While you are waiting, complete each of these mind gyms.

start 9	Triple it	+29	Halve it	¼ of this	X by itself	−25	÷6	x9	Answer ?

start 78	÷13	X by itself	triple it	÷9	x11	−69	3/7 of this	Double it	Answer ?

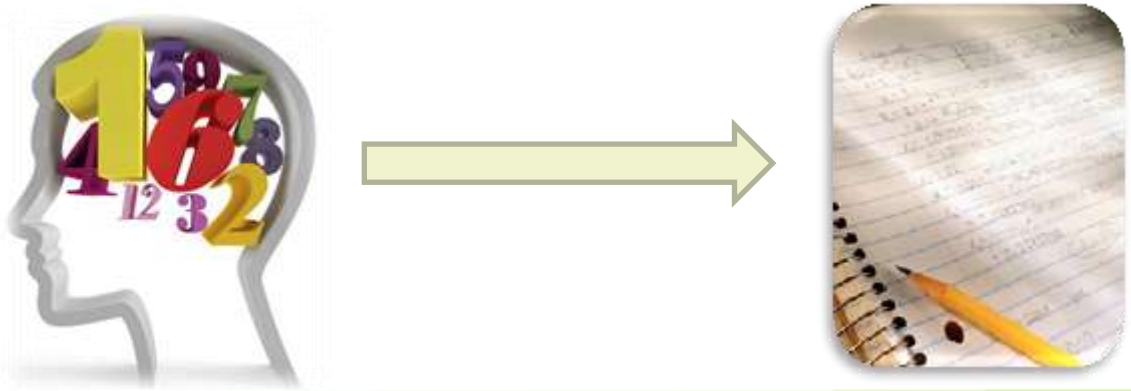
start 336	Half it	÷12	X by itself	75% of this	−56	5/7 of this	40% of this	triple it	Answer ?

The Aim

- for children to do mathematics in their heads, and if the numbers are too large, to use pencil and paper to avoid losing track.
- To do this children need to learn quick and efficient methods, including mental methods and <u>appropriate</u> written methods.

Learning written methods is not the ultimate aim.

Mathematics is foremost an activity of the mind; written calculations are an aid to that mental activity.



What's next?

- It is only once the children are confident in these mental strategies that they begin to look at more formal written methods.

- As they move through KS2, the children are taught a number of techniques, initially expanding on their mental strategies before progressing towards an efficient and more compact written method.

Mental Methods

- 50 + 643
- 360 + 360
- 324 + 58
- 3.2 + 1.9
- 1.5 + 1.6
- 27 + 36 + 13

Did you:

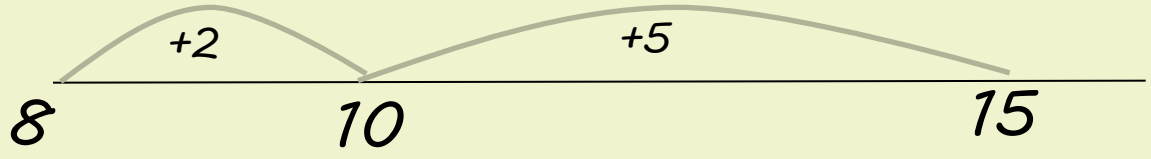
- count on from the largest number?
- re-order the numbers?
- partition the numbers into 100s 10s and ones?
- bridge through 10 and multiples of 10?
- add 9, 11 etc by adding a multiple of 10 and compensating?
- use near doubles?
- use knowledge of number facts?

Number Facts

Children need to be able to recall other simple addition facts such as 4 + 5 and 8 + 9 and relate this to multiples of 10 and 100 (e.g. 40 + 50; 80 + 90).
These are secured through sufficient practice.

When learning to add numbers such as 8 + 7 or 26 + 7, they will learn to 'bridge through 10' to make adding quicker and more efficient. So they will make the first number add to the next 10, then add on what's left. For example,

For 8 + 7, they will do 8 + 2 = 10,
then add on the rest: + 5 = 15.



Games

Ping Pong!

You begin by setting a rhythm where one person, i·e· the adult says ping and the children reply pong· You then start to give a number in place of ping and the children have to give the complement to 10 in place of pong, so it would go something like this 'ping, pong, ping, pong, six, four, ping, pong, five, five' etc·

Children really enjoy it and can actually hear themselves getting quicker at responding·

Dice Games

Don't Roll 1:

Aim is to reach 100 - 2 or more players, 2 dice or more!
- could be practising adding small numbers, doubles, bonds etc.

Odds and Evens:

Aim is to reach 50 - 2 players, 2 dice.
Decide who is 'Odd' and who is 'Even'
Each player rolls a dice, add the 2 numbers together. Decide whether total is odd or even. If it is odd, that number goes to the 'odd' person; if it is even it goes to the 'even' person. Both players roll again and repeat the process. Keep a running total until one player reaches 50.

Three in a Row

Aim is to make a row of three counters on a 6x6 multiplication grid. 2 players, 2 dice, lots of counters/coins.
Roll both the dice and multiply numbers together.
Put a counter on the answer (eg: if 2 and 3 were rolled, a counter could be placed on any 6)
Next player has a turn and play continues until one player gets 3 in a row (horizontally,vertically or diagonally).

	1	2	3	4	5	6
1	1	2	3	4	5	6
2	2	4	6	8	10	12
3	3	6	9	12	15	18
4	4	8	12	16	20	24
5	5	10	15	20	25	30
6	6	12	18	24	30	36

Hundred Square

-1

+1

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	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
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

+ 10

Addition

Subtraction

Multiplication

Division

33 + 20 = 53

Place Value

It is also crucial that children gain an understanding of place value (how much each digit in a number is worth) and how to partition a number into ones (units), tens, hundreds etc. This helps the children manage the calculation more easily.

For example:

23 + 46

can be broken down into:

20 + 40 = 60

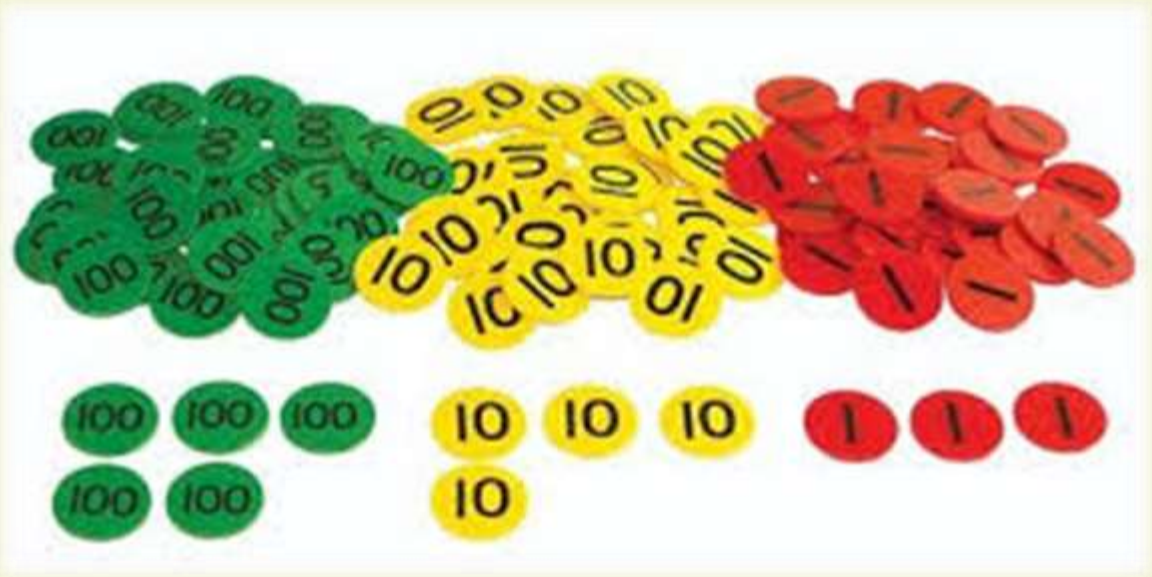
3 + 6 = 9

60 + 9 = 69

They can then use their knowledge of place value to extend known number facts – e.g. using the fact that 3 x 6 = 18 to calculate 30 x 6 = 180.

Place Value

Representations to support understanding


100 100 100
100 100
10 10 10
10


263 - 119 =
1000
100
10
1
3
9
hundreds
tens
ones

10	1

100	10	1

1000	100	10	1

1000	100	10	1	.	10th	100th

1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90

1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90
100	200	300	400	500	600	700	800	900

1	2	3	4	5	6	7	8	9
10	20	30	40	50	60	70	80	90
100	200	300	400	500	600	700	800	900
1 000	2 000	3 000	4 000	5 000	6 000	7 000	8 000	9 000

Let's do some Maths!

ADDITION

Key Words

total come increase

both altogether

sum plus combine

in all add join

A sledgehammer to crack a nut!

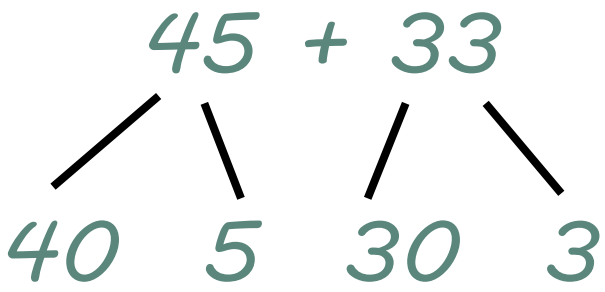
$$\begin{array}{r} {}^{0}\cancel{1}\,{}^{1}\cancel{0}\,{}^{9}\cancel{0}\,{}^{1}\cancel{0} \\ -\quad 7 \\ \hline 993 \end{array}$$

$$\begin{array}{r} {}^{1}\cancel{1}6^{\,0} \\ -\ 9 \\ \hline 7 \end{array}$$

$$\begin{array}{r} 97 \\ \times\ 100 \\ \hline 00 \\ 000 \\ 9700 \\ \hline 9700 \end{array}$$

$$7\overline{)\,{}^{0}\cancel{5}\,6}\quad 08$$

Stage 1: Partitioning



40 + 30 = 70

5 + 3 = 8

70 + 8 = 78

Your turn...

53 + 46 =

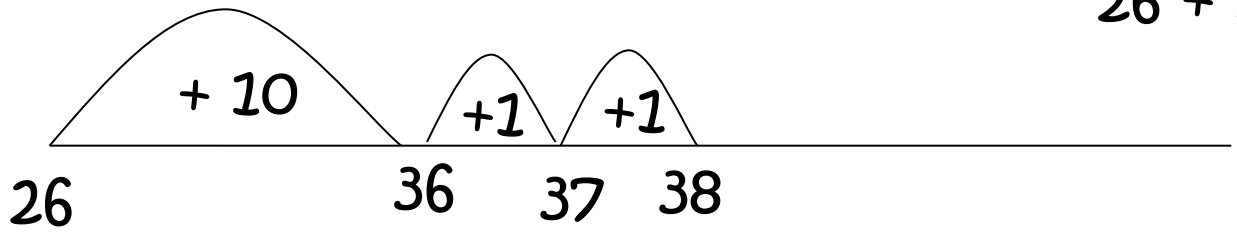
YouTube Videos

- https://www.youtube.com/channel/UCz2UTZlymIu3KJky0iRv_Xg

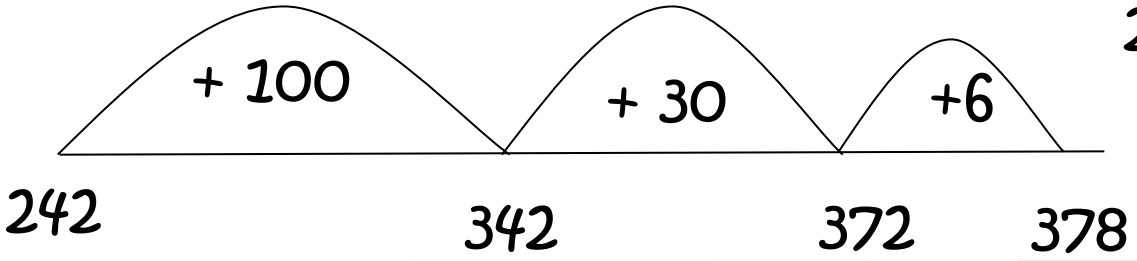
These videos will show you how we teach the written methods for all four operations, alongside the manipulatives.

Stage 2: Number line

26 + 12 = 38

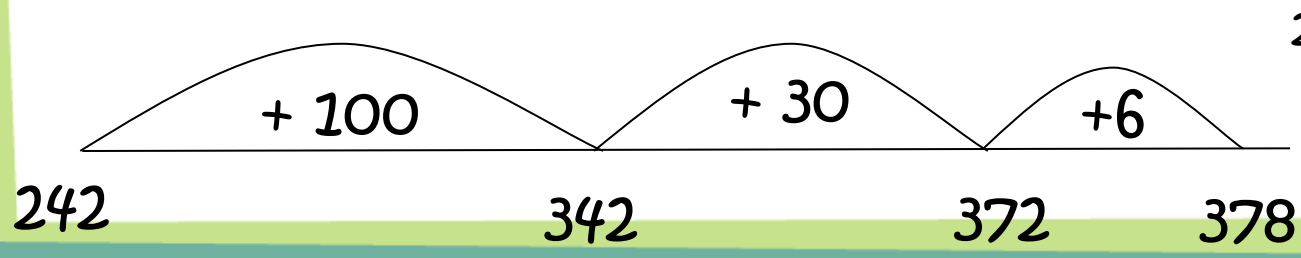


242 + 136 = 378



Use the number line to work these out...

- 67 + 48 =
- 346 + 237 =
- 3241 + 1471 =



242 + 136 = 378

Stage 3: Column Method

Expanded

$$
\begin{array}{r}
358 \\
+\ 33 \\
\hline
11 \\
80 \\
300 \\
\hline
391
\end{array}
$$

Leading to →

Compact

$$
\begin{array}{r}
358 \\
+\ 33 \\
\hline
391 \\
{\scriptstyle 1}
\end{array}
$$

SUBTRACTION

Key Words

Take away

decrease

remain

difference

minus

How many more?

fewer

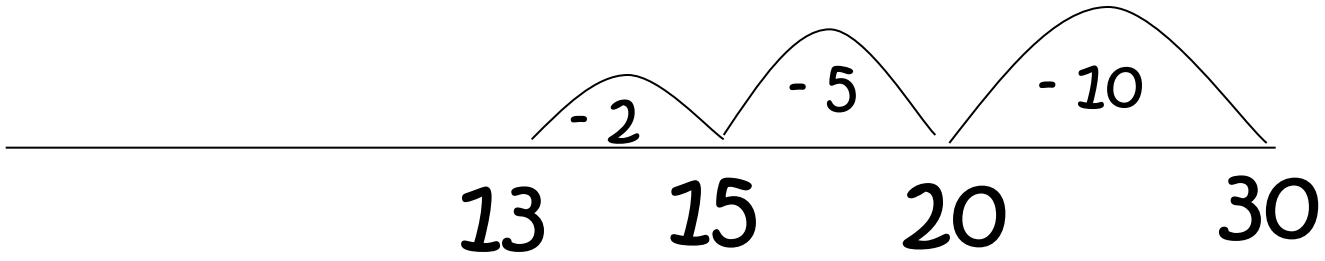
left

How would you solve these?

- 67 - 45
- 67 - 59
- 178 - 99
- 3241 - 2167

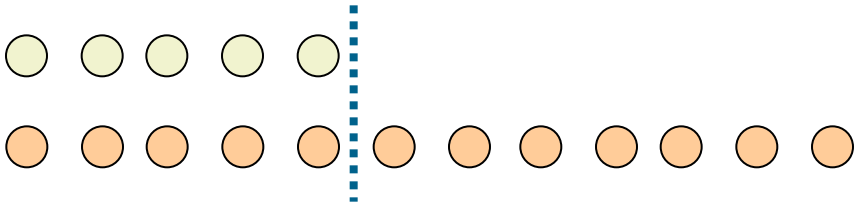
Stage 1: Number line

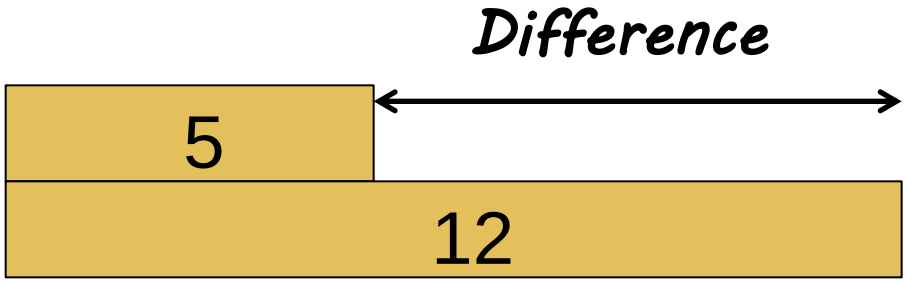
- Subtraction as taking away



30 – 17 = 13

- Subtraction as finding the difference

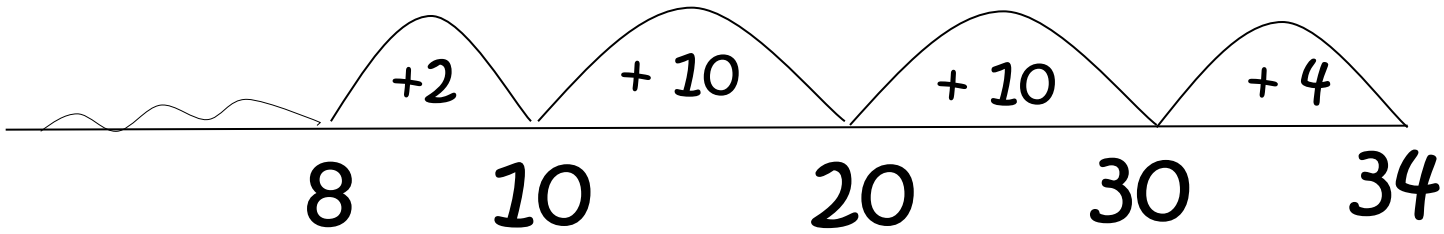




Stage 2: Number line

- Subtraction as finding the difference

34 – 8 =

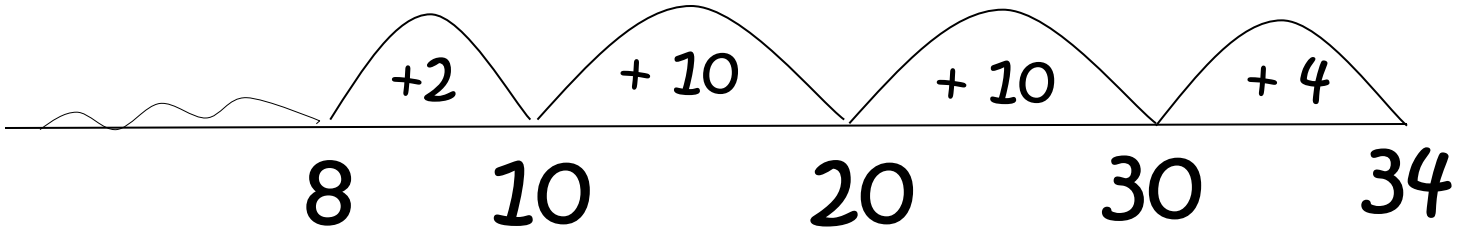


- Jump to next multiple of 10
- Count the jumps

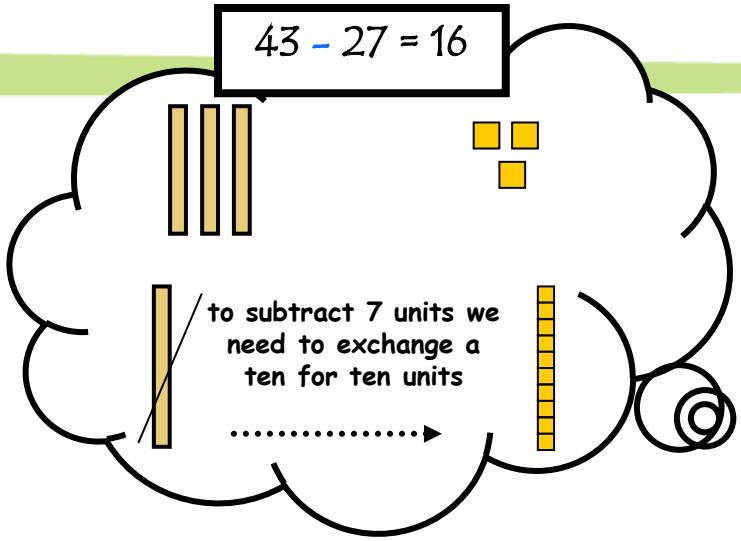
10 + 3 = 13

Use the number line to work these out...

- 48 - 31 =
- 256 - 107 =



Stage 3: Expanded Column Method



Expanded method

It is important that the children have a good understanding of place value and partitioning using concrete resources and visual images to support calculations. The expanded method enables children to see what happens to numbers in the standard written method.

T	U
4	3
– 2	7

$$\begin{array}{rrcr} {}^{30}\cancel{40} & & + & {}^{10+}3 \\ - & 20 & + & 7 \\ \hline & 10 & + & 6 \end{array}$$

Stage 4: Column Method

$$\begin{array}{r} 547 \\ -\ 134 \\ \hline 413 \end{array}$$

$$\begin{array}{r} {}^{3}\not{4}{}^{1}3 \\ 27 \\ \hline 16 \end{array}$$

Multiplication

per

of

multiplied

product

twice

double

by

as much

times

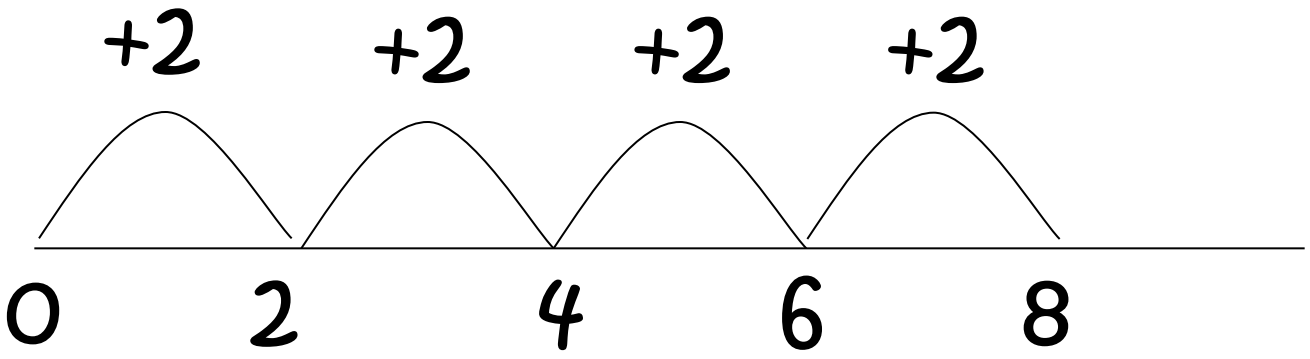
How would you solve these?

- 24×50
- 24×4
- 24×15
- 136×9

Stage 1: Number line

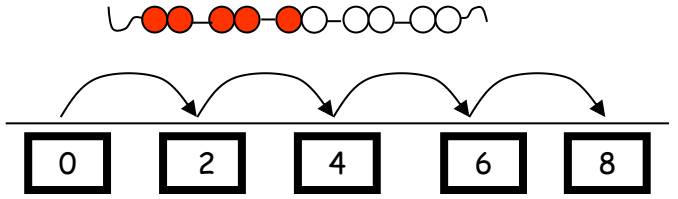
Multiplication as repeated addition

4×2



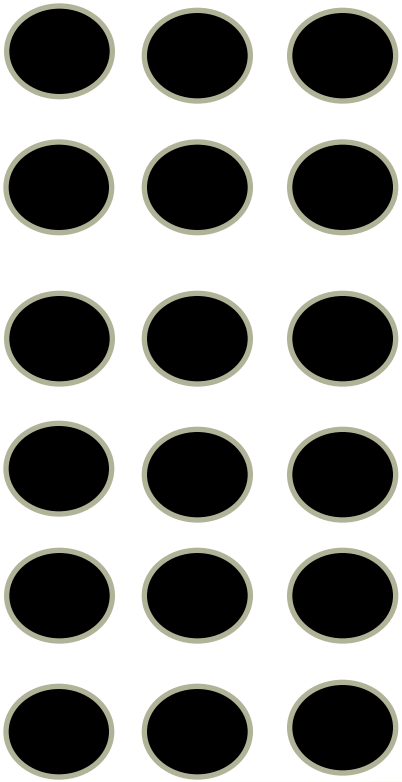
$4 \times 2 = 2 + 2 + 2 + 2$

So, $2 \times 4 = 8$

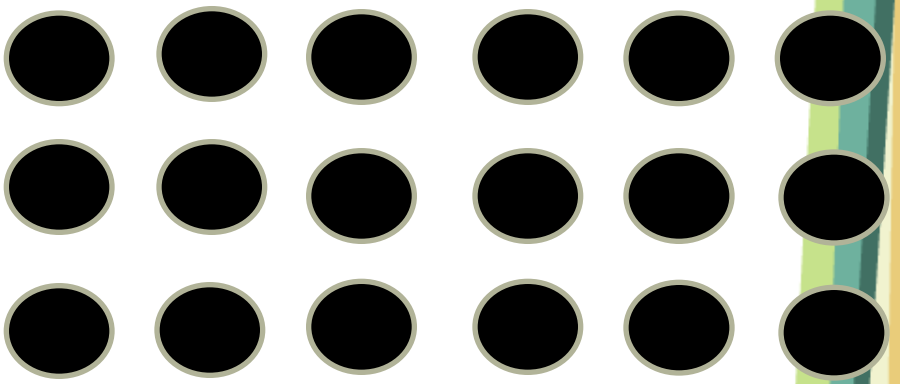


Stage 2: Arrays

3 x 6



Or



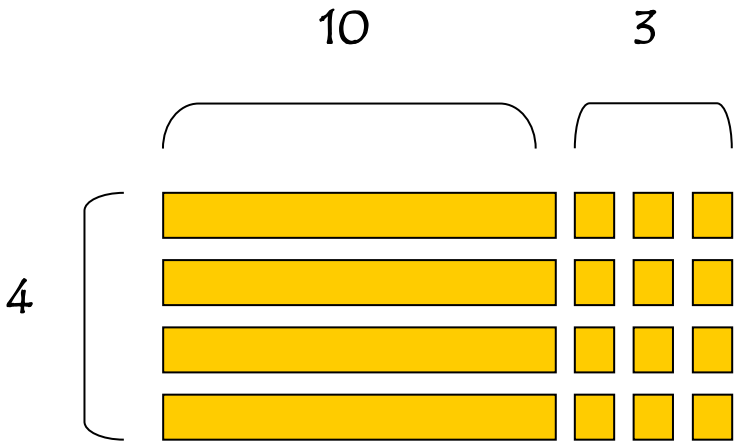
Add the dots

What multiplication are these arrays showing?

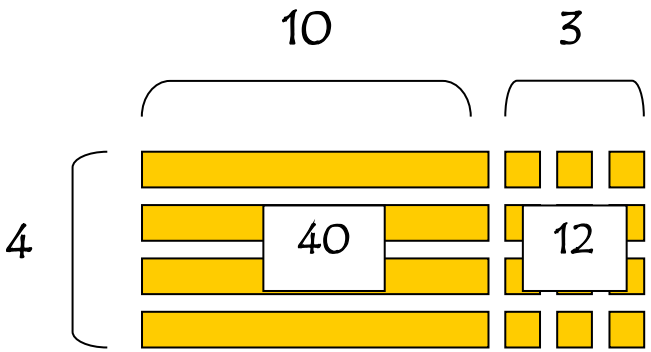
Stage 3: Partitioning

Use place value apparatus to support the multiplication of U x TU

4 x 13



Stage 3: Partitioning



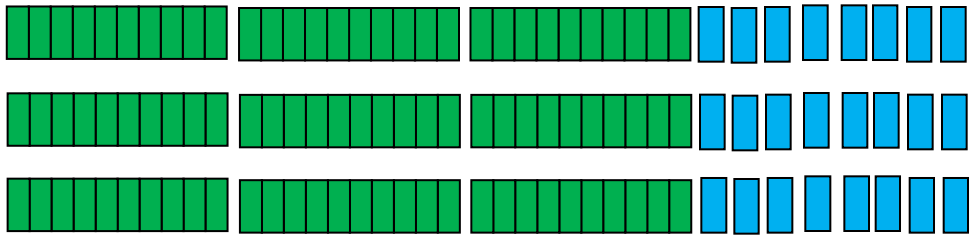
4	10	3
	40	12

40 + 12 = 52

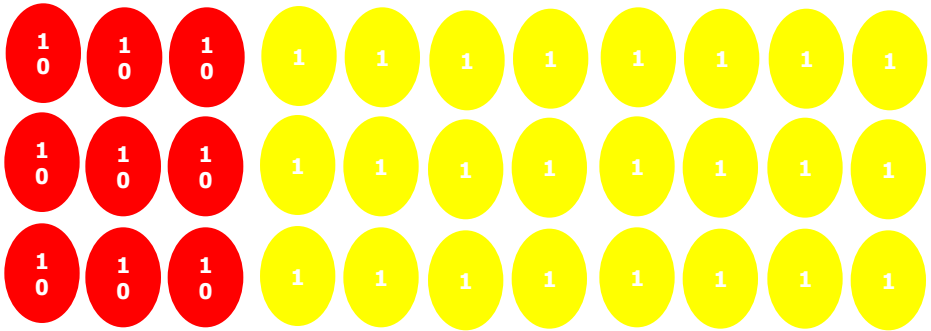
Use place value apparatus to support the multiplication of U x TU alongside the grid method

4 x 13

Manipulatives for multiplication



	30	8
3	90	24



$$\begin{array}{r} 38 \\ \times \quad 3 \\ \hline 114 \\ \hline {\scriptstyle 2} \end{array}$$

What's different about all these models?
What is the same?

Stage 3: Partitioning

24 x 5

20 x 5 = 100
4 x 5 = 20

100 + 20 = 120

Step 4: Grid Method

Multiplying TU x TU

14 x 33

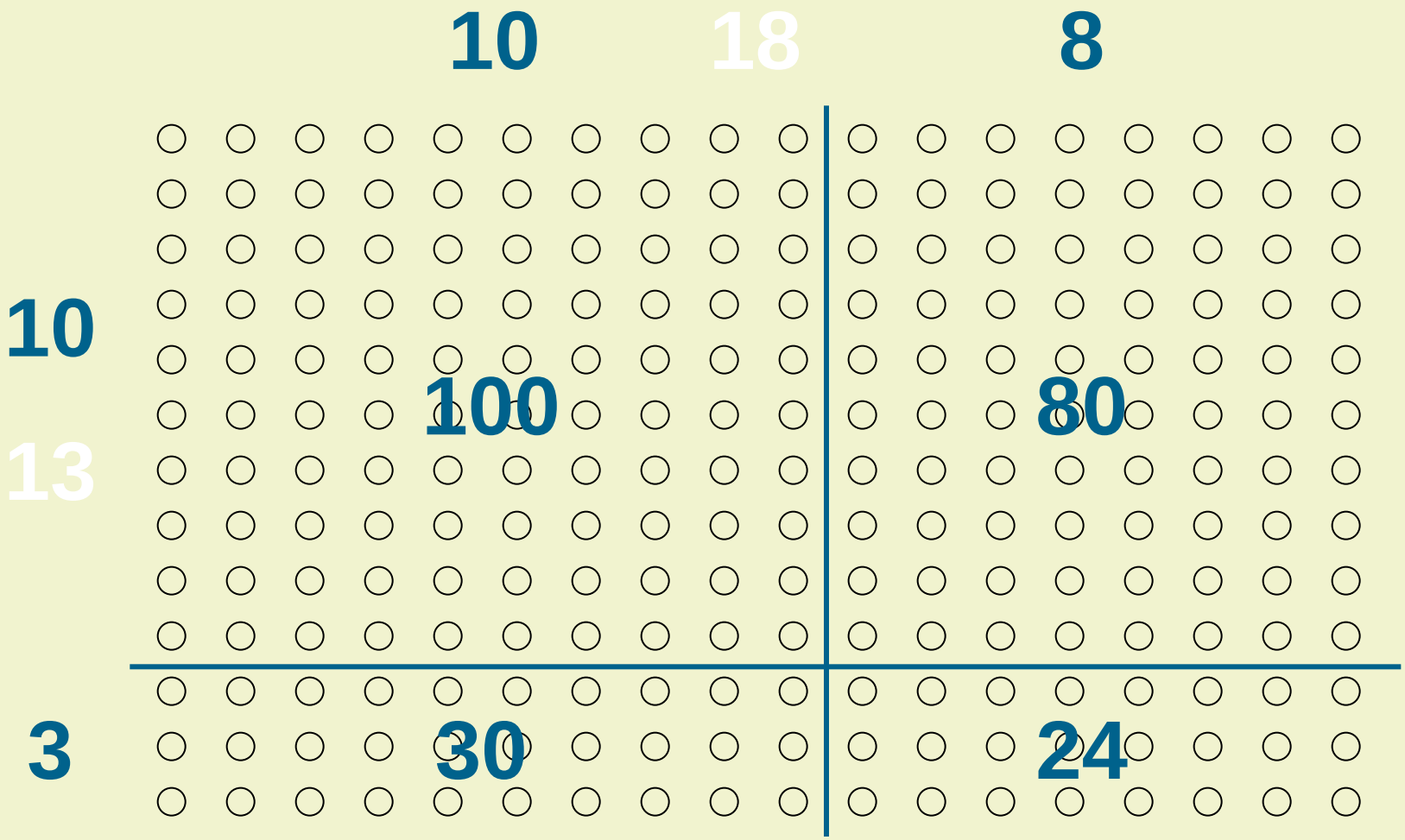
	30	3
10	300	30
4	120	12

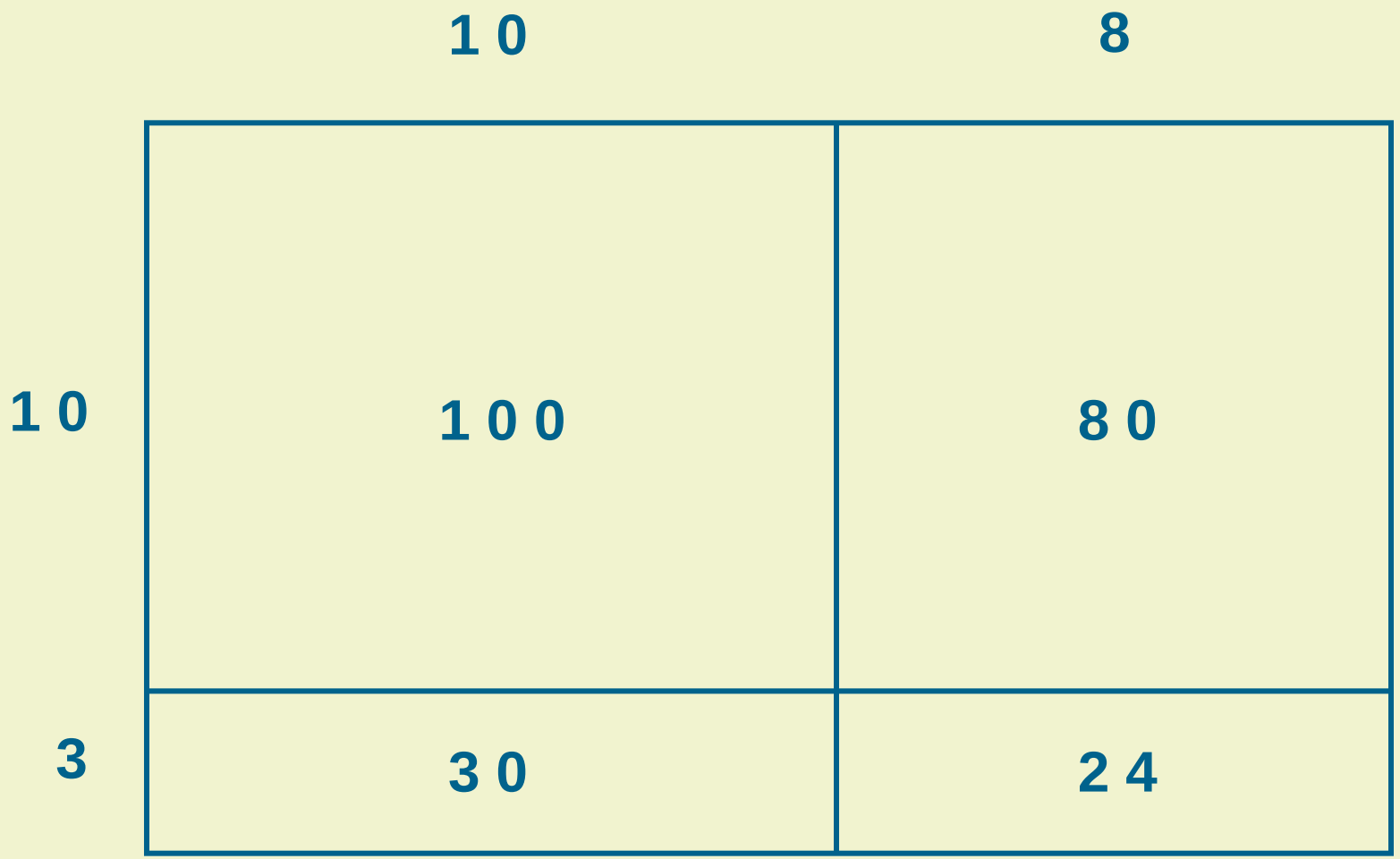
= 330 +

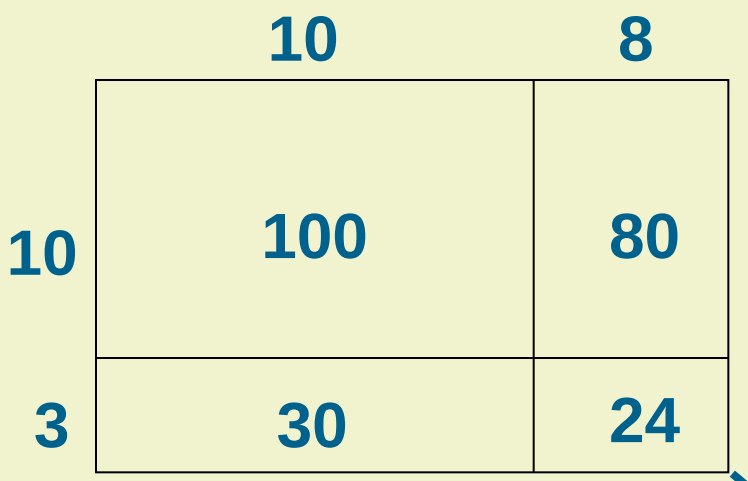
= 132

462

BBC News Video Link


10
18
8
10
13
100
80
3
30
24


10
8
10
100
80
3
30
24



		1	8			
	×	1	3			
		5	4			
	1	8	0			
	2	3	4			

Use the grid method to work these out:

24 x 7

142 x 3

14 x 33

	30	3
10	300	30
4	120	12

= 330 +

= 132

462

Division

cut	each
evenly	Every
Quotient	out of
equal parts	divided by
In half	average

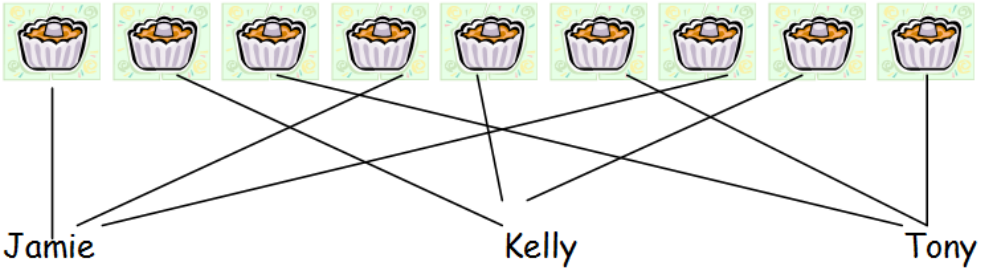
How would you solve these?

- 123 ÷ 3
- 165 ÷ 10
- 325 ÷ 25
- 623 ÷ 24

Division

Sharing

The tray had 9 cakes in and they were shared out between Jamie, Kelly and Tony. Each child had the same number of cakes. How many did they have each?



So, 9 ÷ 3 = 3

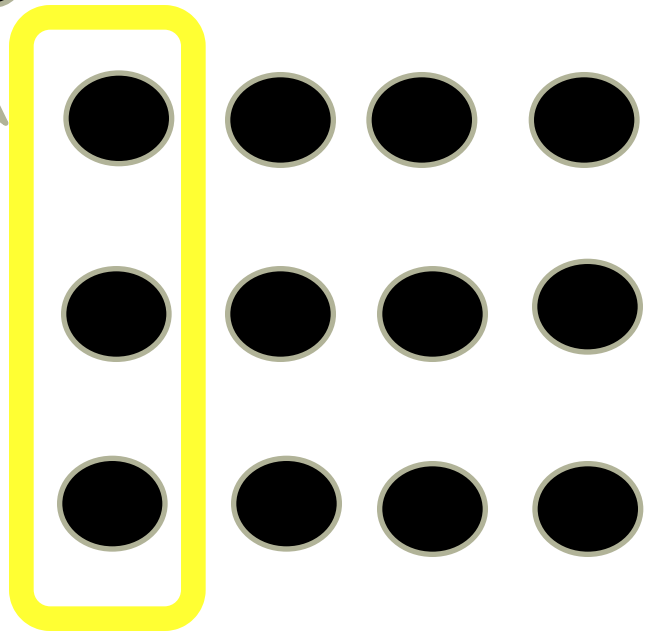
Grouping

The apples need putting into bags with 5 apples in each bag. Julie has 15 apples. How many bags will she need?

So, 15 ÷ 5 = 3

Stage 2: Arrays

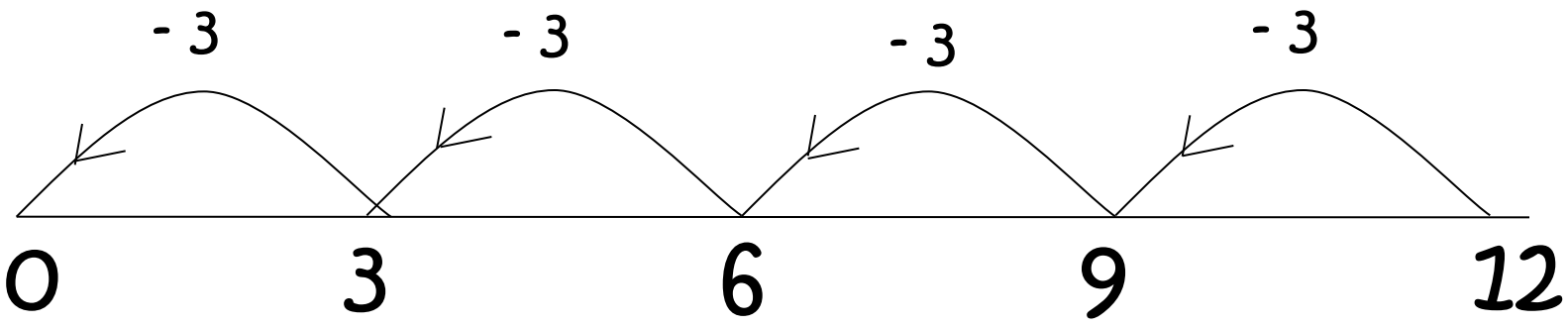
First group of 3



$12 \div 3 = 4$

Stage 3: Repeated subtraction

12 ÷ 3 = 4

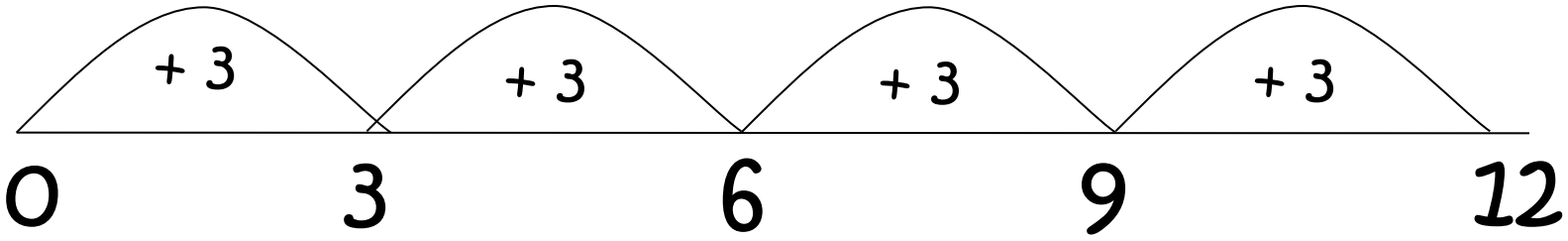


12 - 3 - 3 - 3 - 3 = 4 groups of 3.

Counting in steps

12 ÷ 3 = 4

Add the jumps

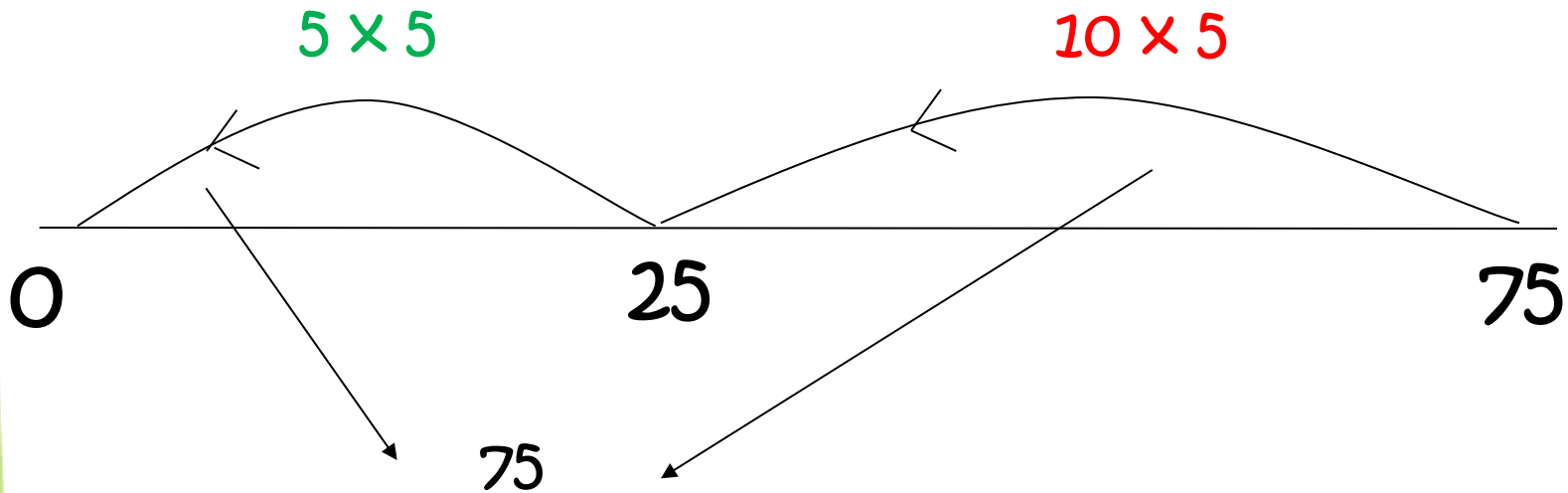


Fingers

“3 “6 “9 “12

Step 4: Chunking

75 ÷ 5



75
- 50 (10 X 5)
25
- 25 (5 X 5)
0

75 ÷ 5 = 15

Need to know tables!

BBC News Video Link

Children need to see that as the numbers get larger, large chunk subtraction is the more efficient method. Multiples of the divisor (large chunks) are taken away. Multiplication facts are needed to see the size of the 'chunk'.

What facts do I know about the 7 times-table?

100 ÷ 7 = 14 r 2

100

- 70 (10 x 7)

30

- 28 (4 x 7)

2

518 ÷ 7 = 74

518

- 350 (50 x 7)

168

- 140 (20 x 7)

28

- 28 (4 x 7)

0

Fact Box

1 x 7 = 7

2 x 7 = 14

5 x 7 = 35

10 x 7 = 70

20 X 7 = 140

50 x 7 = 350

100 x 7 = 700

Stage 5: Short Division

For example: 84 ÷ 7 can be partitioned into (70 + 14) ÷ 7
This can now be calculated: 70 ÷ 7 = 10
14 ÷ 7 = 2 Therefore 84 ÷ 7 = 12

Another example: 104 ÷ 8 = (80 + 24) ÷ 8
80 ÷ 8 = 10
24 ÷ 8 = 3 Therefore 104 ÷ 8 = 13

Remainders may also sometimes need to be recorded:
97 ÷ 6 = (60 + 37) ÷ 6
90 ÷ 6 = 10
37 ÷ 6 = 6 r1 Therefore 97 ÷ 6 = 16 r1

Stage 5: Short Division

The short division method can be recorded like this:

$$6 \overline{)\ 60 + 37} \quad \begin{matrix} 10 + 6\ \text{r}1 \\ = 16\ \text{r}1 \end{matrix}$$

$$6 \overline{)\ 9^{3}7} \quad 1\,6\ \text{r}1$$

	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Square numbers Double 3s for 6s Double 4s for 8s Double 6s for 12s

九九乘法口诀表

乘宝宝

1

1×1=1
1×2=2
1×3=3
1×4=4
1×5=5
1×6=6
1×7=7
1×8=8
1×9=9

2

2×2= 4
2×3= 6
2×4= 8
2×5=10
2×6=12
2×7=14
2×8=16
2×9=18

3

3×3= 9
3×4=12
3×5=15
3×6=18
3×7=21
3×8=24
3×9=27

4

4×4=16
4×5=20
4×6=24
4×7=28
4×8=32
4×9=36

5

5×5=25
5×6=30
5×7=35
5×8=40
5×9=45

6

6×6=36
6×7=42
6×8=48
6×9=54

7

7×7=49
7×8=56
7×9=63

8

8×8=64
8×9=72

9

9×9=81

MATHS WEBSITES

www.whiz.com

www.ictgames.com

www.bbc.co.uk/schools

www.crickweb.co.uk

www.counton.org

www.mathzone.co.uk

www.nrich.maths.org

www.mathsplayground.com

www.lancsngfl.ac.uk

www.childparenting.about.com

www.mad4maths.com

www.maths-games.org

www.topmarks.co.uk

www.mathletics.co.uk

www.themathsfactor.com

www.mathsformumsanddads.co.uk

Thank you!