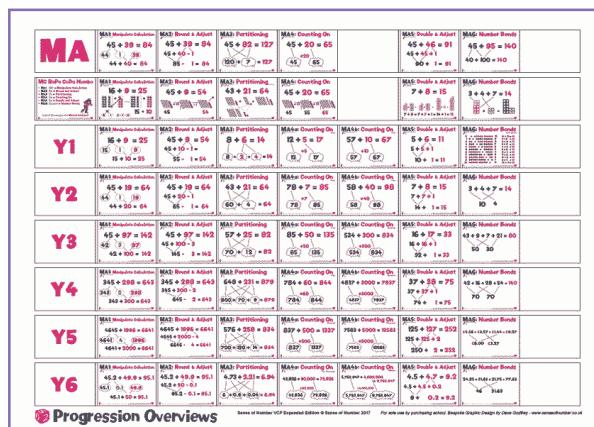
**Written
Strategies VCP**

**Mental
Strategies VCP**

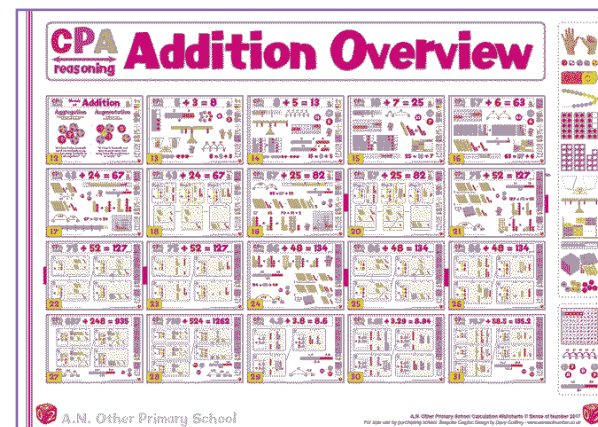
**Concrete
& Pictorial VCP**



273 A4 posters
showing the progression
of written strategies
(from Y1 to Y6) for all
4 operations in line with
the National Curriculum.



214 A4 posters showing
the progression of
mental strategies
(from Y1 to Y6) for all
4 operations in line with
the National Curriculum.



84 A3 wallcharts
showing the range
of models and images
that help children to
understand and master
calculation strategies.

Introductory Posters

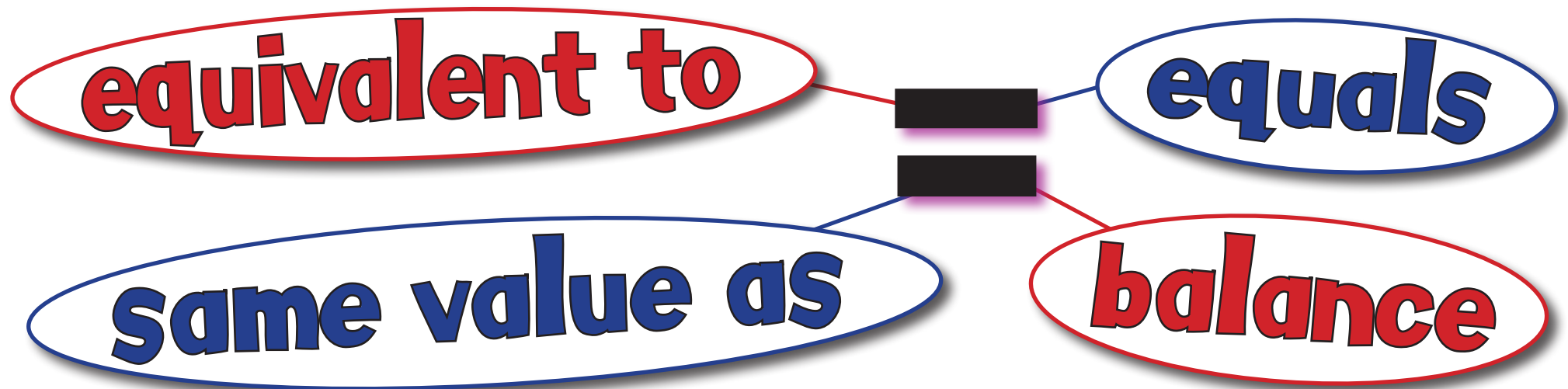
Calculation Vocabulary



Make? Draw? Head? Jotting? Written?

- 1) Can I make it?**
- 2) Can I draw a picture of it?**
- 3) Can I do this in my head?**
- 4) Do I need to do a jotting?**
- 5) Do I need a written method?**

Calculation Vocabulary



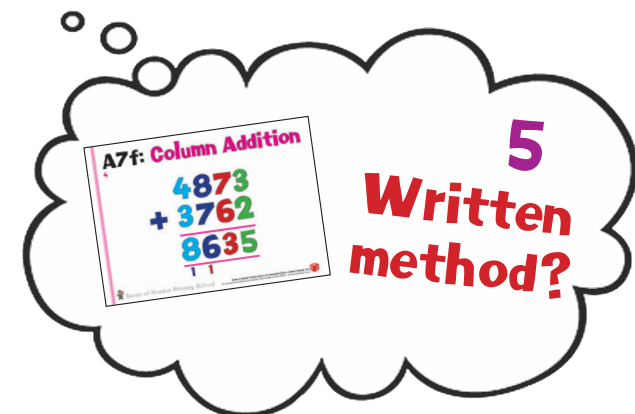
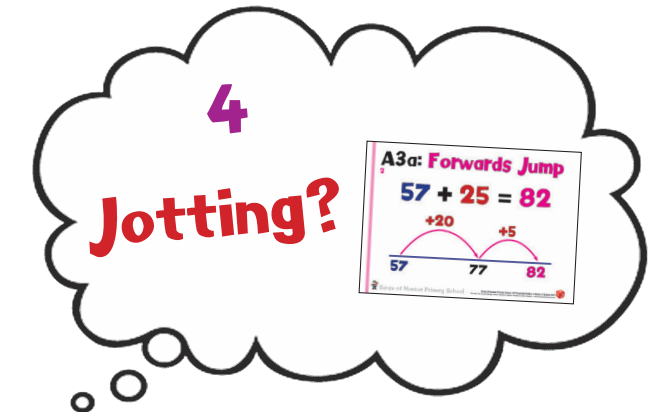
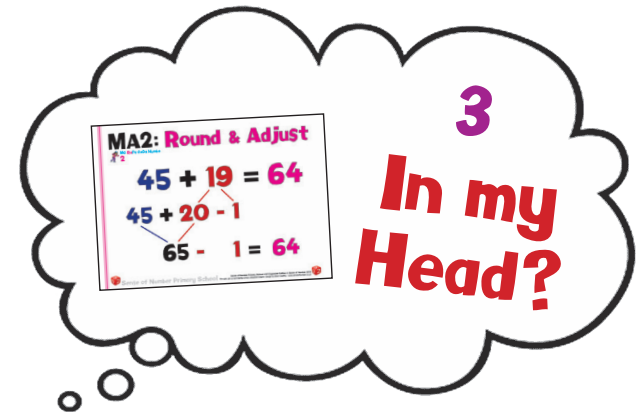
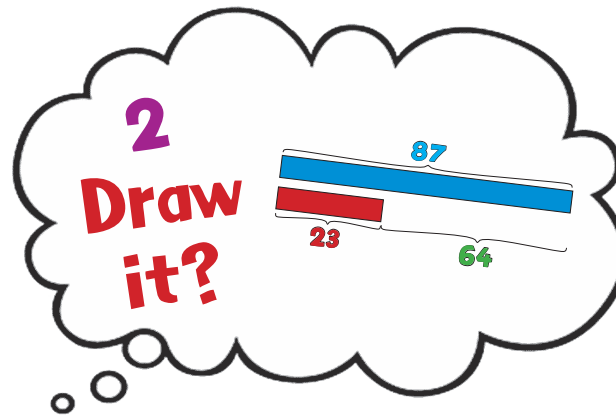
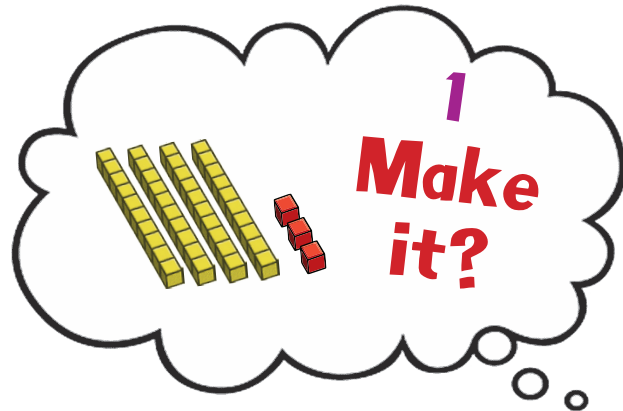
Key Vocabulary!

$$\underset{\text{Addend}}{8} + \underset{\text{Addend}}{2} = \underset{\text{Total Sum}}{10}$$

$$\underset{\text{Minuend}}{8} - \underset{\text{Subtrahend}}{2} = \underset{\text{Difference}}{6}$$

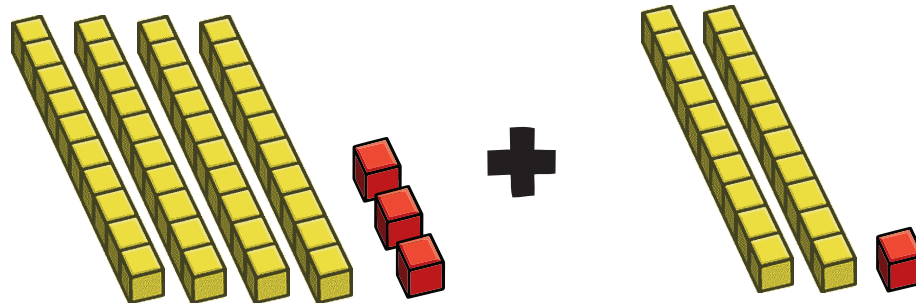
$$\underset{\text{Multiplicand}}{8} \times \underset{\text{Multiplier}}{2} = \underset{\text{Product}}{16}$$

$$\underset{\text{Dividend}}{8} \div \underset{\text{Divisor}}{2} = \underset{\text{Quotient}}{4}$$



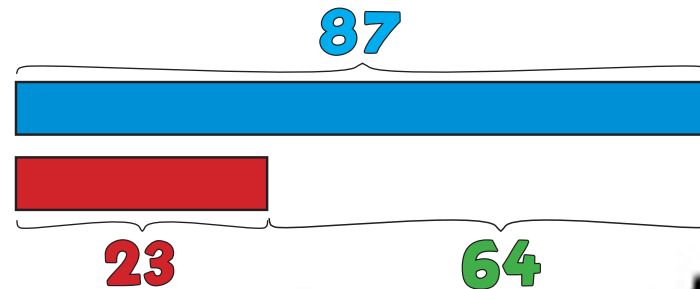
1

Can I make it?



2

Can I draw a picture?



3

Can I do it in
my head?

MA2: Round & Adjust

$45 + 19 = 64$

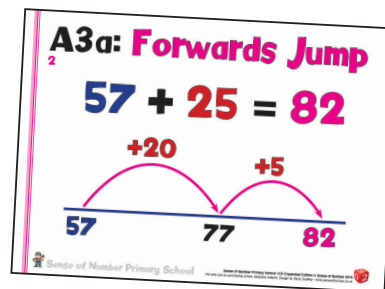
$45 + 20 - 1$

$65 - 1 = 64$

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4

Do I need a
jotting?



5

Do I need a
written method?

A7f: Column Addition

$$\begin{array}{r} 4873 \\ + 3762 \\ \hline 8635 \\ \hline \end{array}$$

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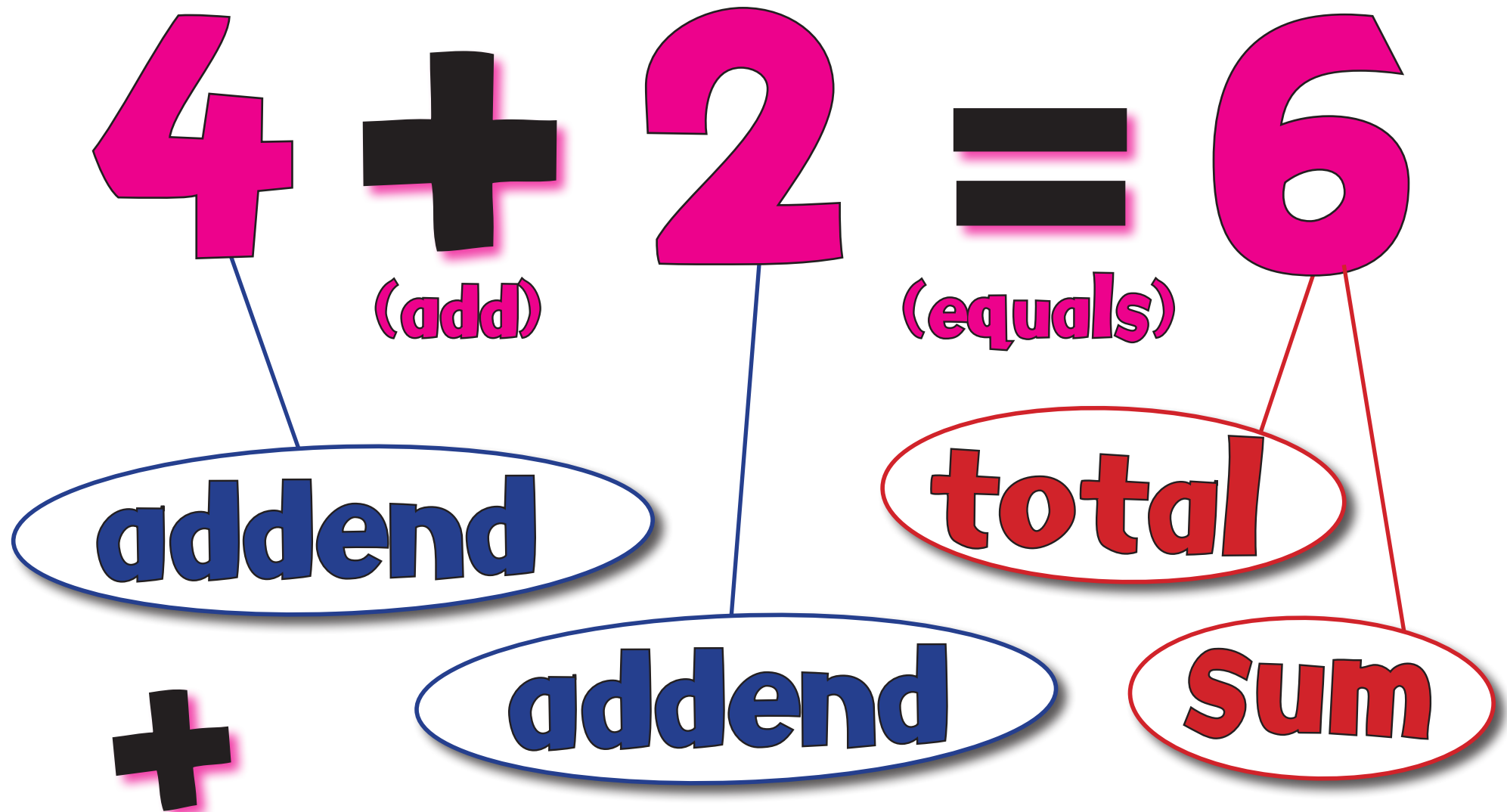
Addition Strategies

Calculation & Vocabulary

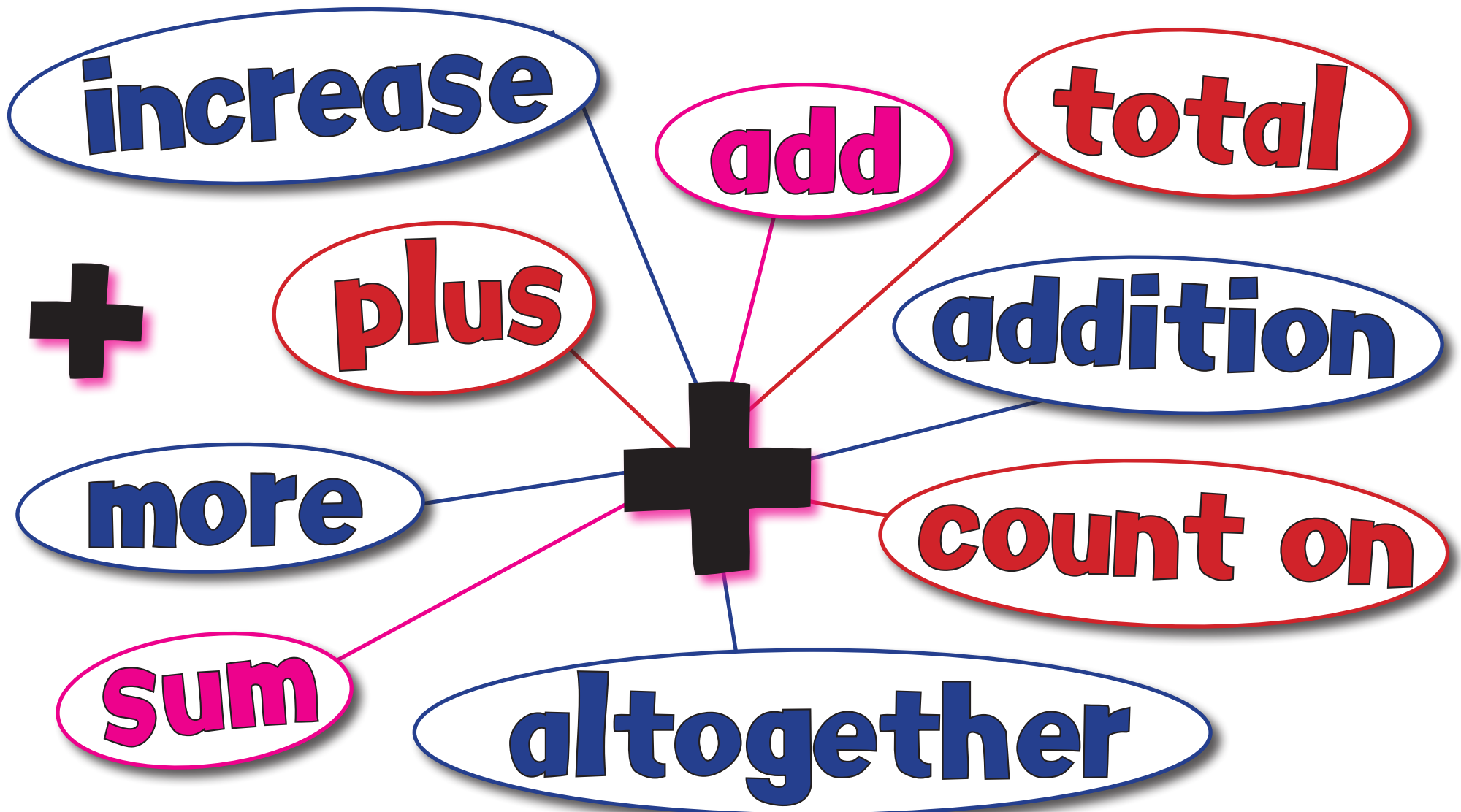
A1	Objects & Pictures
A2	Counting On
A3	Forwards Jump
A4	Partitioning
A5	Partition Jot
A6	Expanded Column
A7	Column Addition



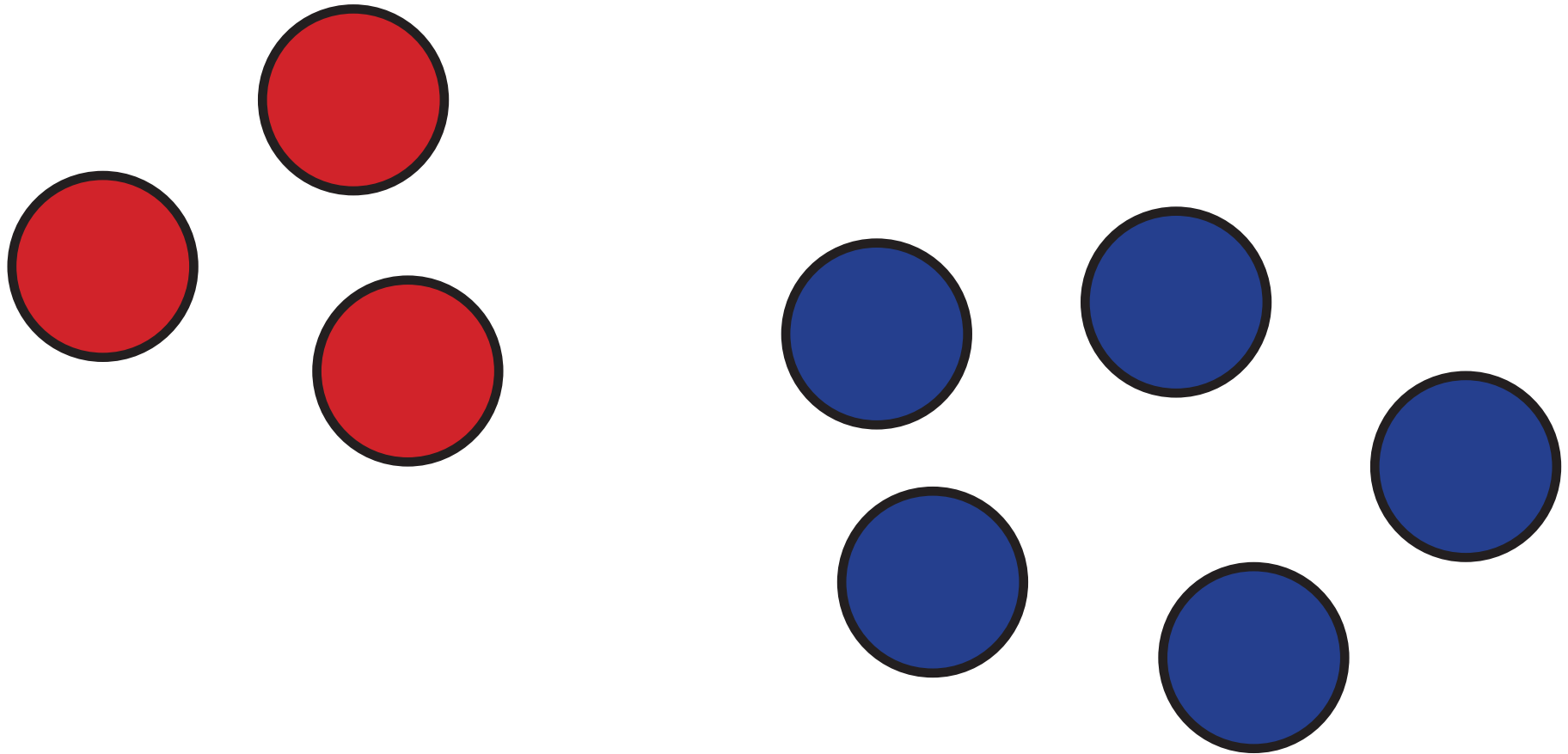
Addition Calculation



Addition Vocabulary



A1: Objects & Pictures



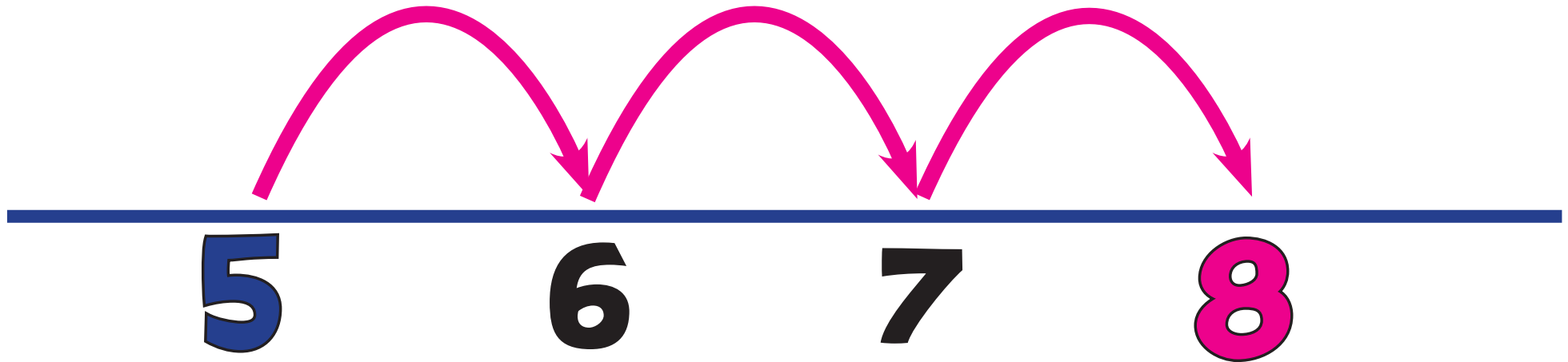
“If I have 3 and then 5 more, how many altogether? Answer: 8”

A2: Counting On

+1

+1

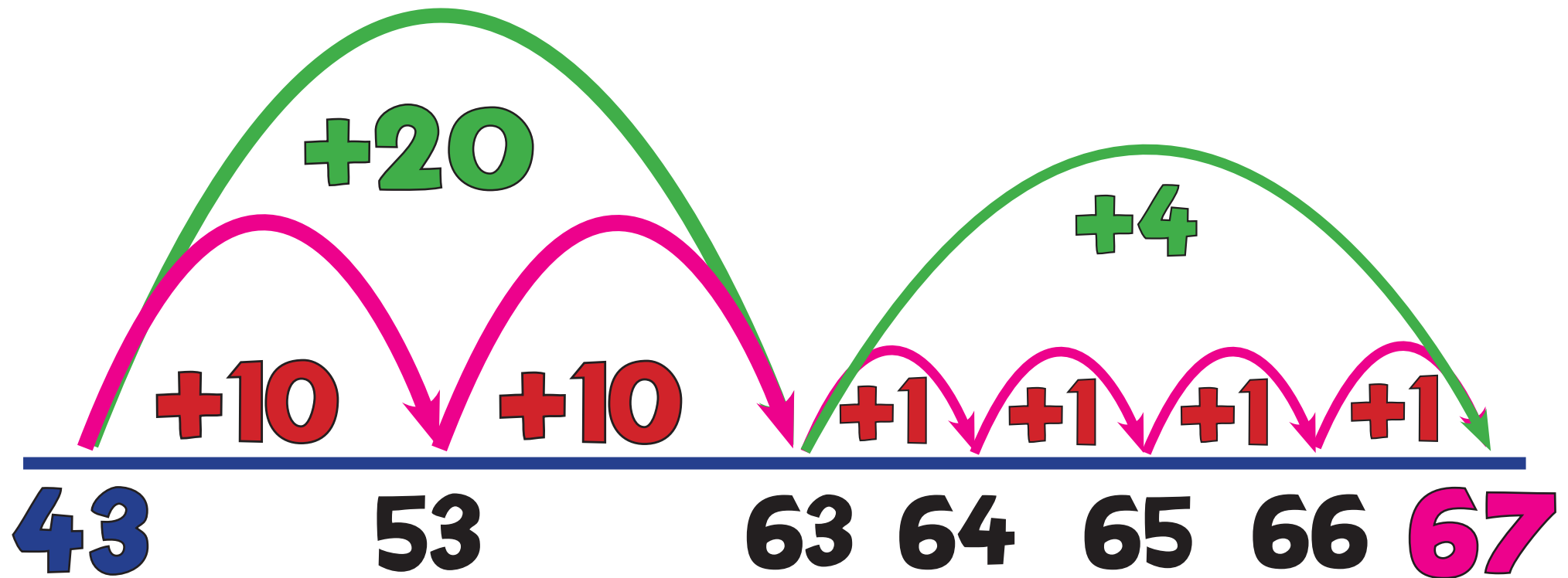
+1



$$5 + 3 = 8$$

A3: Forwards Jump

$$43 + 24 = 67$$



A4: Partitioning

$$43 + 24 = 67$$

$$40 + 20 = 60$$

$$3 + 4 = 7$$

$$67$$

A5: Partition Jot

$$\begin{array}{c} 43 + 24 = 67 \\ \text{---} \\ 60 + 7 \end{array}$$

The diagram illustrates the partitioning of the numbers 43 and 24. A red line connects the '4' in 43 to the '6' in 60. A green line connects the '3' in 43 to the '7' in 7. A red line connects the '2' in 24 to the '6' in 60. A green line connects the '4' in 24 to the '7' in 7. This shows that 43 is partitioned into 40 and 3, and 24 is partitioned into 20 and 4, which are then combined to form 60 and 7.

A6: Expanded Column

Addition

$$\begin{array}{r} \begin{array}{ccc} 100 & 10 & 1 \end{array} \\ \begin{array}{ccc} 6 & 8 & 7 \end{array} \\ + \begin{array}{ccc} 2 & 4 & 8 \end{array} \\ \hline \begin{array}{ccc} & 15 & \\ 1 & 20 & \\ 8 & 00 & \end{array} \\ \hline \begin{array}{ccc} 9 & 3 & 5 \end{array} \end{array}$$

A7: Column Addition

	100	10	1
	6	8	7
+	2	4	8
	9	3	5
	1	1	

MC RaPa CoDa Numbo

MA1 MC = Manipulate Calculation

MA2 Ra = Round and Adjust

MA3 Pa = Partitioning

MA4 Co = Counting On

MA5 Da = Double and Adjust

MA6 Numbo = Number Bonds



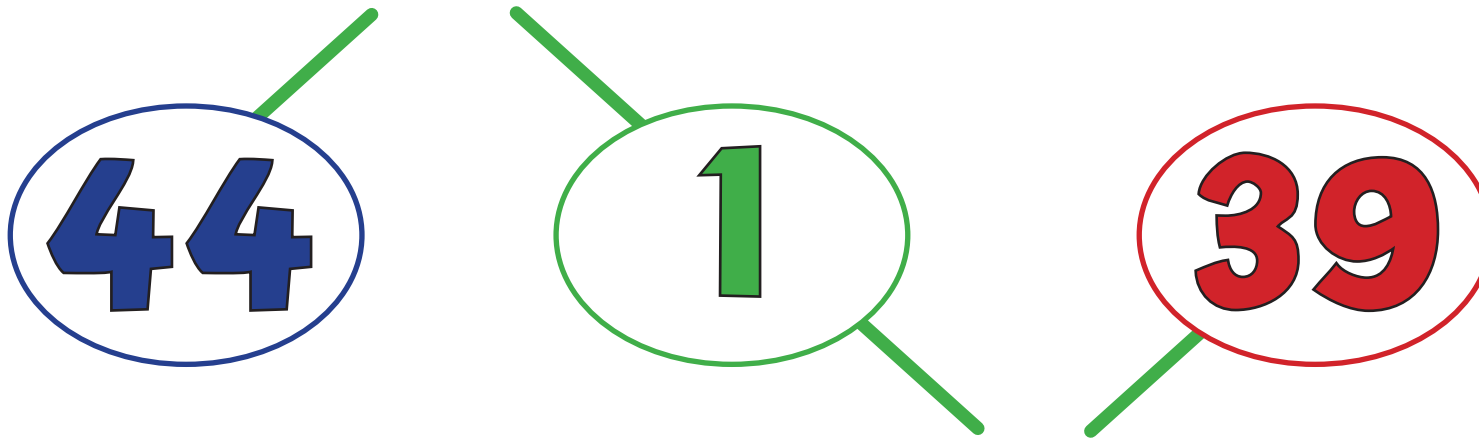
6 Cool Strategies for Mental Addition!

MA1: Manipulate Calculation



MC RaPa CoDa Numbo

$$45 + 39 = 84$$



$$44 + 40 = 84$$

MA2: Round & Adjust



MC RaPa CoDa Numbo

$$45 + 39 = 84$$

$$45 + 40 - 1$$

$$85 - 1 = 84$$

MA3: Partitioning



MC RaPa CoDa Numbo

$$45 + 82 = 127$$

The diagram illustrates the partitioning of the numbers 45 and 82. Two blue lines connect the '4' in 45 to the '1' in 120 and the '2' in 7. Two red lines connect the '5' in 45 to the '2' in 82 and the '0' in 120. This visualizes the process of exchanging the 5 tens from 45 with the 2 tens from 82 to make 10 tens (120), leaving 2 units from 45 and 2 units from 82 to make 4 units, which then combine with the 3 units from 82 to make 7 units.

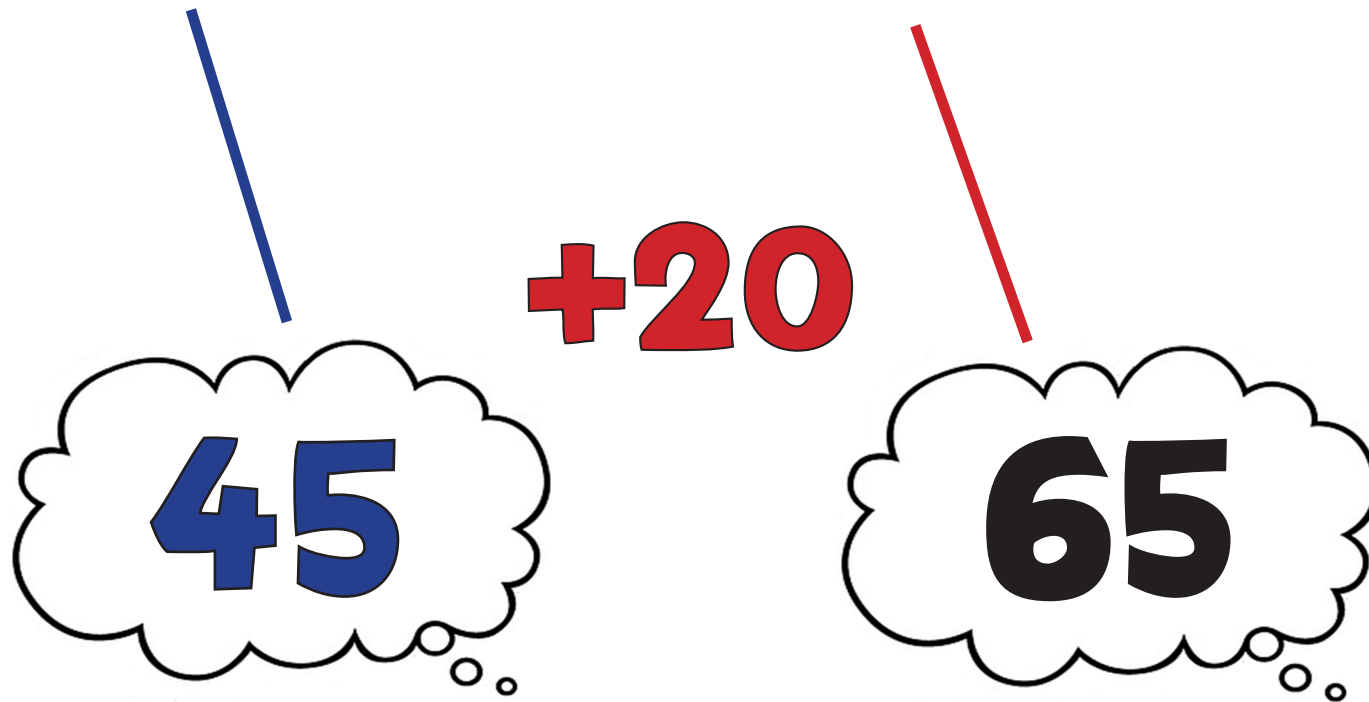
$$120 + 7 = 127$$

MA4: Counting On



MC RaPa CoDa Numbo

$$45 + 20 = 65$$



MA5: Double & Adjust



MC RaPa CoDa Numbo

$$45 + 46 = 91$$

$$45 + 45 + 1$$

Diagram showing the decomposition of 46 into 45 and 1. A red line connects the '4' of 46 to the '4' of 45, and another red line connects the '6' of 46 to the '1' of 1. A blue line connects the '45' of the first equation to the '45' of this equation.

$$90 + 1 = 91$$

Diagram showing the decomposition of 45 into 90 and 1. A red line connects the '4' of 45 to the '9' of 90, and another red line connects the '5' of 45 to the '1' of 1. A blue line connects the '45' of the previous equation to the '90' of this equation.

MA6: Number Bonds



MC RaPa CoDa Numbo

$$45 + 95 = 140$$

$$40 + 100 = 140$$

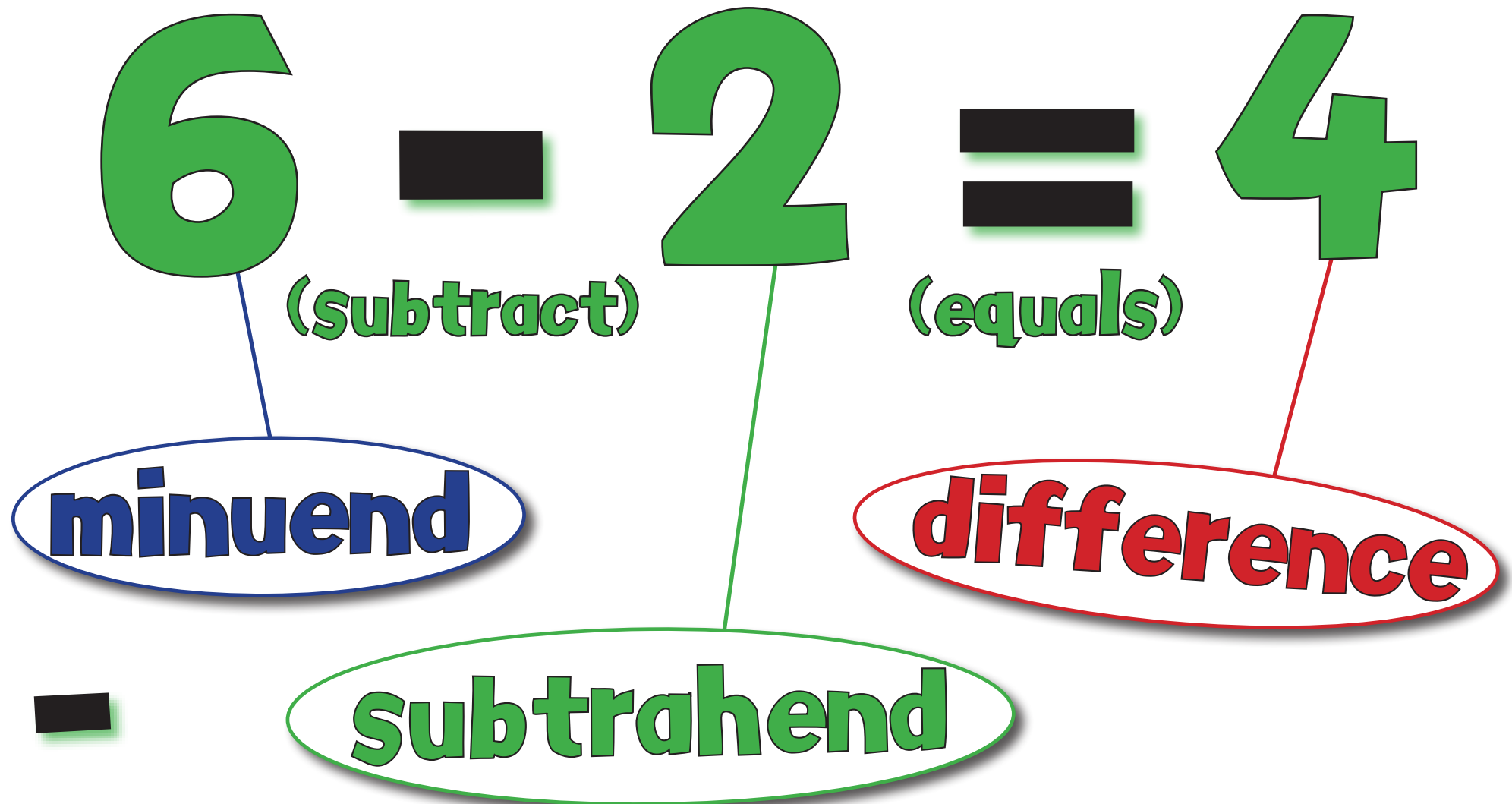
Subtraction Strategies

Calculation & Vocabulary

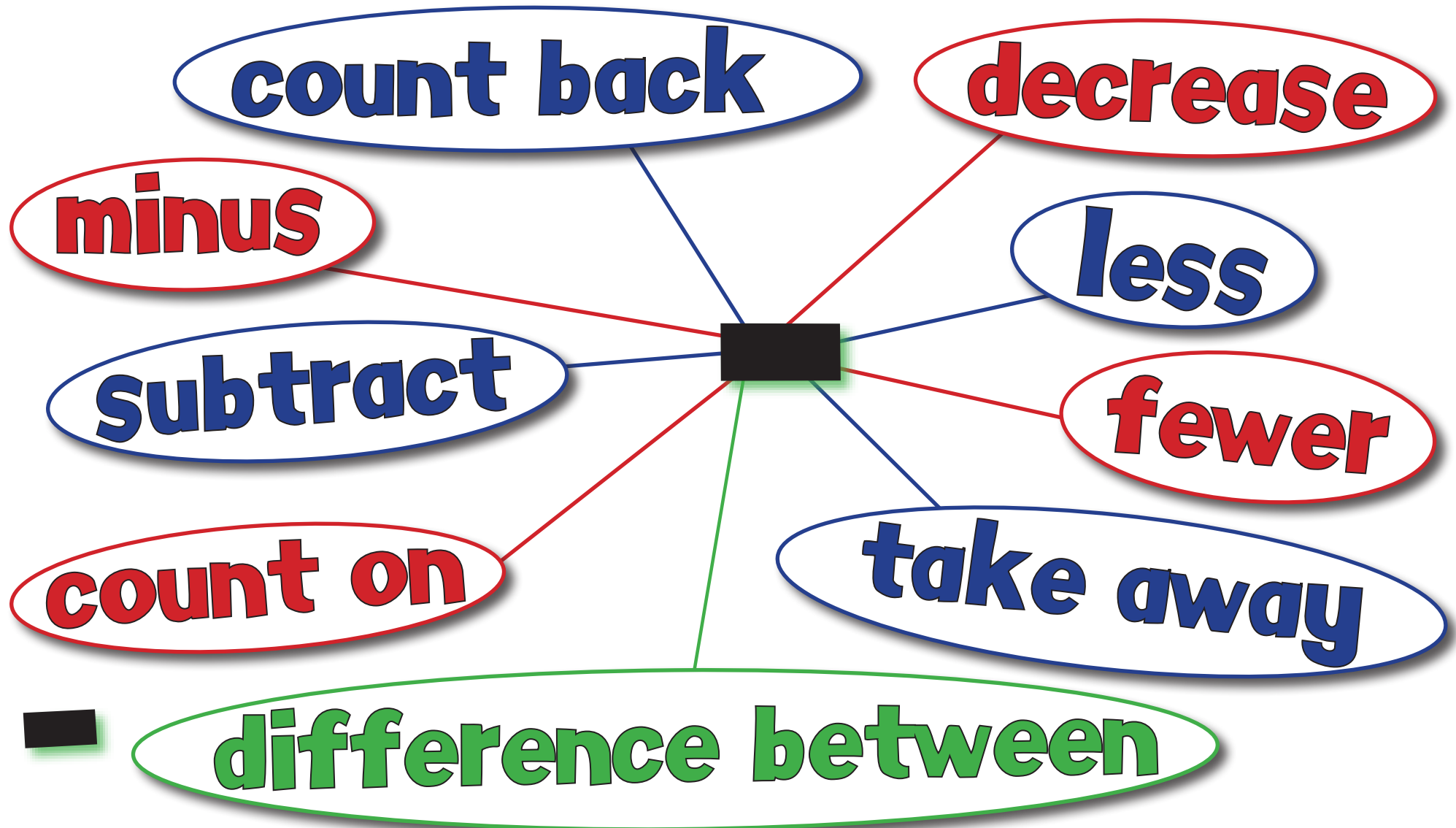
- S1** Objects and Pictures
- S2** What's the Difference?
- S3** Counting Back
- S4** Counting On
- S5** Backwards Boing
- S6** Backwards Bounce
- S7** Backwards Jump
- S8** Triple Jump
- S9** 10s Jump, 1s Jump
- S10** Expanded Column
- S11** Column Subtraction



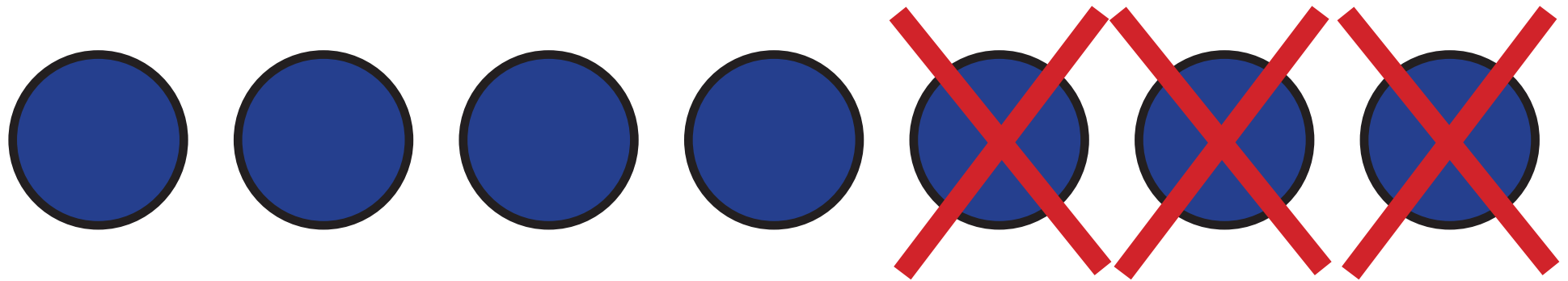
Subtraction Calculation



Subtraction Vocabulary



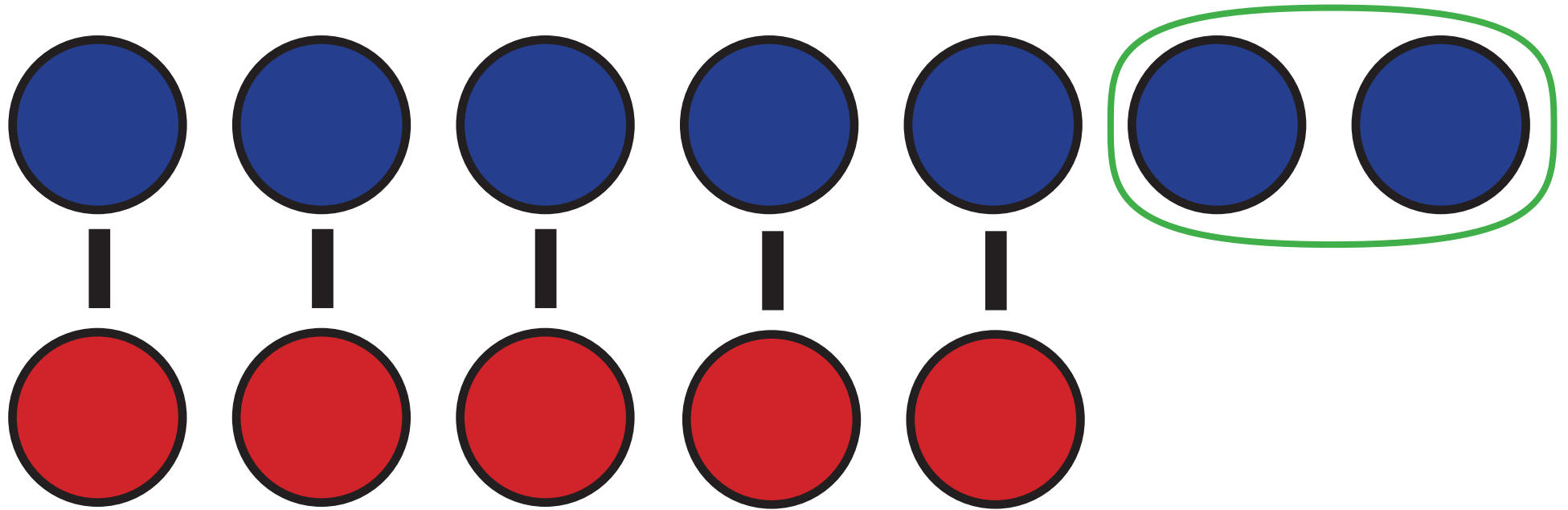
S1: Objects & Pictures



$$7 - 3 = 4$$

“What do I get if I take 3 away from 7? Answer: 4”

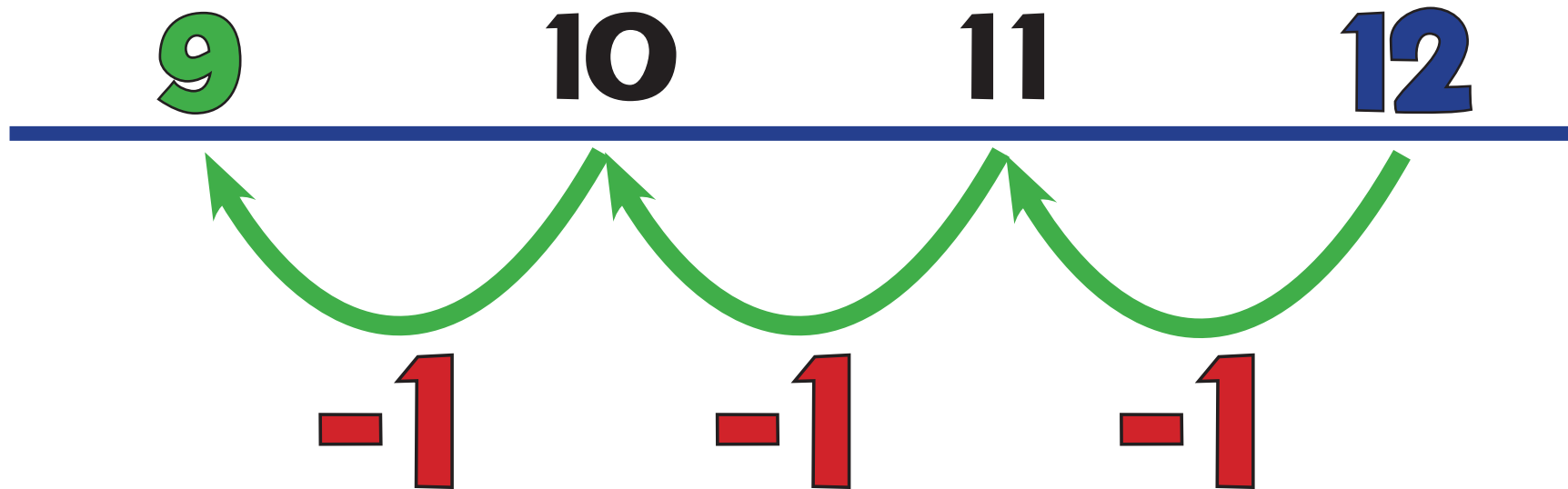
S2: What's the Difference?



$$7 - 5 = 2$$

“How many more is 7 than 5? What is the difference?”

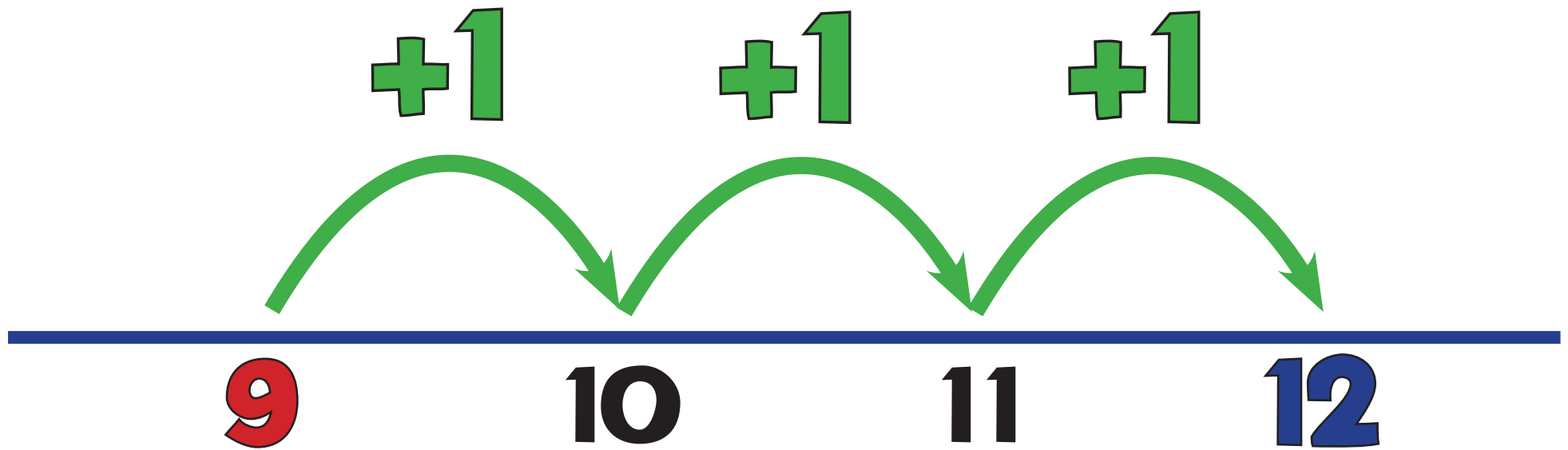
S3: Counting Back



$$12 - 9 = 3$$

“What do I get if I take 3 away from 12? Answer: 9”

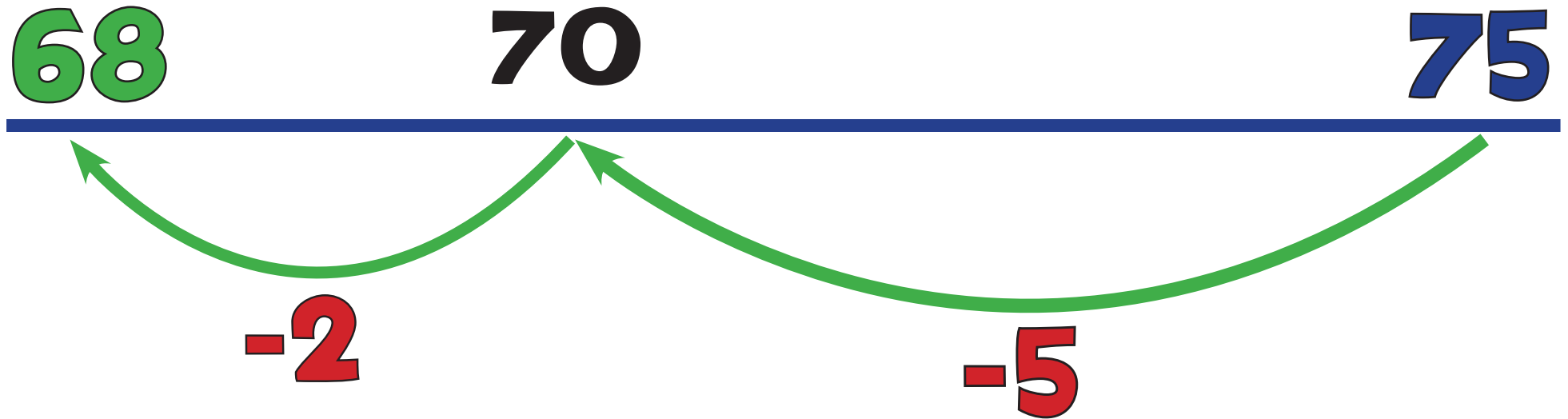
S4: Counting On



$$12 - 9 = 3$$

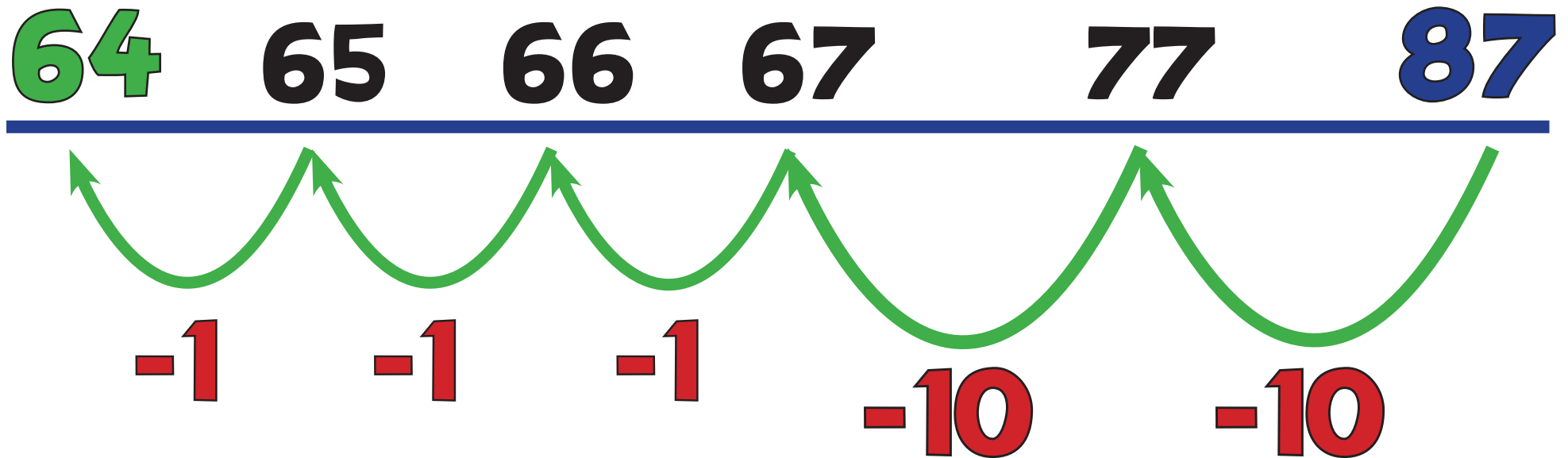
“How many more is 12 than 9? What is the difference?”

S5: Backwards Boing



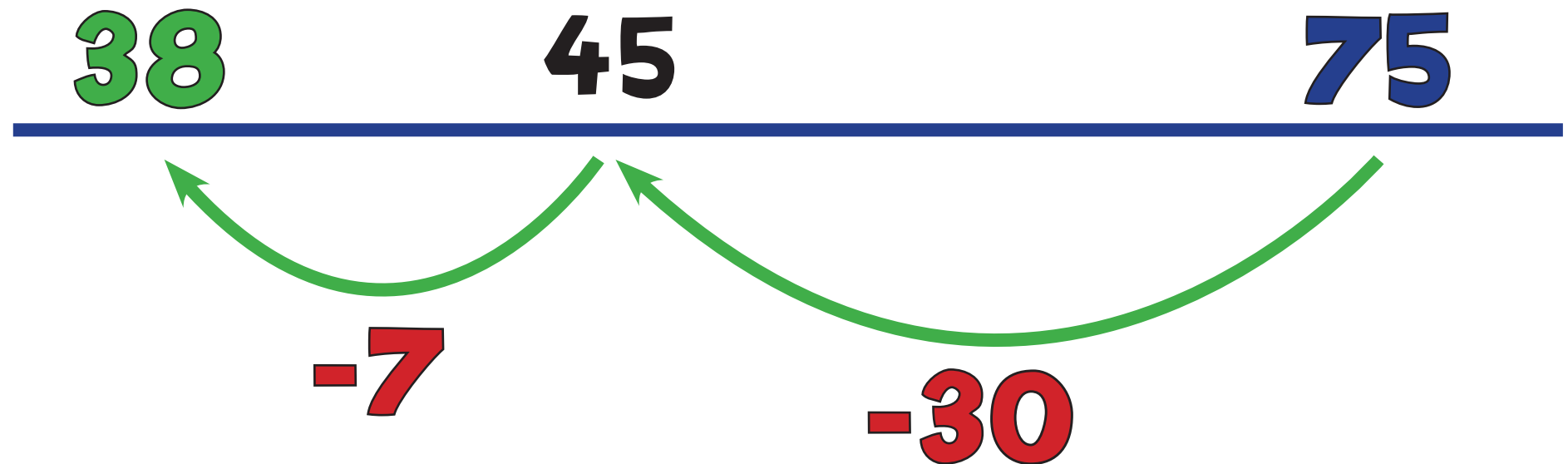
$$75 - 7 = 68$$

S6: Backwards Bounce



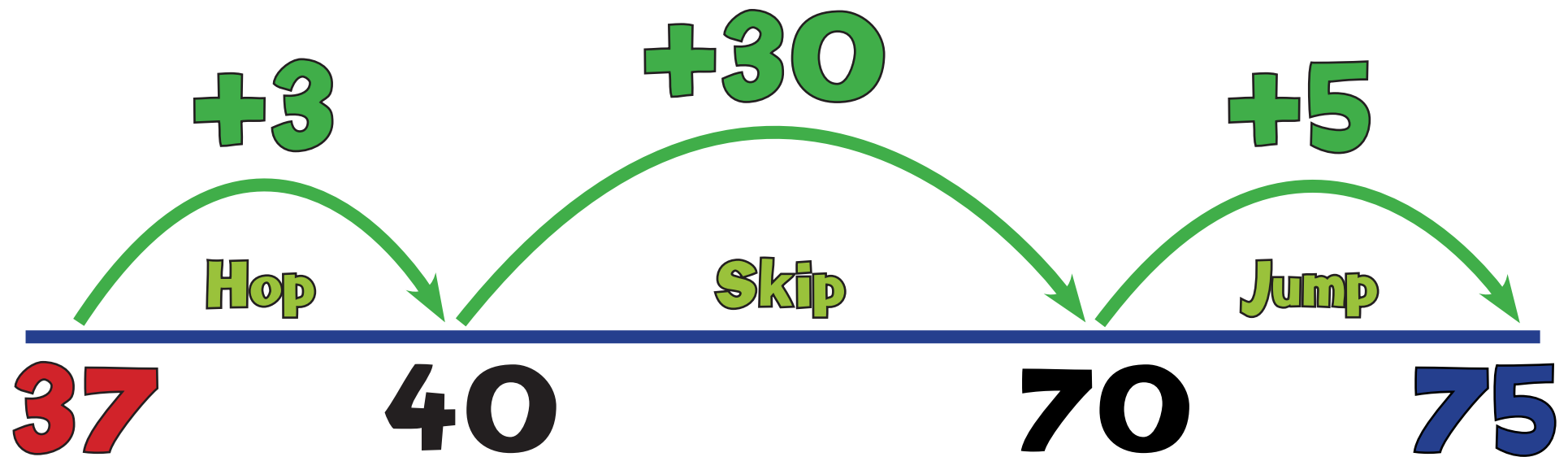
$$87 - 23 = 64$$

S7: Backwards Jump



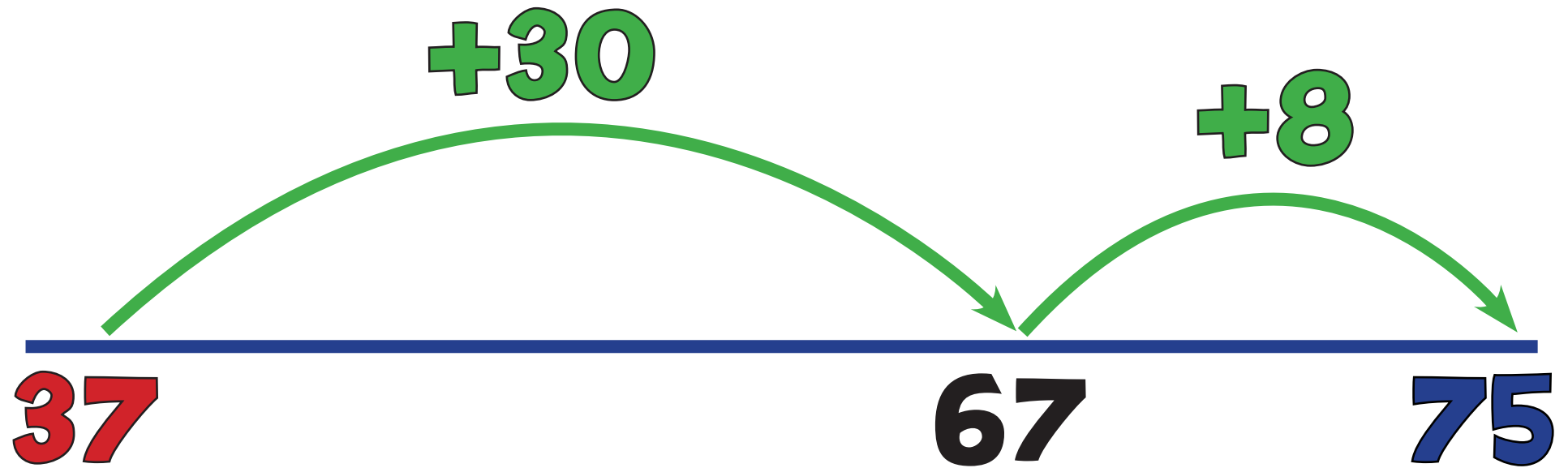
$$75 - 37 = 38$$

S8: Triple Jump!



$$75 - 37 = 38$$

S9: 10s Jump, 1s Jump!



$$75 - 37 = 38$$

S10: Expanded Column

Subtraction (100, 10, 1s)

$$723 - 356 = 367$$

600	110	1
700	20	3
- 300	50	6
300	60	7

S11: Column Subtraction

$$\begin{array}{r} \text{100} \quad \text{10} \quad \text{1} \\ \text{6} \quad \text{11} \quad \text{1} \\ \text{7} \text{ } \text{2} \text{ } \text{3} \\ - \text{3} \text{ } \text{5} \text{ } \text{6} \\ \hline \text{3} \text{ } \text{6} \text{ } \text{7} \end{array}$$

MC RaPa CoOCoB NumFa

MS1 MC = Manipulate Calculation

MS2 Ra = Round and Adjust

MS3 Pa = Partitioning

MS4 CoO = Counting On

MS5 CoB = Counting Back

MS6 NumFa = Number Facts



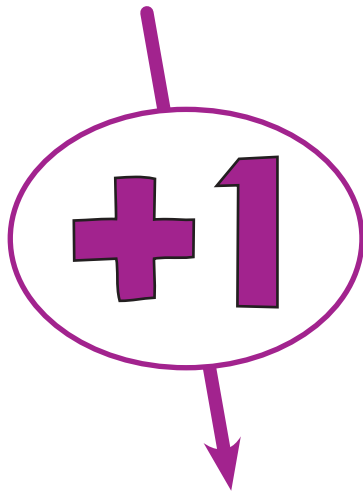
6 Cool Strategies for Mental Subtraction!

MS1: Manipulate Calculation



MC RaPa CoOCoB NumFa

$$84 - 29 = 55$$



$$85 - 30 = 55$$

MA2: Round & Adjust



MC RaPa CoOCoB NumFa

$$84 - 29 = 55$$

$$84 - 30 + 1$$

$$54 + 1 = 55$$

MA3: Partitioning



MC RaPa CoOCoB NumFa

$$63 - 35 = 28$$

$$-33 \quad -2$$

63

30

28

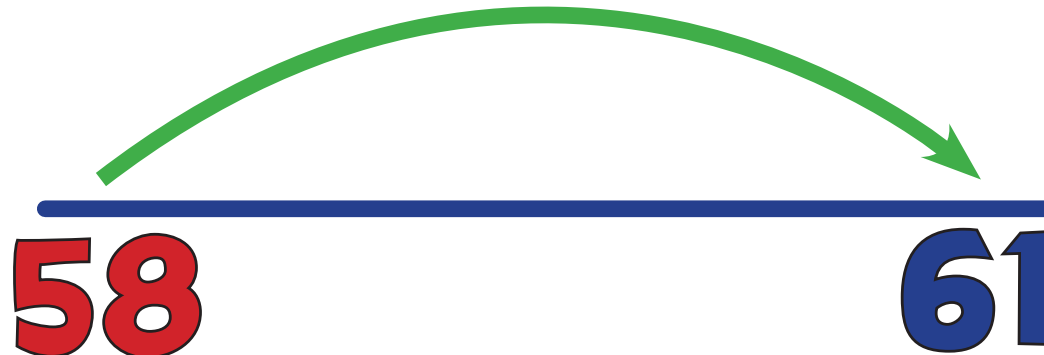
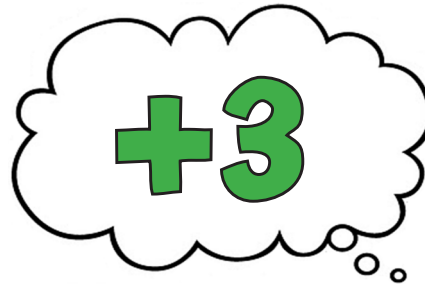
MS4a: Counting On



MC RaPa CoOCoB NumFa

Small Difference

$$61 - 58 = 3$$



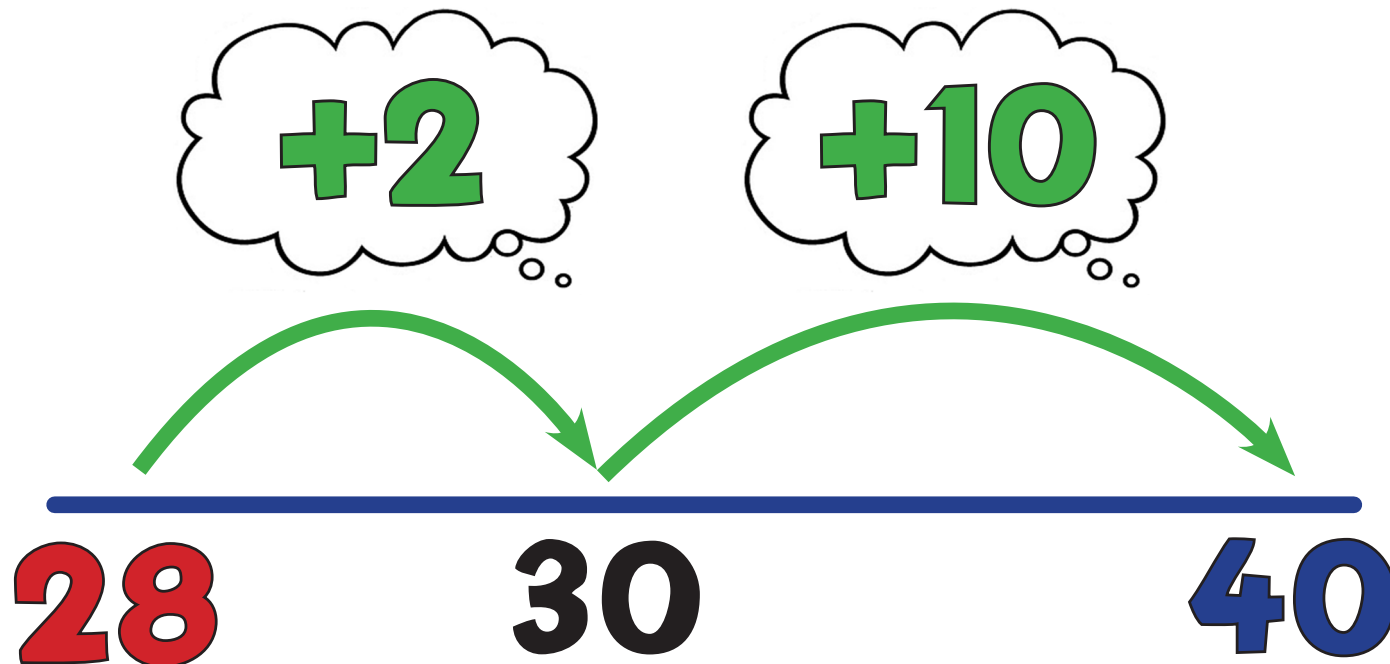
MS4b: Counting On

MC RaPa CoOCoB NumFa

Jumps



$$40 - 28 = 12$$

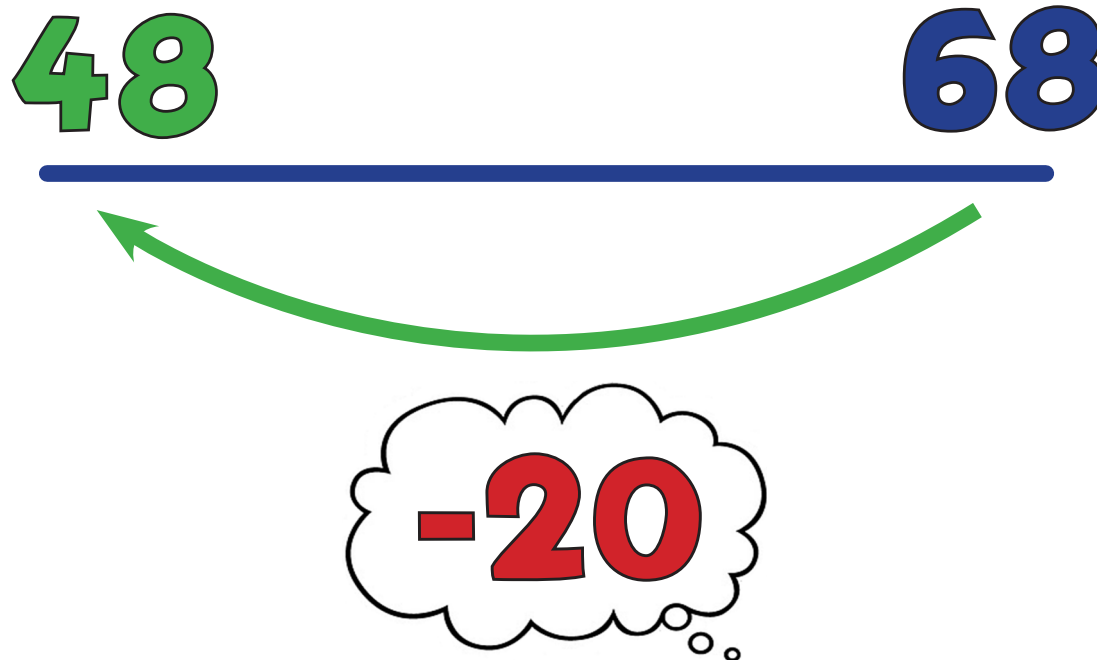


MS5a: Counting Back



MC RaPa CoOCoB NumFa

$$68 - 20 = 48$$



MS5b: Counting Back



MC RaPa CoOCoB NumFa

Jumps

$$86 - 12 = 74$$

-10

-2

86

76

74

MS6: Number Facts



MC RaPa CoOCoB NumFa

$$61 - 41 = 20$$

$$41 + 20 = 61$$

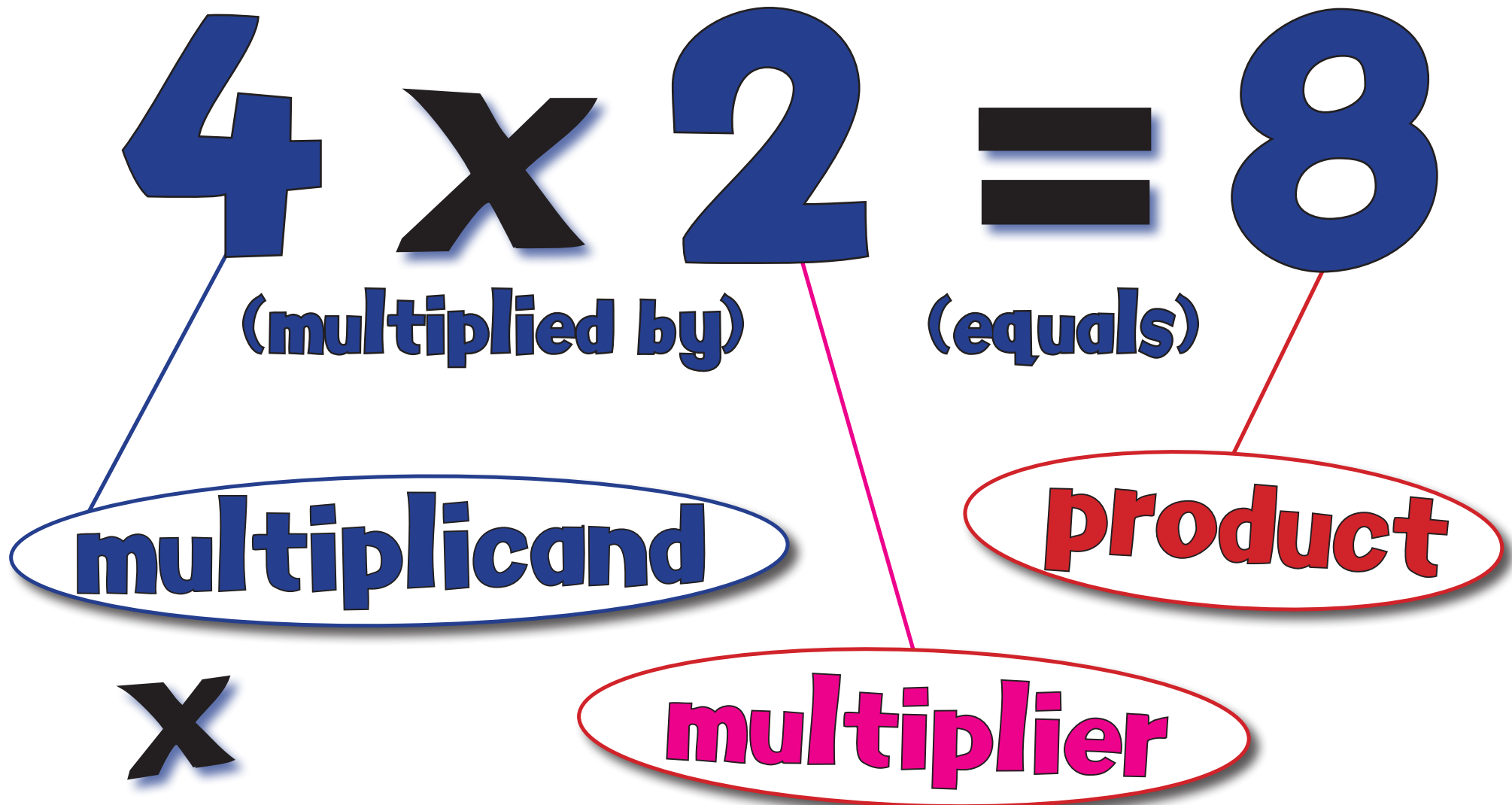
Multiplication Strategies

Calculation & Vocabulary

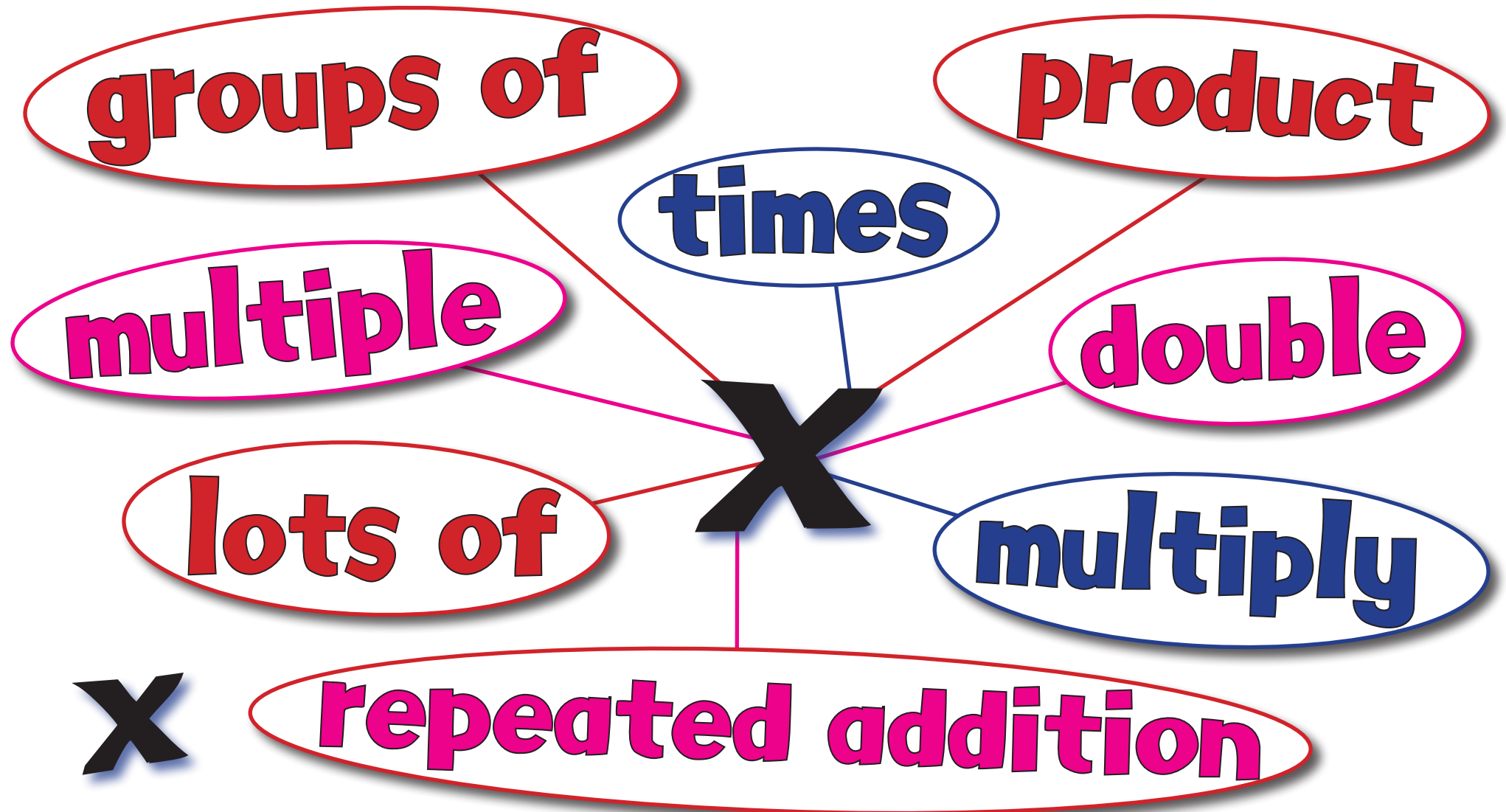
M1	Repeated Addition (Groups)
M2	Repeated Addition (Number Line)
M3	Arrays
M4	Multi Boing!
M5	Partitoning
M6	Grid Method
M7	Expanded Column
M8	Column Multiplication
M9	Grid Method (Long Mult.)
M10	Long Multiplication



Multiplication Calculation

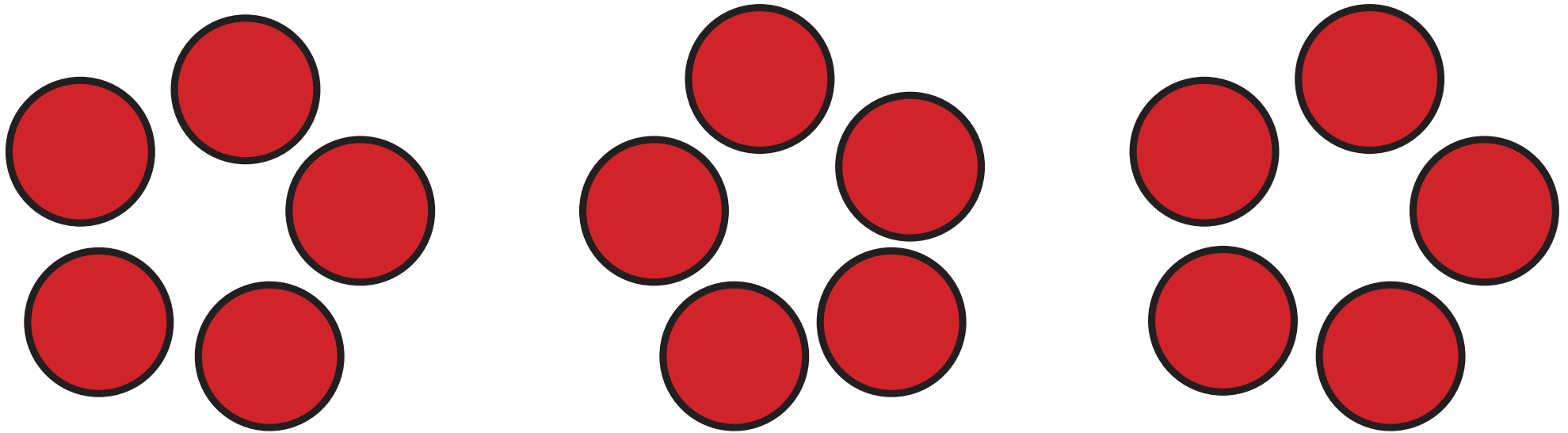


Multiplication Vocabulary



M1: Repeated Addition

(Groups)

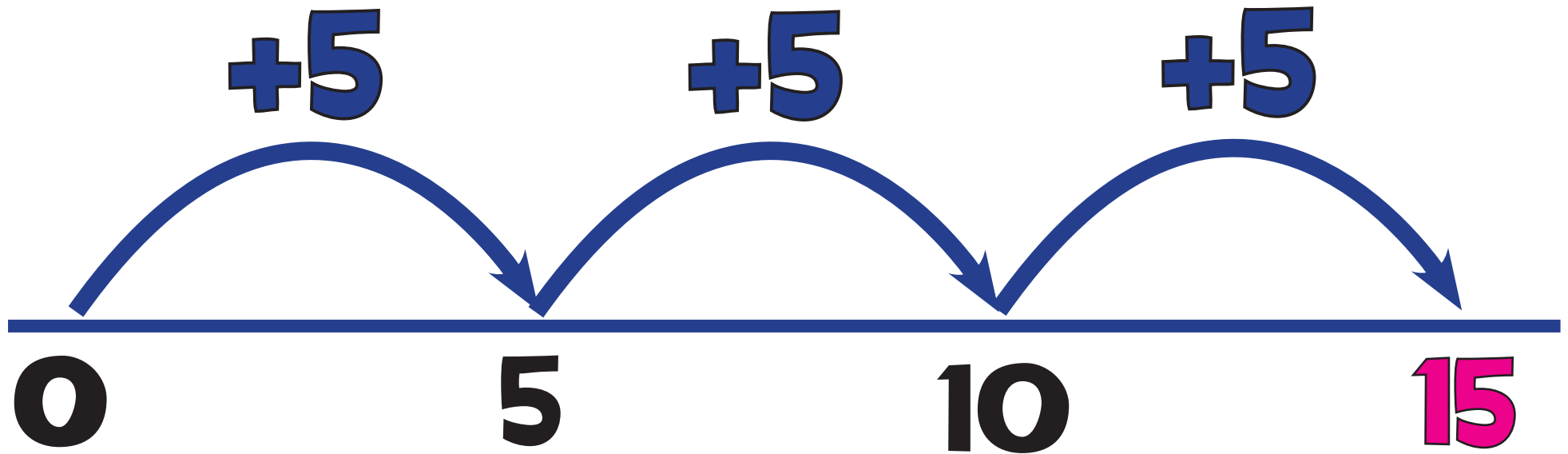


$$5 \times 3 = 5 + 5 + 5 = 15$$

“5 multiplied by 3” means “5, 3 times”, which gives “3 lots of 5”!

M2: Repeated Addition

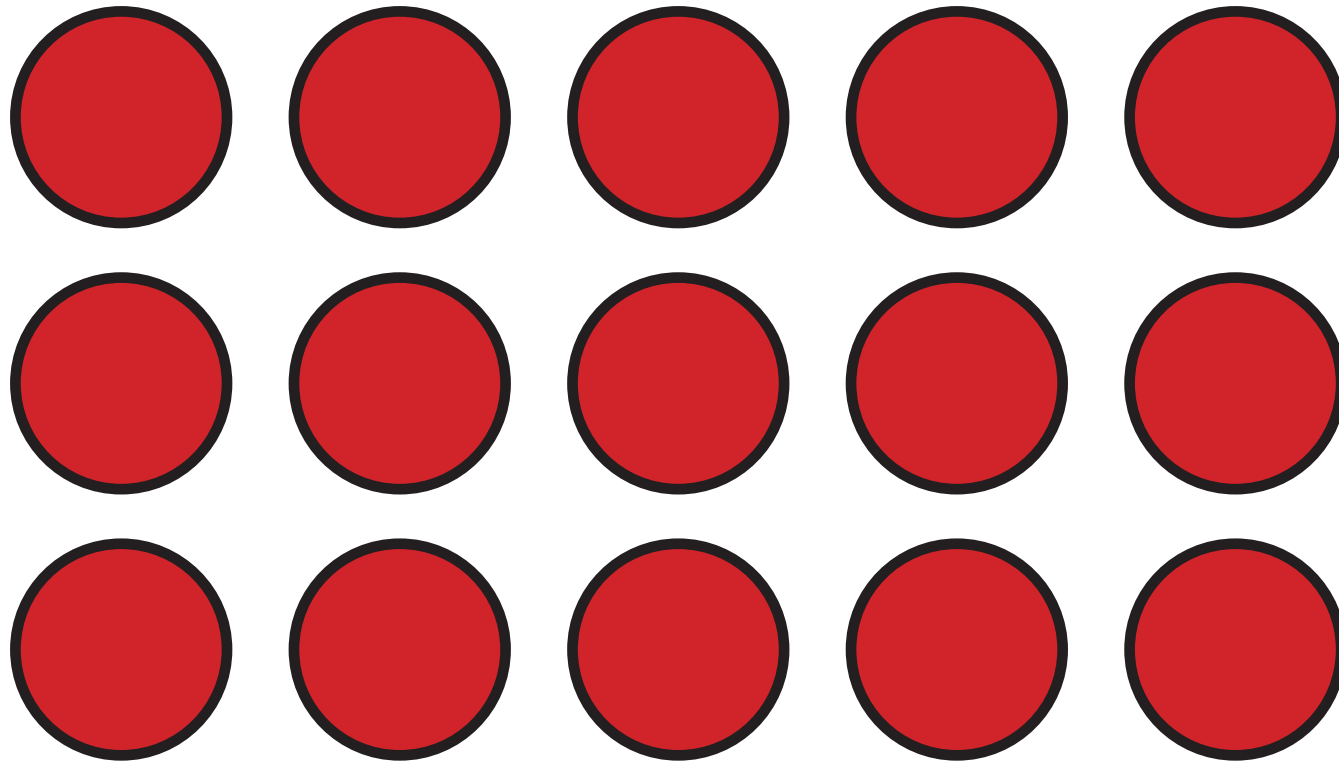
(Number Line)



$$5 \times 3 = 5 + 5 + 5 = 15$$

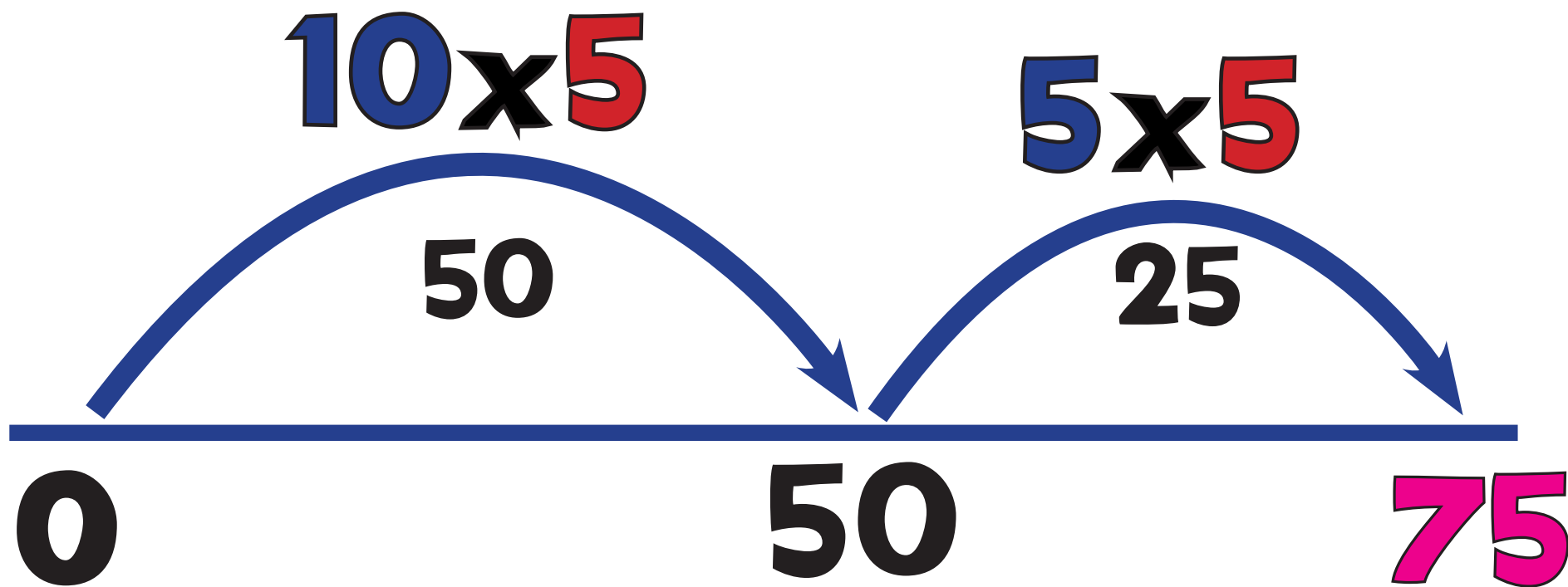
“5 times 3” means “5, 3 times!”

M3: Arrays



$$3 \times 5 = 15 \text{ or } 5 \times 3 = 15$$

M4: Multi Boing!



$$15 \times 5 = 75$$

M5: Partitioning

$$15 \times 5 = 75$$

$$10 \times 5 = 50$$

$$5 \times 5 = 25$$

$$50 + 25 = 75$$

M6: Grid Method

Short Multiplication

$$15 \times 5 = 75$$

x	10	5
5	50	25

$$50 + 25 = 75$$

M7: Expanded Column

$$\begin{array}{r} 100 \quad 10 \quad 1 \\ 1 \quad 4 \quad 7 \\ \times \quad \quad 4 \\ \hline \end{array}$$

$$28$$

$$(7 \times 4)$$

$$160$$

$$(40 \times 4)$$

$$400$$

$$(100 \times 4)$$

$$\hline 588$$

M8: Column Multiplication

100	10	1
1	4	7
x		
4		
5	8	8
1	2	

M9: Grid Method

Long Multiplication

$$15 \times 12 = 180$$

x	10	5
10	100	50
2	20	10

$$100 + 50 + 20 + 10 = 180$$

M10: Long Multiplication

Column

$$\begin{array}{r} 43 \\ \times 65 \\ \hline 215 \\ + 2580 \\ \hline 2795 \end{array}$$

(43 x 5)

(43 x 60)

Mental Multiplication

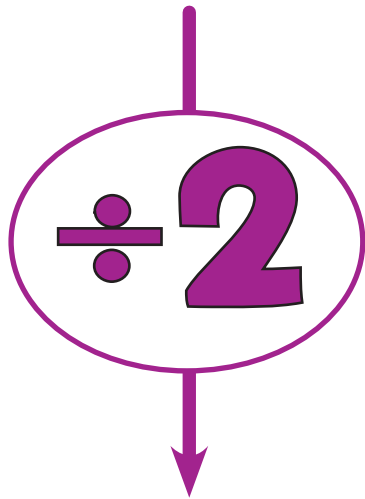
MM1	Manipulate Calculation
MM2	Factorising
MM3	Re-ordering
MM4	Partitioning
MM5	Round & Adjust
MM6	Doubling
MM7	Doubling Table Facts
MM8	Doubling Up
MM9	Multiply by ... then Halve
MM10	Jump



10 Cool Strategies for Mental Multiplication

MM1: Manipulate Calculation

$$16 \times 3$$



$$8 \times 6 = 48$$

MM2: Factorising

$$\begin{array}{c} 16 \times 3 = 48 \\ \swarrow \quad \searrow \\ (8 \times 2 \times 3) \\ \swarrow \quad \searrow \\ 8 \times 6 = 48 \end{array}$$

MM3: Re-ordering

$$\begin{array}{l} (9 \times 2) \times 5 \\ 18 \times 5 = 90 \end{array}$$

$$\begin{array}{l} (9 \times 5) \times 2 \\ 45 \times 2 = 90 \end{array}$$

$$\begin{array}{l} (2 \times 5) \times 9 \\ 10 \times 9 = 90 \quad *$$

MM4: Partitioning

$$15 \times 5 = 75$$

$$\begin{array}{c} \text{50} \\ (10 \times 5) \end{array} + \begin{array}{c} \text{25} \\ (5 \times 5) \end{array} = 75$$

MM5: Round & Adjust

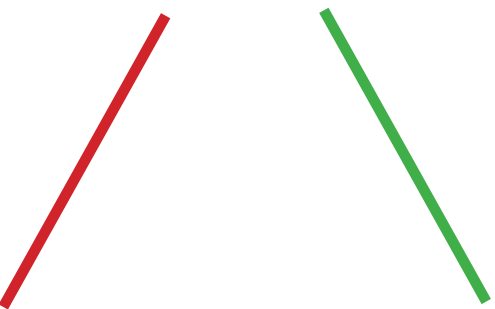
$$49 \times 3 = 147$$

$$(50 \times 3) - (1 \times 3)$$

$$150 - 3 = 147$$

MM6: Doubling

Double 17 = 34


$$20 + 14 = 34$$

MM7: Doubling Table Facts

$$\begin{array}{l} 8 \times 6 = 48 \\ (4 \times 2) \end{array}$$

$$\begin{array}{ccc} 4 \times 6 = 24 & & \\ \downarrow & & \downarrow \times 2 \\ 8 \times 6 = 48 & & \end{array}$$

MM8: Doubling Up

$$17 \times 4 = 68$$

$$\text{Double } 17 = 34 \quad (17 \times 2)$$

$$\text{Double } 34 = 68 \quad (17 \times 4)$$

MM9: Mult by ^{10, 100}_{& 1000} then Halve

$$86 \times 5 = 430$$

$$86 \times 10 = 860$$

$$860 \div 2 = 430$$

MM10: Jump!

x100

x10

1000 100 10 1

3400



340



34

Division Strategies

Calculation & Vocabulary

- D1** **Sharing** (Concept)
- D2** **Grouping** (Concept)
- D3** **Sharing**
- D4** **Grouping**
- D5** **Grouping on a Number Line**
- D6** **Grouping Grid**
- D7** **Chunking Jump**
- D8** **Find the Hunk**
- D9** **Mega Hunk**
- D10** **Short Division**
- D11** **Chunking**
- D12** **Long Division** (Short Division Method)
- D13** **Long Division** (Chunking Method)
- D14** **Long Division** (Traditional Method)



Division Calculation

$$8 \div 2 = 4$$

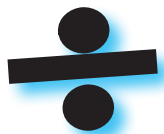
(divided by)

(equals)

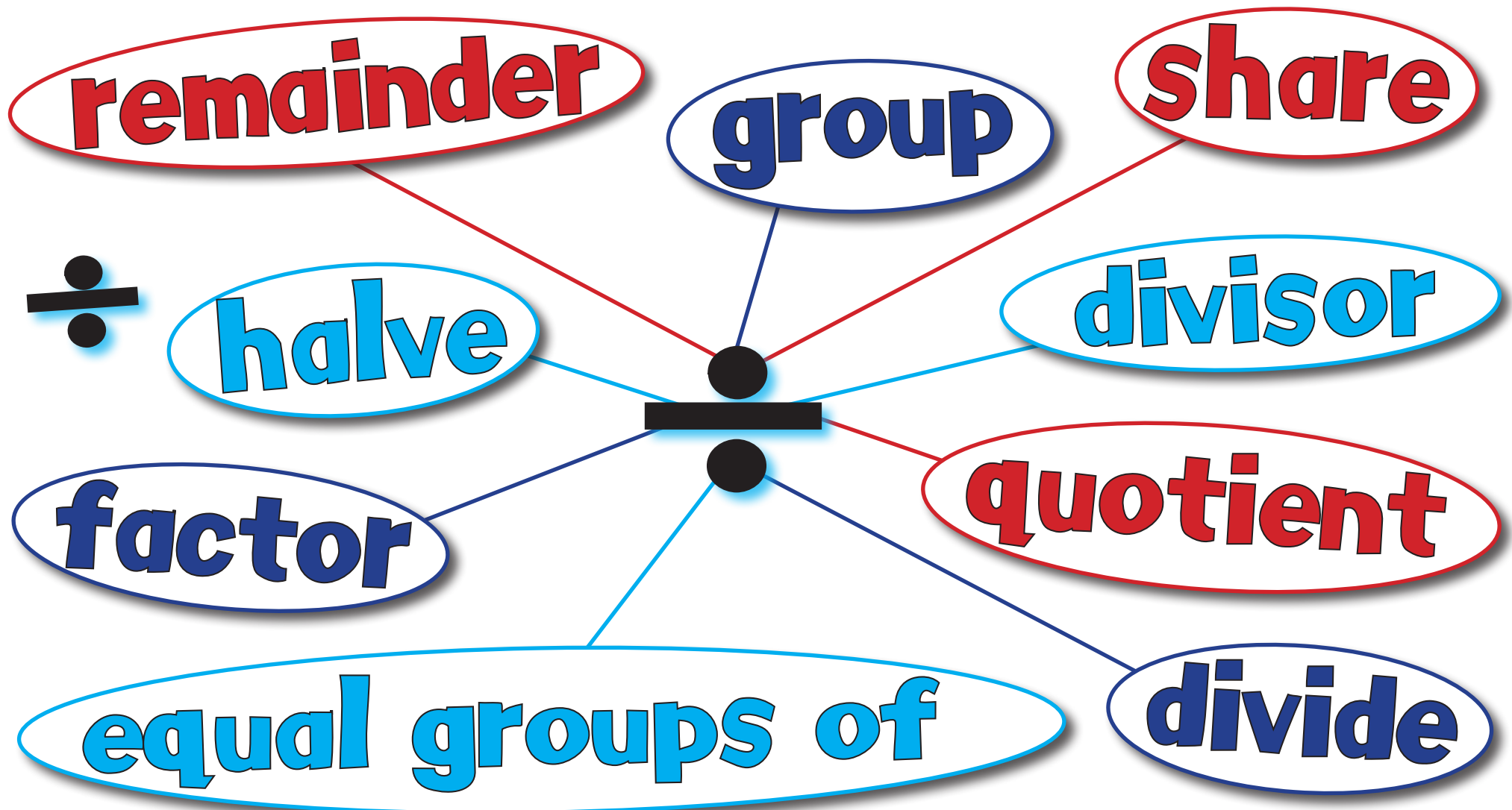
dividend

quotient

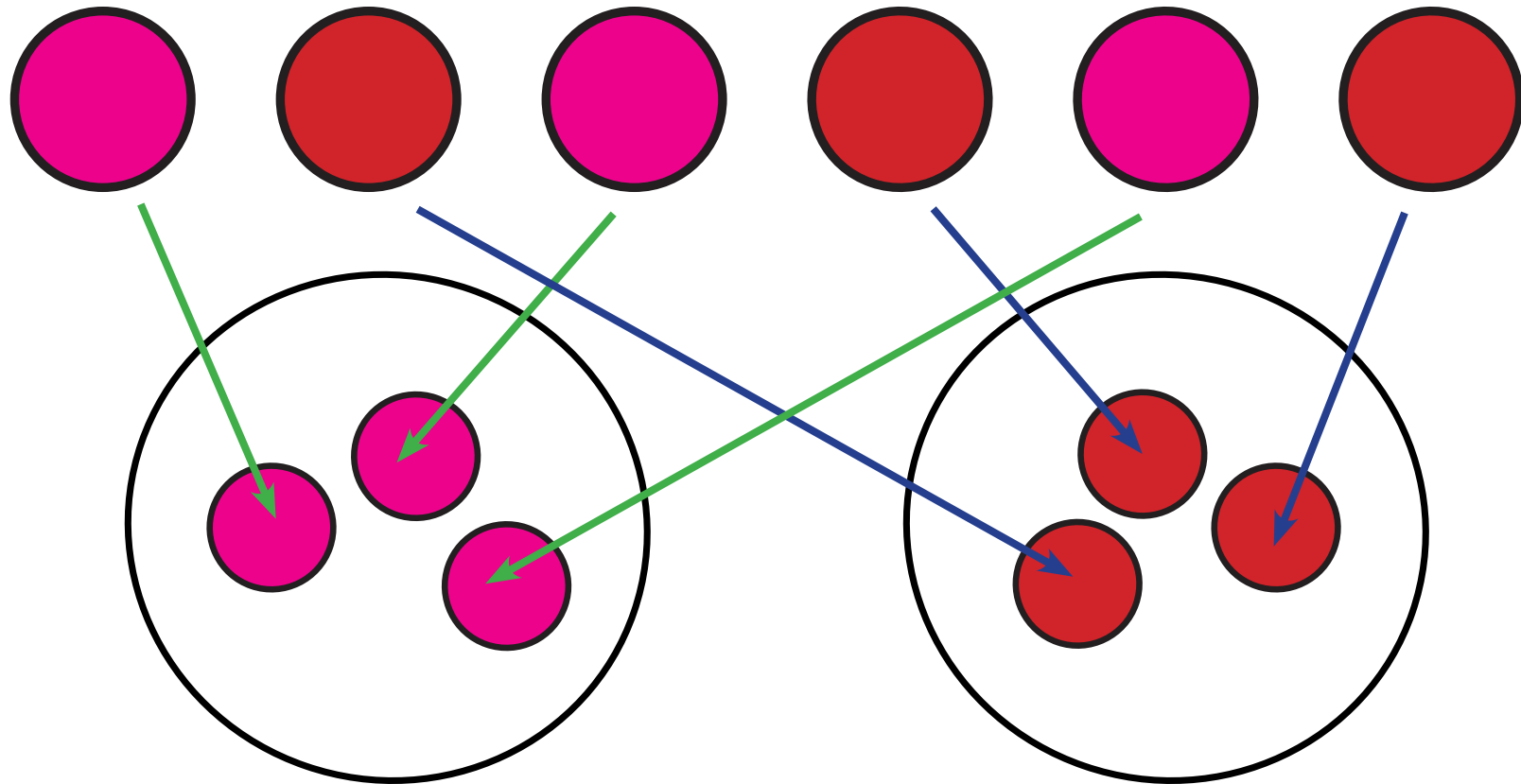
divisor



Division Vocabulary

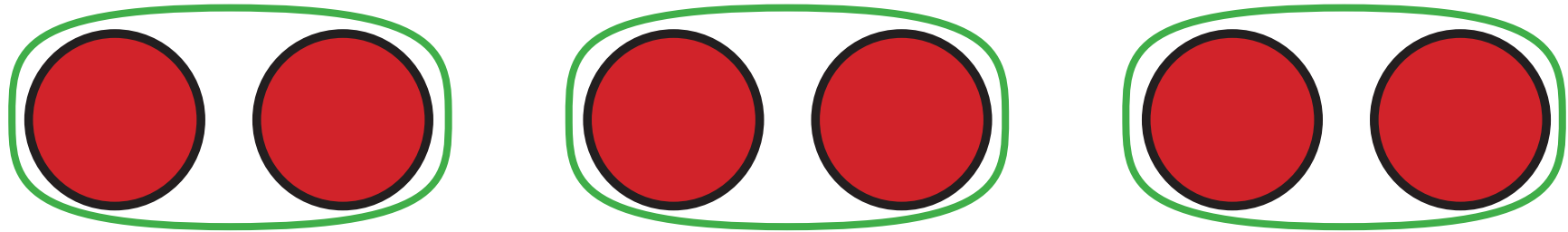


D1: Sharing (Concept)



**“If I share 6 into 2 equal amounts,
how many in each group?” Answer: 3**

D2: Grouping (Concept)



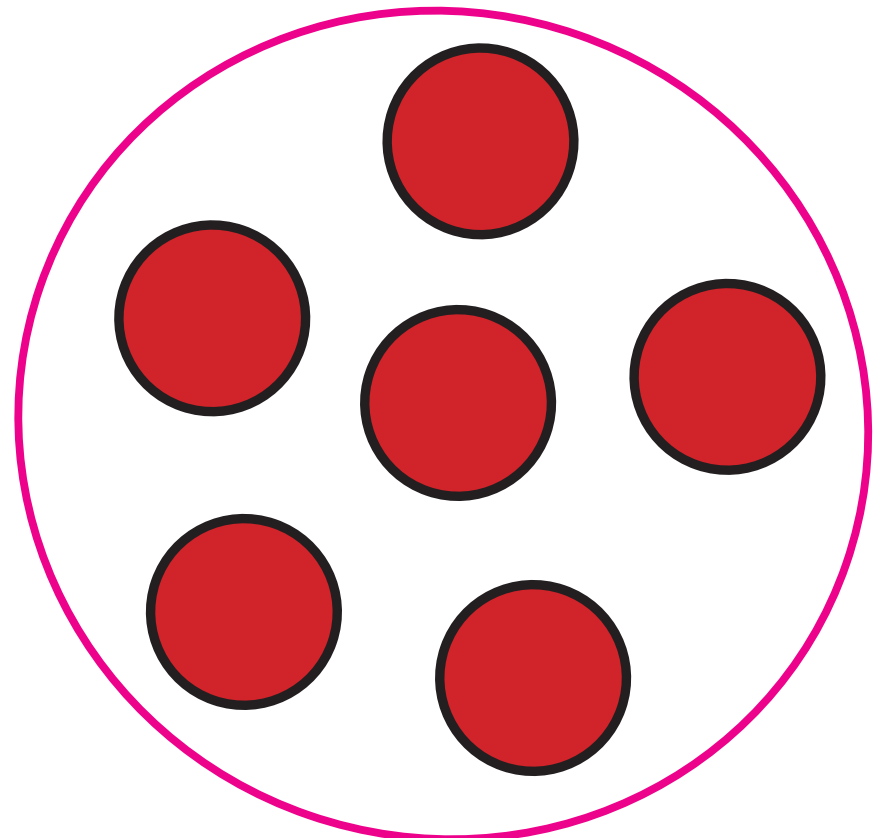
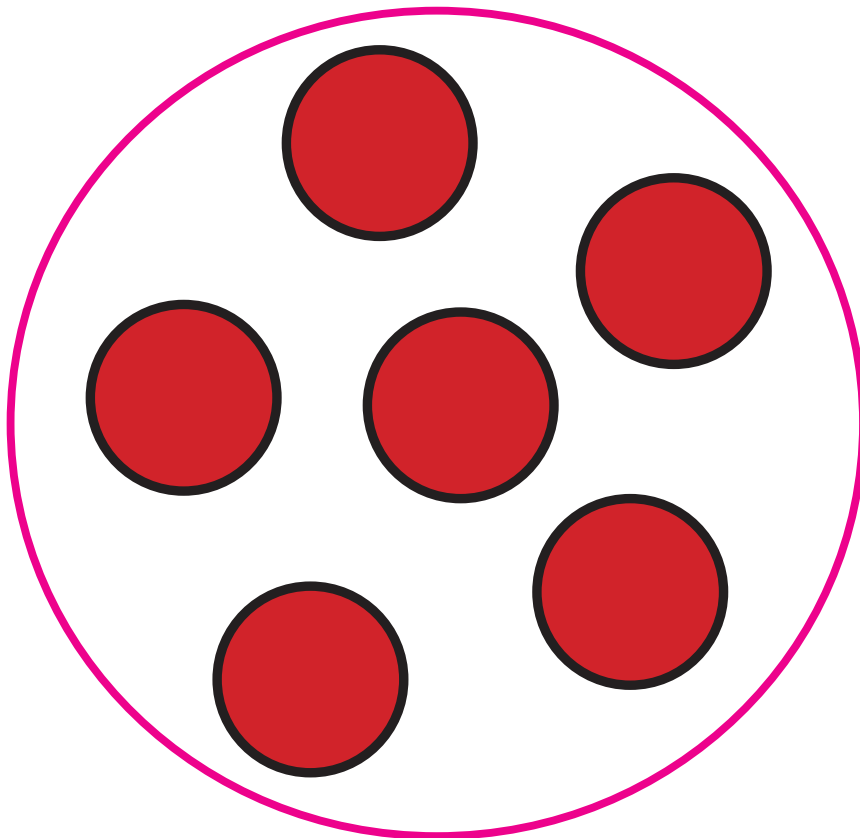
“How many groups of 2 can I make out of 6?”

Answer: 3

D3: Division as Sharing

$$12 \div 2 = 6$$

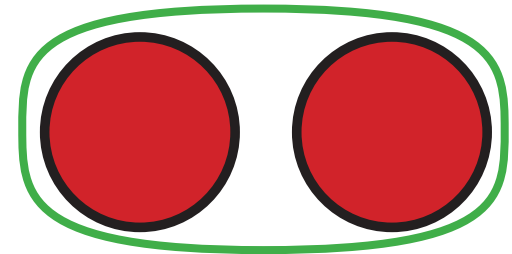
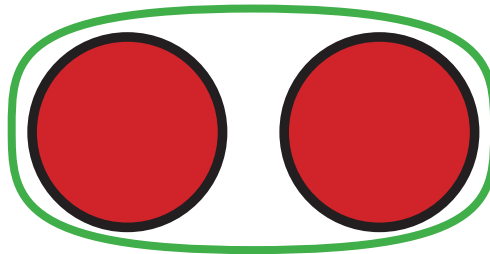
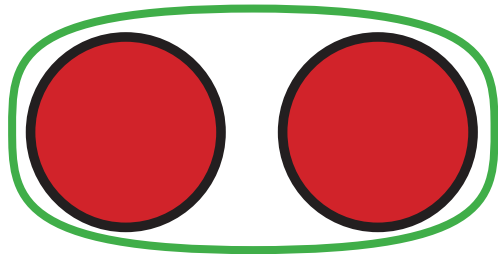
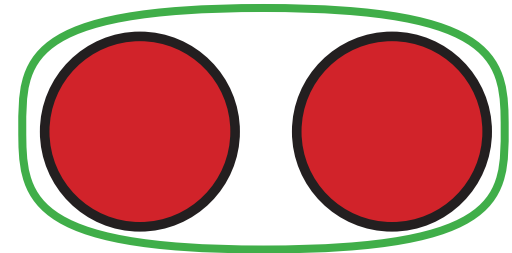
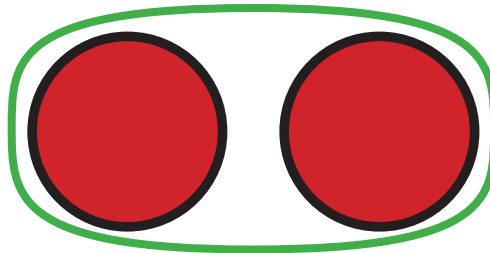
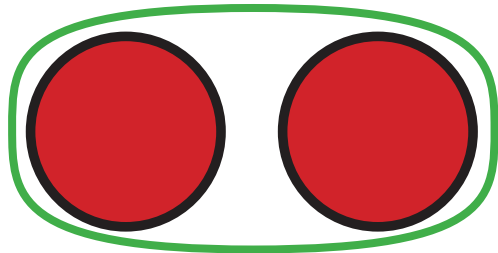
“If I share **12** into **2** equal amounts, how many in each group?” Answer: **6**



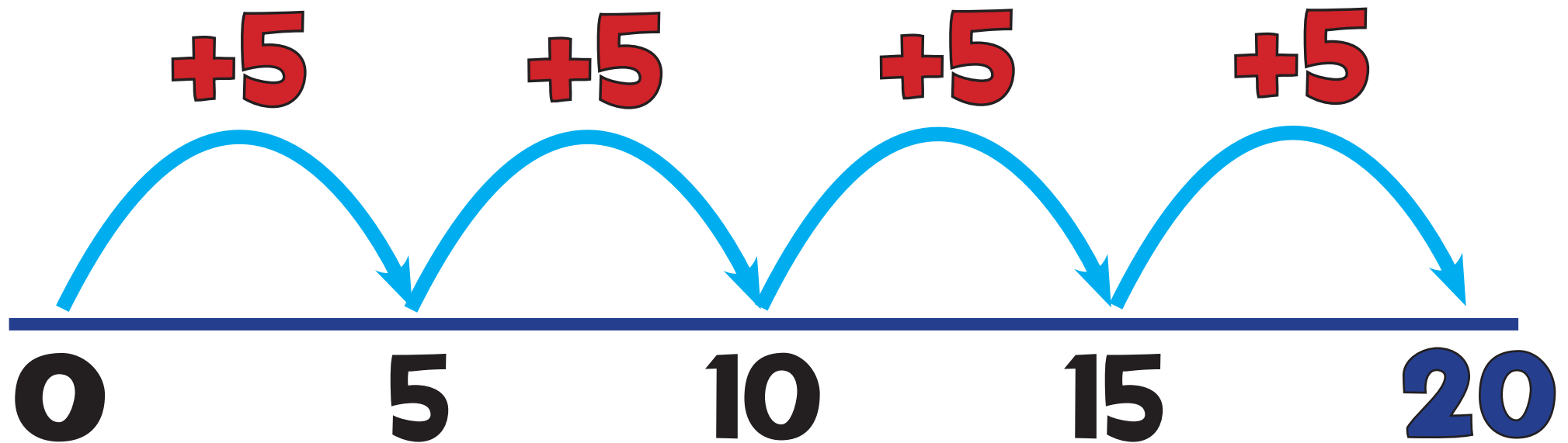
D4: Division as Grouping

$$12 \div 2 = 6$$

**"How many groups of 2
can I fit into 12?"**
Answer: 6



D5: Grouping on a Number Line



"How many 5s in 20?"

Answer: 4

$$20 \div 5 = 4$$

D6: Grouping Grid

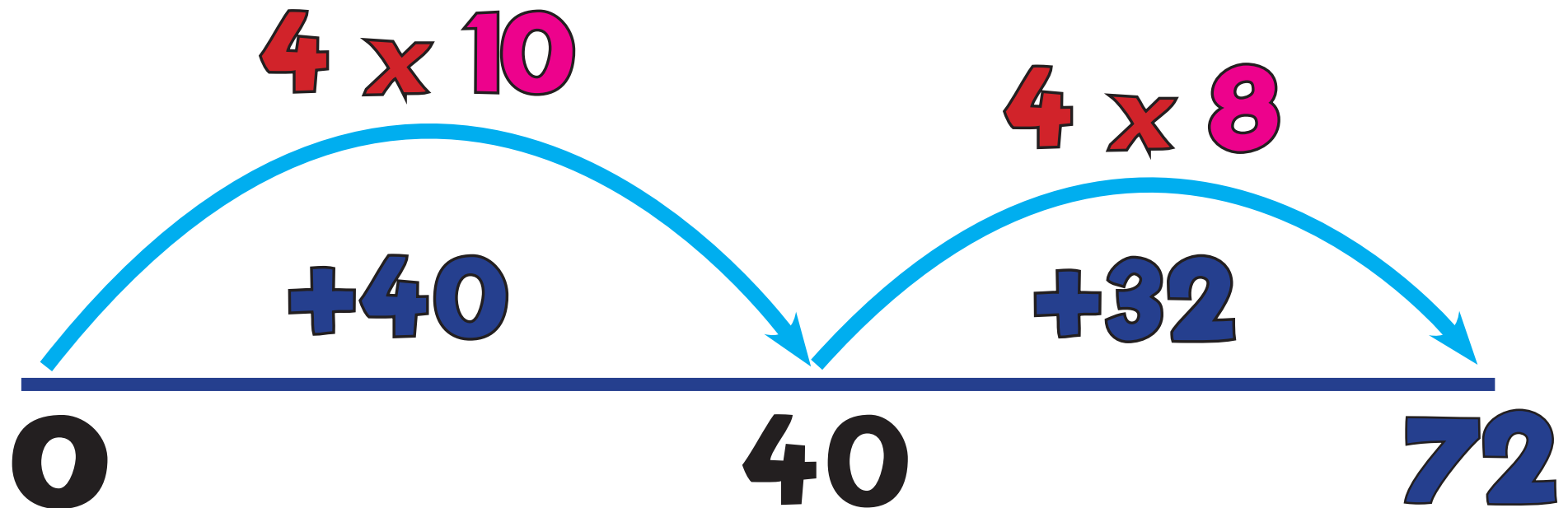
4	4	4	4	4
4				3

“How many times
can I fit (groups
of) 4 into 27?”

Answer: 6r3

$$27 \div 4 = 6r3$$

D7: Chunking Jump



“How many 4s in 72?”
Answer: 18

$$72 \div 4 = 18$$

D8: Find the Hunk!

$$72 \div 4 = 18$$

The
Hunk!

40

+

Chunk

32



10

+



8

$\div 4$

= 18

D9: Mega Hunk!

$$136 \div 4 = 34$$

Mega
Hunk!

120

+

16



30

+

4

$\div 4$

= 34

D10: Short Division

$$136 \div 4 = 34$$

$$\begin{array}{r} 34 \\ 4 \overline{) 136} \end{array}$$

D11: Chunking

$$\begin{array}{r} 34 \\ 4 \overline{) 136} \\ \underline{-120} \quad (4 \times 30) \\ 16 \\ \underline{-16} \quad (4 \times 4) \\ 0 \end{array}$$

$$136 \div 4 = 34$$

D12: Long Division

Short Division Method

$$\begin{array}{r} 26 \text{ r}21 \\ 37 \overline{) 983} \end{array}$$

The diagram illustrates the short division method for 983 divided by 37. The divisor 37 is written in black on the left. The dividend 983 is written in the middle, with the 9 in blue, the 8 in red, and the 3 in green. Above the dividend, the quotient 26 is written in pink, followed by a remainder of 21 (r21) also in pink. A pink horizontal line separates the quotient from the dividend. Above the 9, a blue 9 is written, and above the 8, a red 24 is written, indicating the multiplication steps: 37 times 2 equals 74, and 37 times 6 equals 222.

D13: Long Division

Chunking Method

$$\begin{array}{r} 26 \text{ r}21 \\ 37 \overline{) 983} \\ \underline{- 740} \quad (37 \times 20) \\ 243 \\ \underline{- 222} \quad (37 \times 6) \\ 21 \end{array}$$

$$983 \div 37 = 26 \text{ r}21$$



D14: Long Division

Traditional Method

$$\begin{array}{r} 26 \text{ r}21 \\ 37 \overline{) 983} \\ \underline{- 74} \\ 243 \\ \underline{- 222} \\ 21 \end{array}$$

$$983 \div 37 = 26 \text{ r}21$$



Mental Division

- MD1** **Manipulate Calculation**
- MD2** **Divide by 100 then Double**
- MD3** **Halving**
- MD4** **Halve and Halve Again**
- MD5** **Division as a Fraction**
- MD6** **Find the Hunk**
- MD7** **Jump**



7 Cool Strategies for Mental Division!

MD1: Manipulate Calculation

$$140 \div 20$$

$\div 10$

$\div 10$

$$14 \div 2 = 7$$

MD2: Divide by 100 then Double

4

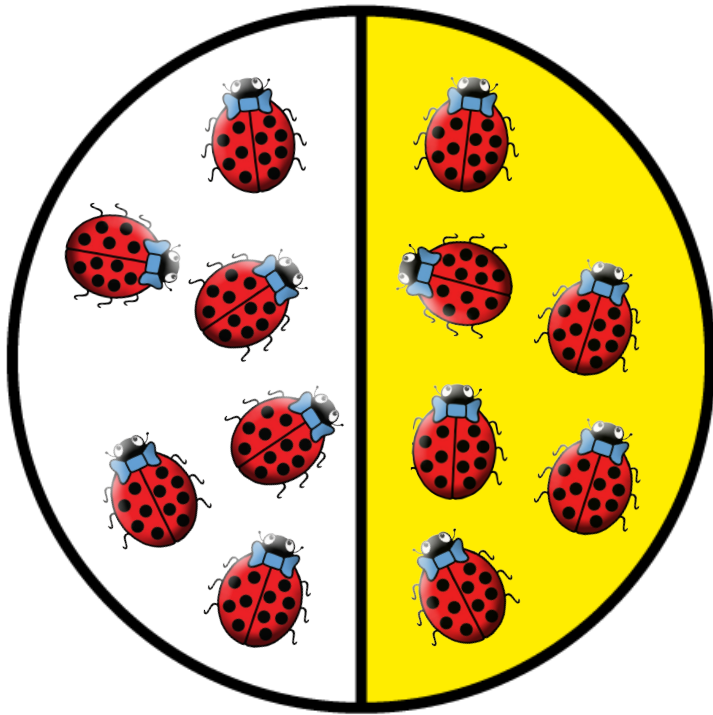
$$800 \div 50 = 16$$

$$800 \div 100 = 8$$

$$8 \times 2 = 16$$

MD3: Halving

Half of **12** is equivalent to **$12 \div 2$**



$$\frac{1}{2} \text{ of } 12 = 12 \div 2$$

MD4: Halve & Halve Again

$$84 \div 4 = 21$$

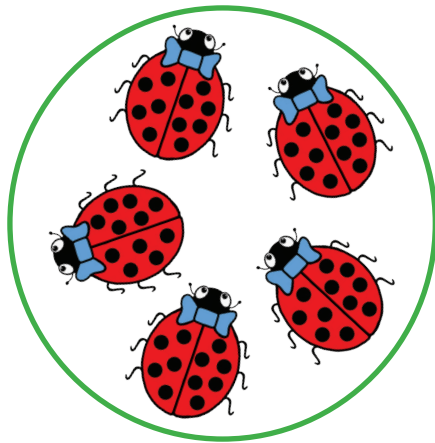
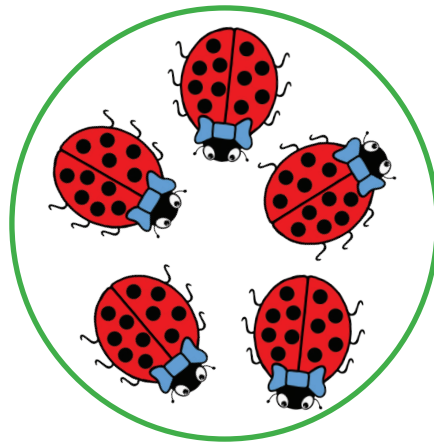
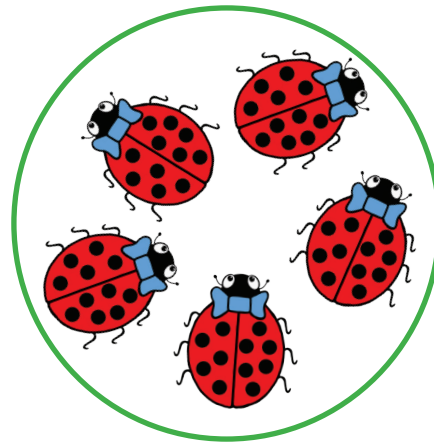
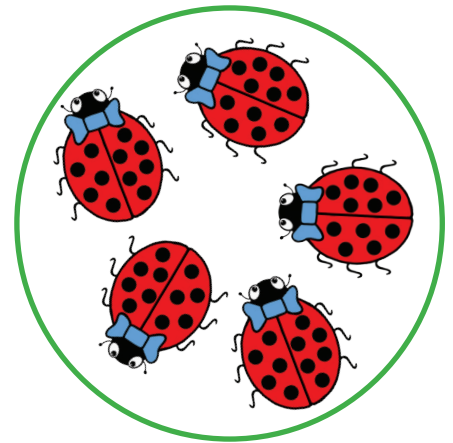
$$\text{Half of } 84 = 42 \quad (84 \div 2)$$

$$\text{Half of } 42 = 21 \quad (84 \div 4)$$

MD5: Division as a Fraction

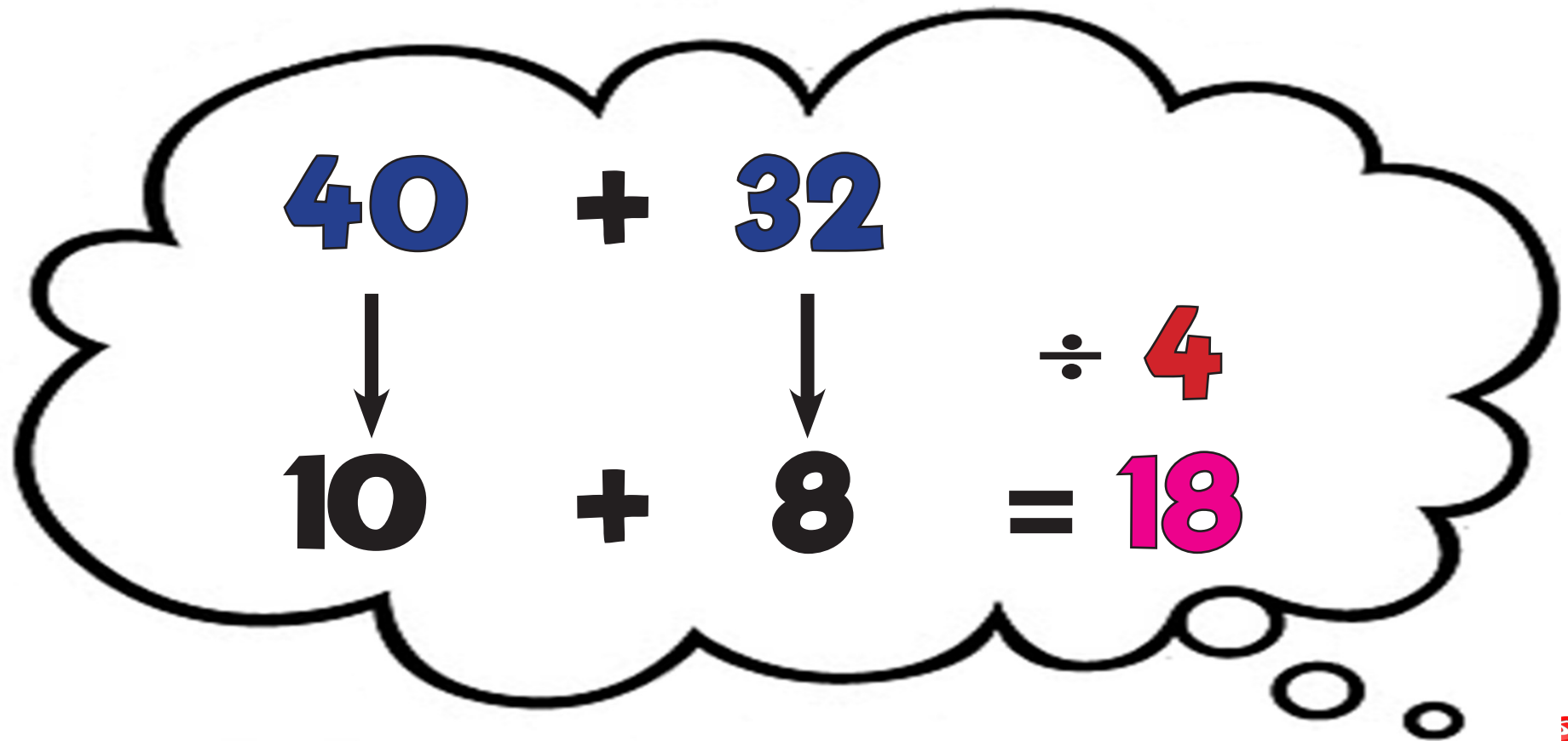
Sharing Model

$$\frac{1}{4} \text{ of } 20 = 20 \div 4 = 5$$

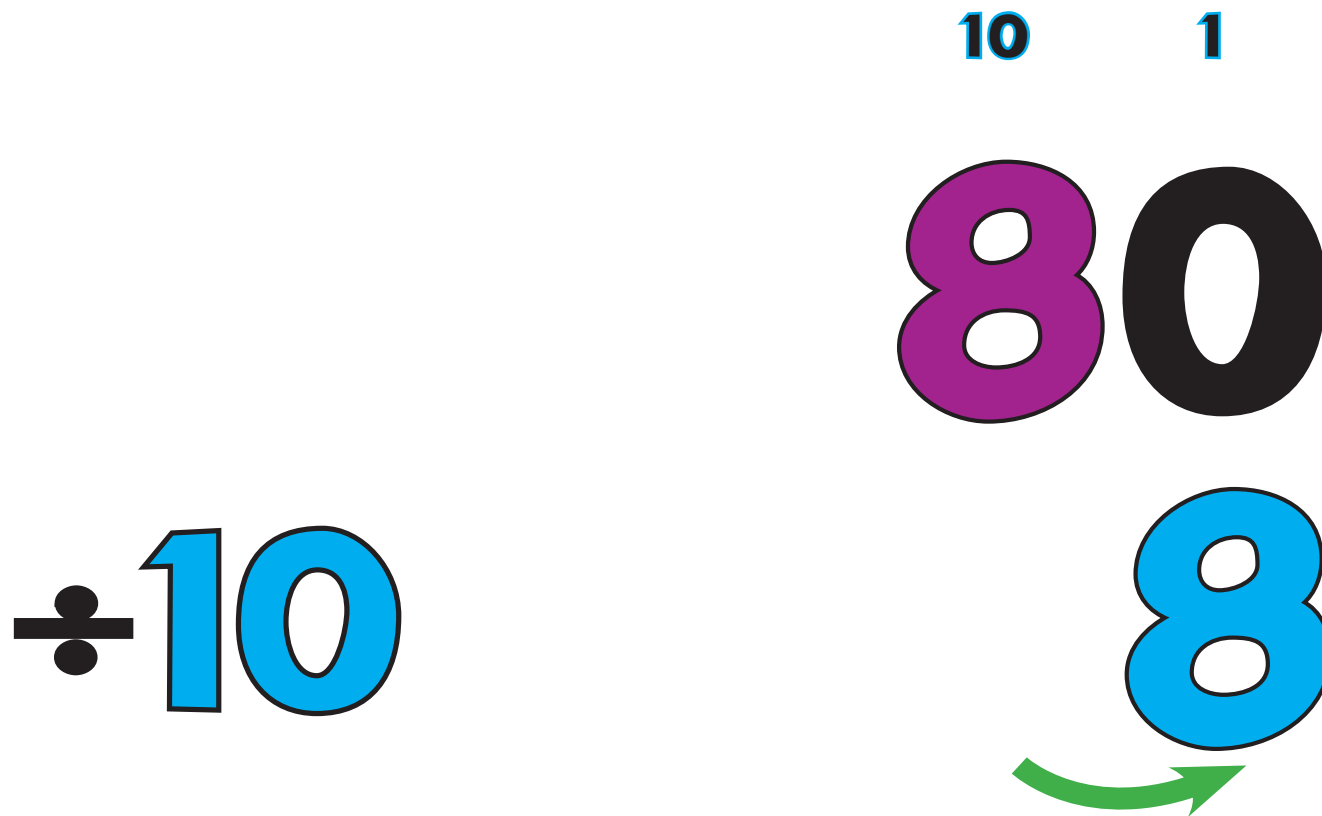

$$\frac{1}{4}$$

$$\frac{1}{4}$$

$$\frac{1}{4}$$

$$\frac{1}{4}$$

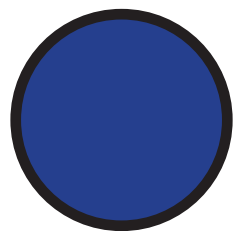
MD6: Find the Hunk!

$$72 \div 4 = 18$$



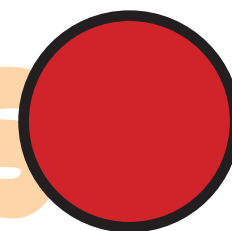
MD7: Jump ($\div 10$)





Sense of Number Standard Alternative Slides

by Dave Godfrey



dave@senseofnumber.co.uk Tel: 01904 778848

The following slides the standard alternative slide configurations to the main set of slides.



Grange Primary School

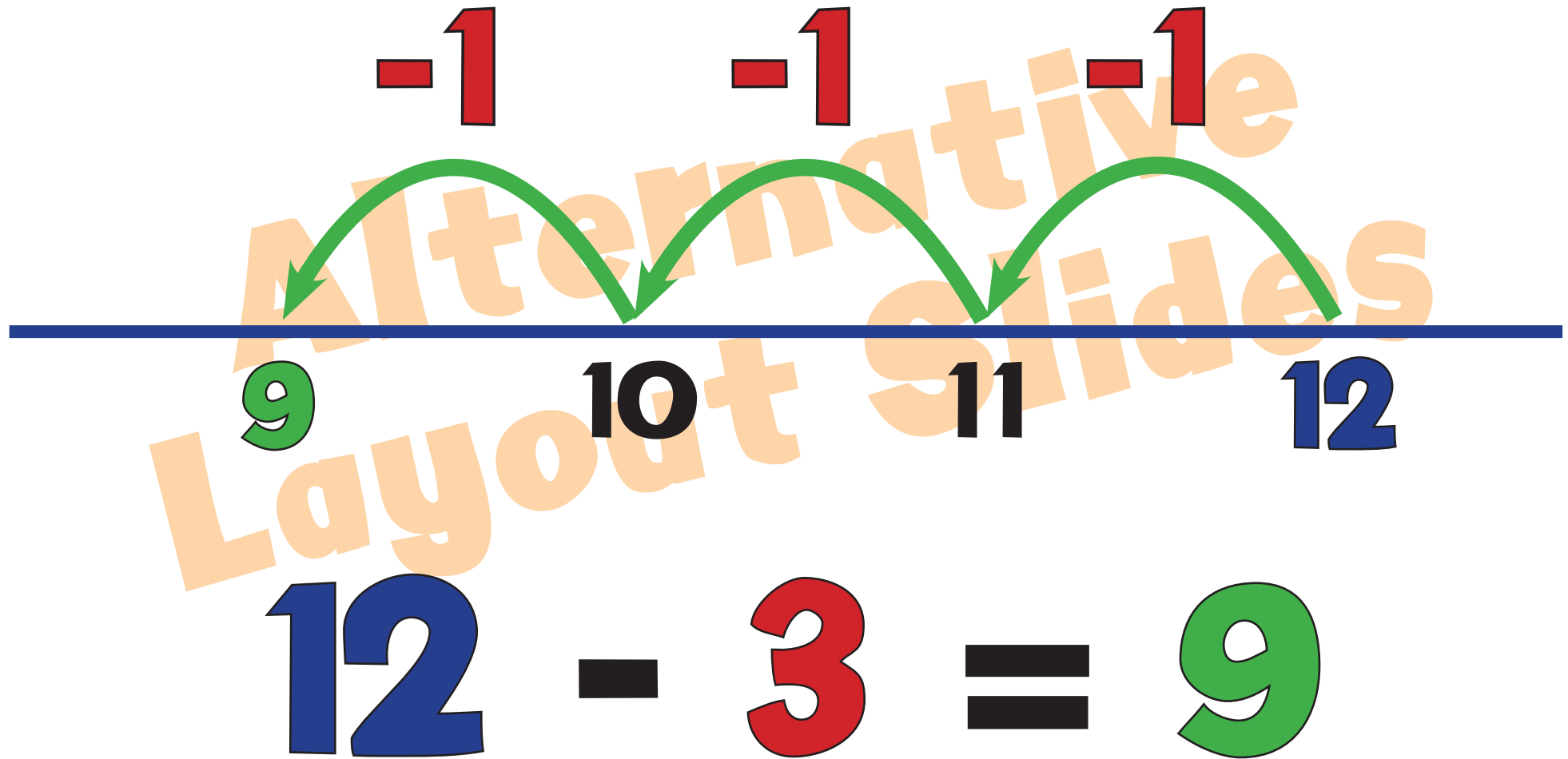
Grange Primary School VCP Basic Edition © Sense of Number 2017
For sole use by purchasing school. Bespoke Graphic Design by Dave Godfrey - www.senseofnumber.co.uk



A7: Column Addition

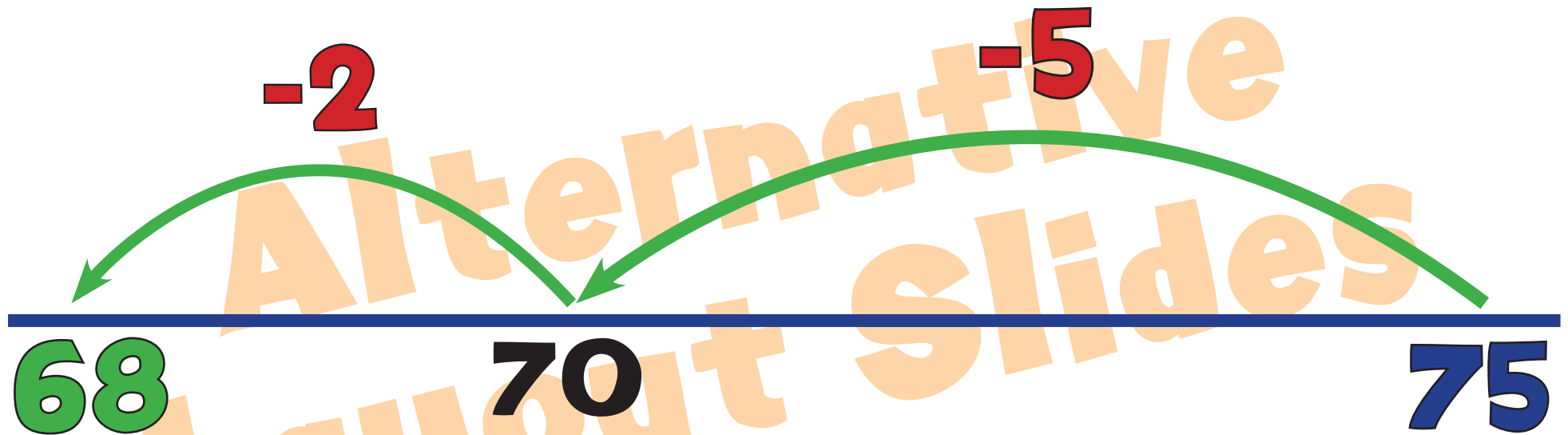
$$\begin{array}{r} \text{100} \quad \text{10} \quad \text{1} \\ \text{687} \\ + \text{248} \\ \hline \text{1} \quad \text{1} \\ \hline \text{935} \end{array}$$

S3: Counting Back



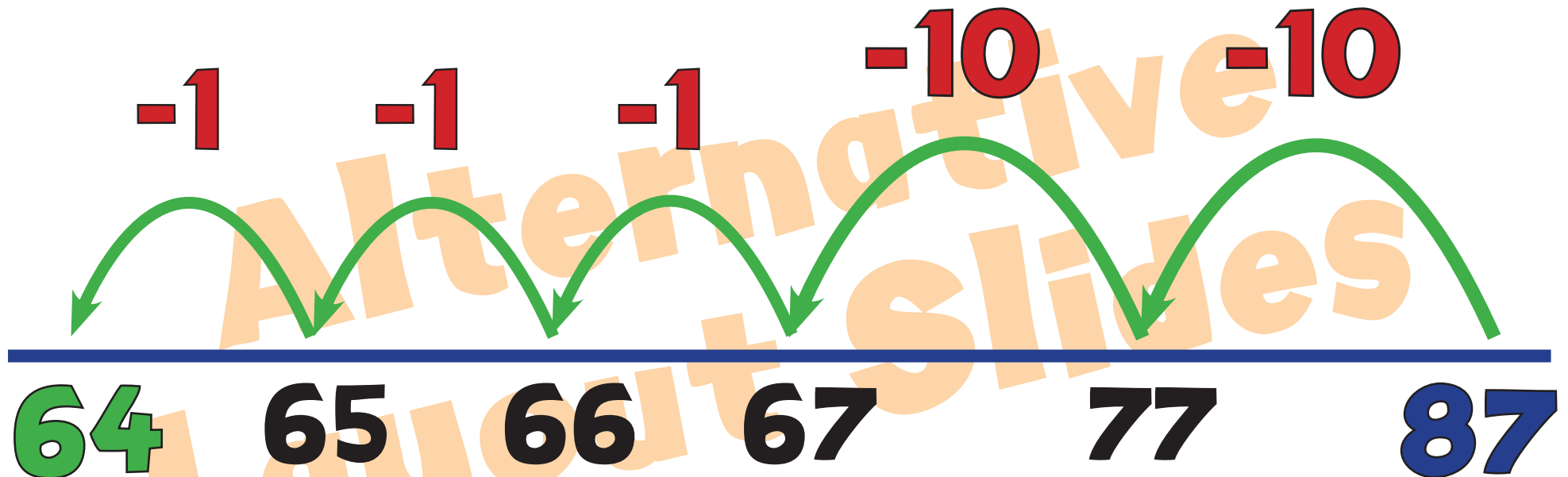
“What do I get if I take 3 away from 12? Answer: 9”

S5: Backwards Boing



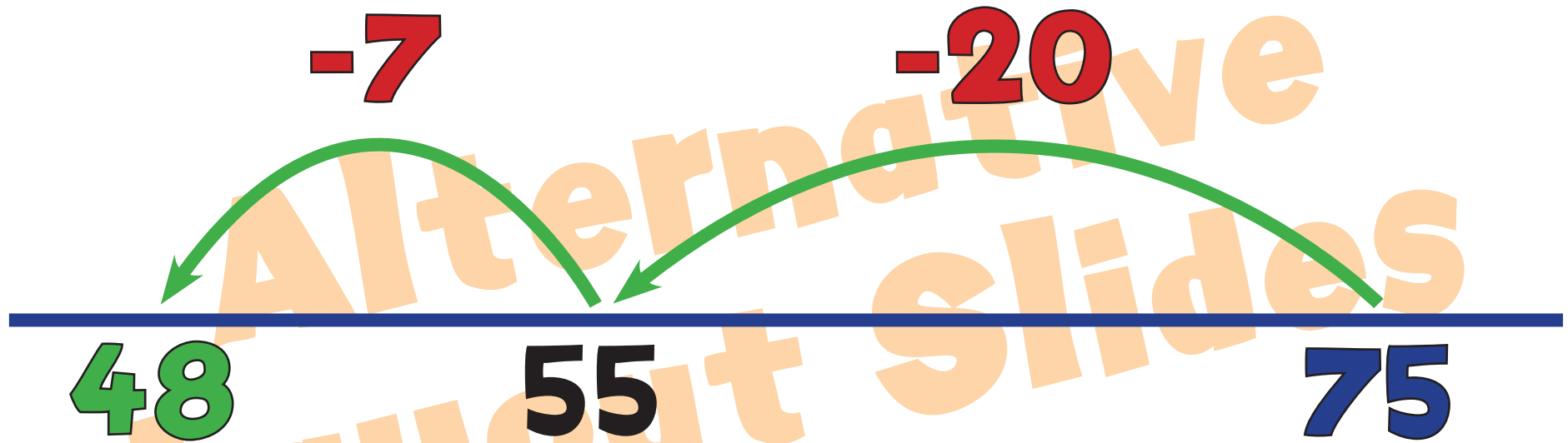
$$75 - 7 = 68$$

S6: Backwards Bounce



$$87 - 23 = 64$$

S7: Backwards Jump



$$75 - 27 = 48$$

M8: Column Multiplication

100 10 1

147

x 4

1 2

588



M10: Long Multiplication

Column

$$\begin{array}{r} 43 \\ \times 65 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \quad 1 \\ 215 \end{array}$$

$$(43 \times 5)$$

$$\begin{array}{r} 2 \quad 1 \\ + 2580 \\ \hline \end{array}$$

$$(43 \times 60)$$

$$\begin{array}{r} 2795 \end{array}$$