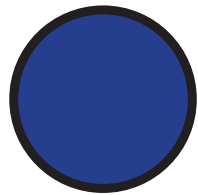


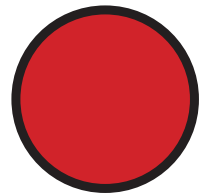
# **Sense of Number**

## **Expanded Visual Calculation Policy**

# **Mental Strategies Policy**



**Triangle CE Primary School**  
**December 2020**

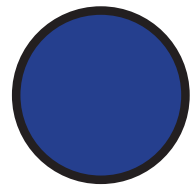


**Graphic Design by Dave Godfrey**  
**Compiled by the Sense of Number Maths Team**

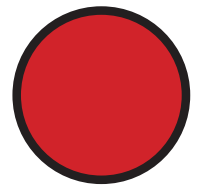
**For sole use in Triangle CE Primary School**

**'A picture is worth 1000 words!' [www.senseofnumber.co.uk](http://www.senseofnumber.co.uk)**





# Guide to using a



# Visual Calculation Policy

**The Full Sense of Number Visual Calculation Policy Package provides a comprehensive visual representation of a school's Calculation Policy.**

- 1: CPVCP**      **Concrete and Pictorial VCP - The foundation of the policy, featuring key models and images to help children gain deep understanding of the abstract procedures.**
- 2: WSVCP**      **Written Strategies progression from jottings to formal written methods from Y1 to Y6.**
- 3: MSVCP**      **Mental Strategies progression across KS1 and KS2 for all four operations.**
- 4: ECPD**      **Editable Calculation Policy Document - a comprehensive written explanation of a school's calculation policy, featuring thumbnails of the posters from the three documents above.**

## **Typical uses:**

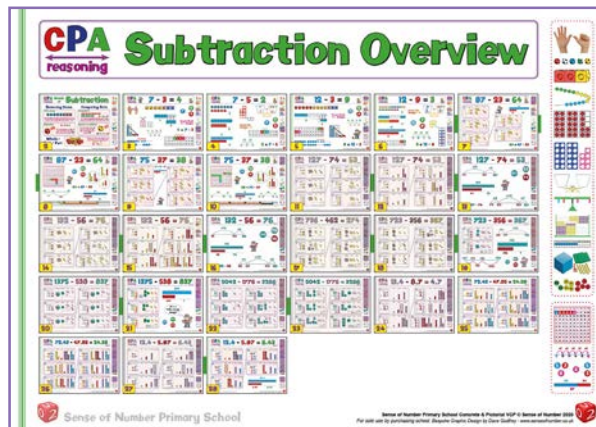
- Classroom:**      **The posters are printed out (e.g. A4) and the appropriate slides are displayed for continual reference or on a working wall. Posters are used on the interactive whiteboard.**
- Reference:**      **The summary overviews are printed out and inserted in the teacher's planning folder.**
- Parents:**      **The posters are used to communicate to parents the methods being used within school.**
- Website:**      **Screen grabs of slides from the VCP are inserted on a schools' maths webpages.  
(PLEASE NOTE: the VCP should not be placed on school website for copyright reasons.)  
A secure PDF copy of the Editable Calculation Policy may be placed on the school website.**



# Expanded Visual Calculation Policy

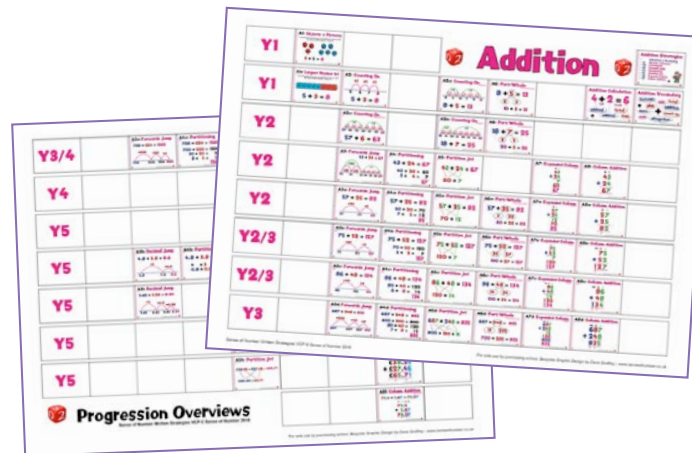
The Expanded Visual Calculation Policy helps children and teaching staff achieve mastery of all aspects of calculation. It contains the following three documents:

## Concrete & Pictorial VCP



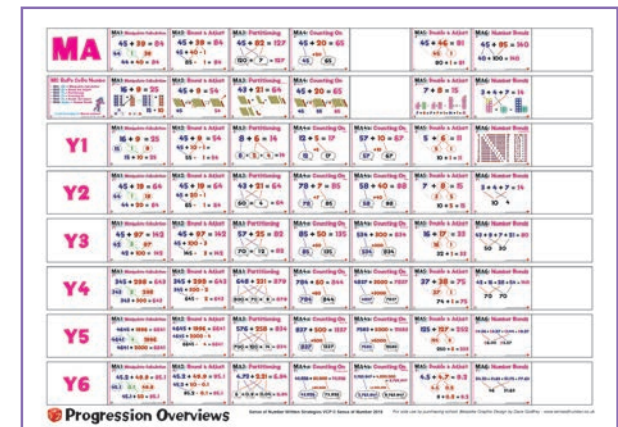
**92 A3 wallcharts** showing the range of models and images that help children to understand and master calculation strategies.

## Written Strategies VCP

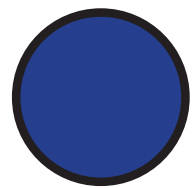


**271 A4 posters** showing the progression of written strategies (from Y1 to Y6) for all 4 operations in line with the National Curriculum.

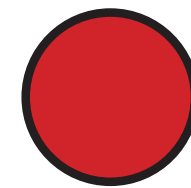
## Mental Strategies VCP



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



# Poster Guide



## Expanded Visual Calc. Policy

Code	Section	Concrete & Pictorial (92 A3 Wallcharts)		Written VCP (348 A4 Posters)		Mental VCP (215 A4 Posters)	
		Number of Wallcharts	Wallchart Numbers	No. of Posters	Poster Numbers	No. of Posters	Poster Numbers
	Policy Introduction Slides	4	1-4	4	1-4	4	1-4
	Introductory Posters	3	5-7	9	5-13		
	Operation Overviews	4	8-11	13	14-26	8	5-12
<b>C</b>	<b>Counting Policy</b>			<b>15</b>	<b>27-41</b>		
<b>A</b>	<b>Addition</b>	<b>20</b>	<b>12-31</b>	<b>54</b>	<b>42-103</b>		
<b>MA</b>	<b>Mental Addition</b>					<b>55</b>	<b>13-67</b>
<b>S</b>	<b>Subtraction</b>	<b>27</b>	<b>1-27</b>	<b>48</b>	<b>104-169</b>		
<b>MS</b>	<b>Mental Subtraction</b>					<b>63</b>	<b>68-130</b>
<b>M</b>	<b>*Multiplication</b>	<b>20</b>	<b>1-20</b>	<b>39</b>	<b>170-219</b>		
<b>MM</b>	<b>Mental Multiplication</b>					<b>46</b>	<b>131-176</b>
<b>D</b>	<b>*Division</b>	<b>15</b>	<b>1-15</b>	<b>71</b>	<b>220-291</b>		
<b>MD</b>	<b>Mental Division</b>					<b>39</b>	<b>177-215</b>
	<b>*Multiplication Tables</b>			<b>22</b>	<b>292-313</b>		
	<b>Alternative layouts (Column &amp; Number Lines)</b>			<b>34</b>	<b>314-348</b>		

**\* Contains some posters which have both 'multiplied by' and 'groups of' options**



# MC RaPa CoDa Numbo

14 **MA1 MC = Manipulate Calculation**

22 **MA2 Ra = Round and Adjust**

30 **MA3 Pa = Partitioning**

38 **MA4 Co = Counting On**

52 **MA5 Da = Double and Adjust**

60 **MA6 Numbo = Number Bonds**



## 6 Cool Strategies for Mental Addition!



<h1>MA</h1>	<b>MA1: Manipulate Calculation</b> $45 + 19 = 64$  $44 + 20 = 64$	<b>MA2: Round &amp; Adjust</b> $45 + 39 = 84$ $45 + 40 - 1$ $85 - 1 = 84$	<b>MA3: Partitioning</b> $45 + 82 = 127$ $120 + 7 = 127$	<b>MA4: Counting On</b> $45 + 20 = 65$ 		<b>MA5: Double &amp; Adjust</b> $45 + 46 = 91$ $45 + 1 = 46$ $90 + 1 = 91$	<b>MA6: Number Bonds</b> $45 + 95 = 140$ $40 + 100 = 140$
<b>MC RaPa CoDa Numbo</b> <ul style="list-style-type: none"> <li>MA1 MC = Manipulate Calculation</li> <li>MA2 Ra = Round and Adjust</li> <li>MA3 Pa = Partitioning</li> <li>MA4 Co = Counting On</li> <li>MA5 Do = Double and Adjust</li> <li>MA6 Numbo = Number Bonds</li> </ul>	<b>MA1: Manipulate Calculation</b> $16 + 9 = 25$  $15 + 10$	<b>MA2: Round &amp; Adjust</b> $45 + 9 = 54$ 	<b>MA3: Partitioning</b> $43 + 21 = 64$ 	<b>MA4: Counting On</b> $45 + 20 = 65$ 		<b>MA5: Double &amp; Adjust</b> $7 + 8 = 15$ $7 + 8 = 7 + 7 + 1 = 14 + 1 = 15$	<b>MA6: Number Bonds</b> $3 + 4 + 7 = 14$ 
<h1>Y1</h1>	<b>MA1: Manipulate Calculation</b> $16 + 9 = 25$  $15 + 10 = 25$	<b>MA2: Round &amp; Adjust</b> $45 + 9 = 54$ $45 + 10 - 1 =$ $55 - 1 = 54$	<b>MA3: Partitioning</b> $8 + 6 = 14$ 	<b>MA4a: Counting On</b>  $8 + 6 = 14$	<b>MA4b: Counting On</b> $57 + 10 = 67$ 	<b>MA5: Double &amp; Adjust</b> $5 + 6 = 11$  $10 + 1 = 11$	<b>MA6: Number Bonds</b> $3 + 4 + 7 = 14$ 
<h1>Y2</h1>	<b>MA1: Manipulate Calculation</b> $45 + 19 = 64$  $44 + 20 = 64$	<b>MA2: Round &amp; Adjust</b> $45 + 19 = 64$ $45 + 20 - 1$ $65 - 1 = 64$	<b>MA3: Partitioning</b> $43 + 21 = 64$ 	<b>MA4a: Counting On</b>  $78 + 7 = 85$	<b>MA4b: Counting On</b> $58 + 40 = 98$ 	<b>MA5: Double &amp; Adjust</b> $7 + 8 = 15$  $14 + 1 = 15$	<b>MA6: Number Bonds</b> $13 + 4 + 7 + 16 = 40$ 
<h1>Y3</h1>	<b>MA1: Manipulate Calculation</b> $45 + 97 = 142$  $42 + 100 = 142$	<b>MA2: Round &amp; Adjust</b> $45 + 97 = 142$ $45 + 100 - 3$ $145 - 3 = 142$	<b>MA1: Partitioning</b> $57 + 25 = 82$ 	<b>MA4a: Counting On</b>  $85 + 50 = 135$	<b>MA4b: Counting On</b> $534 + 300 = 834$ 	<b>MA5: Double &amp; Adjust</b> $16 + 17 = 33$  $32 + 1 = 33$	<b>MA6: Number Bonds</b> $42 + 16 + 28 + 54 = 140$ 
<h1>Y4</h1>	<b>MA1: Manipulate Calculation</b> $345 + 298 = 643$  $343 + 300 = 643$	<b>MA2: Round &amp; Adjust</b> $345 + 298 = 643$ $345 + 300 - 2$ $645 - 2 = 643$	<b>MA1: Partitioning</b> $648 + 231 = 879$ 	<b>MA4a: Counting On</b>  $784 + 60 = 844$	<b>MA4b: Counting On</b> $4837 + 3000 = 7837$ 	<b>MA5: Double &amp; Adjust</b> $37 + 38 = 75$  $74 + 1 = 75$	<b>MA6: Number Bonds</b> $342 + 16 + 28 + 114 = 50$ 
<h1>Y5</h1>	<b>MA1: Manipulate Calculation</b> $4645 + 1996 = 6641$  $4641 + 2000 = 6641$	<b>MA2: Round &amp; Adjust</b> $4645 + 1996 = 6641$ $4645 + 2000 - 4$ $6645 - 4 = 6641$	<b>MA3: Partitioning</b> $576 + 258 = 834$ 	<b>MA4a: Counting On</b>  $837 + 500 = 1337$	<b>MA4b: Counting On</b> $7583 + 5000 = 12583$ 	<b>MA5: Double &amp; Adjust</b> $125 + 127 = 252$  $250 + 2 = 252$	<b>MA6: Number Bonds</b> $£4.56 + £3.27 + £1.44 = £9.27$ 
<h1>Y6</h1>	<b>MA1: Manipulate Calculation</b> $45.2 + 49.9 = 95.1$  $45.1 + 50 = 95.1$	<b>MA2: Round &amp; Adjust</b> $45.2 + 49.9 = 95.1$ $45.2 + 50 - 0.1$ $95.2 - 0.1 = 95.1$	<b>MA3: Partitioning</b> $4.73 + 2.21 = 6.94$ 	<b>MA4a: Counting On</b>  $6.7 + 0.8 = 7.5$	<b>MA4b: Counting On</b> $5,763,947 + 4,000,000 = 9,763,947$ 	<b>MA5: Double &amp; Adjust</b> $4.5 + 4.7 = 9.2$  $9 + 0.2 = 9.2$	<b>MA6: Number Bonds</b> $24.25 + 31.63 + 21.75 = 77.63$ 



# MC RaPa CoOCoB NumFa

69 **MS1** **MC** = **Manipulate Calculation**

77 **MS2** **Ra** = **Round and Adjust**

85 **MS3** **Pa** = **Partitioning**

91 **MS4** **CoO** = **Counting On**

108 **MS5** **CoB** = **Counting Back**

123 **MS6** **NumFa** = **Number Facts**



## 6 Cool Strategies for Mental Subtraction!



# MS

<b>MS1: Manipulate Calculation</b> $84 - 29 = 55$ $85 - 30 = 55$	<b>MA2: Round &amp; Adjust</b> $84 - 29 = 55$ $84 - 30 + 1 = 55$	<b>MS3: Partitioning</b> $63 - 35 = 28$ 63, 30, 28	<b>MS4a: Counting On</b> $61 - 58 = 3$	<b>MS4b: Counting On</b> $40 - 28 = 12$	<b>MS5a: Counting Back</b> $68 - 20 = 48$	<b>MS5b: Counting Back</b> $86 - 12 = 74$	<b>MS6: Number Facts</b> $61 - 41 = 20$ $41 + 20 = 61$
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**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

5 Cool Strategies for Mental Subtraction!

<b>MS1: Manipulate Calculation</b> $24 - 9 = 15$ $24 - 9 = 25 - 10$	<b>MA2: Round &amp; Adjust</b> $24 - 9 = 15$	<b>MS3: Partitioning</b> $63 - 35 = 28$ 28, 30, 63	<b>MS4a: Counting On</b> $12 - 9 = 3$	<b>MS4b: Counting On</b> $40 - 28 = 12$	<b>MS5a: Counting Back</b> $68 - 20 = 48$	<b>MS5b: Counting Back</b> $86 - 12 = 74$	<b>MS6: Number Facts</b> $61 - 41 = 20$ $41 + 20 = 61$
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# Y1

<b>MS1: Manipulate Calculation</b> $24 - 9 = 15$ $25 - 10 = 15$	<b>MA2: Round &amp; Adjust</b> $24 - 9 = 15$ $24 - 10 + 1 = 15$	<b>MS3: Partitioning</b> $23 - 8 = 15$ 23, 20, 15	<b>MS4a: Counting On</b> $12 - 9 = 3$	<b>MS5a: Counting Back</b> $15 - 4 = 11$	<b>MS6: Number Facts</b> $19 - 9 = 10$ $9 + 10 = 19$
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# Y2

<b>MS1: Manipulate Calculation</b> $84 - 29 = 55$ $85 - 30 = 55$	<b>MA2: Round &amp; Adjust</b> $84 - 29 = 55$ $84 - 30 + 1 = 55$	<b>MS3: Partitioning</b> $63 - 35 = 28$ 63, 30, 28	<b>MS4a: Counting On</b> $61 - 58 = 3$	<b>MS4b: Counting On</b> $40 - 28 = 12$	<b>MS5a: Counting Back</b> $68 - 20 = 48$	<b>MS5b: Counting Back</b> $86 - 12 = 74$	<b>MS6: Number Facts</b> $61 - 41 = 20$ $41 + 20 = 61$
--	--	--	---	--	--	--	--

# Y3

<b>MS1: Manipulate Calculation</b> $463 - 97 = 366$ $466 - 100 = 366$	<b>MA2: Round &amp; Adjust</b> $463 - 97 = 366$ $463 - 100 + 3 = 366$	<b>MS3: Partitioning</b> $123 - 28 = 95$ 123, 100, 95	<b>MS4a: Counting On</b> $302 - 297 = 5$	<b>MS4b: Counting On</b> $61 - 37 = 24$	<b>MS5a: Counting Back</b> $378 - 50 = 328$	<b>MS5b: Counting Back</b> $89 - 34 = 55$	<b>MS6: Number Facts</b> $123 - 83 = 40$ $83 + 40 = 123$
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# Y4

<b>MS1: Manipulate Calculation</b> $876 - 298 = 578$ $878 - 300 = 578$	<b>MA2: Round &amp; Adjust</b> $876 - 298 = 578$ $876 - 300 + 2 = 578$	<b>MS3: Partitioning</b> $132 - 58 = 74$ 132, 80, 74	<b>MS4a: Counting On</b> $1003 - 998 = 5$	<b>MS4b: Counting On</b> $324 - 280 = 44$	<b>MS5a: Counting Back</b> $768 - 200 = 568$	<b>MS5b: Counting Back</b> $578 - 45 = 533$	<b>MS6: Number Facts</b> $847 - 447 = 400$ $447 + 400 = 847$
--	--	--	--	--	---	--	--

# Y5

<b>MS1: Manipulate Calculation</b> $5864 - 2996 = 2868$ $5868 - 3000 = 2868$	<b>MA2: Round &amp; Adjust</b> $5864 - 2996 = 2868$ $5864 - 3000 + 4 = 2868$	<b>MS3: Partitioning</b> $750 - 372 = 378$ 750, 400, 378	<b>MS4a: Counting On</b> $8.3 - 7.9 = 0.4$	<b>MS4b: Counting On</b> $1204 - 950 = 254$	<b>MS5a: Counting Back</b> $7291 - 2000 = 5291$	<b>MS5b: Counting Back</b> $8.6 - 4.1 = 4.5$	<b>MS6: Number Facts</b> $1424 - 724 = 700$ $724 + 700 = 1424$
--	--	--	---	--	--	---	--

# Y6

<b>MS1: Manipulate Calculation</b> $46357 - 11999 = 34358$ $46358 - 12000 = 34358$	<b>MA2: Round &amp; Adjust</b> $46357 - 11999 = 34358$ $46357 - 12000 + 1 = 34358$	<b>MS3: Partitioning</b> $€64.30 - €24.50 = €39.80$ €64.30, €40, €39.80	<b>MS4a: Counting On</b> $€12.02 - €11.98 = 4p$	<b>MS4b: Counting On</b> $12.4 - 9.8 = 2.6$	<b>MS5a: Counting Back</b> $86374 - 20000 = 66374$	<b>MS5b: Counting Back</b> $€65.87 - €30.24 = €35.63$	<b>MS6: Number Facts</b> $13.2 - 9.2 = 4$ $9.2 + 4 = 13.2$
--	--	---	--	--	---	--	--





# Mental Multiplication

132	<b>MM1</b>	<b>Manipulate Calculation</b>
139	<b>MM2</b>	<b>Factorising</b>
146	<b>MM3</b>	<b>Re-ordering</b>
149	<b>MM4</b>	<b>Partitioning</b>
154	<b>MM5</b>	<b>Round &amp; Adjust</b>
158	<b>MM6</b>	<b>Doubling</b>
166	<b>MM7</b>	<b>Doubling Table Facts</b>
170	<b>MM8</b>	<b>Doubling Up</b>
173	<b>MM9</b>	<b>Multiply by ... then Halve</b>
175	<b>MM10</b>	<b>Jump</b>



## 10 Cool Strategies for Mental Multiplication



# MM

**MM1: Manipulate Calculation**

$$16 \times 3 = 48$$

$$\begin{array}{c} +2 \quad +2 \\ \times 2 \quad \times 2 \\ \hline 8 \times 6 = 48 \end{array}$$

**MM2: Factorising**

$$16 \times 3 = 48$$

$$(8 \times 2 \times 3)$$

$$8 \times 6 = 48$$

**MM3: Re-ordering**

$$(9 \times 2) \times 5 = 90$$

$$18 \times 5 = 90$$

$$(9 \times 5) \times 2 = 90$$

$$45 \times 2 = 90$$

$$(2 \times 5) \times 9 = 90$$

$$10 \times 9 = 90 *$$

**MM4: Partitioning**

$$15 \times 5 = 75$$

$$50 + 25 = 75$$

$$(10 \times 5) \quad (5 \times 5)$$

**MM5: Round & Adjust**

$$49 \times 3 = 147$$

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

$$150 - 3 = 147$$

**MM6: Doubling**

$$\text{Double } 17 = 34$$

$$20 + 14 = 34$$

**MM7: Doubling Table Facts**

$$8 \times 6 = 48$$

$$(4 \times 2)$$

$$4 \times 6 = 24$$

$$8 \times 6 = 48$$

$$\downarrow \times 2$$

**MM8: Doubling Up**

$$17 \times 4 = 68$$

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

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

**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

**MM1a: Manipulate Calculation**

$$27 \times 3 = 81$$

$$\begin{array}{c} +3 \quad +3 \\ \times 3 \quad \times 3 \\ \hline 9 \times 9 = 81 \end{array}$$

**MM2a: Factorising**

$$27 \times 3 = 81$$

$$(9 \times 3 \times 3)$$

$$9 \times 9 = 81$$

**MM3a: Re-ordering**

$$(7 \times 4) \times 5 = 140$$

$$28 \times 5 = 140$$

$$(7 \times 5) \times 4 = 140$$

$$35 \times 4 = 140$$

$$(4 \times 5) \times 7 = 140$$

$$20 \times 7 = 140 *$$

**MM4a: Partitioning**

$$37 \times 4 = 148$$

$$120 + 28 = 148$$

$$(30 \times 4) \quad (7 \times 4)$$

**MM5a: Round & Adjust**

$$198 \times 4 = 792$$

$$(200 \times 4) - (2 \times 4)$$

$$800 - 8 = 792$$

**MM6a: Doubling**

$$\text{Double } 37 = 74$$

$$60 + 14 = 74$$

**MM7a: Doubling Table Facts**

$$12 \times 7 = 84$$

$$(6 \times 2)$$

$$6 \times 7 = 42$$

$$12 \times 7 = 84$$

$$\downarrow \times 2$$

**MM8a: Doubling Up**

$$36 \times 8 = 288$$

$$\text{Double } 36 = 72 \quad (36 \times 2)$$

$$\text{Double } 72 = 144 \quad (36 \times 4)$$

$$\text{Double } 144 = 288 \quad (36 \times 8)$$

**MM1b: Manipulate Calculation**

$$45 \times 14 = 630$$

$$\begin{array}{c} \times 2 \quad \times 2 \\ \hline 90 \times 7 = 630 \end{array}$$

**MM2b: Factorising**

$$45 \times 14 = 630$$

$$(45 \times 2 \times 7)$$

$$90 \times 7 = 630$$

**MM3b: Re-ordering**

$$(9 \times 8) \times 6 = 432$$

$$72 \times 6 = 432$$

$$(9 \times 6) \times 8 = 432 *$$

$$54 \times 8 = 432 *$$

$$(8 \times 6) \times 9 = 432$$

$$48 \times 9 = 432$$

**MM4b: Partitioning**

$$126 \times 6 = 756$$

$$600 + 120 + 36 = 756$$

$$(100 \times 6) \quad (20 \times 6) \quad (6 \times 6)$$

**MM5b: Round & Adjust**

$$3.9 \times 5 = 19.5$$

$$(4 \times 5) - (0.1 \times 5)$$

$$20 - 0.5 = 19.5$$

**MM6b: Doubling**

$$\text{Double } 78 = 156$$

$$140 + 16 = 156$$

**MM7b: Doubling Table Facts**

$$16 \times 7 = 112$$

$$(8 \times 2)$$

$$8 \times 7 = 56$$

$$16 \times 7 = 112$$

$$\downarrow \times 2$$

**MM8b: Doubling Up**

$$125 \times 16 = 2000$$

$$\text{Double } 125 = 250 \quad (125 \times 2)$$

$$\text{Double } 250 = 500 \quad (125 \times 4)$$

$$\text{Double } 500 = 1000 \quad (125 \times 8)$$

$$\text{Double } 1000 = 2000 \quad (125 \times 16)$$

**MM1c: Manipulate Calculation**

$$36 \times 25 = 900$$

$$\begin{array}{c} +4 \quad +4 \\ \times 4 \quad \times 4 \\ \hline 9 \times 100 = 900 \end{array}$$

**MM2c: Factorising**

$$36 \times 25 = 900$$

$$(9 \times 4 \times 25)$$

$$9 \times 100 = 900$$

**MM4c: Partitioning**

$$4.3 \times 8 = 34.4$$

$$32 + 2.4 = 34.4$$

$$(4 \times 8) \quad (0.3 \times 8)$$

**MM5c: Round & Adjust**

$$£5.99 \times 6 = £35.94$$

$$(£6 \times 6) - (1p \times 6)$$

$$£36 - 6p = £35.94$$

**MM6c: Doubling**

$$\text{Double } 340 = 680$$

$$600 + 80 = 680$$

**MM7c: Doubling Table Facts**

$$22 \times 12 = 264$$

$$(11 \times 2)$$

$$11 \times 12 = 132$$

$$22 \times 12 = 264$$

$$\downarrow \times 2$$

**MM1d: Manipulate Calculation**

$$32 \times 15 = 480$$

$$\begin{array}{c} \times 5 \quad +5 \\ \hline 160 \times 3 = 480 \end{array}$$

**MM2d: Factorising**

$$32 \times 15 = 480$$

$$(32 \times 5 \times 3)$$

$$160 \times 3 = 480$$

**MM4d: Partitioning**

$$2.16 \times 3 = 6.48$$

$$6 + 0.3 + 0.18 = 6.48$$

$$(2 \times 3) \quad (0.1 \times 3) \quad (0.06 \times 3)$$

**MM6d: Doubling**

$$\text{Double } 480 = 960$$

$$800 + 160 = 960$$

**MM1e: Manipulate Calculation**

$$26 \times 32 = 832$$

$$\begin{array}{c} \times 4 \quad +4 \\ \hline 104 \times 8 = 832 \end{array}$$

**MM2e: Factorising**

$$26 \times 32 = 832$$

$$(26 \times 4 \times 8)$$

$$104 \times 8 = 832$$

**MM6e: Doubling**

$$\text{Double } 278 = 556$$

$$400 + 140 + 16 = 556$$

**MM1f: Manipulate Calculation**

$$52 \times 24 = 1248$$

$$\begin{array}{c} \times 4 \quad +4 \\ \hline 208 \times 6 = 1248 \end{array}$$

**MM2f: Factorising**

$$52 \times 24 = 1248$$

$$(52 \times 4 \times 6)$$

$$208 \times 6 = 1248$$

**MM6f: Doubling**

$$\text{Double } 768 = 1536$$

$$1400 + 120 + 16 = 1536$$

**MM9: Mult by ... then Halve**

$$86 \times 5 = 430$$

$$86 \times 10 = 860$$

$$860 \div 2 = 430$$

**MM10: Jump!**

$$\begin{array}{r} \times 100 \quad 1000 \quad 100 \quad 10 \quad 1 \\ \times 10 \quad 3400 \\ \times 10 \quad 340 \\ \times 10 \quad 34 \end{array}$$

**MM6g: Doubling**

$$\text{Double } 3.7 = 7.4$$

$$6 + 1.4 = 7.4$$

**MM9a: Mult by ... then Halve**

$$56 \times 25 = 1400$$

$$56 \times 100 = 5600$$

$$5600 \div 2 = 2800$$

$$2800 \div 2 = 1400$$

**MM10a: Jump!**

$$\begin{array}{r} \times 1000 \quad 63400 \\ \times 100 \quad 6340 \\ \times 10 \quad 634 \\ \times 10 \quad 63.4 \end{array}$$


# Progression Overviews

Sense of Number Written Strategies VCP © Sense of Number 2018




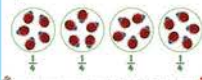
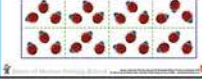
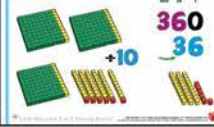

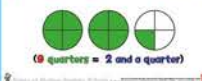

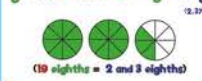

# Mental Division

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



## 7 Cool Strategies for Mental Division!



<h1>MD</h1>	<b>MD1: Manipulate Calculation</b> $140 \div 20$ $\begin{array}{l} +10 \\ +10 \end{array}$ $14 \div 2 = 7$	<b>MD2: Divide by 100 then Double</b> $800 \div 50 = 16$ $800 \div 100 = 8$ $8 \times 2 = 16$	<b>MD3: Halving</b> Half of 12 is equivalent to $12 \div 2$  $\frac{1}{2}$ of 12 = $12 \div 2$	<b>MD4: Halve &amp; Halve Again</b> $84 \div 4 = 21$ Half of 84 = 42 ( $84 \div 2$ ) Half of 42 = 21 ( $42 \div 2$ )	<b>MD5: Division as a Fraction</b> $\frac{1}{4}$ of 20 = $20 \div 4 = 5$ 	<b>MD6: Find the Hunk!</b> $72 \div 4 = 18$ $\begin{array}{l} 40 \\ +32 \end{array} \div 4$ $\begin{array}{l} 10 \\ +8 \end{array} = 18$	<b>MD7: Jump (+10)</b> $80$ $+10$ $8$	
<b>Mental Division</b> • 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!	<b>MD1a: Manipulate Calculation</b> $84 \div 12$ $\begin{array}{l} \div 2 \\ \div 2 \end{array}$ $42 \div 6 = 7$ $21 \div 3 = 7$	<b>MD2a: Divide by 100 then Double twice</b> $800 \div 25 = 32$ $800 \div 100 = 8$ $8 \times 2 = 16$ $16 \times 2 = 32$	<b>MD3a: Halving</b> Half of 26 $10 + 3 = 13$	<b>MD4a: Halve &amp; Halve Again</b> $128 \div 4 = 32$ Half of 128 = 64 ( $128 \div 2$ ) Half of 64 = 32 ( $64 \div 2$ )	<b>MD5a: Division as a Fraction</b> $\frac{1}{8}$ of 24 = $24 \div 8 = 3$ 	<b>MD6a: Find the Hunk!</b> $65 \div 4 = 16r1$ $\begin{array}{l} 40 \\ +25 \end{array} \div 4$ $\begin{array}{l} 10 \\ +6r1 \end{array} = 16r1$	<b>MD7a: Jump (+10)</b>  $360$ $+10$ $36$	
	<b>MD1b: Manipulate Calculation</b> $1200 \div 400$ $\begin{array}{l} +100 \\ +100 \end{array}$ $12 \div 4 = 3$		<b>MD3b: Halving</b> Half of 58 $25 + 4 = 29$	<b>MD4b: Halve, Halve, Halve</b> $360 \div 8 = 45$ Half of 360 = 180 ( $360 \div 2$ ) Half of 180 = 90 ( $180 \div 2$ ) Half of 90 = 45 ( $90 \div 2$ )	<b>MD5b: Division as a Fraction</b> $\frac{1}{4}$ of 3 = $3 \div 4 = \frac{3}{4}$ 	<b>MD6b: Find the Hunk!</b> $136 \div 4 = 34$ $\begin{array}{l} 120 \\ +16 \end{array} \div 4$ $\begin{array}{l} 30 \\ +4 \end{array} = 34$	<b>MD7a: Jump (+10)</b> $360$ $+10$ $36$	
	<b>MD1c: Manipulate Calculation</b> $162 \div 18$ $\begin{array}{l} \div 2 \\ \div 2 \end{array}$ $81 \div 9 = 9$		<b>MD3c: Halving</b> Half of 92 $40 + 6 = 46$ Half of 92 $45 + 1 = 46$	<b>MD4c: Halve, Halve, Halve</b> $5000 \div 8 = 625$ Half of 5000 = 2500 ( $5000 \div 2$ ) Half of 2500 = 1250 ( $2500 \div 2$ ) Half of 1250 = 625 ( $1250 \div 2$ )	<b>MD5c: Division as a Fraction</b> $\frac{1}{4}$ of 9 = $9 \div 4 = 2\frac{1}{4}$ 	<b>MD6c: Find the Hunk!</b> $394 \div 6 = 65r4$ $\begin{array}{l} 360 \\ +34 \end{array} \div 6$ $\begin{array}{l} 60 \\ +5r4 \end{array} = 65r4$	<b>MD7b: Jump (+10/100)</b> $6300$ $+10$ $+100$ $630$ $63$	
	<b>MD1d: Manipulate Calculation</b> $18 \div 1.5$ $\begin{array}{l} \times 2 \\ \times 2 \end{array}$ $36 \div 3 = 12$		<b>MD3d: Halving</b> Half of 326 $160 + 3 = 163$ Half of 326 $150 + 10 + 3 = 163$		<b>MD5d: Division as a Fraction</b> $\frac{1}{5}$ of 17 = $17 \div 5 = 3\frac{2}{5}$ 	<b>MD6d: Find the Hunk!</b> $536 \div 4 = 134$ $\begin{array}{l} 400 \\ +120 \\ +16 \end{array} \div 4$ $\begin{array}{l} 100 \\ +30 \\ +4 \end{array} = 134$	<b>MD7c: Jump (+10/100/1000)</b> $634$ $+10$ $+100$ $+1000$ $63.4$ $6.34$ $0.634$	
	<b>MD1e: Manipulate Calculation</b> $9.3 \div 0.3$ $\begin{array}{l} \times 10 \\ \times 10 \end{array}$ $93 \div 3 = 31$		<b>MD3b: Halving</b> Half of 5.84 $2.5 + 0.4 + 0.02 = 2.92$		<b>MD5e: Division as a Fraction</b> $\frac{1}{8}$ of 19 = $19 \div 8 = 2\frac{3}{8}$ 	<b>MD6e: Find the Hunk!</b> $18 \div 1.5 = 12$ $\begin{array}{l} 15 \\ +3 \end{array} \div 1.5$ $\begin{array}{l} 10 \\ +2 \end{array} = 12$		
	<b>MD1f: Manipulate Calculation</b> $6.25 \div 0.25$ $\begin{array}{l} \times 4 \\ \times 4 \end{array}$ $25 \div 1 = 25$		<b>MD3f: Halving</b> Half of 34.72 = 17.36 $15 + 2 + 0.35 + 0.01$ Half of 34.72 $10 + 7 + 0.3 + 0.6$		<b>MD5f: Division as a Fraction</b> $\frac{1}{12}$ of 9 = $9 \div 12 = \frac{3}{4}$ 			



# Progression Overviews

Sense of Number Written Strategies VCP © Sense of Number 2018



# MC RaPa CoDa Numbo

- 14 **MA1** **MC** = **Manipulate Calculation**
- 22 **MA2** **Ra** = **Round and Adjust**
- 30 **MA3** **Pa** = **Partitioning**
- 38 **MA4** **Co** = **Counting On**
- 52 **MA5** **Da** = **Double and Adjust**
- 60 **MA6** **Numbo** = **Number Bonds**



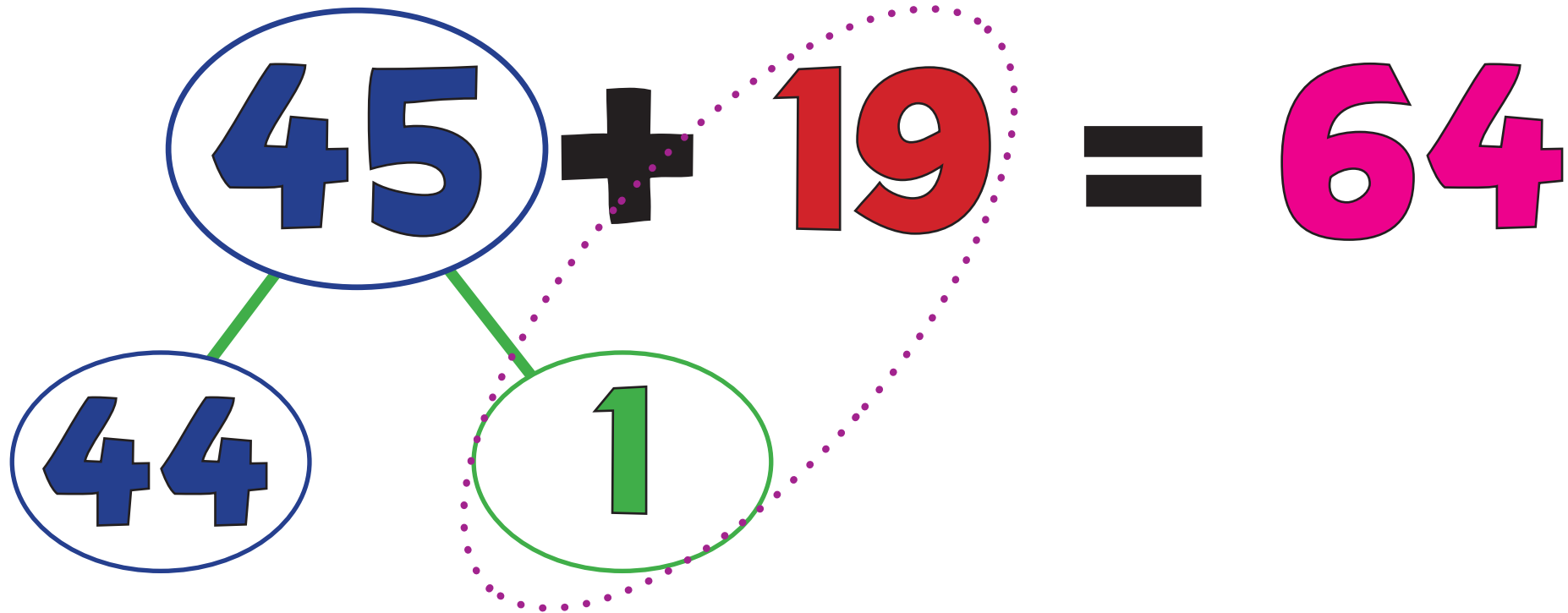
## 6 Cool Strategies for Mental Addition!



# MA1: Manipulate Calculation



MC RaPa CoDa Numbo



$$44 + 20 = 64$$

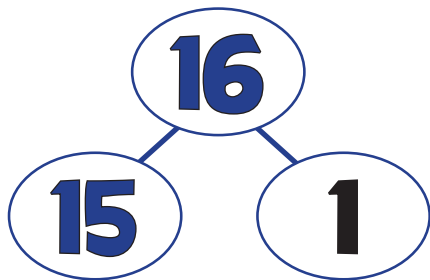
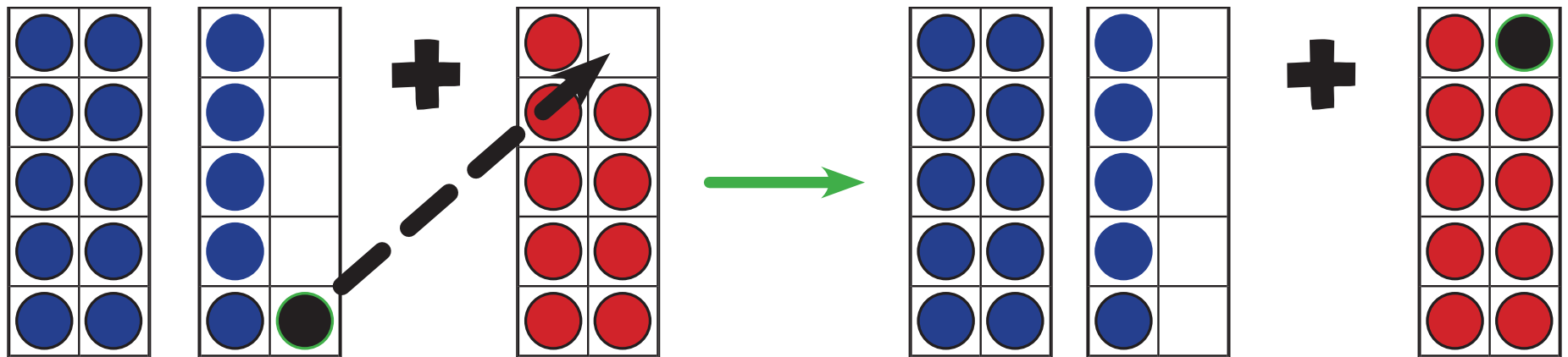


# MA1: Manipulate Calculation



MC RaPa CoDa Numbo  
Visualisation

$$16 + 9 = 25$$



$$9 + 1 = 10$$

$$15 + 10$$

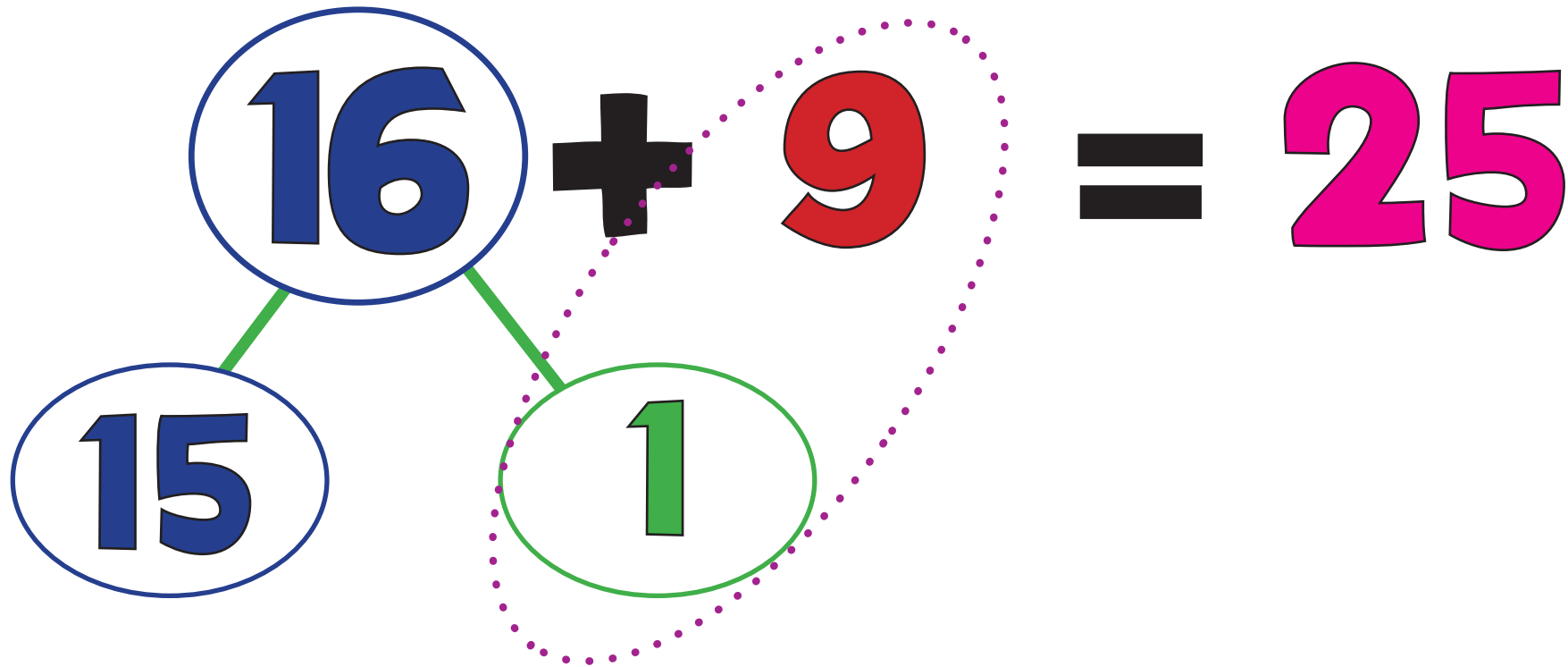


# MA1: Manipulate Calculation



MC RaPa CoDa Numbo

1



$$15 + 10 = 25$$



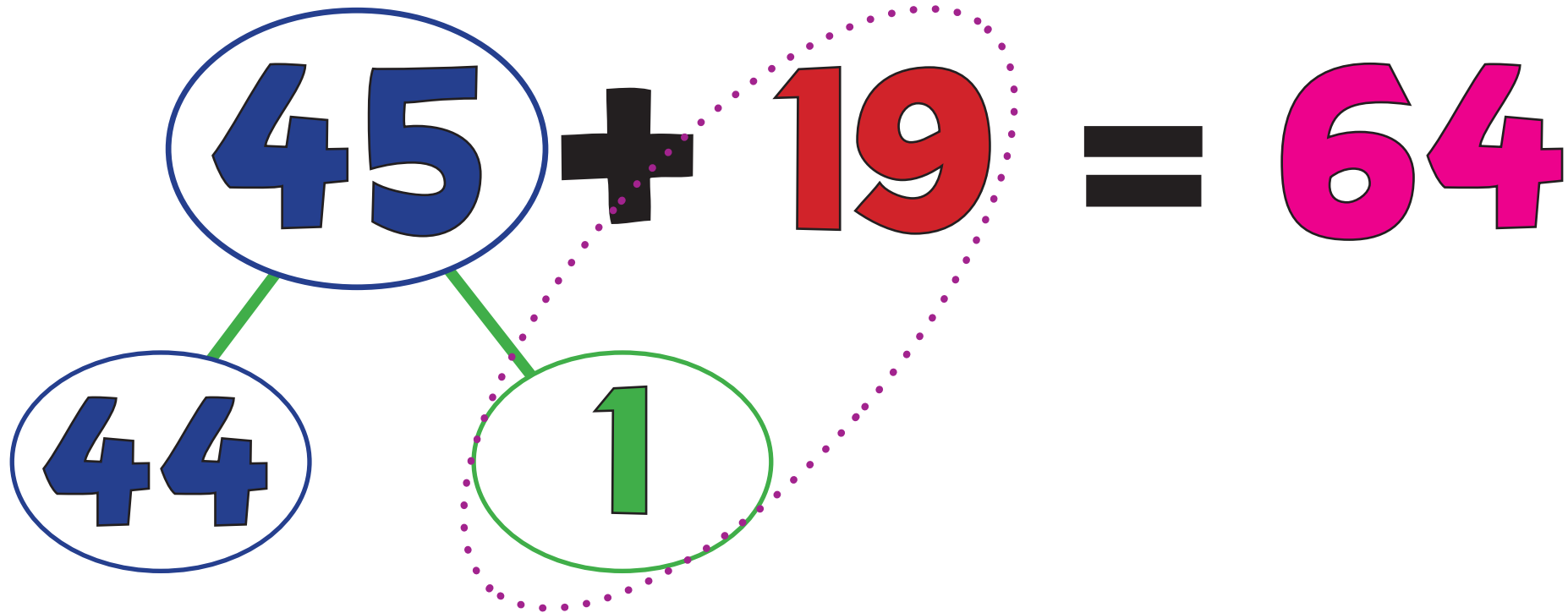


# MA1: Manipulate Calculation



MC RaPa CoDa Numbo

2



$$44 + 20 = 64$$

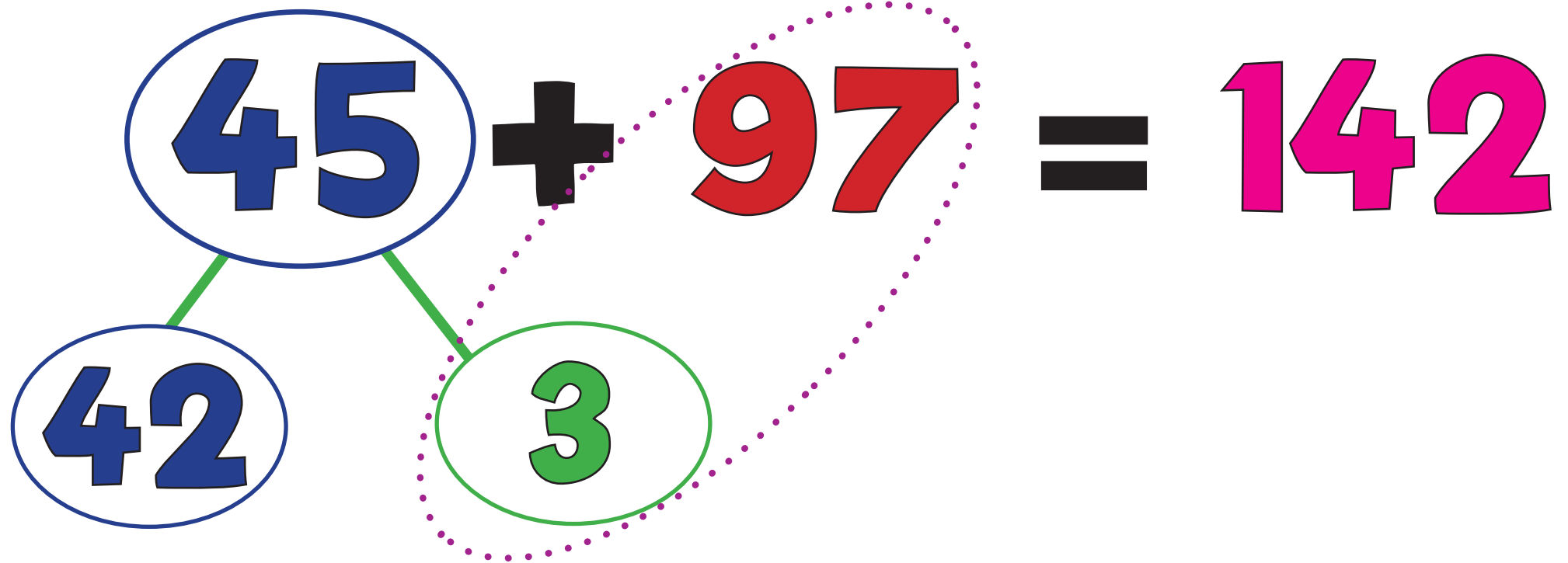


# MA1: Manipulate Calculation



MC RaPa CoDa Numbo

3



$$42 + 100 = 142$$



# MA1: Manipulate Calculation



MC RaPa CoDa Numbo

4

$$\begin{array}{c} \textcircled{345} + 298 = 643 \\ \swarrow \quad \searrow \\ \textcircled{343} \quad \textcircled{2} \end{array}$$

A dotted purple line connects the number 2 in the second row to the 8 in the first row, and another dotted purple line connects the 2 to the 5 in the first row, illustrating the adjustment of the second number to 300.

$$343 + 300 = 643$$



# MA1: Manipulate Calculation



MC RaPa CoDa Numbo

5

$$4645 + 1996 = 6641$$



$$4641 + 2000 = 6641$$



# MA1: Manipulate Calculation



MC RaPa CoDa Numbo

6

$$45.2 + 49.9 = 95.1$$

$$45.1$$

$$0.1$$

$$45.1 + 50 = 95.1$$



# MA2: Round & Adjust



MC RaPa CoDa Numbo

$$45 + 39 = 84$$

$$45 + 40 - 1$$

Diagram showing the decomposition of 39 into 40 and -1. Red lines connect the 9 in 39 to the 0 in 40 and the -1, and the 4 in 39 to the 4 in 40.

$$85 - 1 = 84$$

Diagram showing the decomposition of 45 into 85 and -1. A blue line connects the 4 in 45 to the 8 in 85, and a red line connects the 5 in 45 to the 5 in 85.

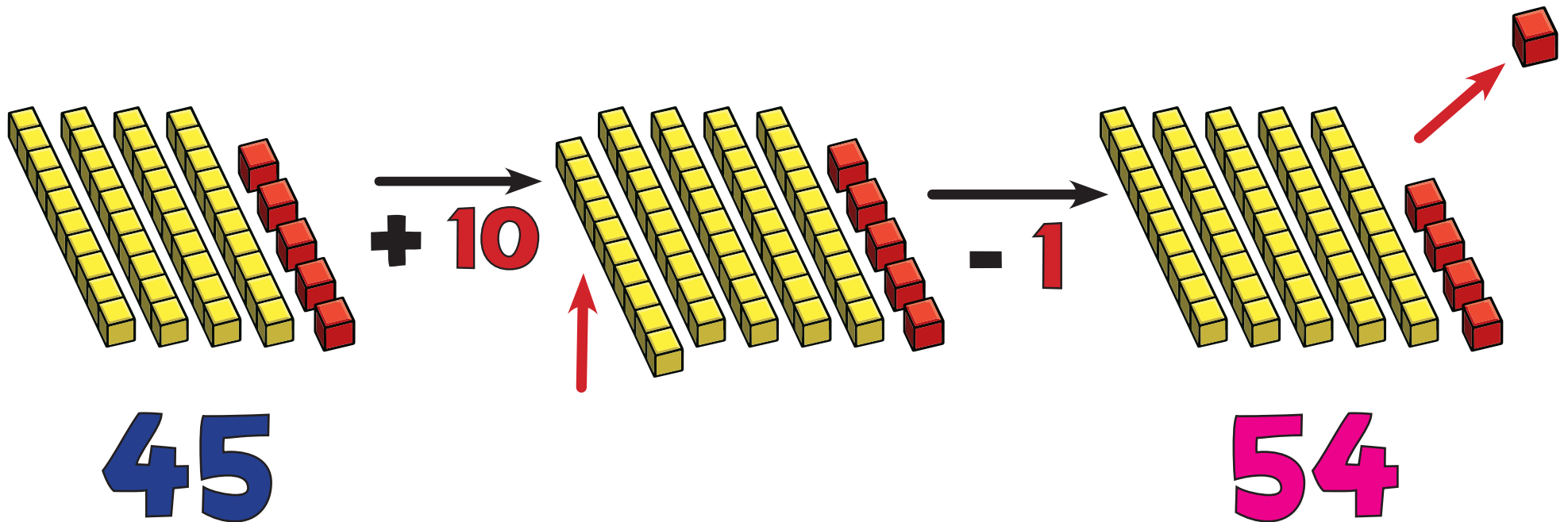


# MA2: Round & Adjust



MC RaPa CoDa Numbo  
Visualisation

$$45 + 9 = 54$$



# MA2: Round & Adjust



MC RaPa CoDa Numbo

1

$$45 + 9 = 54$$

$$45 + 10 - 1 =$$

$$55 - 1 = 54$$





# MA2: Round & Adjust



MC RaPa CoDa Numbo

2

$$45 + 19 = 64$$

$$45 + 20 - 1$$

$$65 - 1 = 64$$



# MA2: Round & Adjust



MC RaPa CoDa Numbo

3

$$45 + 97 = 142$$

$$45 + 100 - 3$$

$$145 - 3 = 142$$



# MA2: Round & Adjust



MC RaPa CoDa Numbo

4

$$345 + 298 = 643$$

$$345 + 300 - 2$$

$$645 - 2 = 643$$



# MA2: Round & Adjust



MC RaPa CoDa Numbo

5

$$4645 + 1996 = 6641$$

$$4645 + 2000 - 4$$

$$6645 - 4 = 6641$$



# MA2: Round & Adjust



MC RaPa CoDa Numbo

6

$$45.2 + 49.9 = 95.1$$

$$45.2 + 50 - 0.1$$

$$95.2 - 0.1 = 95.1$$



# MA3: Partitioning



MC RaPa CoDa Numbo

$$45 + 82 = 127$$

$$120 + 7 = 127$$



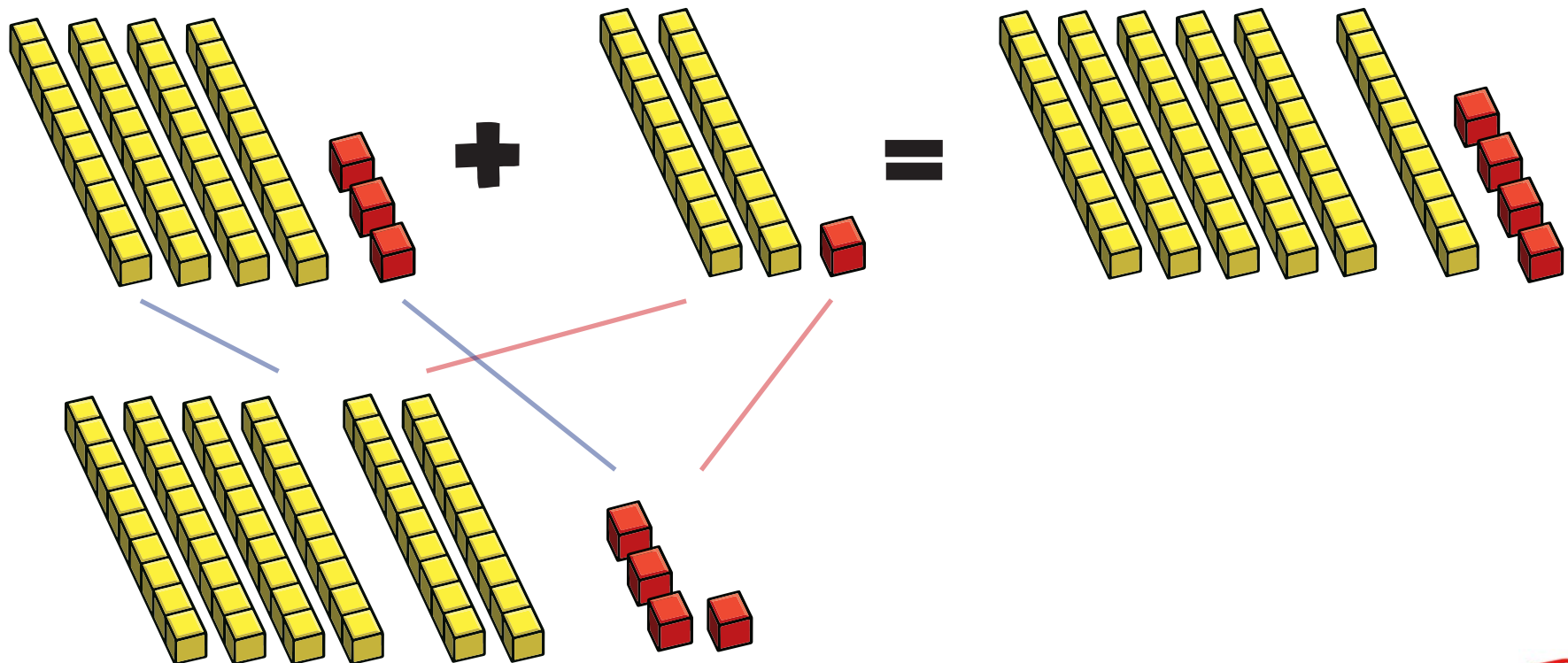
# MA3: Partitioning



MC RaPa CoDa Numbo  
Visualisation

Visualisation

$$43 + 21 = 64$$



# MA3: Partitioning



MC RaPa CoDa Numbo

1

$$8 + 6 = 14$$

$$8 + 2 + 4 = 14$$





# MA3: Partitioning



MC RaPa CoDa Numbo

2

$$43 + 21 = 64$$

$$60 + 4 = 64$$



# MA3: Partitioning



MC RaPa CoDa Numbo

3

$$57 + 25 = 82$$

$$70 + 12 = 82$$



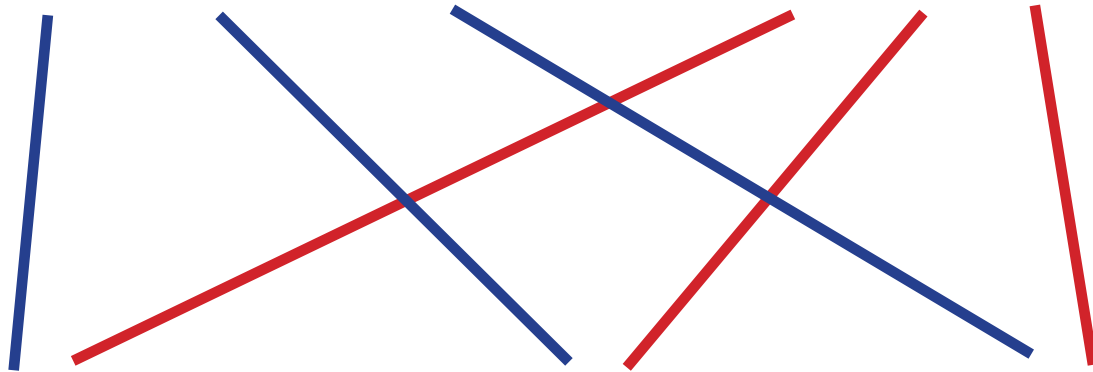
# MA3: Partitioning



MC RaPa CoDa Numbo

4

$$648 + 231 = 879$$



$$800 + 70 + 9 = 879$$



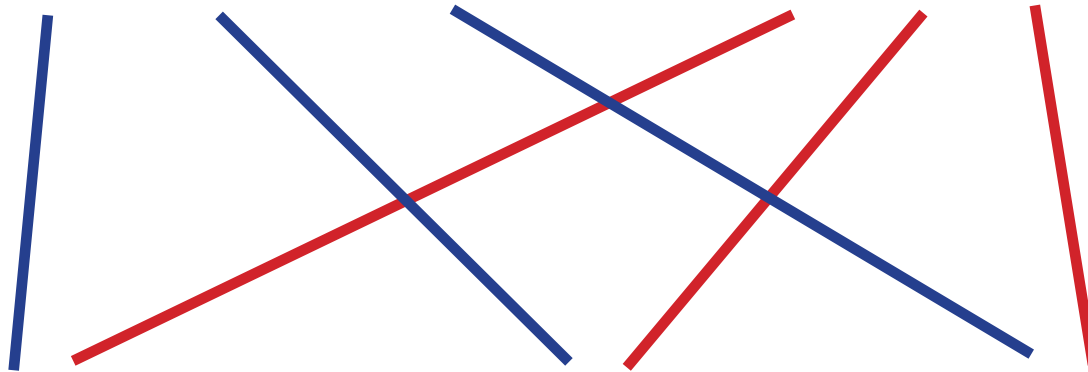
# MA3: Partitioning



MC RaPa CoDa Numbo

5

$$576 + 258 = 834$$



$$700 + 120 + 14 = 834$$



# MA3: Partitioning



MC RaPa CoDa Numbo

6

$$4.73 + 2.21 = 6.94$$

$$6 + 0.9 + 0.04 = 6.94$$

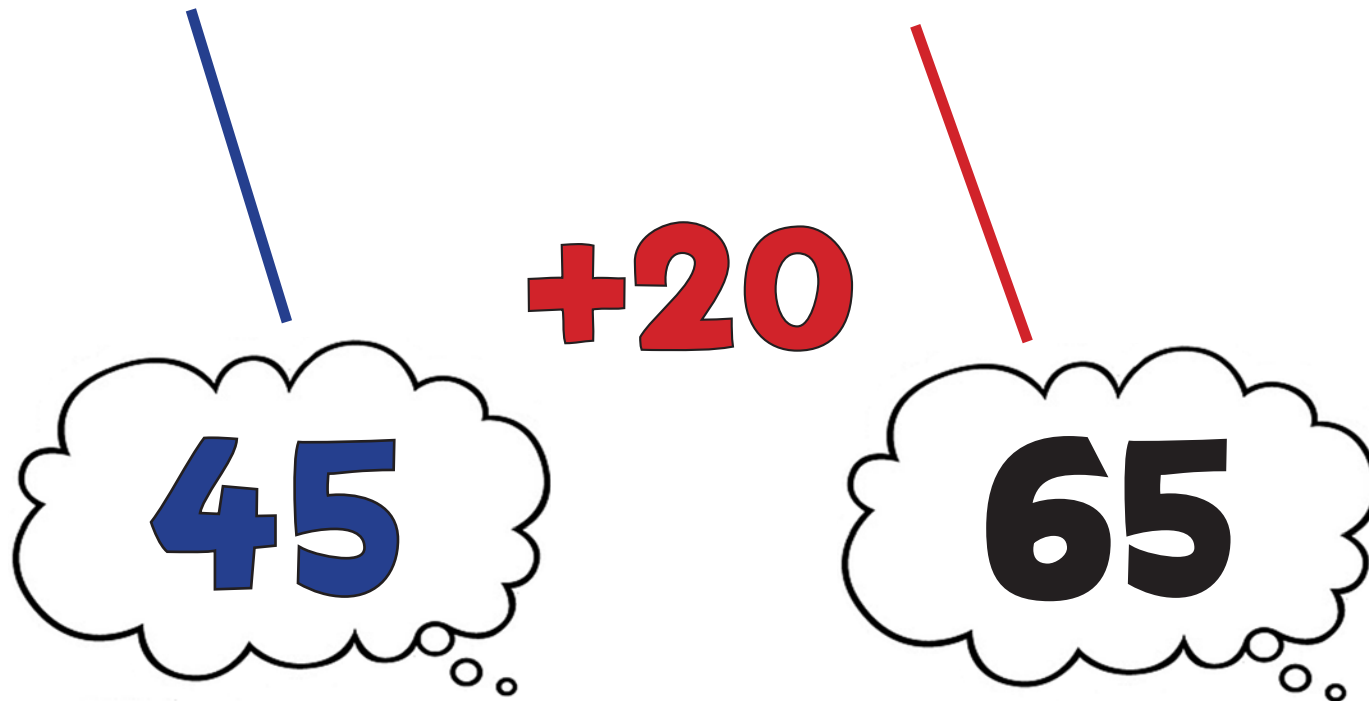


# MA4: Counting On



MC RaPa CoDa Numbo

$$45 + 20 = 65$$

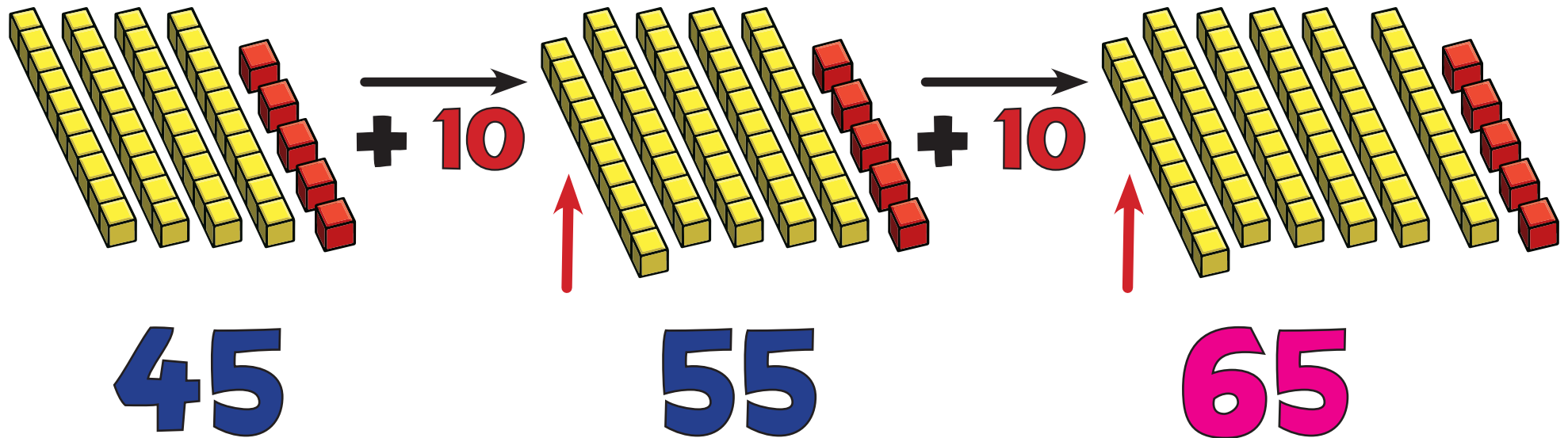


# MA4: Counting On



MC RaPa CoDa Numbo  
Visualisation

$$45 + 20 = 65$$



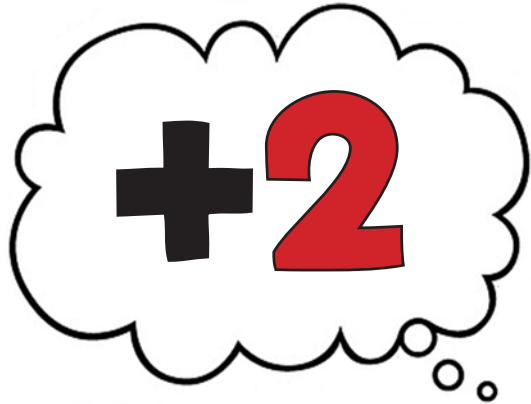
# MA4a: Counting On

Ones



MC RaPa CoDa Numbo

1



$$8 + 6 = 14$$





# MA4b: Counting On

Tens



MC RaPa CoDa Numbo

1

$$57 + 10 = 67$$



+10



# MA4a: Counting On

Ones



MC RaPa CoDa Numbo

2



$$78 + 7 = 85$$



# MA4b: Counting On

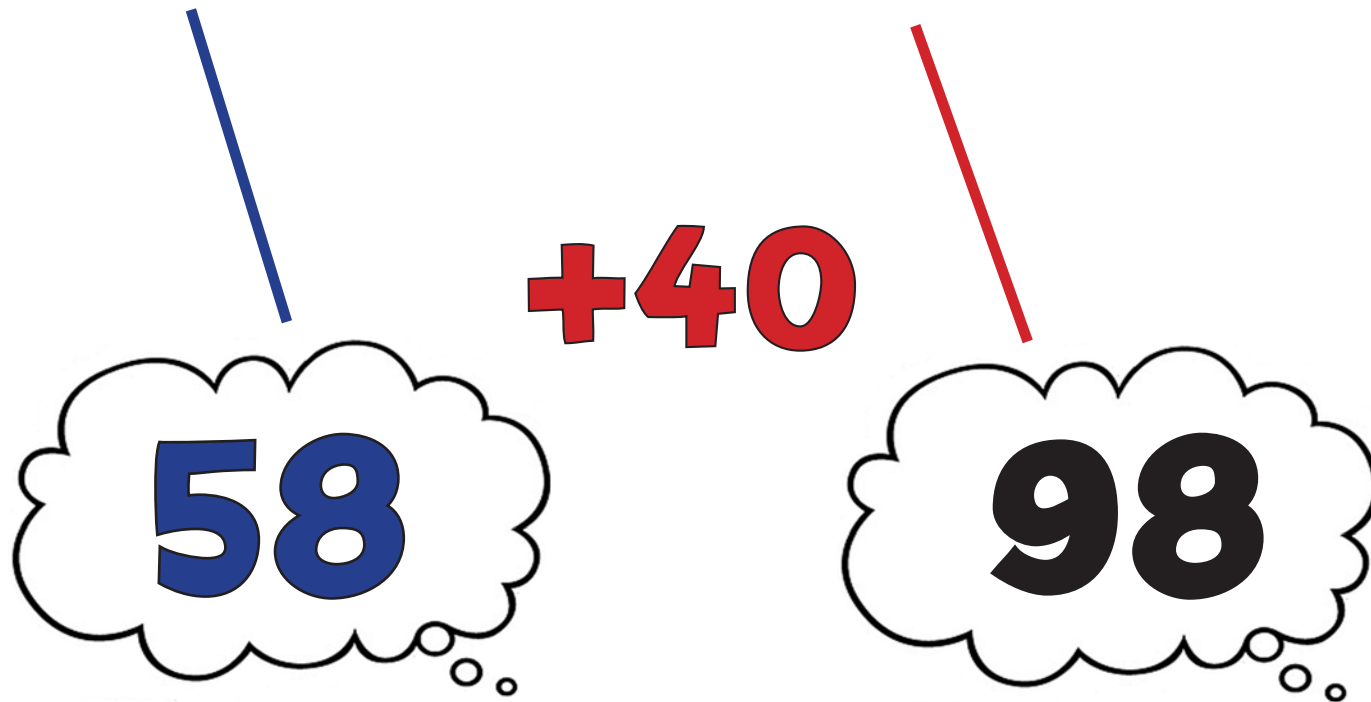
Tens



MC RaPa CoDa Numbo

2

$$58 + 40 = 98$$



# MA4a: Counting On



MC RaPa CoDa Numbo

3

Tens

+20

+30

$$85 + 50 = 135$$

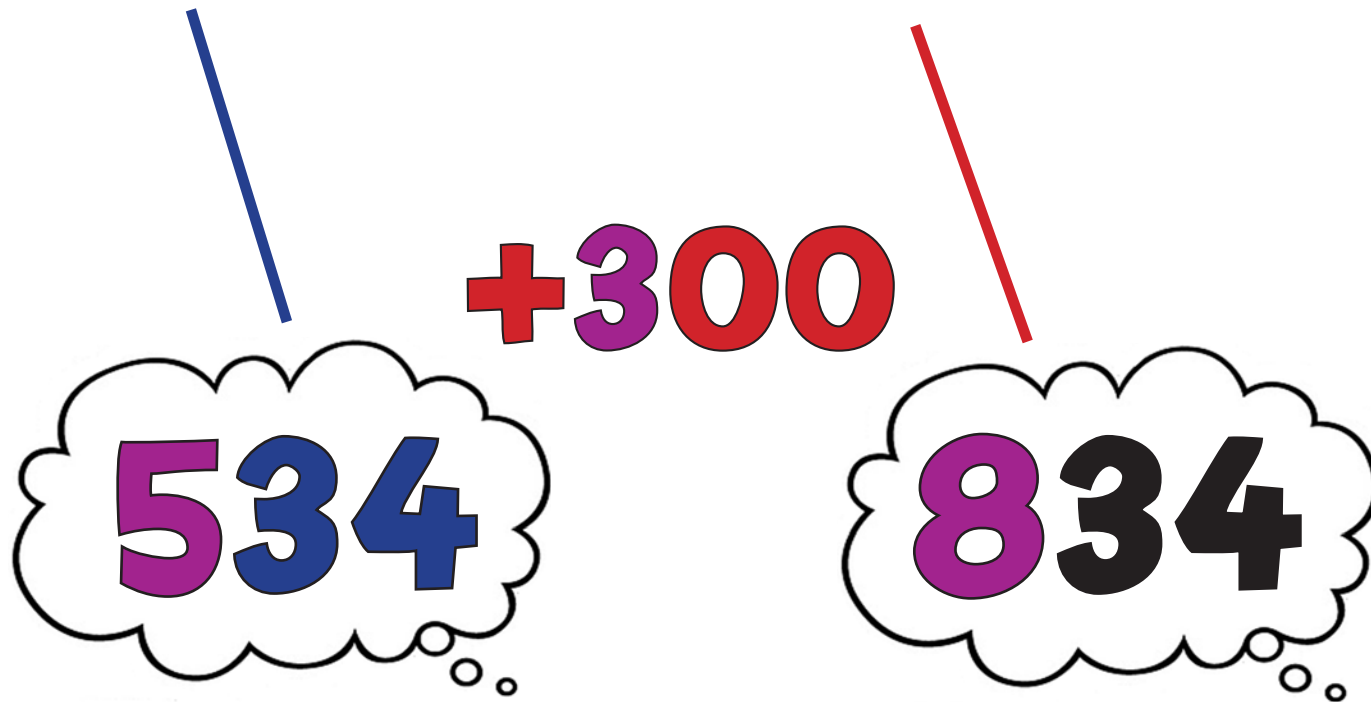


# MA4b: Counting On

MC RaPa CoDa Numbo  
3

Hundreds

$$534 + 300 = 834$$



# MA4a: Counting On



MC RaPa CoDa Numbo

4

Tens

+20

+40

$$784 + 60 = 844$$

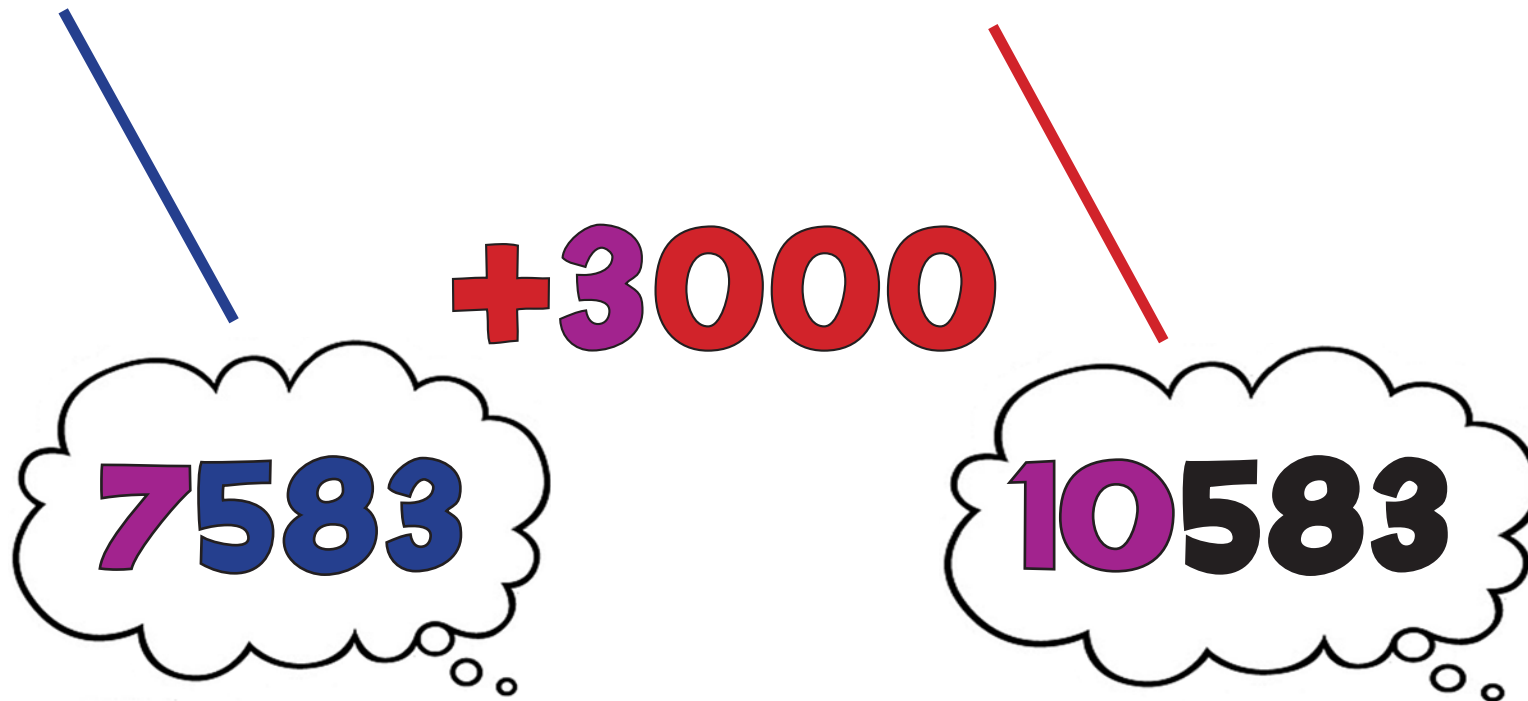


# MA4b: Counting On

MC RaPa CoDa Numbo  
4

Hundreds

$$7583 + 3000 = 10583$$



# MA4a: Counting On

MC RaPa CoDa Numbo  
5

Hundreds

+200

+300

$$837 + 500 = 1337$$





# MA4b: Counting On

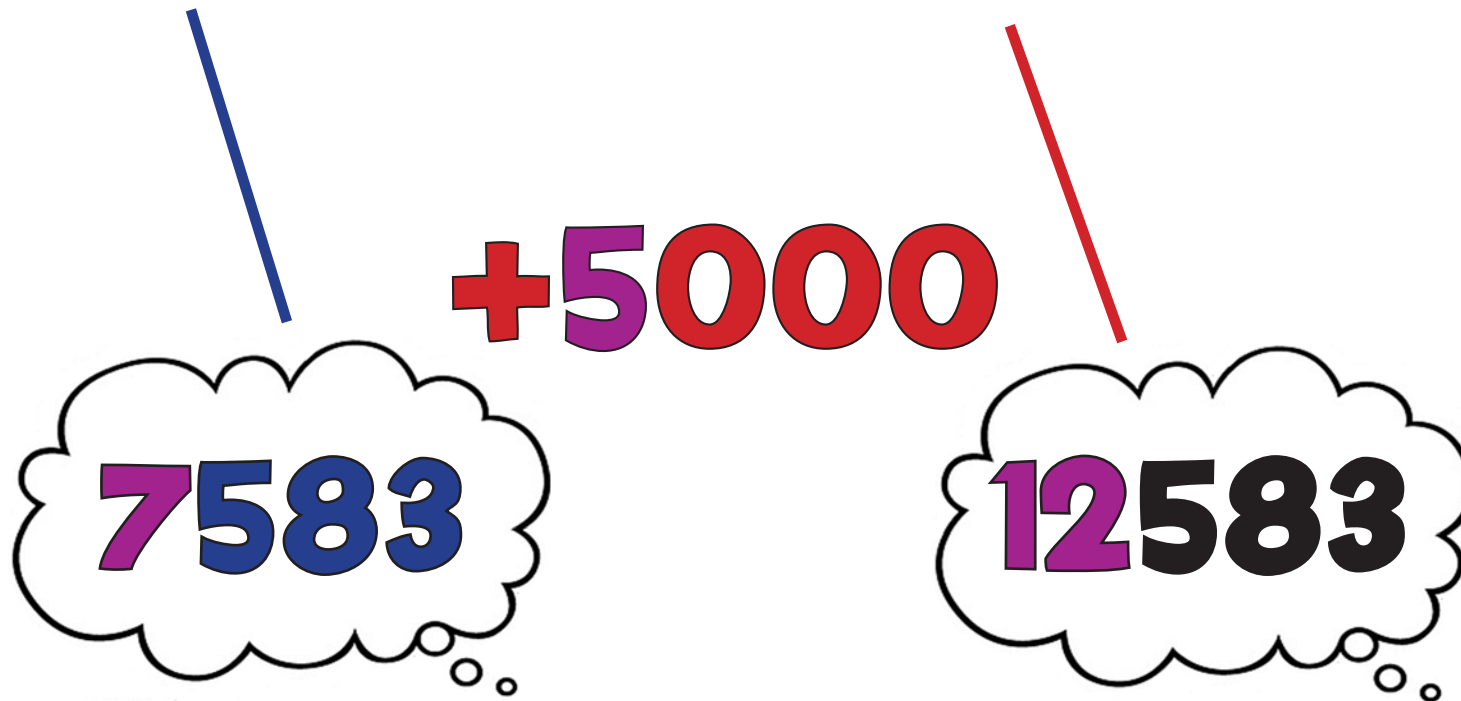
Thousands



MC RaPa CoDa Numbo

5

$$7583 + 5000 = 12583$$



# MA4a: Counting On



MC RaPa CoDa Numbo

6

Ten Thousands

+0.3

+0.5

$$6.7 + 0.8 = 7.5$$



# MA4b: Counting On

Millions



MC RaPa CoDa Numbo

6

$$5,763,947 + 4,000,000 = 9,763,947$$

+4,000,000

5,763,947

9,763,947



# MA5: Double & Adjust



MC RaPa CoDa Numbo

$$45 + 46 = 91$$

45

1

$$90 + 1 = 91$$

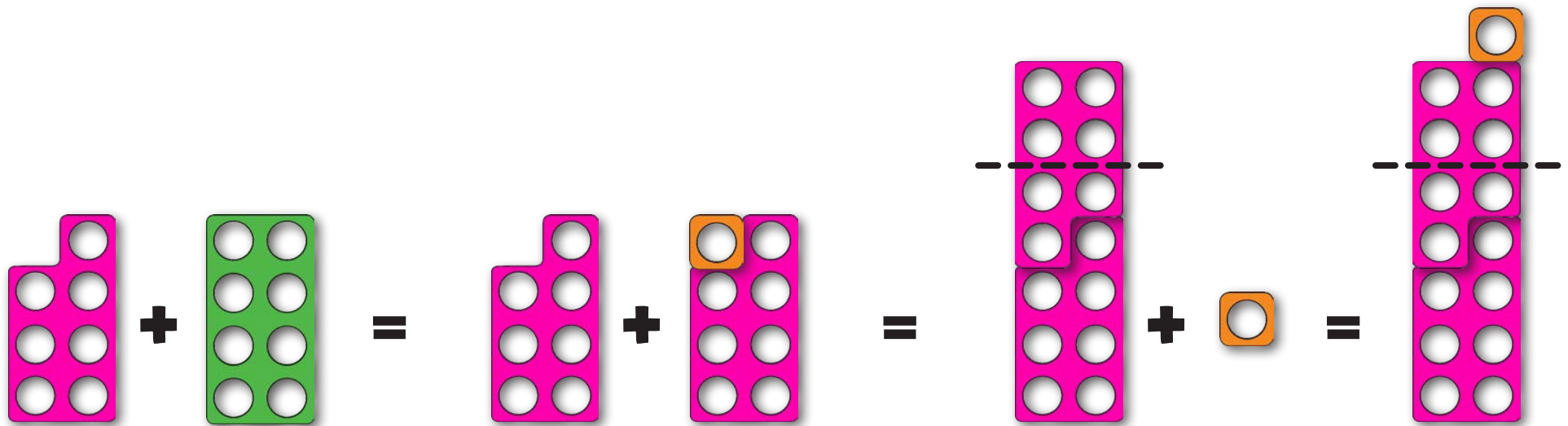


# MA5: Double & Adjust



MC RaPa CoDa Numbo  
Visualisation

$$7 + 8 = 15$$



$$7 + 8 = 7 + 7 + 1 = 14 + 1 = 15$$



# MA5: Double & Adjust



MC RaPa CoDa Numbo

1

$$5 + 6 = 11$$

A diagram illustrating the 'Double & Adjust' strategy. The number 5 is shown in blue. The number 6 is shown in red and circled. A dotted line connects the 5 to the 6, forming a path that loops around the 5 and then goes to the 6. Below the 6, the number 5 is circled in red, and the number 1 is circled in red. Lines connect the 6 to both the 5 and the 1, showing that 6 is composed of 5 and 1.

$$10 + 1 = 11$$

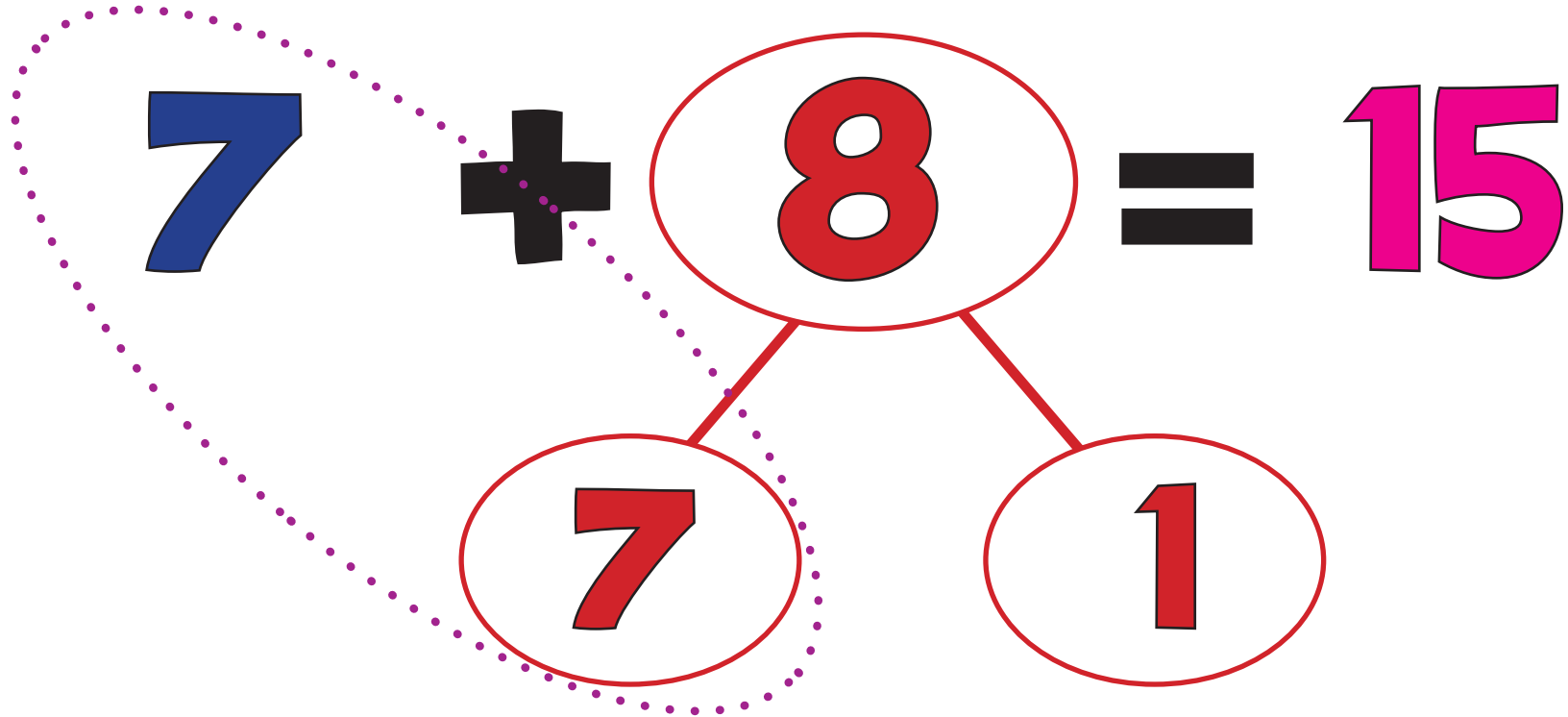


# MA5: Double & Adjust



MC RaPa CoDa Numbo

2



$$14 + 1 = 15$$

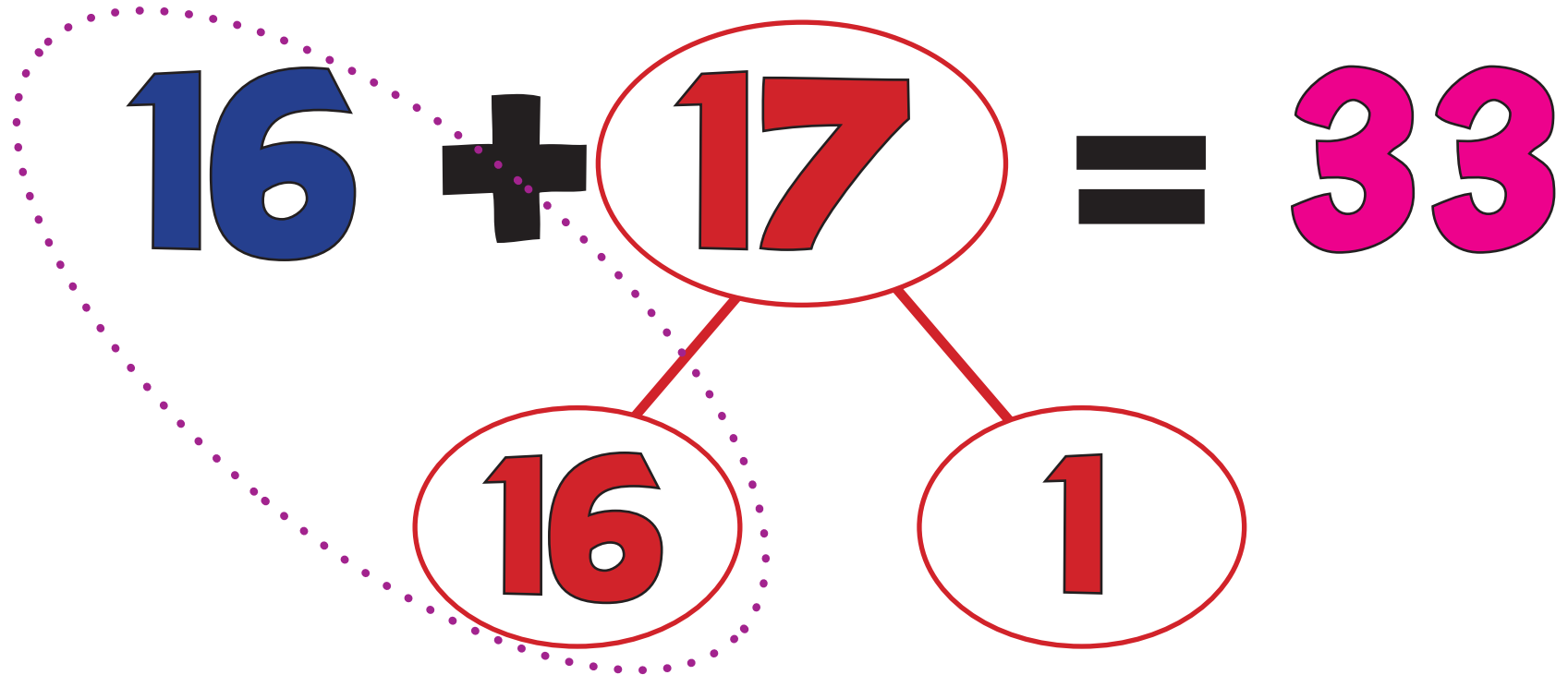


# MA5: Double & Adjust



MC RaPa CoDa Numbo

3



$$32 + 1 = 33$$





# MA5: Double & Adjust



MC RaPa CoDa Numbo

4

$$37 + 38 = 75$$

Diagram illustrating the decomposition of 38 into 37 and 1. A dotted line connects the 37 in the first equation to the 37 in the second equation. The 38 in the first equation is circled in red, and lines connect it to the 37 and 1 in the second equation, which are also circled in red.

$$74 + 1 = 75$$



# MA5: Double & Adjust



MC RaPa CoDa Numbo

5

$$125 + 127 = 252$$

125

2

$$250 + 2 = 252$$



# MA5: Double & Adjust



MC RaPa CoDa Numbo

6

$$4.5 + 4.7 = 9.2$$

4.5

0.2

$$9 + 0.2 = 9.2$$



# MA6: Number Bonds



MC RaPa CoDa Numbo

$$45 + 95 = 140$$

$$40 + 100 = 140$$

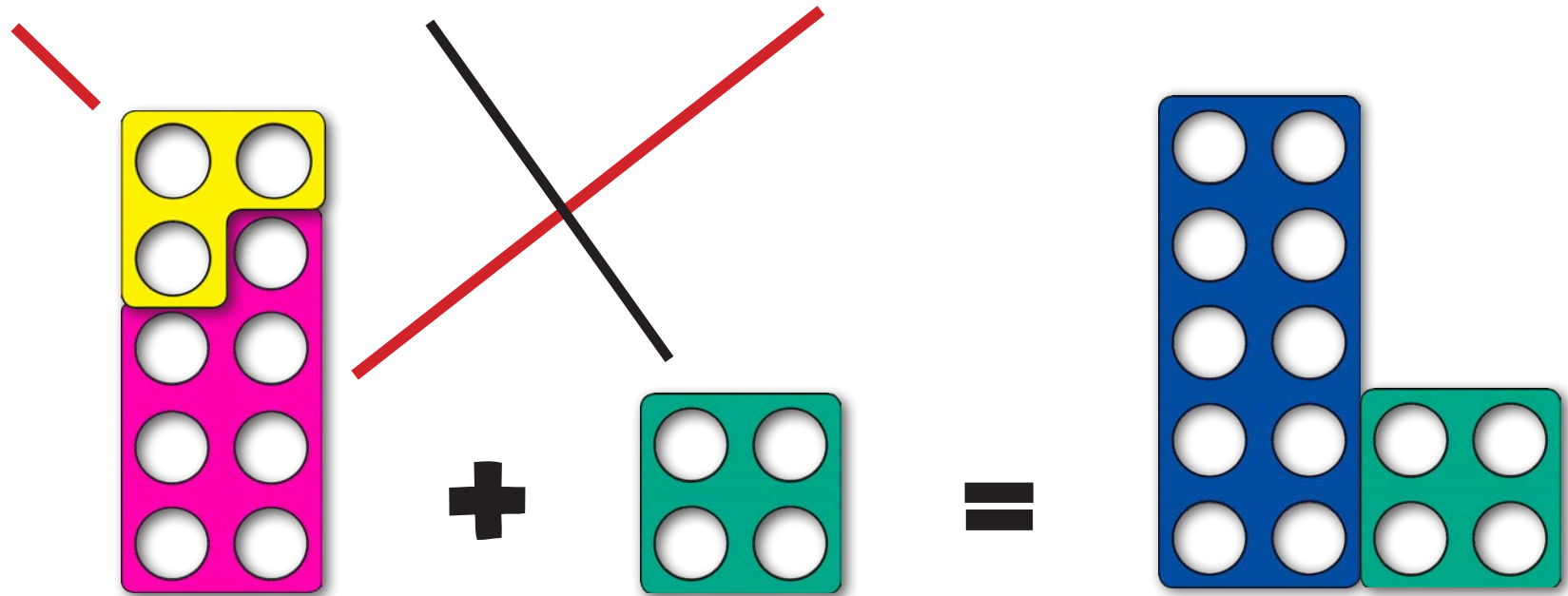


# MA6: Number Bonds



MC RaPa CoDa Numbo  
Visualisation

$$3 + 4 + 7 = 14$$



# MA6: Number Bonds

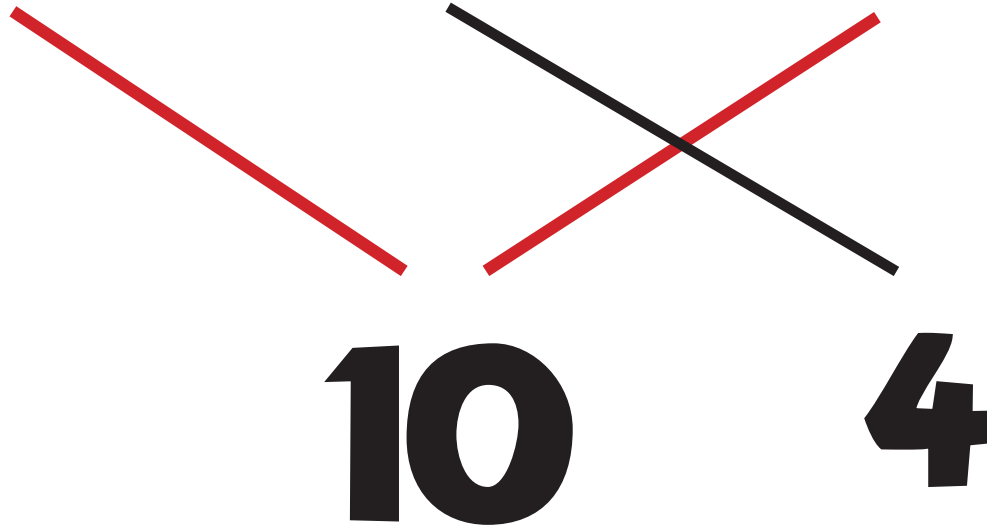


MC RaPa CoDa Numbo

1

Learn Bonds

$$3 + 4 + 7 = 14$$



# MA6: Number Bonds



MC RaPa CoDa Numbo

2

$$13 + 4 + 7 + 16 = 40$$

$$20 \quad 20$$



# MA6: Number Bonds



MC RaPa CoDa Numbo

3

$$42 + 16 + 28 + 54 = 140$$

$$70 \quad 70$$





# MA6: Number Bonds



MC RaPa CoDa Numbo

4

$$342 + 16 + 28 + 114 = 50$$



# MA6: Number Bonds



MC RaPa CoDa Numbo

5

$$£4.56 + £3.27 + £1.44 = £9.27$$

$$£6.00 \quad £3.27$$



# MA6: Number Bonds



MC RaPa CoDa Numbo

6

$$24.25 + 31.63 + 21.75 = 77.63$$

46

31.63



# MC RaPa CoOCoB NumFa

69 **MS1 MC = Manipulate Calculation**

77 **MS2 Ra = Round and Adjust**

85 **MS3 Pa = Partitioning**

91 **MS4 CoO = Counting On**

108 **MS5 CoB = Counting Back**

123 **MS6 NumFa = Number Facts**



## 6 Cool Strategies for Mental Subtraction!



# MS1: Manipulate Calculation



MC RaPa CoOCoB NumFa

$$84 - 29 = 55$$



$$85 - 30 = 55$$



# MS1: Manipulate Calculation



MC RaPa CoOCoB NumFa  
Visualisation

Same Difference!

$$24 - 9 = 15$$

+15



=

+15



9

24

10

25

$$24 - 9 = 25 - 10$$

$$(24 + 1) - (9 + 1)$$



# MS1: Manipulate Calculation

Same Difference!



MC RaPa CoOCob NumFa

1

$$24 - 9 = 15$$



$$25 - 10 = 15$$



# MS1: Manipulate Calculation

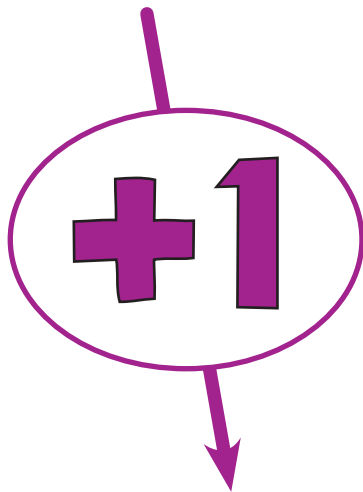


MC RaPa CoOCoB NumFa

2

Same Difference!

$$84 - 29 = 55$$



$$85 - 30 = 55$$





# MS1: Manipulate Calculation

Same Difference!



MC RaPa CoOCoB NumFa

3

$$463 - 97 = 366$$



$$466 - 100 = 366$$



# MS1: Manipulate Calculation

Same Difference!



MC RaPa CoOCoB NumFa

4

$$876 - 298 = 578$$



$$878 - 300 = 578$$



# MS1: Manipulate Calculation

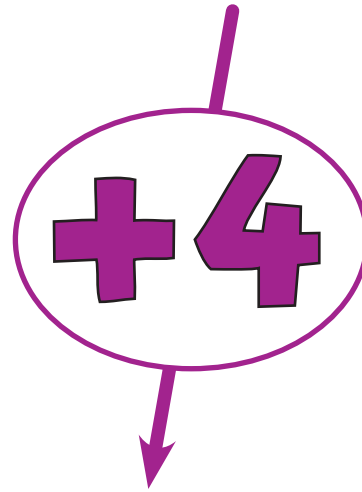
Same Difference!



MC RaPa CoOCoB NumFa

5

$$5864 - 2996 = 2868$$



$$5868 - 3000 = 2868$$



# MS1: Manipulate Calculation

Same Difference!



MC RaPa CoOCoB NumFa

6

$$46357 - 11999 = 34358$$



$$46358 - 12000 = 34358$$



# MS2: Round & Adjust



MC RaPa CoOCoB NumFa

$$84 - 29 = 55$$

$$84 - 30 + 1$$

$$54 + 1 = 55$$

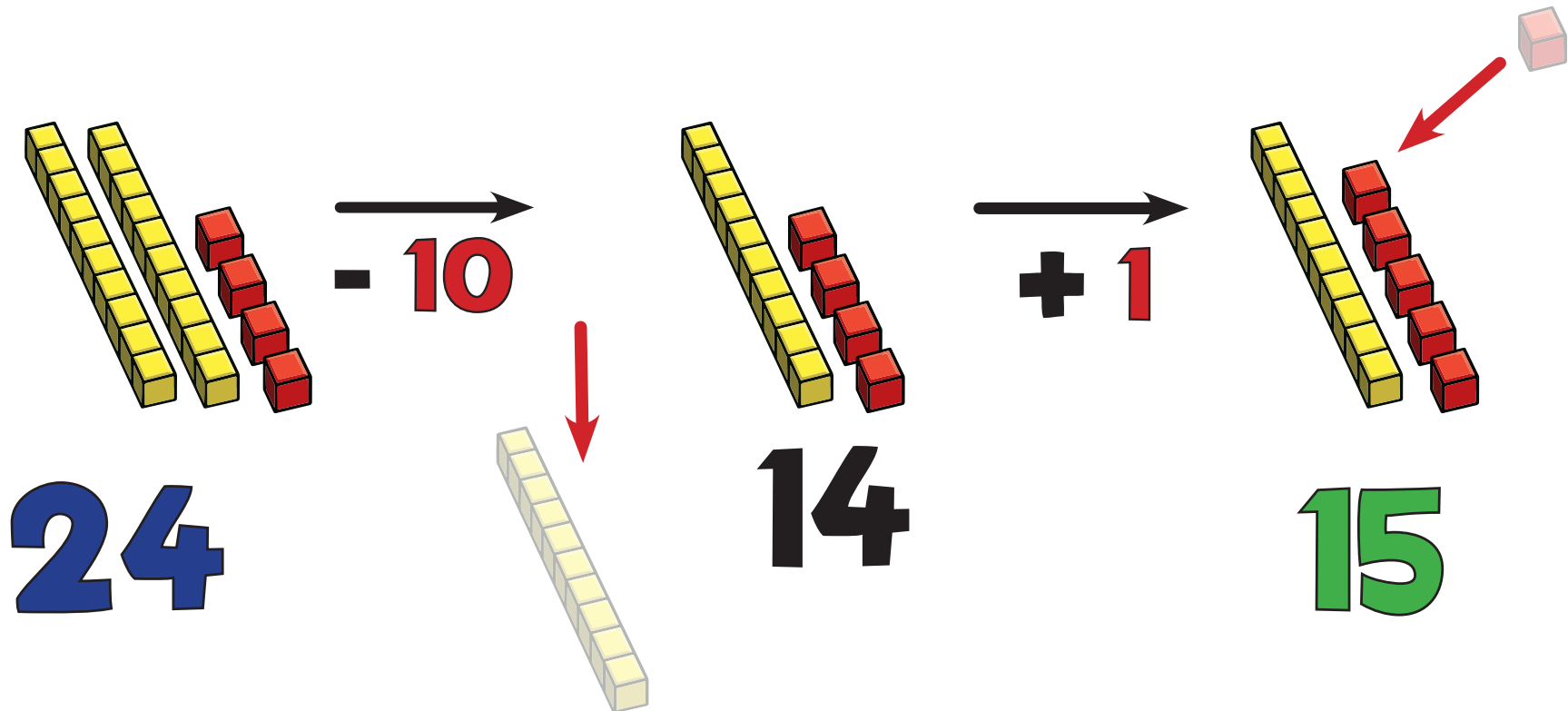


# MS2: Round & Adjust



MC RaPa CoOCoB NumFa  
Visualisation

$$24 - 9 = 15$$



# MS2: Round & Adjust



MC RaPa CoOCoB NumFa

1

$$24 - 9 = 15$$

$$24 - 10 + 1$$

$$14 + 1 = 15$$



# MS2: Round & Adjust



MC RaPa CoOCoB NumFa

2

$$84 - 29 = 55$$

$$84 - 30 + 1$$

$$54 + 1 = 55$$





# MS2: Round & Adjust



MC RaPa CoOCoB NumFa

3

$$463 - 97 = 366$$

$$463 - 100 + 3$$

Diagram illustrating the mental strategy: A blue line connects the 4 in 463 to the 3 in 363. Two red lines connect the 0 in 100 to the 6 in 463 and the 3 in 363.

$$363 + 3 = 366$$



# MA2: Round & Adjust



MC RaPa CoOCoB NumFa

4

$$876 - 298 = 578$$

$$876 - 300 + 2$$

$$576 + 2 = 578$$



# MA2: Round & Adjust



MC RaPa CoOCoB NumFa

5

$$5864 - 2996 = 2868$$

$$5864 - 3000 + 4$$

$$2864 + 4 = 2868$$



# MS2: Round & Adjust



MC RaPa CoOCoB NumFa

6

$$46357 - 11999 = 34358$$

$$46357 - 12000 + 1$$

$$46357 + 1 = 34358$$



# MS3: Partitioning



MC RaPa CoOCoB NumFa

$$63 - 35 = 28$$

$$- 33 - 2$$



# MS3: Partitioning



MC RaPa CoOCOB NumFa  
Visualisation

$$63 - 35 = 28$$

$$\begin{array}{ccc} 28 & 30 & 63 \\ \hline \end{array}$$



# MS3: Partitioning



MC RaPa CoOCoB NumFa

1

$$23 - 8 = 15$$

$$- 3 - 5$$

23

20

15



# MS3: Partitioning



MC RaPa CoOCoB NumFa

2

$$63 - 35 = 28$$

$$- 33 - 2$$





# MS3: Partitioning



MC RaPa CoOCoB NumFa

3

$$123 - 28 = 95$$

$$- 23 - 5$$

123

100

95



# MS3: Partitioning



MC RaPa CoOCoB NumFa

4

$$132 - 58 = 74$$

$$- 52 - 6$$

132

80

74



# MS3: Partitioning



MC RaPa CoOCoB NumFa

5

$$750 - 372 = 378$$

$$- 350 - 22$$

750

400

378



# MS3: Partitioning



MC RaPa CoOCoB NumFa

6

$$£64.30 - £24.50 = £39.80$$

$$- £24.30 - 20p$$

£64.30

£40

£39.80



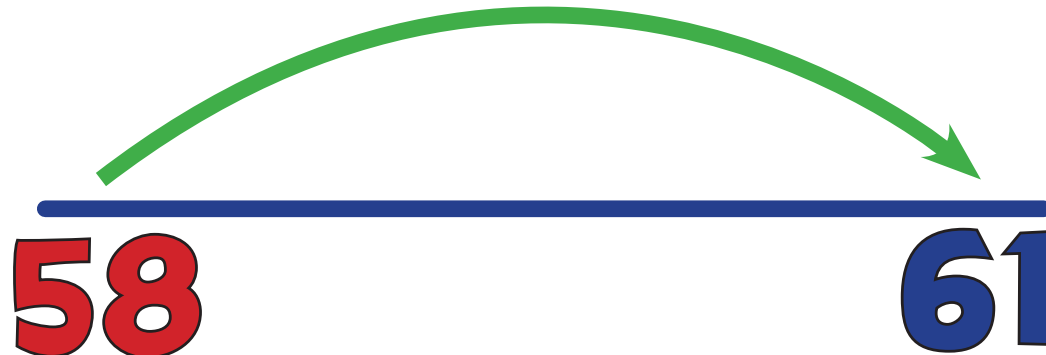
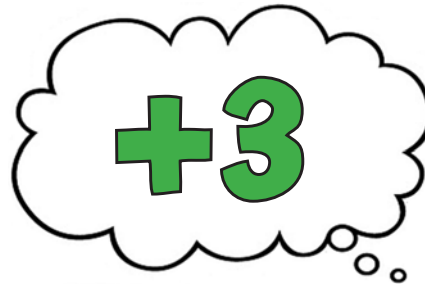
# MS4a: Counting On



MC RaPa CoOCoB NumFa

Small Difference

$$61 - 58 = 3$$



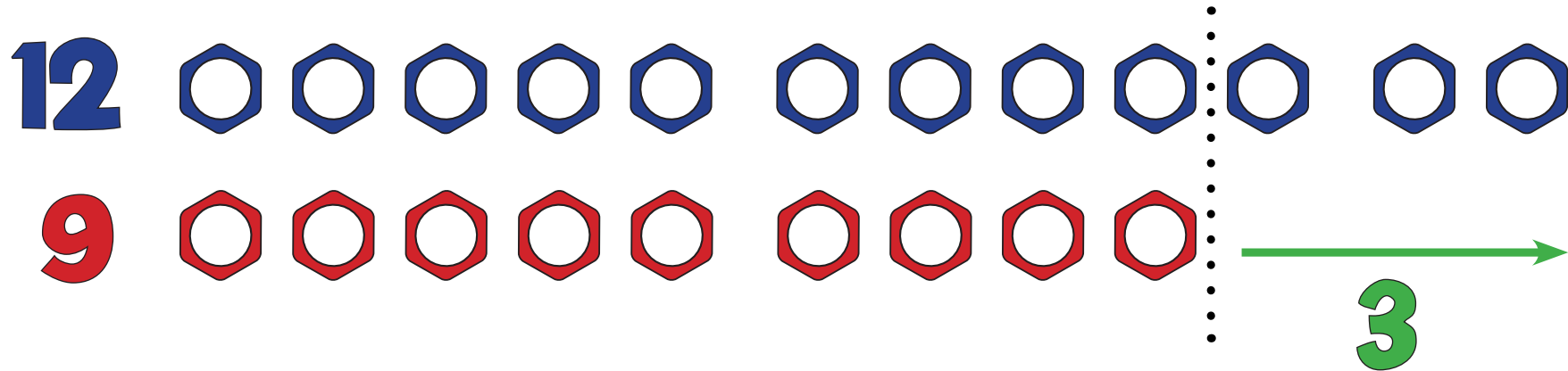
# MS4a: Counting On



MC RaPa CoOCoB NumFa  
Visualisation

Small Difference

$$12 - 9 = 3$$



# MS4a: Counting On

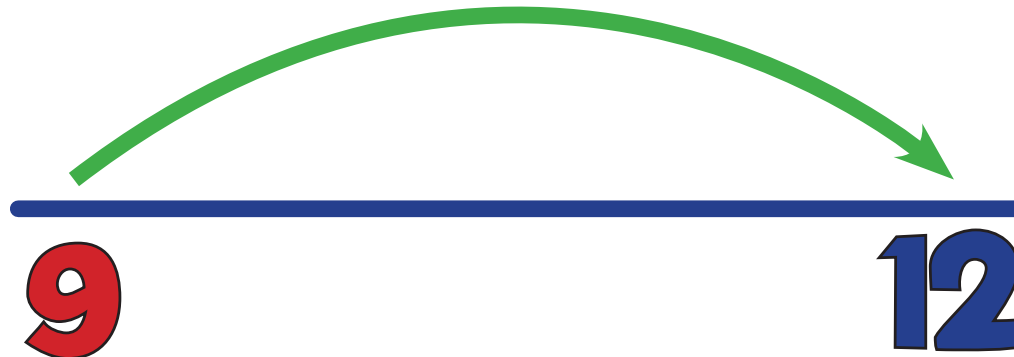


MC RaPa CoOCoB NumFa

1

Small Difference

$$12 - 9 = 3$$



# MS4a: Counting On

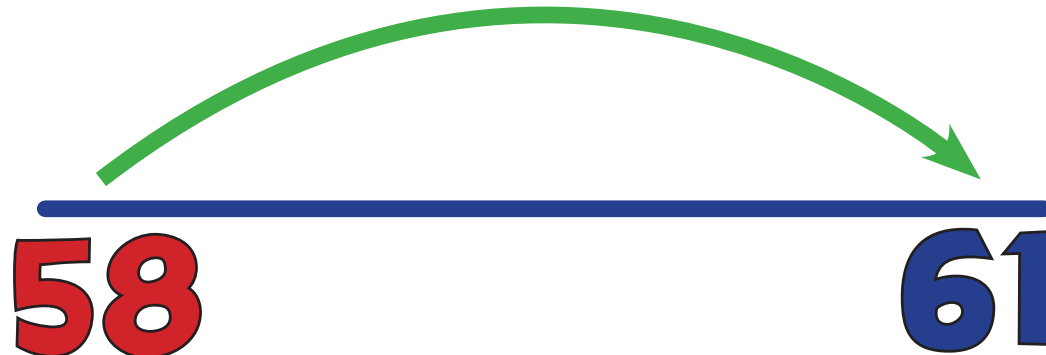


MC RaPa CoOCoB NumFa

2

Small Difference

$$61 - 58 = 3$$





# MS4a: Counting On

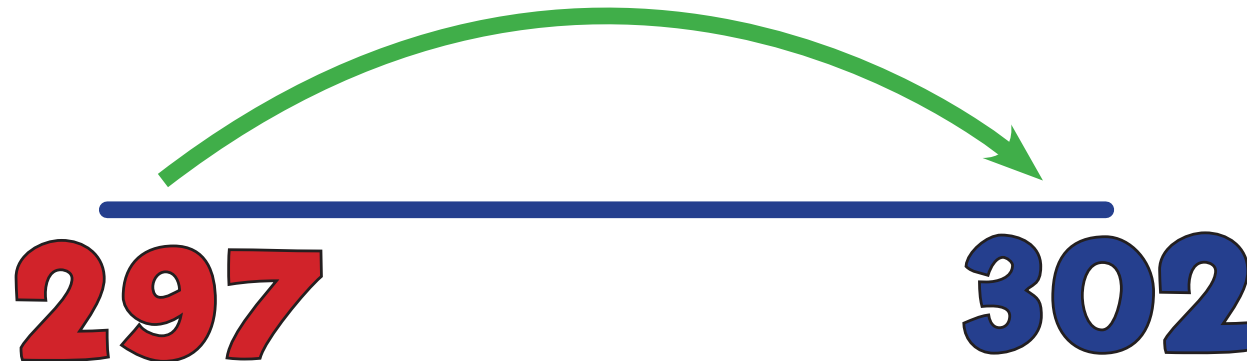


MC RaPa CoOCoB NumFa

3

Small Difference

$$302 - 297 = 5$$



# MS4a: Counting On

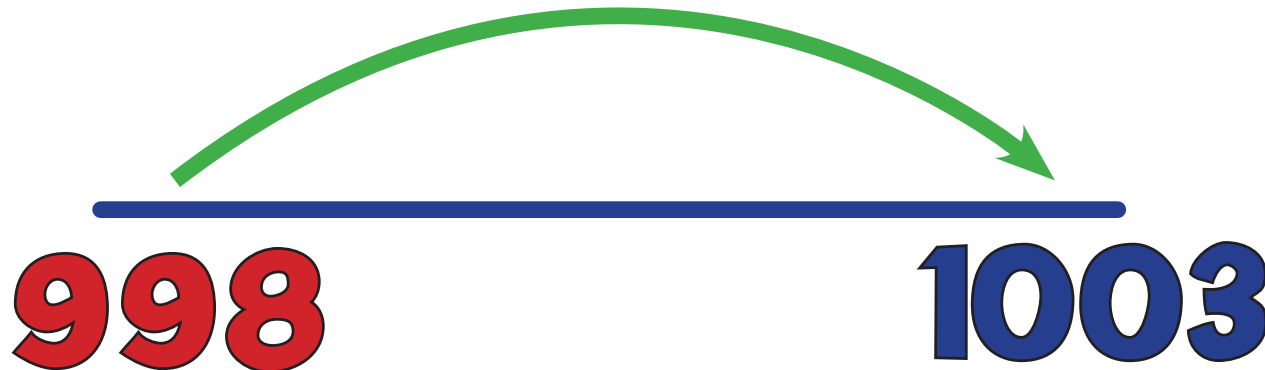


MC RaPa CoOCoB NumFa

4

Small Difference

$$1003 - 998 = 5$$



# MS4a: Counting On



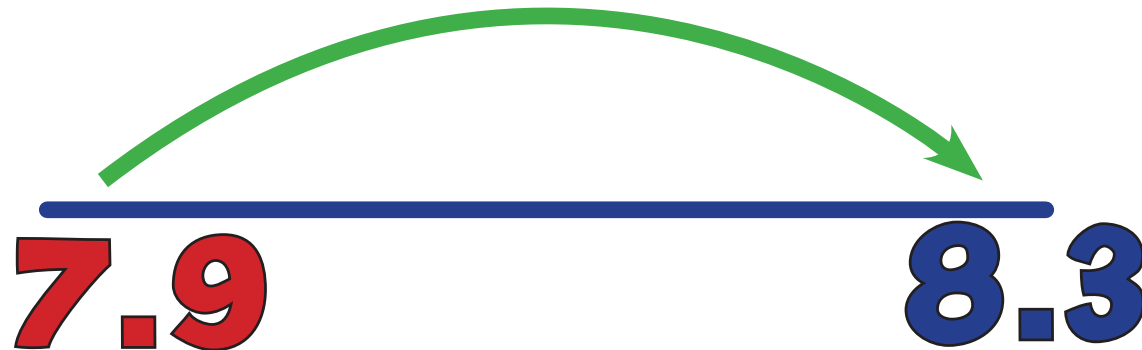
MC RaPa CoOCoB NumFa

5

Small Difference

$$8.3 - 7.9 = 0.4$$

+0.4



# MS4a: Counting On



MC RaPa CoOCoB NumFa

6

Small Difference

$$€12.02 - €11.98 = 4p$$

+4p

€11.98

€12.02



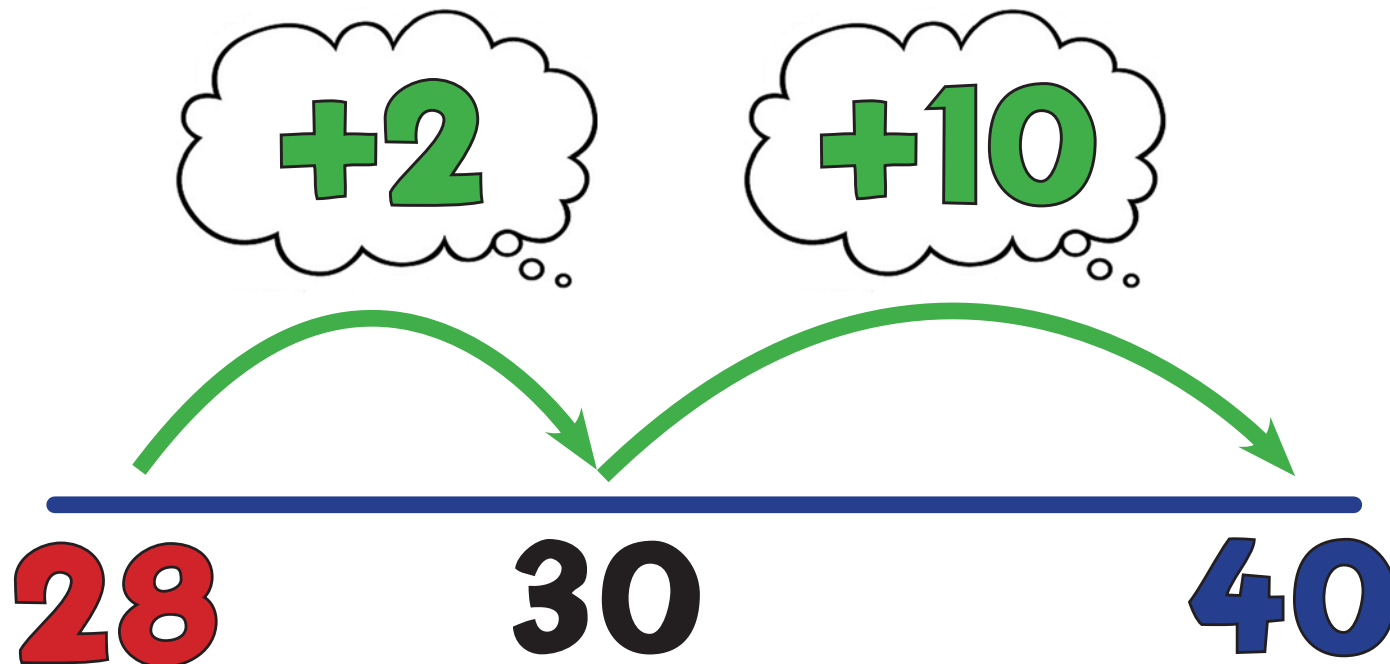
# MS4b: Counting On



MC RaPa CoOCoB NumFa

Jumps

$$40 - 28 = 12$$

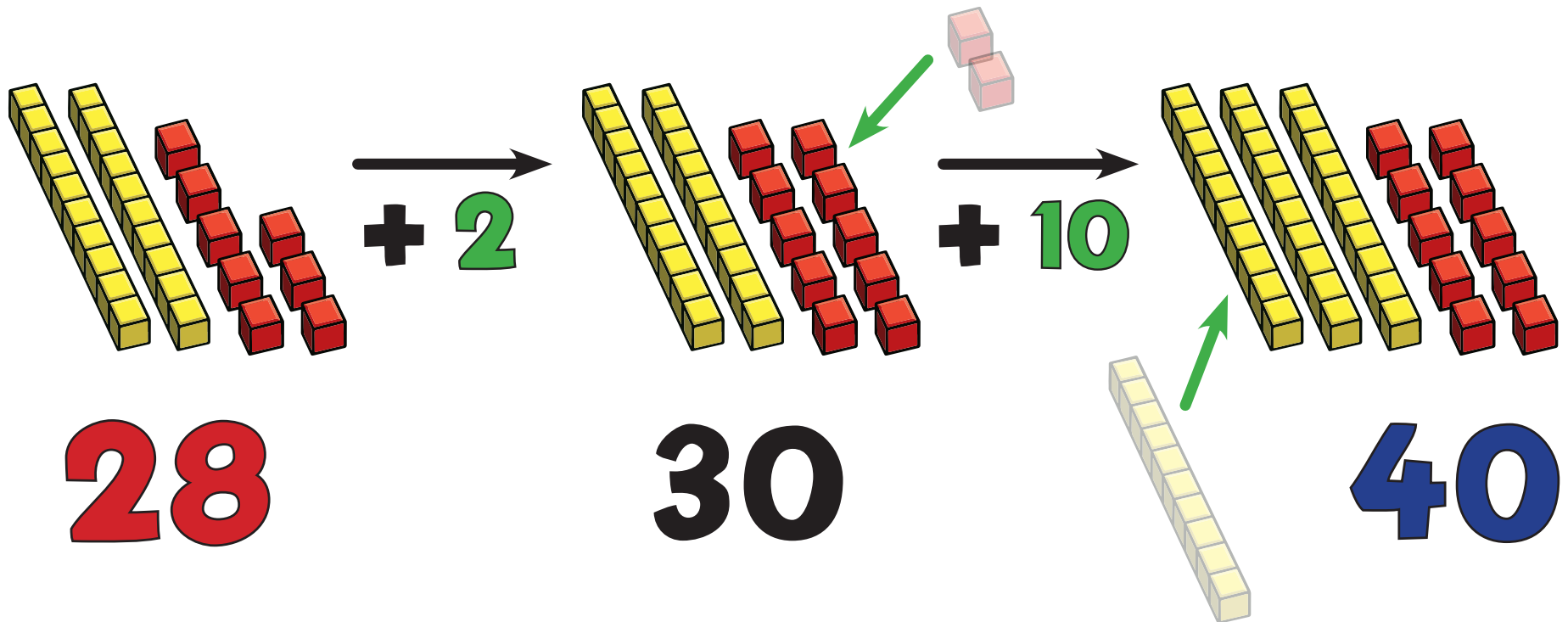


# MS4b: Counting On

MC RaPa CoOCob NumFa  
Visualisation

Jumps

$$40 - 28 = 12$$



# MS4b: Counting On

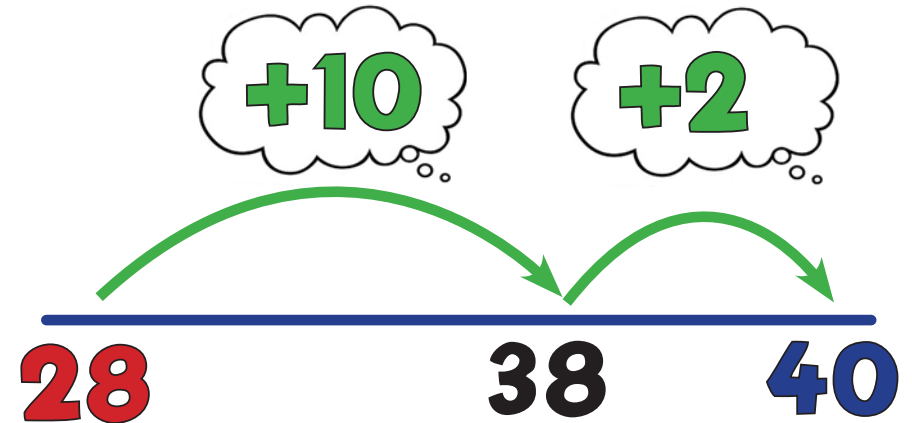
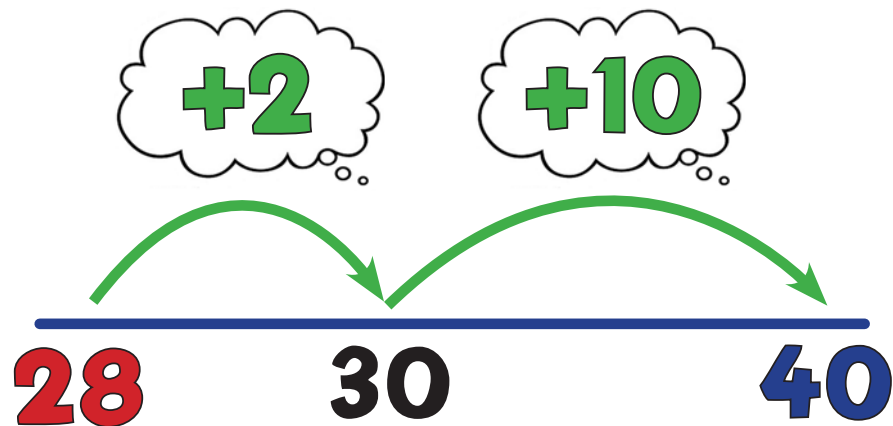


MC RaPa CoOCoB NumFa

2

Jumps

$$40 - 28 = 12$$



# MS4b: Counting On

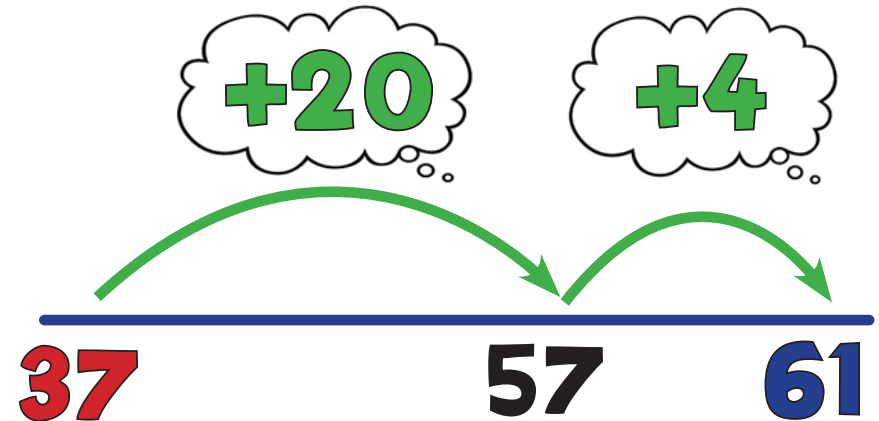
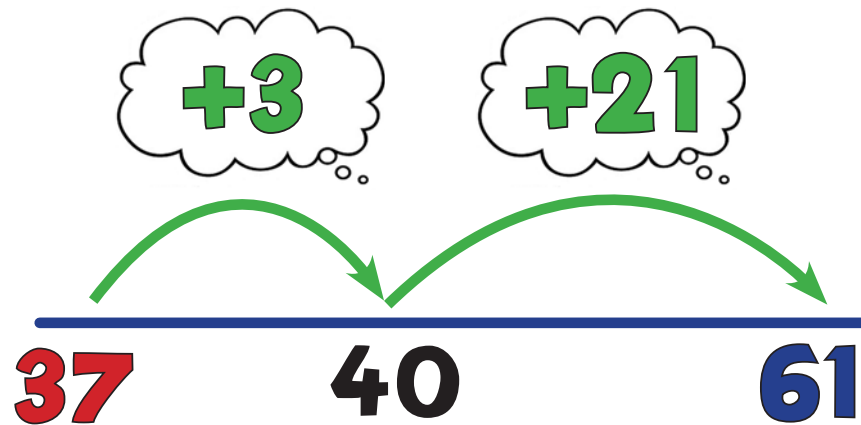


MC RaPa CoOCoB NumFa

3

Jumps

$$61 - 37 = 24$$





# MS4b: Counting On



MC RaPa CoOCoB NumFa

4

Jumps

$$324 - 280 = 44$$

+20

+24



# MS4b: Counting On

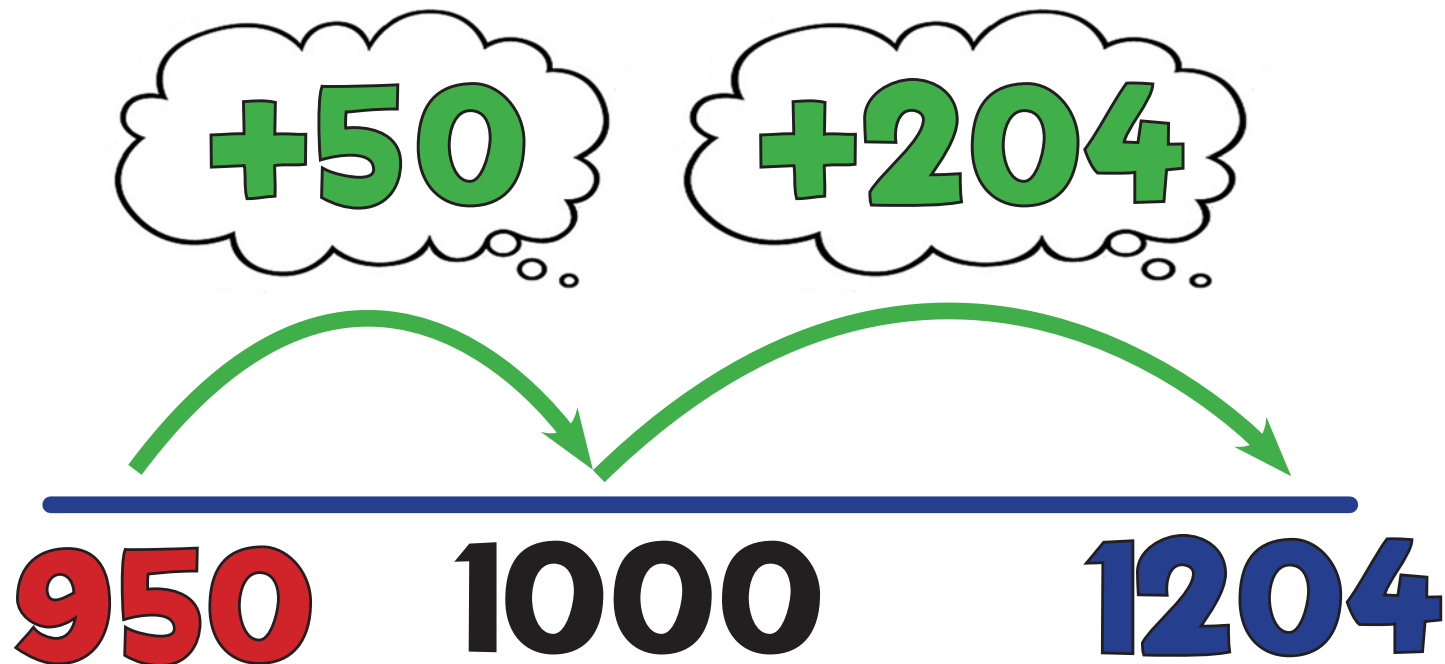


MC RaPa CoOCoB NumFa

5

Jumps

$$1204 - 950 = 254$$



# MS4b: Counting On

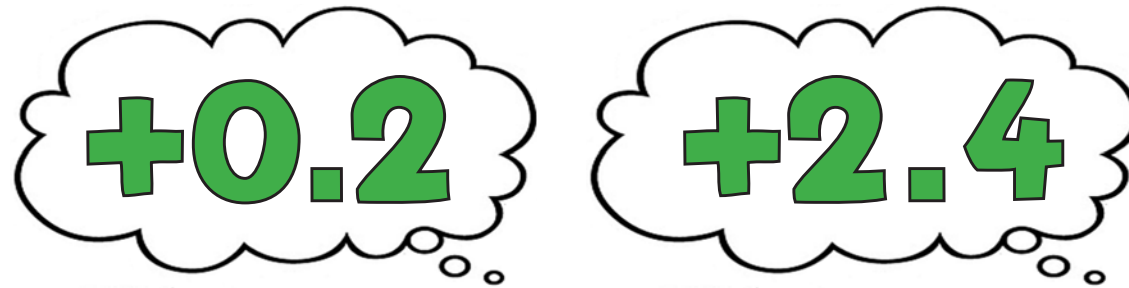


MC RaPa CoOCoB NumFa

6

Jumps

$$12.4 - 9.8 = 2.6$$



# MS5a: Counting Back



MC RaPa CoOCoB NumFa

$$68 - 20 = 48$$

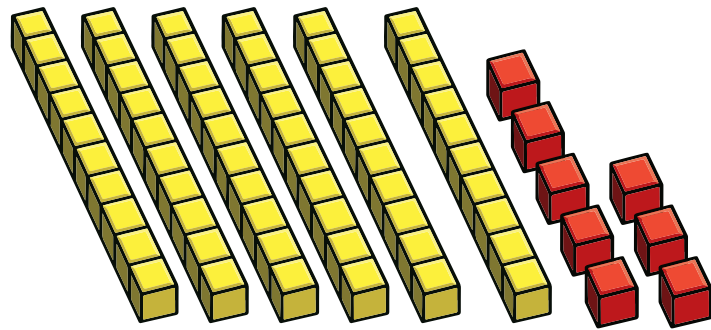


# MS5a: Counting Back



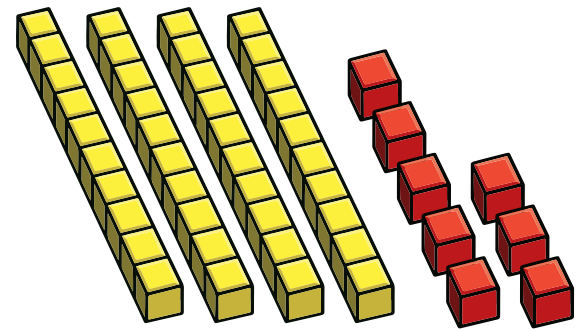
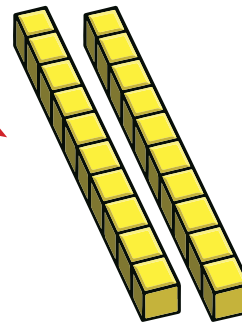
MC RaPa CoOCoB NumFa  
Visualisation

$$68 - 20 = 48$$



68

-20



48



# MS5a: Counting Back



MC RaPa CoOCoB NumFa

1

$$15 - 4 = 11$$



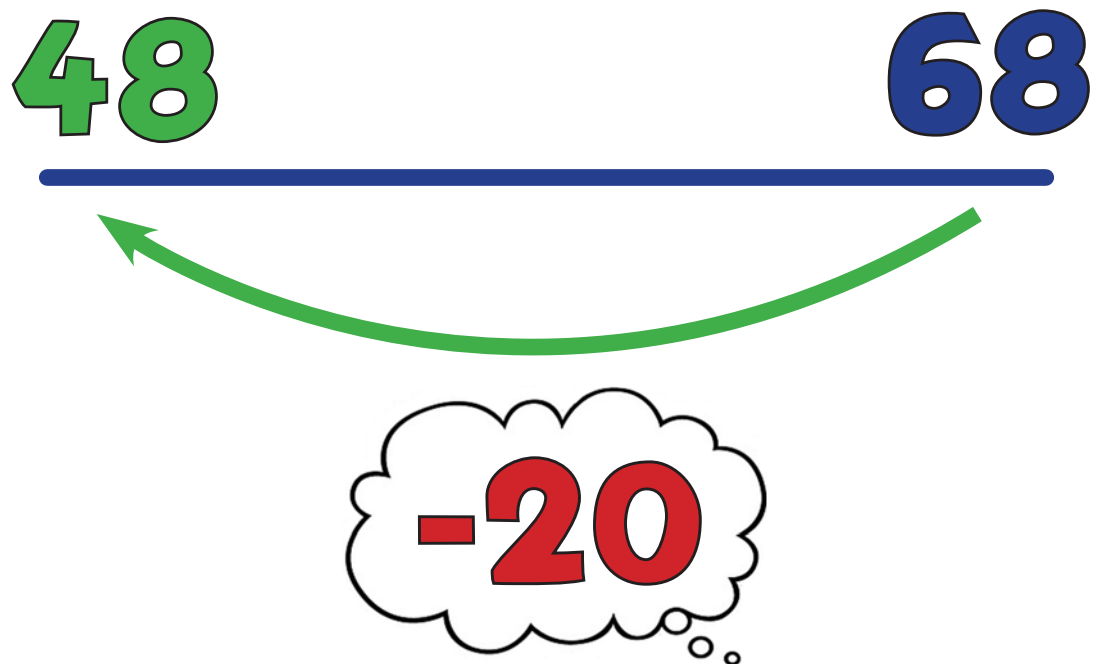
# MS5a: Counting Back



MC RaPa CoOCoB NumFa

2

$$68 - 20 = 48$$







# MS5a: Counting Back



MC RaPa CoOCoB NumFa

4

$$768 - 200 = 568$$

568                      768



-200



# MS5a: Counting Back



MC RaPa CoOCoB NumFa

5

$$7291 - 2000 = 5291$$

5291

7291



-2000



# MS5a: Counting Back



MC RaPa CoOCoB NumFa

6

$$86374 - 20000 = 66374$$

66374                      86374



-20000



# MS5b: Counting Back



MC RaPa CoOCoB NumFa

Jumps

$$86 - 12 = 74$$

$$- 10 - 2$$

86

76

74



# MS5b: Counting Back

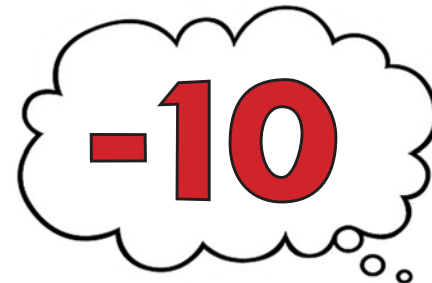
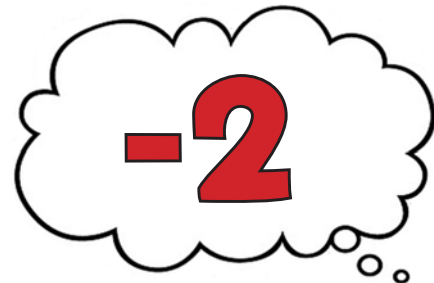


MC RaPa CoOCoB NumFa  
Visualisation

Jumps

$$86 - 12 = 74$$

$$\begin{array}{ccc} 74 & 76 & 86 \\ \hline \end{array}$$



# MS5b: Counting Back



MC RaPa CoOCoB NumFa

2

Jumps

$$86 - 12 = 74$$

$$- 10 - 2$$

86

76

74



# MS5b: Counting Back



MC RaPa CoOCoB NumFa

3

Jumps

$$89 - 34 = 55$$

$$- 30 - 4$$

89

59

55



# MS5b: Counting Back



MC RaPa CoOCoB NumFa

4

Jumps

$$578 - 45 = 533$$

$$- 40 - 5$$

578

538

533





# MS5b: Counting Back



MC RaPa CoOCoB NumFa

5

Jumps

$$8.6 - 4.1 = 4.5$$

- 4                      - 0.1

8.6

4.6

4.5



# MS5b: Counting Back



MC RaPa CoOCoB NumFa

6

Jumps

$$\text{€}65.87 - \text{€}30.24 = \text{€}35.63$$

-  $\text{€}30$       -  $24\text{p}$

$\text{€}65.87$

$\text{€}35.87$

$\text{€}35.63$



# MS6: Number Facts



MC RaPa CoOCoB NumFa

$$61 - 41 = 20$$

$$41 + 20 = 61$$



# MS6: Number Facts



MC RaPa CoOCoB NumFa  
Visualisation

$$61 - 41 = 20$$

$$41 + 20 = 61$$

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	
	Orange bar											Orange bar																			



# MS6: Number Facts



MC RaPa CoOCoB NumFa

1

$$19 - 9 = 10$$

$$9 + 10 = 19$$



# MS6: Number Facts



MC RaPa CoOCoB NumFa

2

$$61 - 41 = 20$$

$$41 + 20 = 61$$



# MS6: Number Facts



MC RaPa CoOCoB NumFa

3

$$123 - 83 = 40$$


$$83 + 40 = 123$$



# MS6: Number Facts



MC RaPa CoOCob NumFa

4

$$847 - 447 = 400$$

$$447 + 400 = 847$$





# MS6: Number Facts



MC RaPa CoOCoB NumFa

5

$$1424 - 724 = 700$$

$$724 + 700 = 1424$$



# MS6: Number Facts



MC RaPa CoOCoB NumFa

6

$$13.2 - 9.2 = 4$$

$$9.2 + 4 = 13.2$$



# Mental Multiplication

132	<b>MM1</b>	<b>Manipulate Calculation</b>
139	<b>MM2</b>	<b>Factorising</b>
146	<b>MM3</b>	<b>Re-ordering</b>
149	<b>MM4</b>	<b>Partitioning</b>
154	<b>MM5</b>	<b>Round &amp; Adjust</b>
158	<b>MM6</b>	<b>Doubling</b>
166	<b>MM7</b>	<b>Doubling Table Facts</b>
170	<b>MM8</b>	<b>Doubling Up</b>
173	<b>MM9</b>	<b>Multiply by ... then Halve</b>
175	<b>MM10</b>	<b>Jump</b>



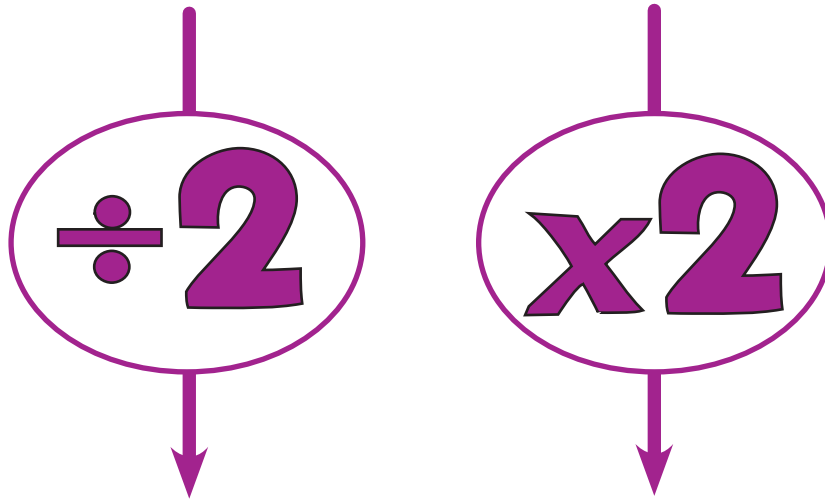
## 10 Cool Strategies for Mental Multiplication



# MM1: Manipulate Calculation

5

$$16 \times 3$$



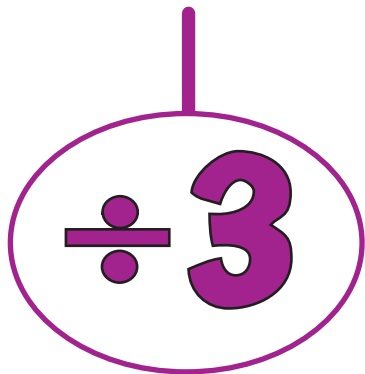
$$8 \times 6 = 48$$



# MM1a: Manipulate Calculation

5

$$27 \times 3$$



$$9 \times 9 = 81$$



# MM1b: Manipulate Calculation

5

$$45 \times 14$$



$$90 \times 7 = 630$$



# MM1c: Manipulate Calculation

5/6

$$36 \times 25$$



$$9 \times 100 = 900$$



# MM1d: Manipulate Calculation

6

$$32 \times 15$$



$$160 \times 3 = 480$$





# MM1e: Manipulate Calculation

6

$$26 \times 32$$



$$104 \times 8 = 832$$



# MM1f: Manipulate Calculation

6

$$52 \times 24$$



$$208 \times 6 = 1248$$



# MM2: Factorising

4

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



# MM2a: Factorising

4

$$27 \times 3 = 81$$

$$(9 \times 3 \times 3)$$

$$9 \times 9 = 81$$



# MM2b: Factorising

5

$$45 \times 14 = 630$$

$$(45 \times 2 \times 7)$$

$$90 \times 7 = 630$$



# MM2c: Factorising

5/6

$$36 \times 25 = 900$$

$$(9 \times 4 \times 25)$$

$$9 \times 100 = 900$$



# MM2d: Factorising

6

$$32 \times 15 = 480$$

$$(32 \times 5 \times 3)$$

$$160 \times 3 = 480$$



# MM2e: Factorising

6

$$26 \times 32 = 832$$

$$(26 \times 4 \times 8)$$

$$104 \times 8 = 832$$





# MM2f: Factorising

6

$$52 \times 24 = 1248$$

$$(52 \times 4 \times 6)$$

$$208 \times 6 = 1248$$



# MM3: Re-ordering

5

$$(9 \times 2) \times 5$$
$$18 \times 5 = 90$$

$$(9 \times 5) \times 2$$
$$45 \times 2 = 90$$

$$(2 \times 5) \times 9$$
$$10 \times 9 = 90 \quad *$$



# MM3a: Re-ordering

5/6

$$(7 \times 4) \times 5$$

$$28 \times 5 = 140$$

$$(7 \times 5) \times 4$$

$$35 \times 4 = 140$$

$$(4 \times 5) \times 7$$

$$20 \times 7 = 140 *$$



# MM3b: Re-ordering

6

$$(9 \times 8) \times 6$$

$$72 \times 6 = 432$$

$$(9 \times 6) \times 8$$

$$54 \times 8 = 432 *$$

$$(8 \times 6) \times 9$$

$$48 \times 9 = 432$$



# MM4: Partitioning

4

$$15 \times 5 = 75$$

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



# MM4a: Partitioning

4/5

$$37 \times 4 = 148$$

$$\begin{array}{c} \text{120} \\ \text{(30 x 4)} \end{array} + \begin{array}{c} \text{28} \\ \text{(7 x 4)} \end{array} = 148$$



# MM4b: Partitioning

5

$$126 \times 6 = 756$$

$$\begin{array}{c} \text{600} \\ \text{(100 x 6)} \end{array} + \begin{array}{c} \text{120} \\ \text{(20 x 6)} \end{array} + \begin{array}{c} \text{36} \\ \text{(6 x 6)} \end{array} = 756$$



# MM4c: Partitioning

6

$$4.3 \times 8 = 34.4$$

$$\begin{array}{c} \text{32} \\ (4 \times 8) \end{array} + \begin{array}{c} \text{2.4} \\ (0.3 \times 8) \end{array} = 34.4$$





# MM4d: Partitioning

6

$$2.16 \times 3 = 6.48$$

$$\begin{array}{c} \text{6} \\ \text{(2 x 3)} \end{array} + \begin{array}{c} \text{0.3} \\ \text{(0.1 x 3)} \end{array} + \begin{array}{c} \text{0.18} \\ \text{(0.06 x 3)} \end{array} = 6.48$$



# MM5: Round & Adjust

4

$$49 \times 3 = 147$$

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

$$150 - 3 = 147$$



# MM5a: Round & Adjust

5

$$198 \times 4 = 792$$

$$(200 \times 4) - (2 \times 4)$$

$$800 - 8 = 792$$



# MM5b: Round & Adjust

5/6

$$3.9 \times 5 = 19.5$$

$$(4 \times 5) - (0.1 \times 5)$$

$$20 - 0.5 = 19.5$$



# MM5c: Round & Adjust

6

$$\text{£}5.99 \times 6 = \text{£}35.94$$

$$(\text{£}6 \times 6) - (1\text{p} \times 6)$$

$$\text{£}36 - 6\text{p} = \text{£}35.94$$



# MM6: Doubling

2

$$20 + 14 = 34$$

Double  $17 = 34$

(15 + 2)

$$30 + 4 = 34$$



# MM6a: Doubling

3

$$60 + 14 = 74$$

$$\text{Double } 37 = 74$$

(35 + 2)

$$70 + 4 = 74$$



# MM6b: Doubling

4

$$140 + 16 = 156$$

$$\text{Double } 78 = 156$$

(75 + 3)

$$150 + 6 = 156$$

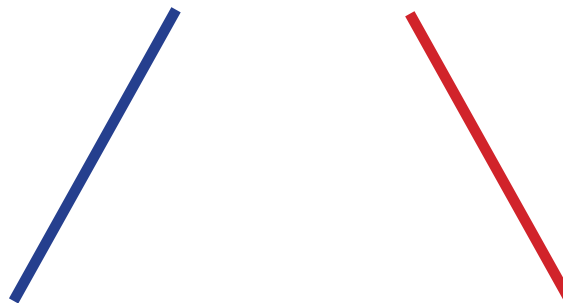




# MM6c: Doubling

4

$$\text{Double } 340 = 680$$


$$600 + 80 = 680$$



# MM6d: Doubling

4/5

$$800 + 160 = 960$$

$$\text{Double } 480 = 960$$

(450 + 30)

$$900 + 60 = 960$$



# MM6e: Doubling

5

$$400 + 140 + 16 = 556$$

$$\text{Double } 278 = 556$$

(250 + 28)

$$500 + 28 = 556$$



# MM6f: Doubling

5/6

$$1400 + 120 + 16 = 1536$$


$$\text{Double } 768 = 1536$$

(750 + 18)


$$1500 + 36 = 1536$$



# MM6g: Doubling

6

$$\text{Double } 3.7 = 7.4$$

$$6 + 1.4 = 7.4$$



# MM7: Doubling Table Facts

3

$$8 \times 6 = 48$$

(4 x 2)

$$4 \times 6 = 24$$



$$8 \times 6 = 48$$



x 2



# MM7a: Doubling Table Facts

4

$$12 \times 7 = 84$$

(6 x 2)

$$\begin{array}{ccc} 6 \times 7 = 42 & & \\ \downarrow & & \downarrow \times 2 \\ 12 \times 7 = 84 & & \end{array}$$



# MM7b: Doubling Table Facts

5

$$16 \times 7 = 112$$

(8 x 2)

$$8 \times 7 = 56$$

↓

$$16 \times 7 = 112$$

↓ x 2





# MM7c: Doubling Table Facts

6

$$\begin{array}{l} \mathbf{22} \times \mathbf{12} = \mathbf{264} \\ \mathbf{(11 \times 2)} \end{array}$$

$$\begin{array}{l} \mathbf{11} \times \mathbf{12} = \mathbf{132} \\ \downarrow \qquad \qquad \qquad \downarrow \times \mathbf{2} \\ \mathbf{22} \times \mathbf{12} = \mathbf{264} \end{array}$$



# MM8: Doubling Up

3/4

$$17 \times 4 = 68$$

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

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



# MM8a: Doubling Up

5

$$36 \times 8 = 288$$

$$\text{Double } 36 = 72 \quad (36 \times 2)$$

$$\text{Double } 72 = 144 \quad (36 \times 4)$$

$$\text{Double } 144 = 288 \quad (36 \times 8)$$



# MM8b: Doubling Up

6

$$125 \times 16 = 2000$$

$$\text{Double } 125 = 250 \quad (125 \times 2)$$

$$\text{Double } 250 = 500 \quad (125 \times 4)$$

$$\text{Double } 500 = 1000 \quad (125 \times 8)$$

$$\text{Double } 1000 = 2000 \quad (125 \times 16)$$



# MM9: Mult by <sup>10, 100</sup> & <sup>1000</sup> then Halve

5

$$86 \times 5 = 430$$

$$86 \times 10 = 860$$

$$860 \div 2 = 430$$



# MM9a: Mult by <sup>10, 100</sup> & <sup>1000</sup> then Halve

6

$$56 \times 25 = 1400$$

$$56 \times 100 = 5600$$

$$5600 \div 2 = 2800$$

$$2800 \div 2 = 1400$$



# MM10: Jump!

3/4

**x100**

**x10**

1000 100 10 1

3400

340

34



# MM10a: Jump!

5/6

**x1000**

**x100**

**x10**

634000

6340

634

63.4





# Mental Division

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



## 7 Cool Strategies for Mental Division!



# MD1: Manipulate Calculation

3

Small Quotient

$$140 \div 20$$

$$\div 10$$

$$\div 10$$

$$14 \div 2 = 7$$



# MD1a: Manipulate Calculation

4

Small Quotient

$$84 \div 12$$

$$\div 2$$

$$\div 2$$

$$42 \div 6 = 7$$

$$\div 2$$

$$\div 2$$

$$21 \div 3 = 7$$

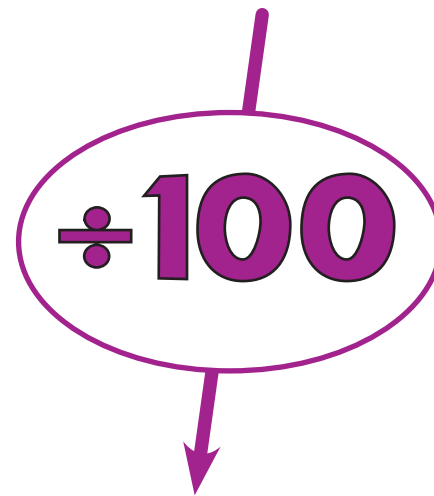
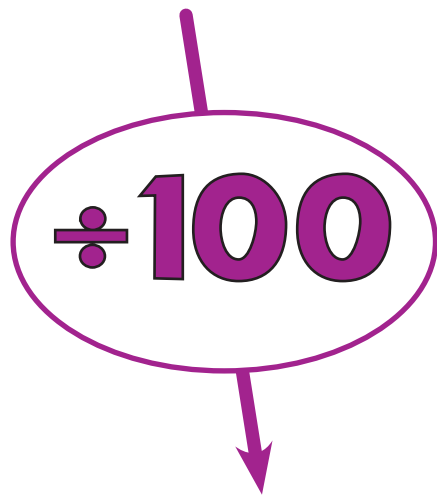


# MD1b: Manipulate Calculation

4

Small Quotient

$$1200 \div 400$$



$$12 \div 4 = 3$$



# MD1c: Manipulate Calculation

5

Small Quotient

$$162 \div 18$$

$\div 2$

$\div 2$

$$81 \div 9 = 9$$

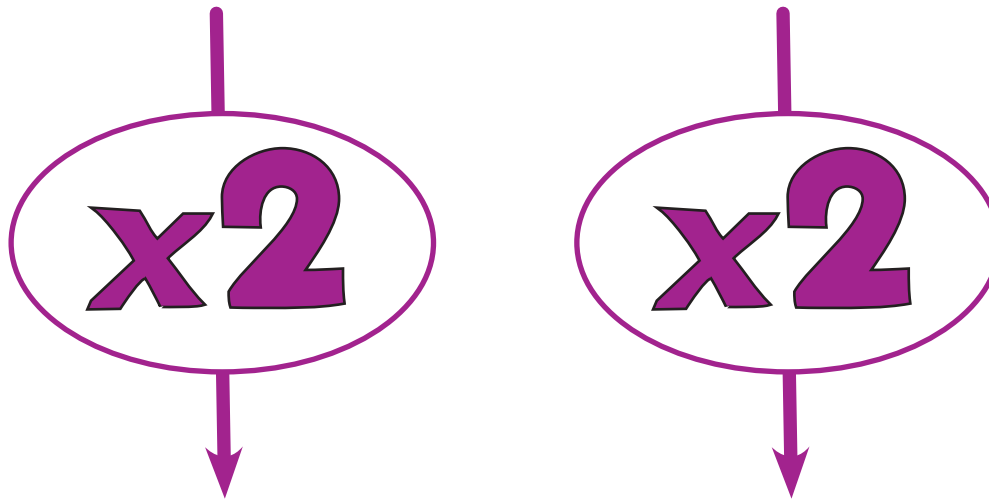


# MD1d: Manipulate Calculation

6

Small Quotient

$$18 \div 1.5$$



$$36 \div 3 = 12$$

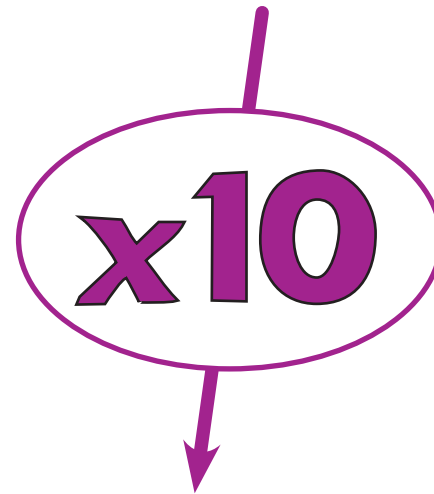
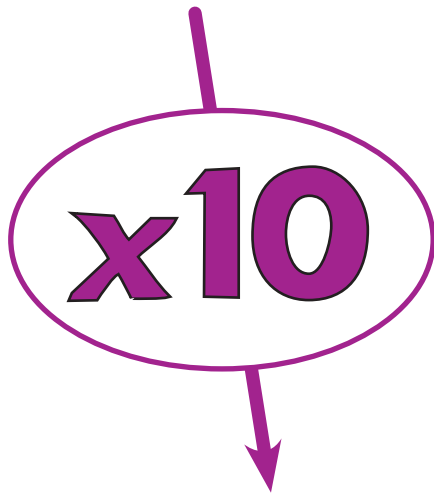


# MD1e: Manipulate Calculation

6

Small Quotient

$$9.3 \div 0.3$$



$$93 \div 3 = 31$$

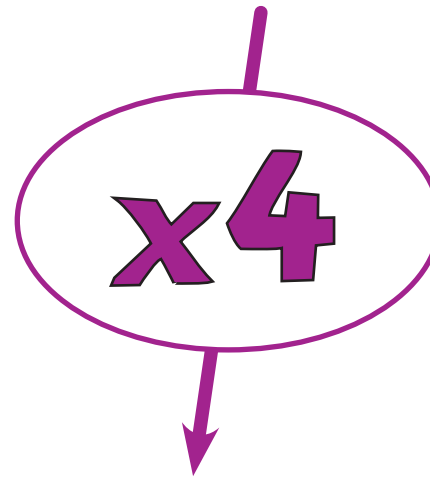
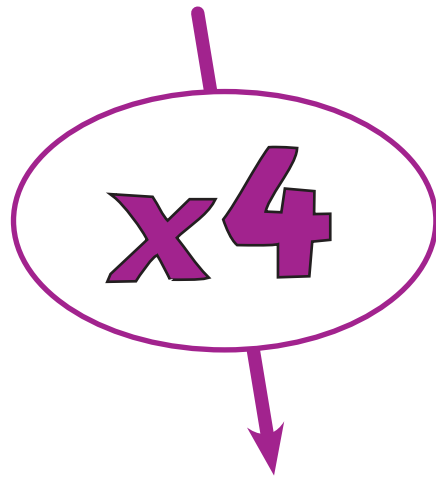


# MD1f: Manipulate Calculation

6

Small Quotient

$$6.25 \div 0.25$$



$$25 \div 1 = 25$$





# MD2: Divide by 100 then Double

4

$$800 \div 50 = 16$$

$$800 \div 100 = 8$$

$$8 \times 2 = 16$$



# MD2a: Divide by 100 then Double twice

5

$$8000 \div 25 = 320$$

$$8000 \div 100 = 80$$

$$80 \times 2 = 160$$

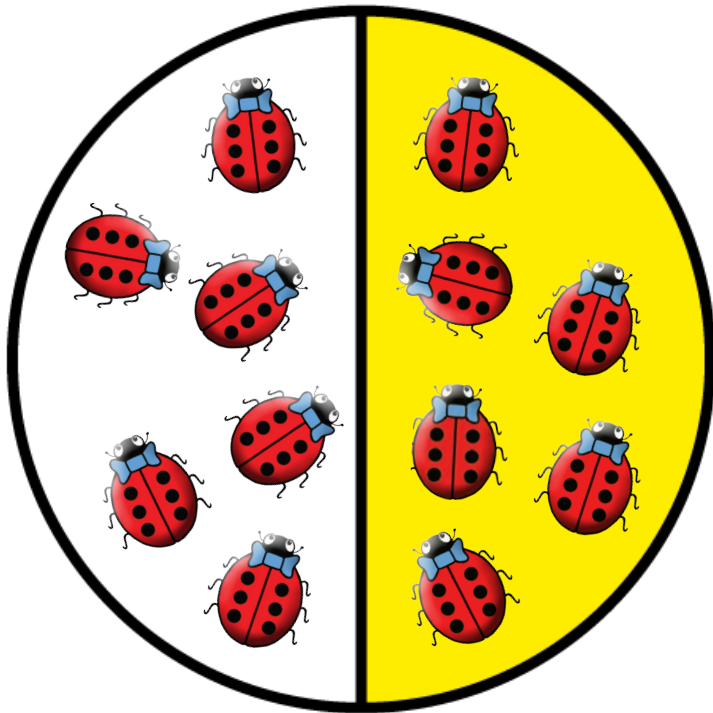
$$160 \times 2 = 320$$



# MD3: Halving

1

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



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



# MD3a: Halving

2

Half of <sup>(20)</sup>26

$$10 + 3 = 13$$



# MD3b: Halving

3

Half of <sup>(50)</sup>58

$$25 + 4 = 29$$



# MD3c: Halving

4

**Half of 92** <sup>(80 + 12)</sup>

40 + 6 = 46

**Half of 92**

45 + 1 = 46



# MD3d: Halving

5

(32 tens)

Half of 326

$$160 + 3 = 163$$

Half of 326

$$150 + 10 + 3 = 163$$



# MD3e: Halving

6

Half of 5.84

The diagram illustrates the halving of 5.84. Three arrows point from the digits of 5.84 to the components of the sum below: 2.5 (from 5), 0.4 (from 8), and 0.02 (from 4). The final result is 2.92.

$$2.5 + 0.4 + 0.02 = 2.92$$





# MD3f: Halving

6

$$\text{Half of } 34.72 = 17.36$$

$$15 + 2 + 0.35 + 0.01$$

(2 tens + 14 ones + 6 tenths + 12 hundredths)

$$\text{Half of } 34.72$$

$$10 + 7 + 0.3 + 0.06$$



# MD4: Halve & Halve Again

3

$$84 \div 4 = 21$$

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

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



# MD4a: Halve & Halve Again

4 (finding a quarter)

$$128 \div 4 = 32$$

$$\text{Half of } 128 = 64 \quad (128 \div 2)$$

$$\text{Half of } 64 = 32 \quad (128 \div 4)$$



# MD4b: Halve, Halve, Halve

5 (finding an eighth)

$$360 \div 8 = 45$$

$$\text{Half of } 360 = 180 \quad (360 \div 2)$$

$$\text{Half of } 180 = 90 \quad (360 \div 4)$$

$$\text{Half of } 90 = 45 \quad (360 \div 8)$$



# MD4c: Halve, Halve, Halve

$$5000 \div 8 = 625$$

$$\text{Half of } 5000 = 2500 \quad (5000 \div 2)$$

$$\text{Half of } 2500 = 1250 \quad (5000 \div 4)$$

$$\text{Half of } 1250 = 625 \quad (5000 \div 8)$$

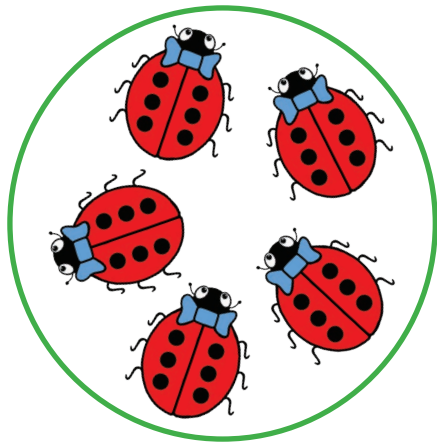


# MD5: Division as a Fraction

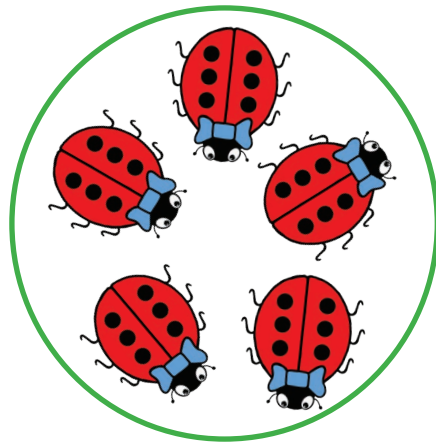
3

Sharing Model

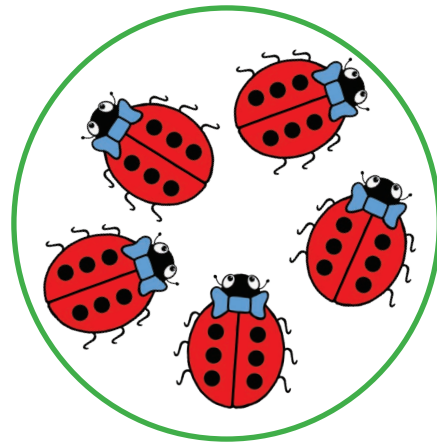
$$\frac{1}{4} \text{ of } 20 = 20 \div 4 = 5$$



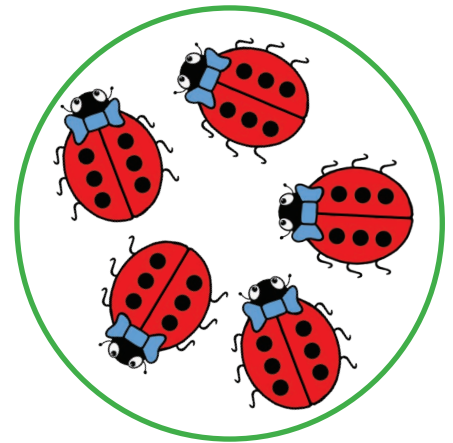
$$\frac{1}{4}$$



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



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



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

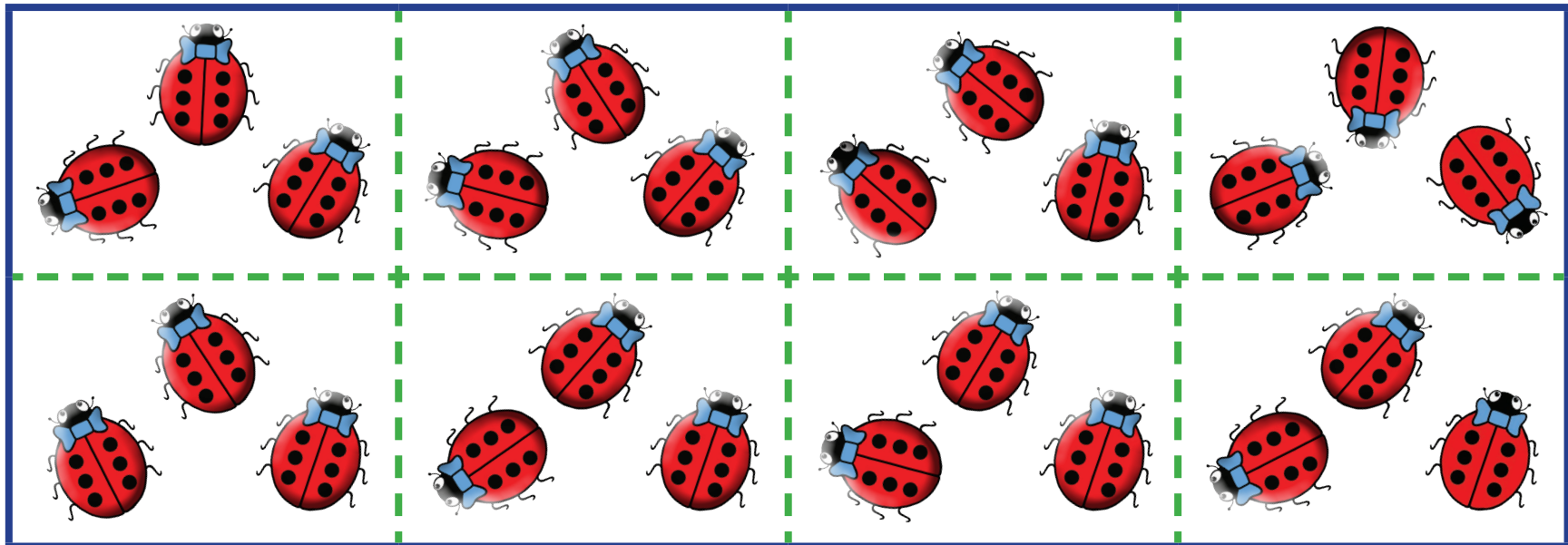


# MD5a: Division as a Fraction

4

Sharing Model

$$\frac{1}{8} \text{ of } 24 = 24 \div 8 = 3$$



# MD5b: Division as a Fraction

4

$$\frac{1}{4} \text{ of } 3 = 3 \div 4 = \frac{3}{4}$$



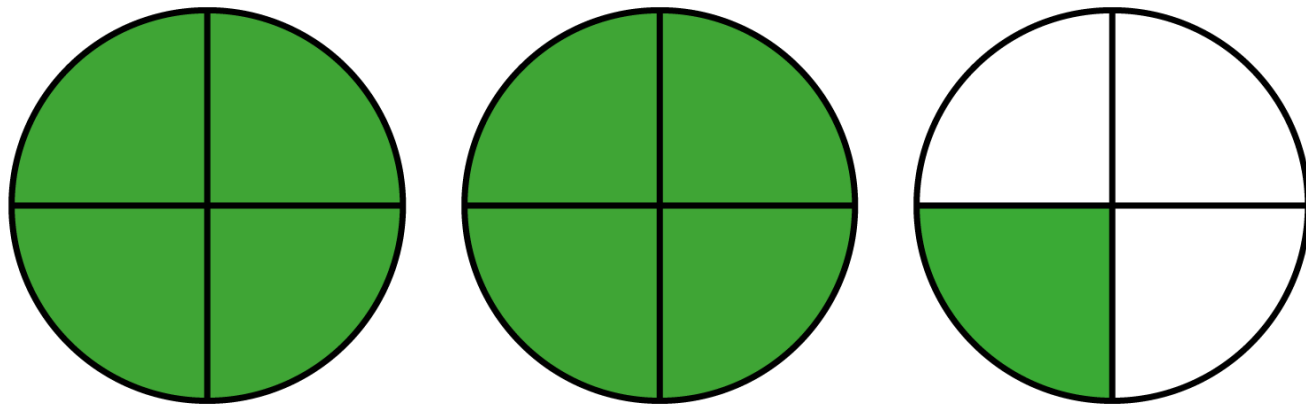


# MD5c: Division as a Fraction

5

Mixed Number Model

$$\frac{1}{4} \text{ of } 9 = 9 \div 4 = \frac{9}{4} = 2\frac{1}{4}$$



(9 quarters = 2 and a quarter)



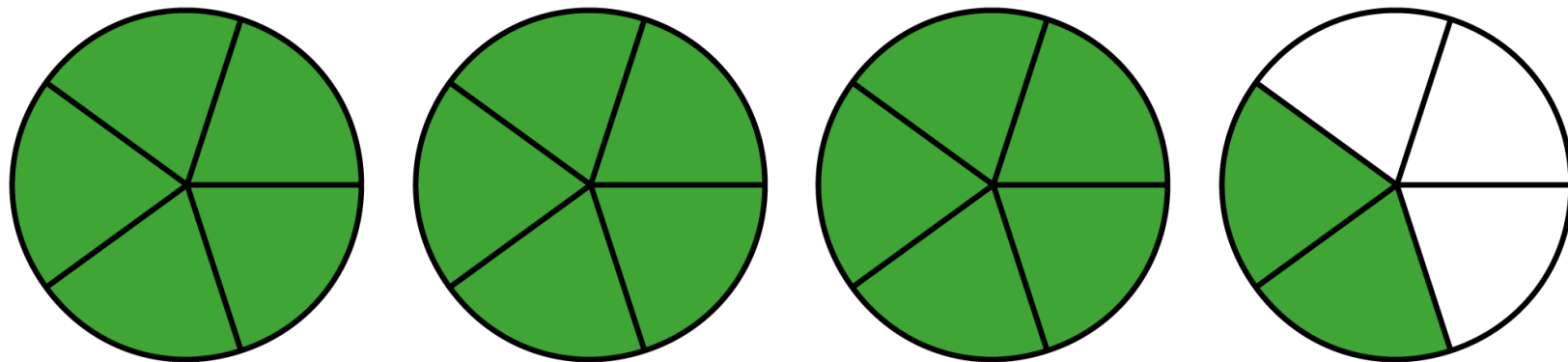
# MD5d: Division as a Fraction

5

Mixed Number Model

$$\frac{1}{5} \text{ of } 17 = 17 \div 5 = \frac{17}{5} = 3 \frac{2}{5}$$

(3.4)



(17 fifths = 3 wholes and 2 fifths)



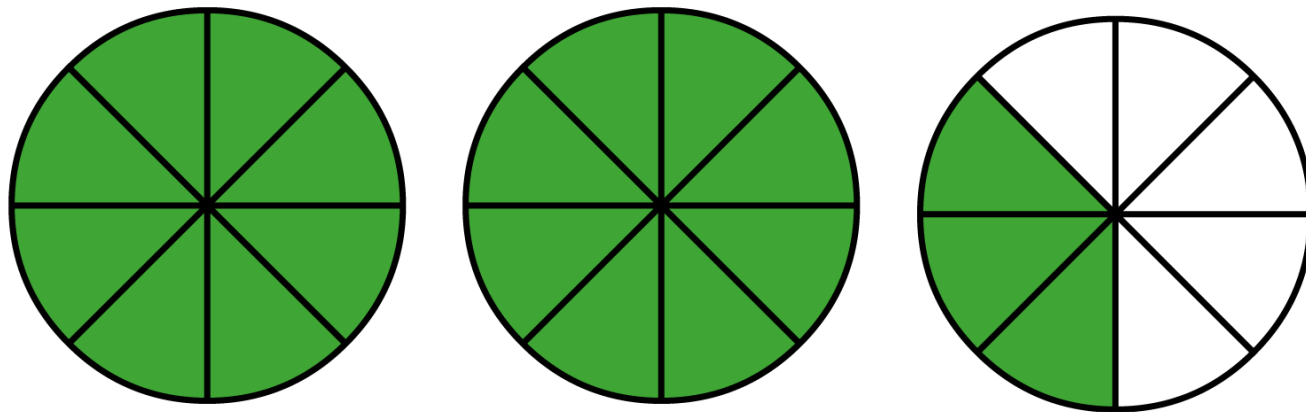
# MD5e: Division as a Fraction

6

Mixed Number Model

$$\frac{1}{8} \text{ of } 19 = 19 \div 8 = \frac{19}{8} = 2\frac{3}{8}$$

(2.375)



(19 eighths = 2 and 3 eighths)

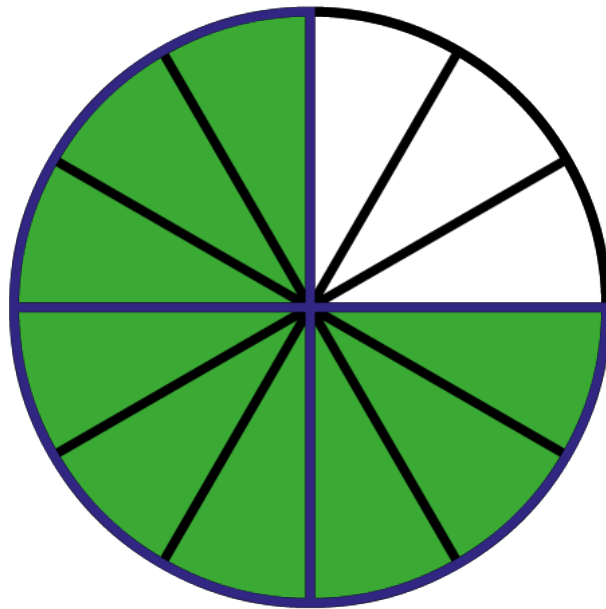


# MD5f: Division as a Fraction

6

Mixed Number Model

$$\frac{1}{12} \text{ of } 9 = 9 \div 12 = \frac{9}{12} = \frac{3}{4} \quad (0.75)$$

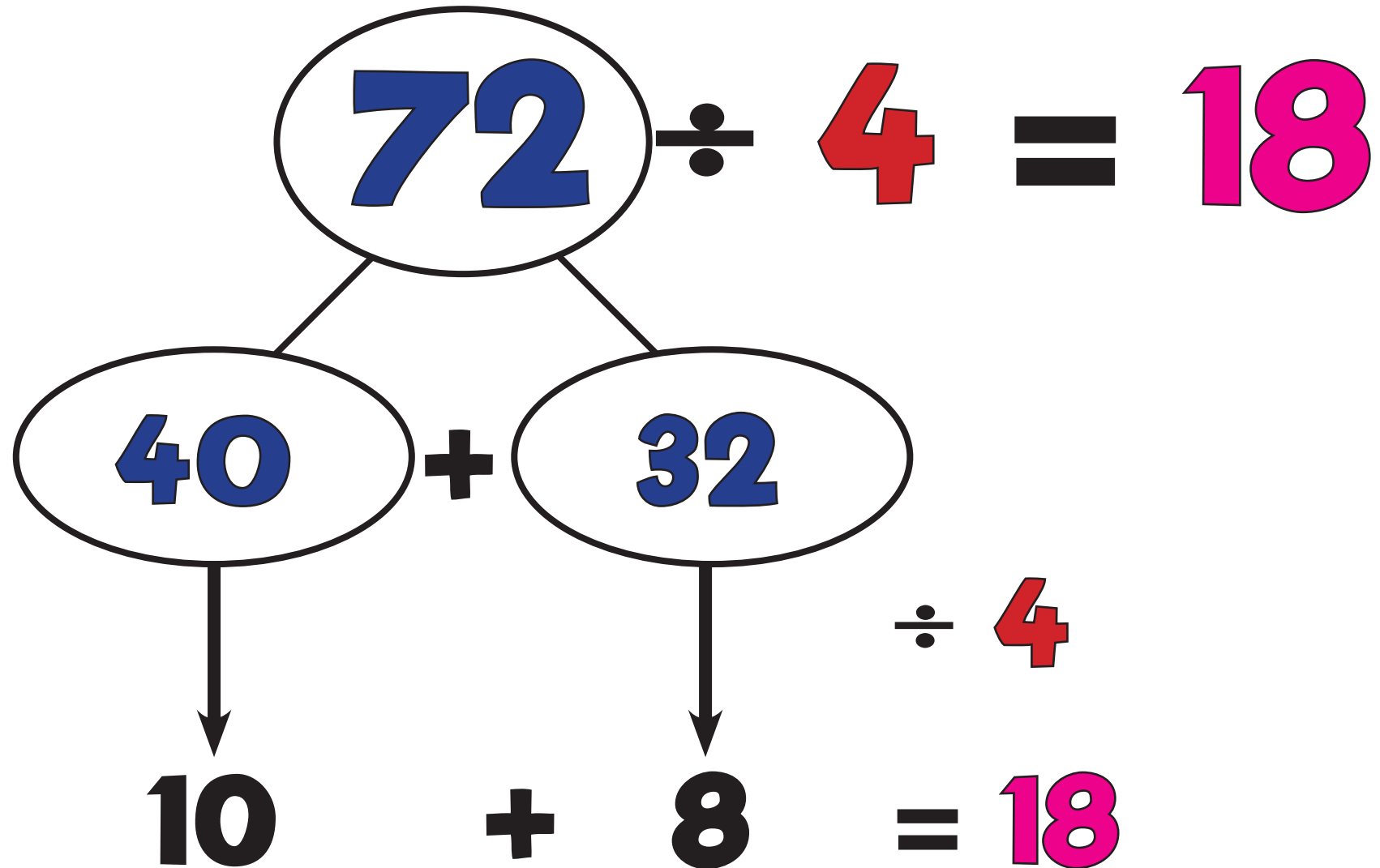


(9 twelfths =  
3 quarters)



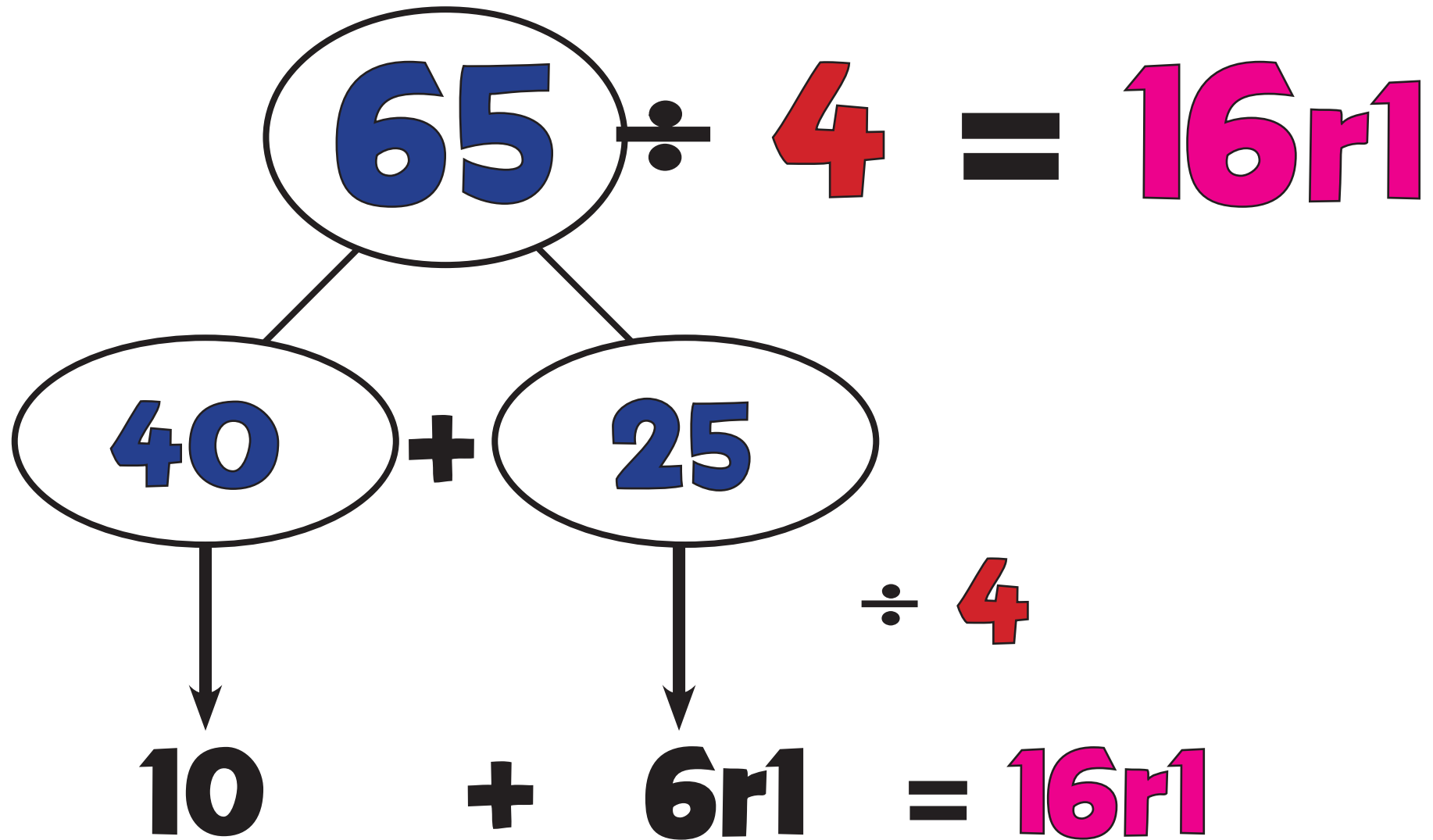
# MD6: Find the Hunk!

4



# MD6a: Find the Hunk!

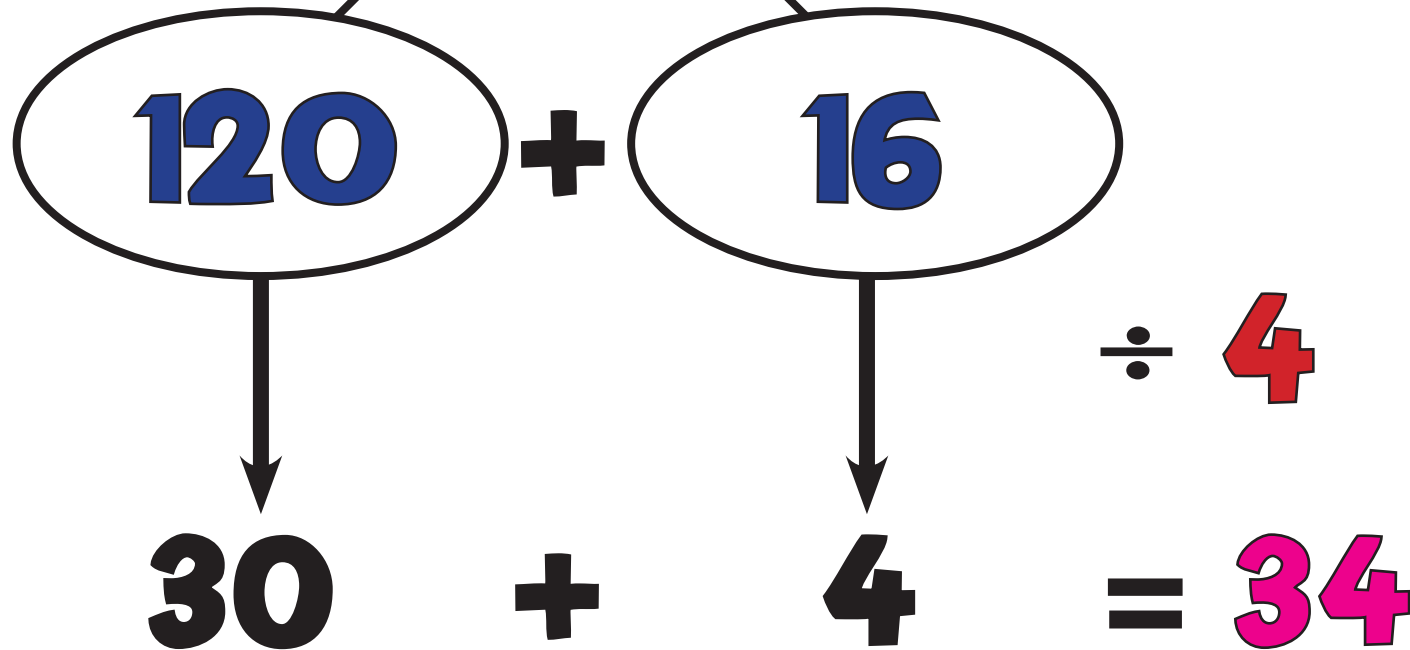
4



# MD6b: Find the Hunk!

5

$$136 \div 4 = 34$$



# MD6c: Find the Hunk!

5

$$394 \div 6 = 65r4$$

$$360 + 34$$

$$60 + 5r4 = 65r4$$





# MD6d: Find the Hunk!

5/6

$$536 \div 4 = 134$$

$$400 + 120 + 16$$

$$100 + 30 + 4 = 134$$



# MD6e: Find the Hunk!

6

$$18 \div 1.5 = 12$$

$$\begin{array}{ccc} \text{15} & + & \text{3} \\ \downarrow & & \downarrow \\ \text{10} & + & \text{2} \end{array} \div 1.5 = 12$$



# MD7: Jump ( $\div 10$ )

2

10

1

80

8



$\div 10$



# MD7 a: Jump ( $\div 10$ )

3

100    10    1

360

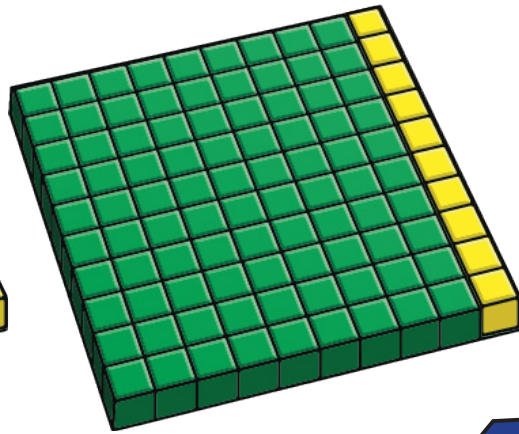
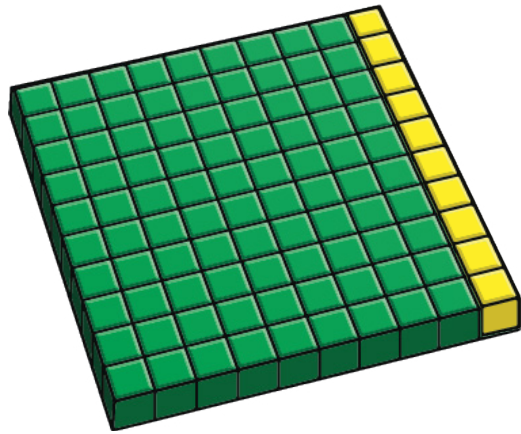
$\div 10$

36



# MD7a: Jump ( $\div 10$ )

3/4 (Pictorial)

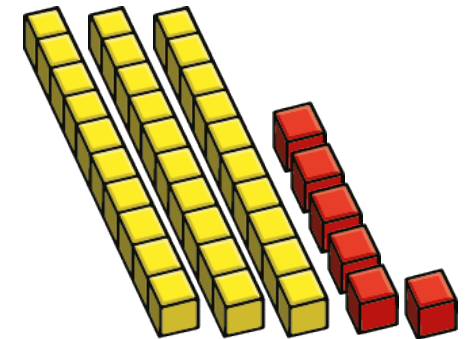
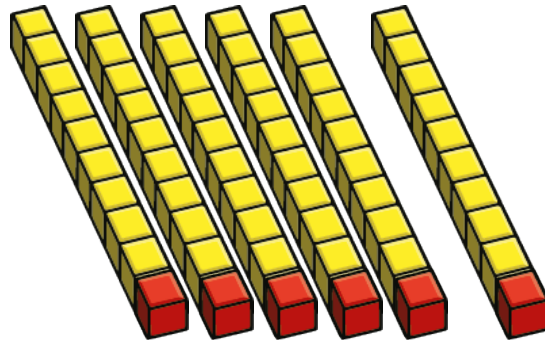
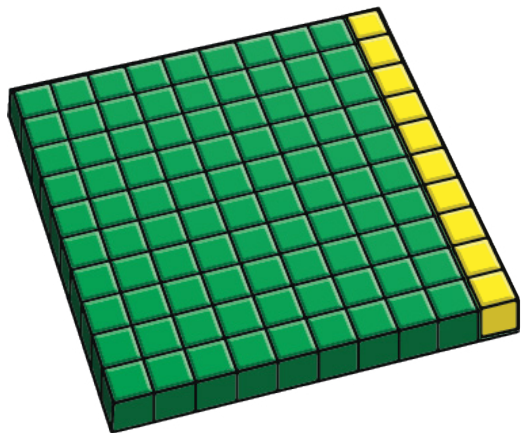


100 10 1

360

36

$\div 10$

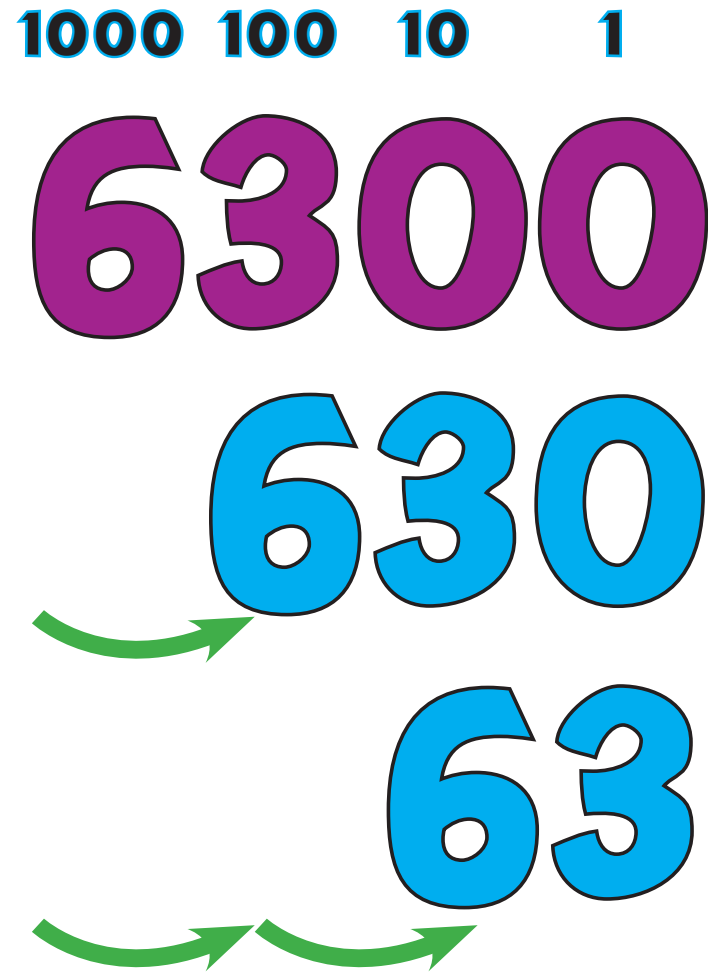


# MD7b: Jump ( $\div 10/100$ )

4/5

$\div 10$

$\div 100$



# MD7c: Jump ( $\div 10/100/1000$ )

5/6

100 10 1 ■  $\frac{1}{10}$   $\frac{1}{100}$   $\frac{1}{1000}$

634

$\div 10$

63.4

$\div 100$

6.34

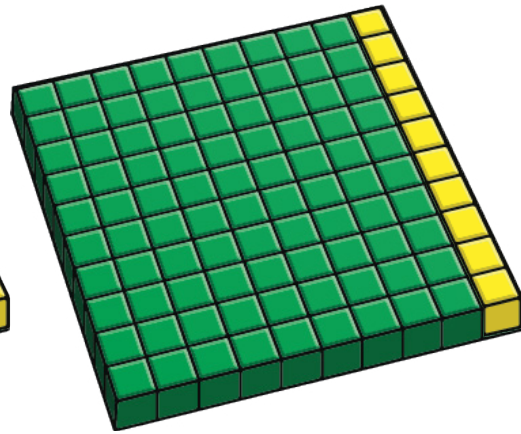
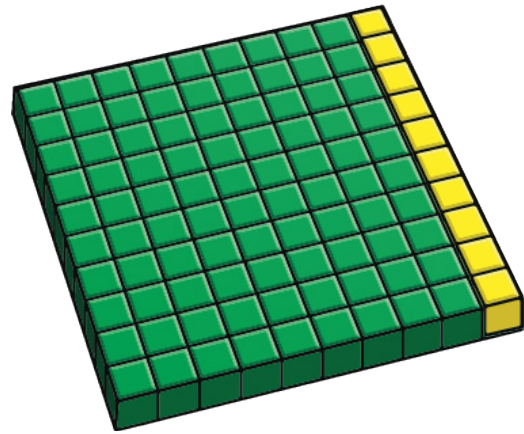
$\div 1000$

0.634



# MD10b: Jump! (x10)

## 3/4 (Pictorial)



100    10    1

36  
360

x10

