PROGRESSION THROUGH CALCULATIONS FOR MULTIPLICATION

MENTAL CALCULATIONS

(ongoing)

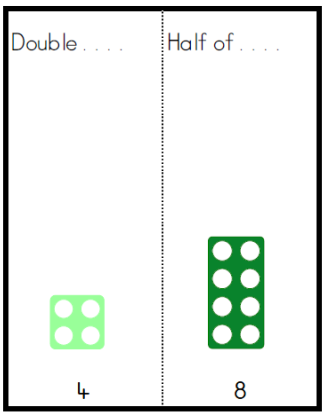
These are a **selection** of mental calculation strategies:

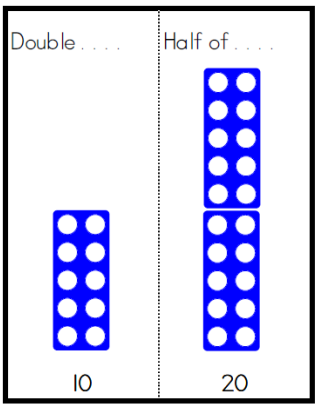
See NNS Framework Section 5, pages 52-57 and Section 6, pages 58-65

Doubling and halving

Applying the knowledge of doubles and halves to known facts.

e.g. 8 x 4 is double 4 x 4





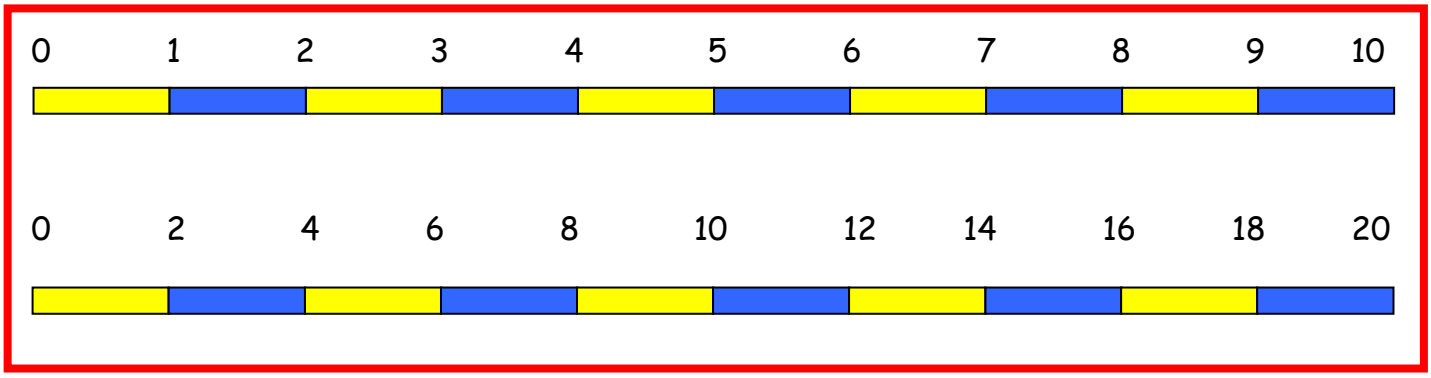
Using multiplication facts

Tables should be taught everyday from Year 2 onwards, either as part of the mental oral starter or other times as appropriate within the day.

Year 2

1 times table
2 times table

1 times table
10 times table
5 times table



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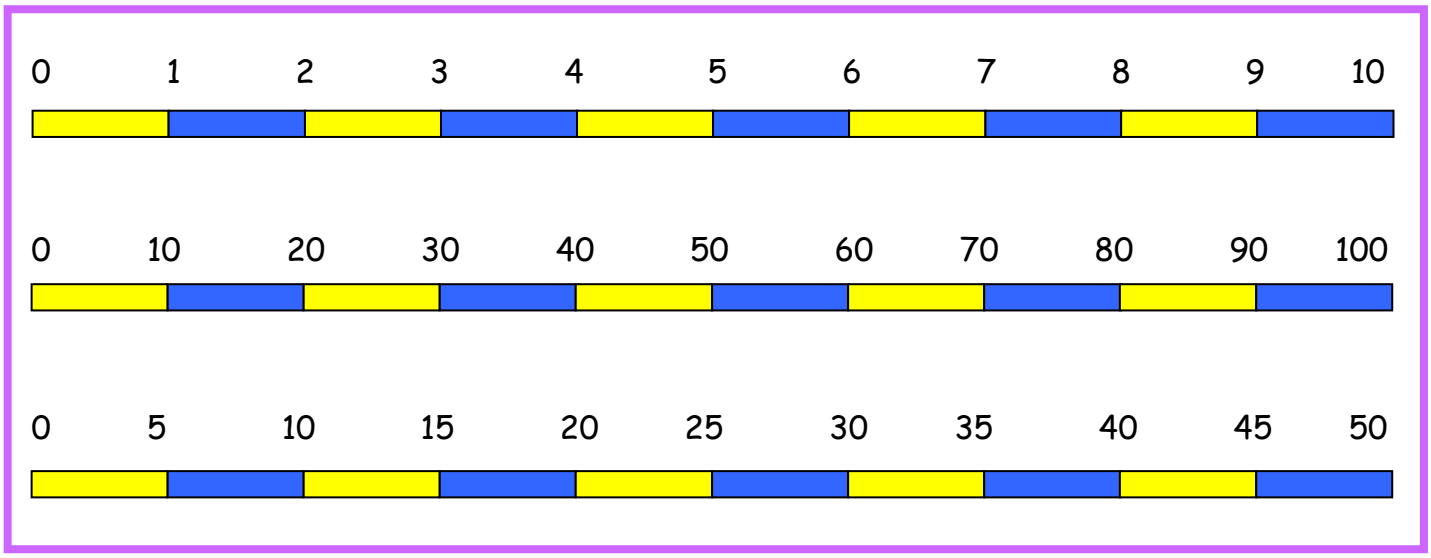
		5	x	1	=	5	
		6	x	1	=	6	
		7	x	1	=	7	
		8	x	1	=	8	
		9	x	1	=	9	
	1	0	x	1	=	1	0

		0	x	2	=	0	
		1	x	2	=	2	
		2	x	2	=	4	
		3	x	2	=	6	
		4	x	2	=	8	
		5	x	2	=	1	0
		6	x	2	=	1	2
		7	x	2	=	1	4
		8	x	2	=	1	6
		9	x	2	=	1	8
	1	0	x	2	=	2	0



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		3	x	1	=	3	
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		5	x	1	=	5	
		6	x	1	=	6	
		7	x	1	=	7	
		8	x	1	=	8	
		9	x	1	=	9	
	1	0	x	1	=	1	0

	0	x	1	0	=		0
	1	x	1	0	=	1	0
	2	x	1	0	=	2	0
	3	x	1	0	=	3	0
	4	x	1	0	=	4	0
	5	x	1	0	=	5	0
	6	x	1	0	=	6	0
	7	x	1	0	=	7	0
	8	x	1	0	=	8	0
	9	x	1	0	=	9	0
1	0	x	1	0	=	1	0	0

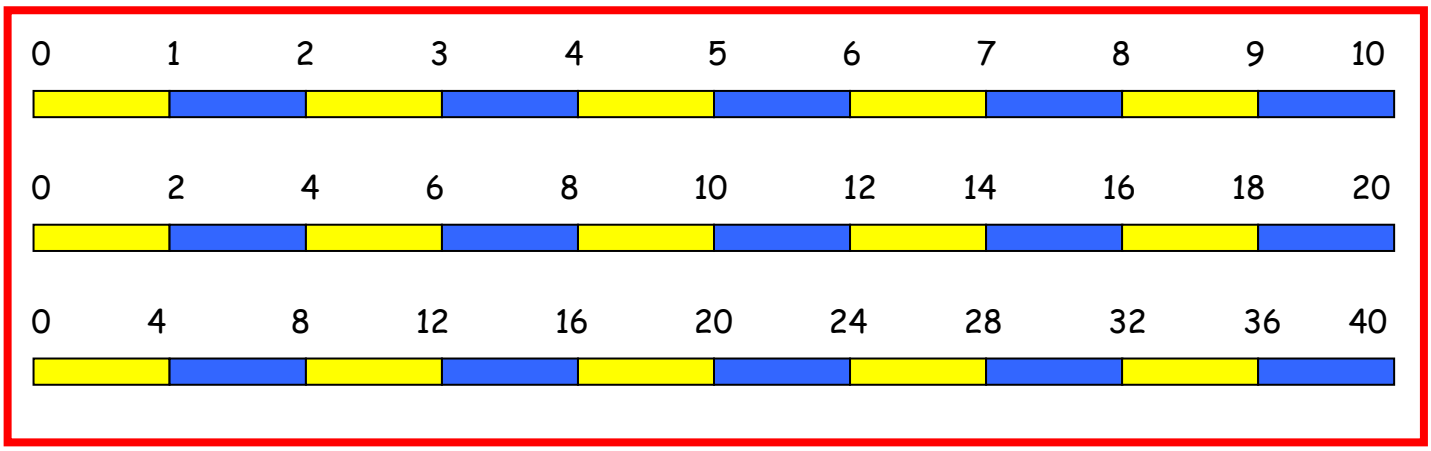
		0	x	5	=		0
		1	x	5	=		5
		2	x	5	=	1	0
		3	x	5	=	1	5
		4	x	5	=	2	0
		5	x	5	=	2	5
		6	x	5	=	3	0
		7	x	5	=	3	5
		8	x	5	=	4	0
		9	x	5	=	4	5
	1	0	x	5	=	5	0

Year 3

1 times table
2 times table
4 times table

1 times table
10 times table
5 times table

1 times table
3 times table



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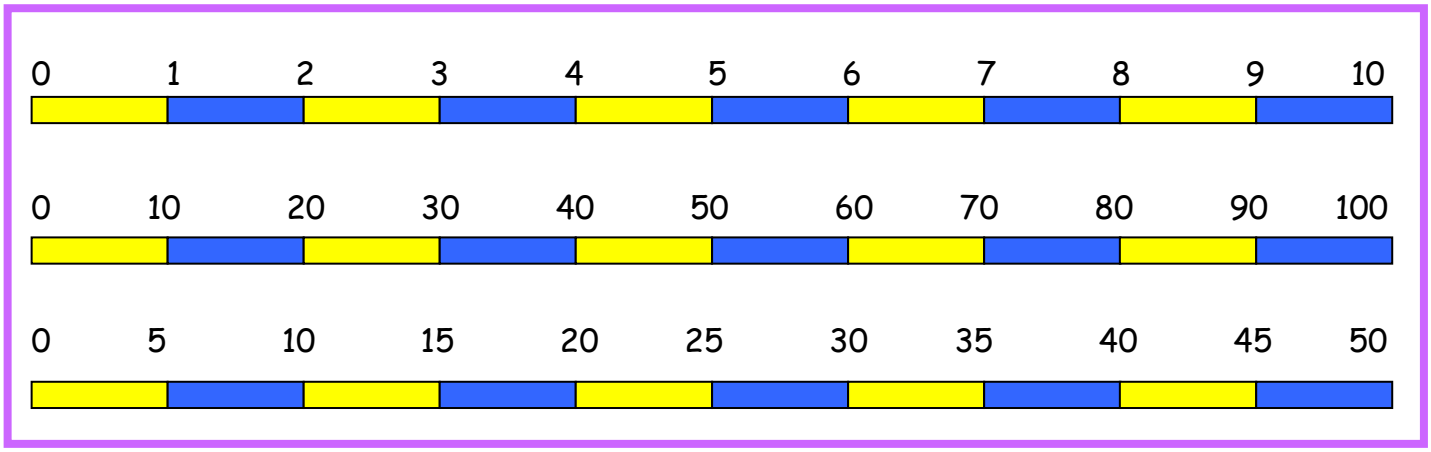
		6	x	1	=		6	
		7	x	1	=		7	
		8	x	1	=		8	
		9	x	1	=		9	
	1	0	x	1	=	1	0	

		0	x	2	=		0	
		1	x	2	=		2	
		2	x	2	=		4	
		3	x	2	=		6	
		4	x	2	=		8	
		5	x	2	=	1	0	
		6	x	2	=	1	2	
		7	x	2	=	1	4	
		8	x	2	=	1	6	
		9	x	2	=	1	8	
	1	0	x	2	=	2	0	

		0	x	4	=		0	
		1	x	4	=		4	
		2	x	4	=		8	
		3	x	4	=	1	2	
		4	x	4	=	1	6	
		5	x	4	=	2	0	
		6	x	4	=	2	4	
		7	x	4	=	2	8	
		8	x	4	=	3	2	
		9	x	4	=	3	6	
	1	0	x	4	=	4	0	



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		3	x	1	=		3
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		5	x	1	=		5
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		7	x	1	=		7
		8	x	1	=		8
		9	x	1	=		9
	1	0	x	1	=	1	0

	0	x	1	0	=		0
	1	x	1	0	=	1	0
	2	x	1	0	=	2	0
	3	x	1	0	=	3	0
	4	x	1	0	=	4	0
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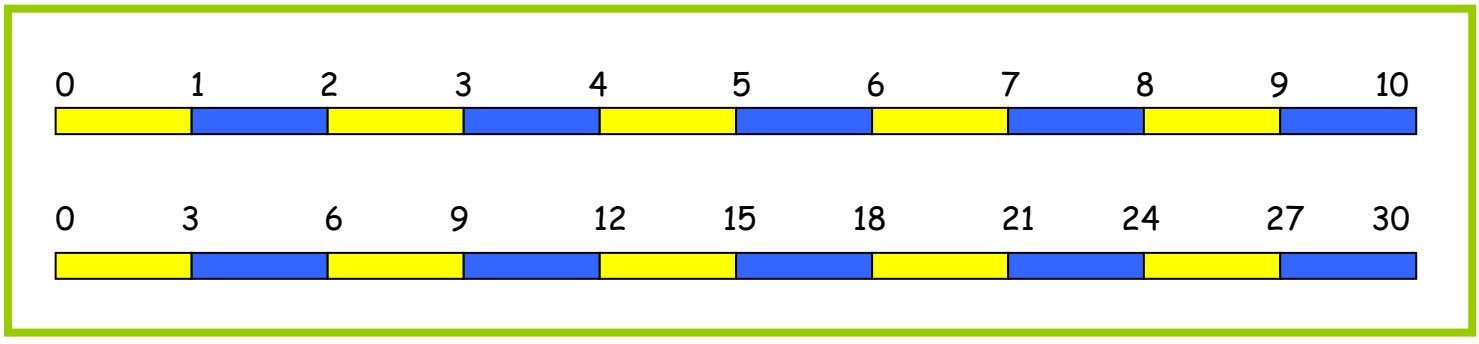
	8	x	1	0	=	8	0
	9	x	1	0	=	9	0
1	0	x	1	0	=	1	0	0

		0	x	5	=		0
		1	x	5	=		5
		2	x	5	=	1	0
		3	x	5	=	1	5
		4	x	5	=	2	0
		5	x	5	=	2	5
		6	x	5	=	3	0
		7	x	5	=	3	5
		8	x	5	=	4	0
		9	x	5	=	4	5
	1	0	x	5	=	5	0



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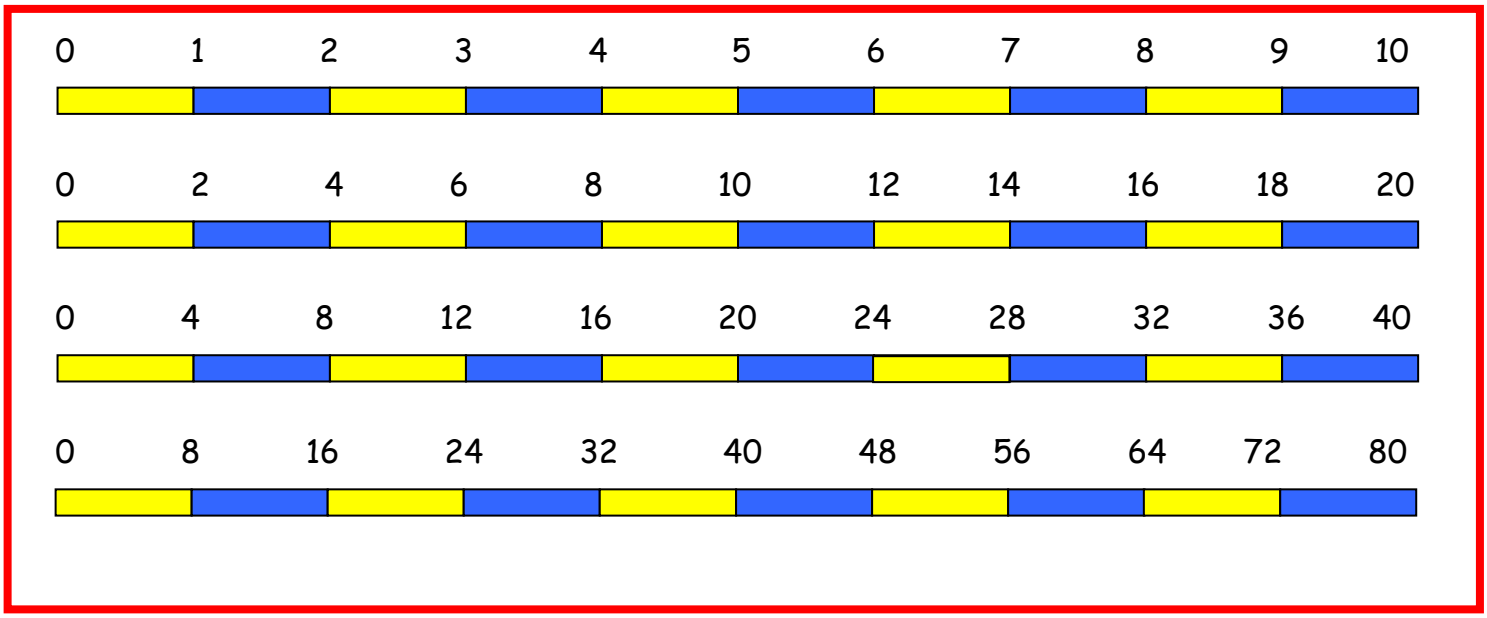
		3	x	1	=		3
		4	x	1	=		4
		5	x	1	=		5
		6	x	1	=		6
		7	x	1	=		7
		8	x	1	=		8
		9	x	1	=		9
	1	0	x	1	=	1	0

		0	x	3	=		0
		1	x	3	=		3
		2	x	3	=		6
		3	x	3	=		9
		4	x	3	=	1	2
		5	x	3	=	1	5
		6	x	3	=	1	8
		7	x	3	=	2	1
		8	x	3	=	2	4
		9	x	3	=	2	7
	1	0	x	3	=	3	0

Year 4

1 times table	1 times table	1 times table
2 times table	10 times table	3 times table
4 times table	5 times table	6 times table
8 times table		9 times table



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	3	x	1	=		3
	4	x	1	=		4
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	8	x	1	=		8
	9	x	1	=		9
1	0	x	1	=	1	0

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	1	x	2	=		2
	2	x	2	=		4
	3	x	2	=		6
	4	x	2	=		8
	5	x	2	=	1	0
	6	x	2	=	1	2
	7	x	2	=	1	4
	8	x	2	=	1	6
	9	x	2	=	1	8
1	0	x	2	=	2	0

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	1	x	4	=		4
	2	x	4	=		8
	3	x	4	=	1	2
	4	x	4	=	1	6
	5	x	4	=	2	0
	6	x	4	=	2	4
	7	x	4	=	2	8
	8	x	4	=	3	2
	9	x	4	=	3	6
1	0	x	4	=	4	0

	0	x	8	=		0
	1	x	8	=		8
	2	x	8	=	1	6
	3	x	8	=	2	4
	4	x	8	=	3	2
	5	x	8	=	4	0
	6	x	8	=	4	8
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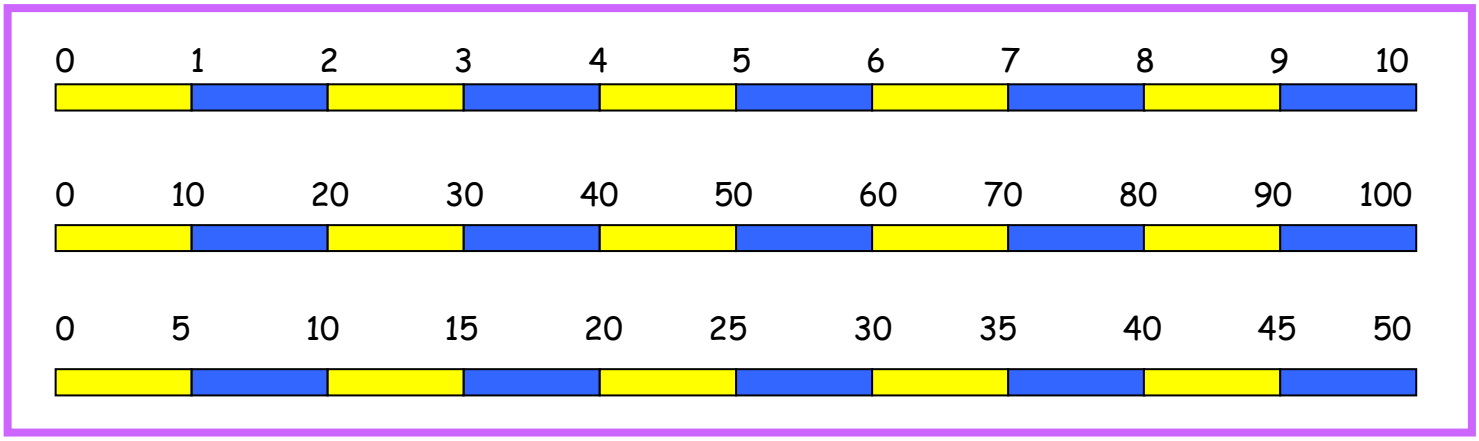
	8	x	8	=	6	4
	9	x	8	=	7	2
1	0	x	8	=	8	0



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	3	x	1	=		3
	4	x	1	=		4
	5	x	1	=		5
	6	x	1	=		6
	7	x	1	=		7
	8	x	1	=		8
	9	x	1	=		9
1	0	x	1	=	1	0

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	2	x	1	0	=	2 0
	3	x	1	0	=	3 0
	4	x	1	0	=	4 0
	5	x	1	0	=	5 0
	6	x	1	0	=	6 0
	7	x	1	0	=	7 0
	8	x	1	0	=	8 0
	9	x	1	0	=	9 0
1	0	x	1	0	=	1 0 0

	0	x	5	=		0
	1	x	5	=		5
	2	x	5	=	1	0
	3	x	5	=	1	5
	4	x	5	=	2	0
	5	x	5	=	2	5
	6	x	5	=	3	0
	7	x	5	=	3	5
	8	x	5	=	4	0
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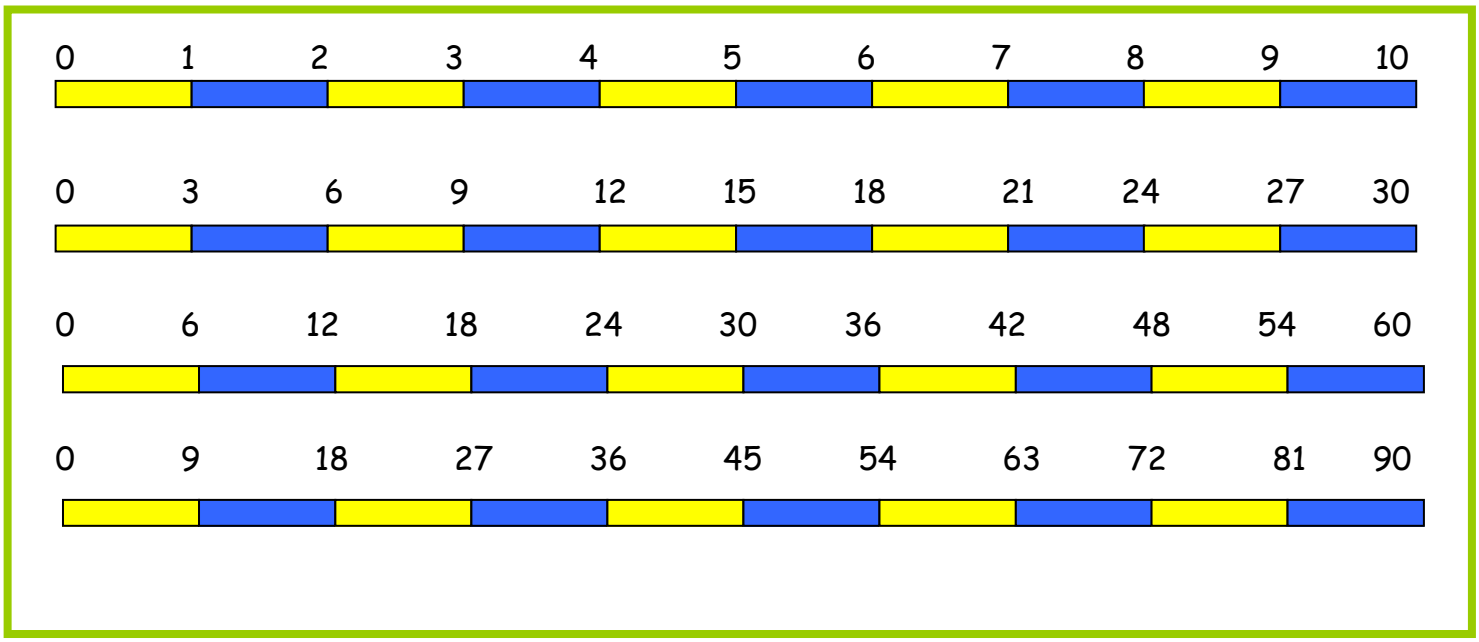

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	4	x	1	=		4
	5	x	1	=		5
	6	x	1	=		6
	7	x	1	=		7
	8	x	1	=		8
	9	x	1	=		9
1	0	x	1	=	1	0

	0	x	3	=		0
	1	x	3	=		3
	2	x	3	=		6
	3	x	3	=		9
	4	x	3	=	1	2
	5	x	3	=	1	5
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	8	x	3	=	2	4
	9	x	3	=	2	7
1	0	x	3	=	3	0

	0	x	6	=		0
	1	x	6	=		6
	2	x	6	=	1	2
	3	x	6	=	1	8
	4	x	6	=	2	4
	5	x	6	=	3	0
	6	x	6	=	3	6
	7	x	6	=	4	2
	8	x	6	=	4	8
	9	x	6	=	5	4
1	0	x	6	=	6	0

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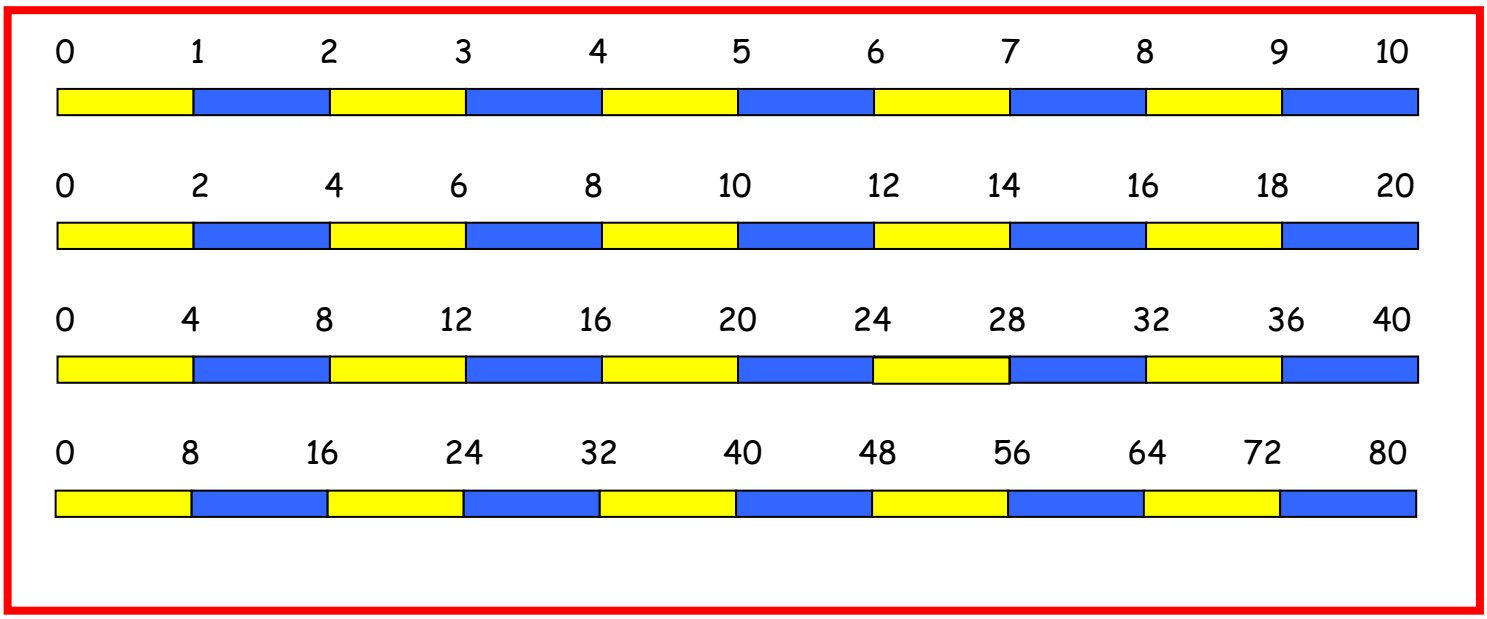
Years 5 and 6 Derive and recall quickly all multiplication facts up to 10 x 10.

1 times table	1 times table	1 times table	1 times table
2 times table	10 times table	3 times table	7 times table
4 times table	5 times table	6 times table	
8 times table		9 times table	



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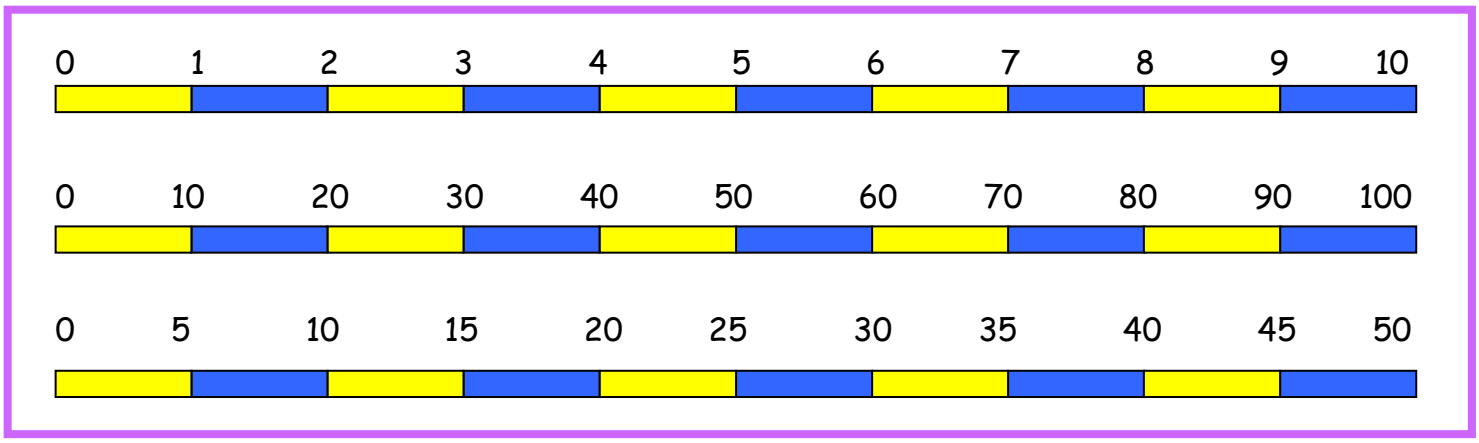
2 x 1 =	2
3 x 1 =	3
4 x 1 =	4
5 x 1 =	5
6 x 1 =	6
7 x 1 =	7
8 x 1 =	8
9 x 1 =	9
10 x 1 =	10

0 x 2 =	0
1 x 2 =	2
2 x 2 =	4
3 x 2 =	6
4 x 2 =	8
5 x 2 =	10
6 x 2 =	12
7 x 2 =	14
8 x 2 =	16
9 x 2 =	18
10 x 2 =	20

0 x 4 =	0
1 x 4 =	4
2 x 4 =	8
3 x 4 =	12
4 x 4 =	16
5 x 4 =	20
6 x 4 =	24
7 x 4 =	28
8 x 4 =	32
9 x 4 =	36
10 x 4 =	40

0 x 8 =	0
1 x 8 =	8
2 x 8 =	16
3 x 8 =	24
4 x 8 =	32
5 x 8 =	40
6 x 8 =	48
7 x 8 =	56
8 x 8 =	64
9 x 8 =	72
10 x 8 =	80



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		7	x	1	=		7
		8	x	1	=		8
		9	x	1	=		9
	1	0	x	1	=	1	0

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	2	x	1	0	=	2	0
	3	x	1	0	=	3	0
	4	x	1	0	=	4	0
	5	x	1	0	=	5	0
	6	x	1	0	=	6	0
	7	x	1	0	=	7	0
	8	x	1	0	=	8	0
	9	x	1	0	=	9	0
1	0	x	1	0	=	1	0	0

		0	x	5	=		0
		1	x	5	=		5
		2	x	5	=	1	0
		3	x	5	=	1	5
		4	x	5	=	2	0
		5	x	5	=	2	5
		6	x	5	=	3	0
		7	x	5	=	3	5
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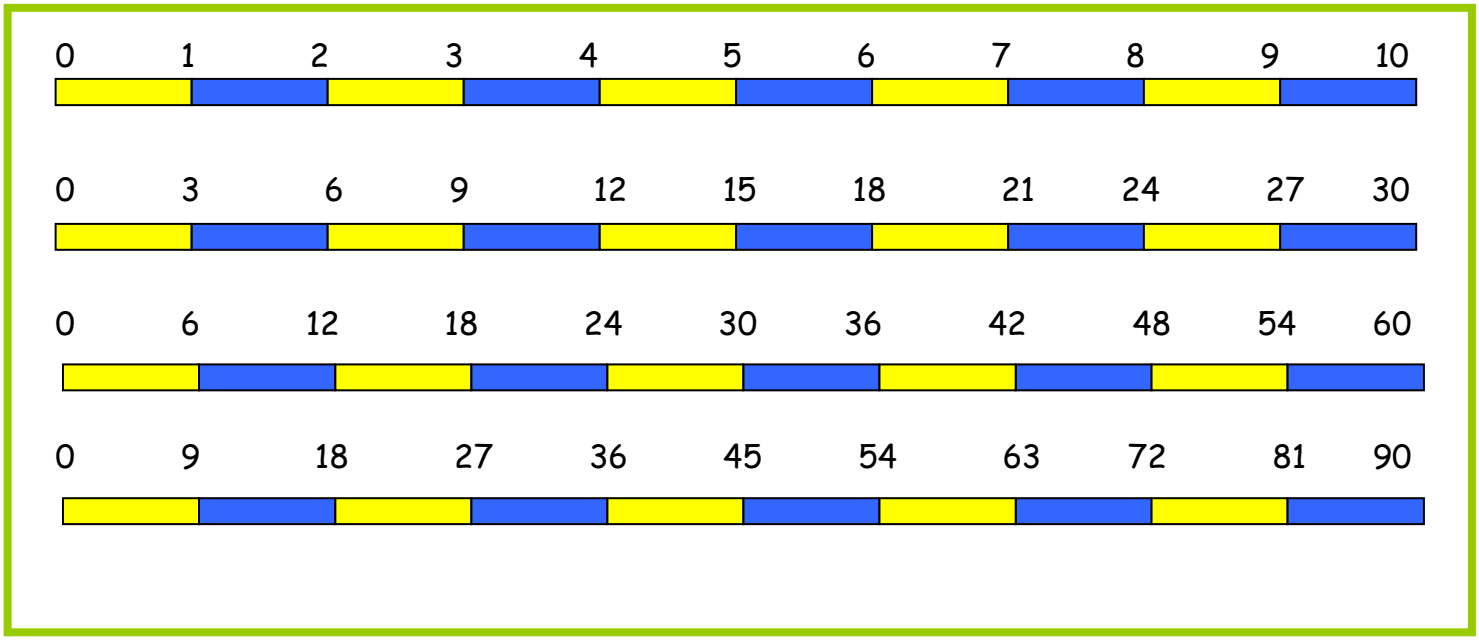

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	8	x	1	=		8
	9	x	1	=		9
1	0	x	1	=	1	0

	0	x	3	=		0
	1	x	3	=		3
	2	x	3	=		6
	3	x	3	=		9
	4	x	3	=	1	2
	5	x	3	=	1	5
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	7	x	3	=	2	1
	8	x	3	=	2	4
	9	x	3	=	2	7
1	0	x	3	=	3	0

	0	x	6	=		0
	1	x	6	=		6
	2	x	6	=	1	2
	3	x	6	=	1	8
	4	x	6	=	2	4
	5	x	6	=	3	0
	6	x	6	=	3	6
	7	x	6	=	4	2
	8	x	6	=	4	8
	9	x	6	=	5	4
1	0	x	6	=	6	0

	0	x	9	=		0
	1	x	9	=		9
	2	x	9	=	1	8
	3	x	9	=	2	7
	4	x	9	=	3	6
	5	x	9	=	4	5
	6	x	9	=	5	4
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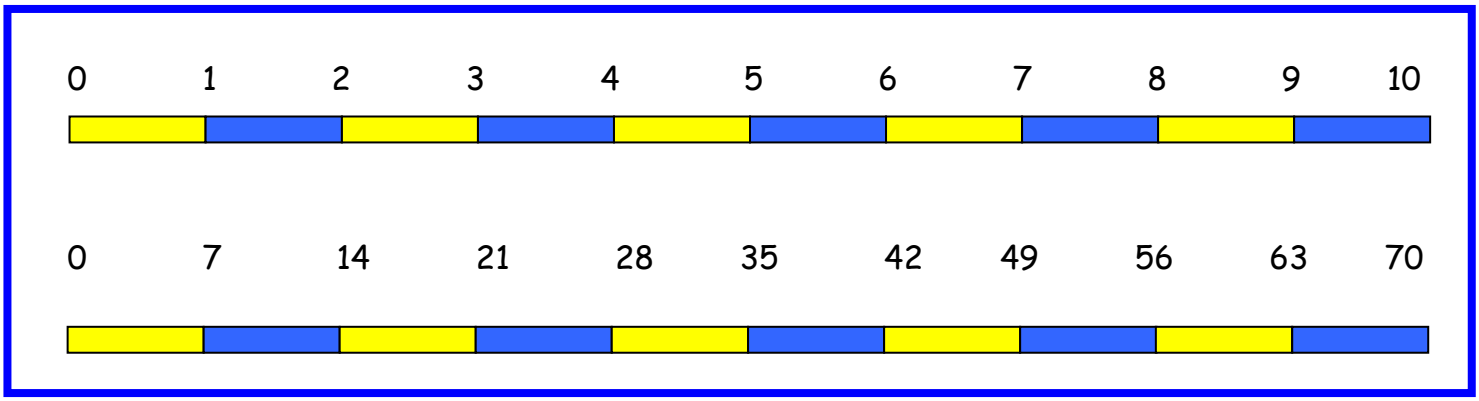

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		4	x	1	=		4
		5	x	1	=		5
		6	x	1	=		6
		7	x	1	=		7
		8	x	1	=		8
		9	x	1	=		9
	1	0	x	1	=	1	0

		0	x	7	=		0
		1	x	7	=		7
		2	x	7	=	1	4
		3	x	7	=	2	1
		4	x	7	=	2	8
		5	x	7	=	3	5
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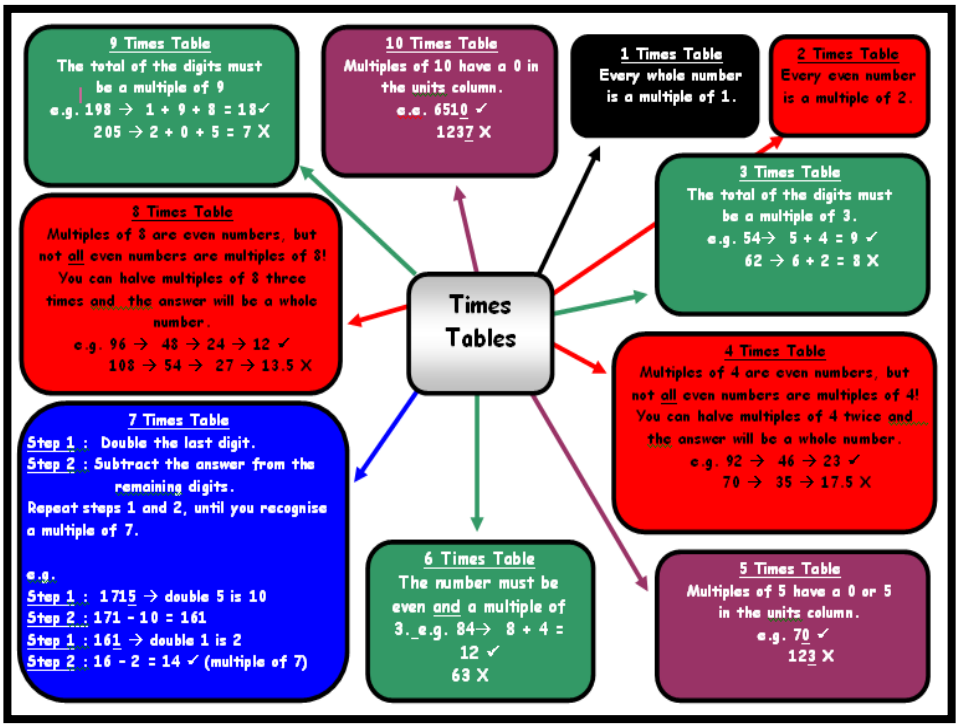


Pupils should be able to utilise their tables' knowledge to derive other facts.
E.g. If I know 3 x 7 = 21, what else do I know?

30 x 7 = 3 x 7 x 10 =210

300 x 7 = 3 x 7 x 10 x 10 = 3 x 7 x 100 = 2100

3000 x 7 = 3 x 7 x 10 x 10 x 10 = 3 x 7 x 10 x 100 = 3 x 7 x 1000 = 21 000

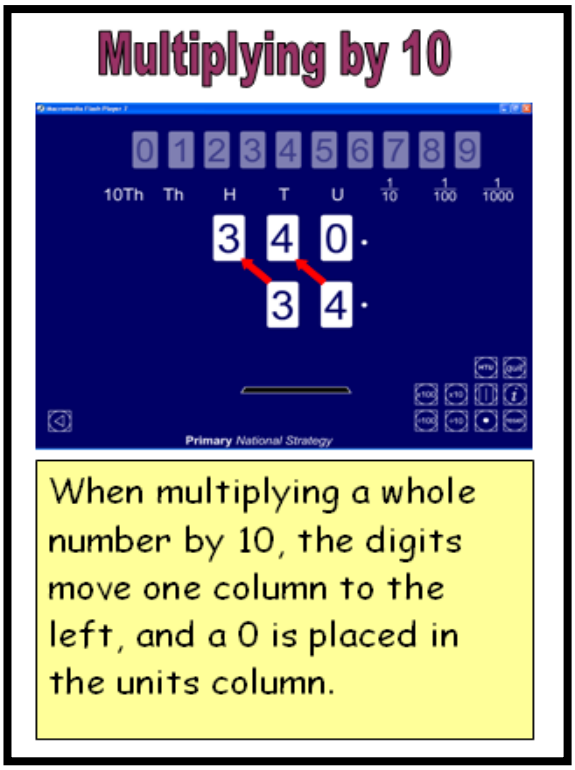
0.3 x 7 = (3 x 7) ÷ 10 = 2.1

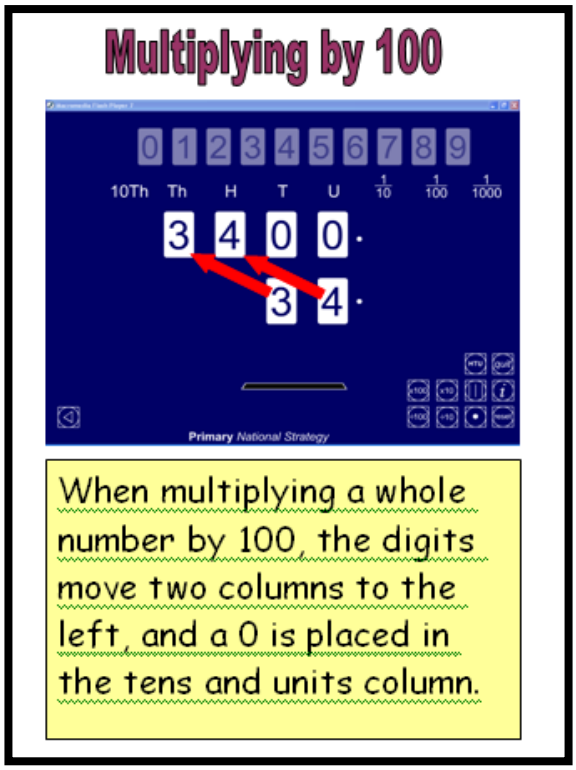
Use closely related facts already known

13 x 11 = (13 x 10) + (13 x 1)
= 130 + 13
= 143

Multiplying by 10 or 100

Knowing that the effect of multiplying by 10 is a shift in the digits one place to the left.
Knowing that the effect of multiplying by 100 is a shift in the digits two places to the left.

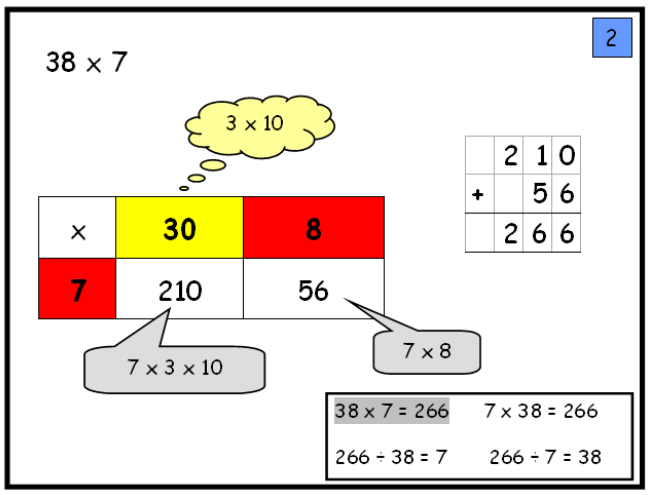




Moving Digits 0.8.exe

Partitioning

38 x 7 = (30 x 7) + (8 x 7)
= 210 + 56
= 266



Use of factors

21 x 18 = 21 x 9 x 2
21 x 9 = 189
189 x 2 = 378

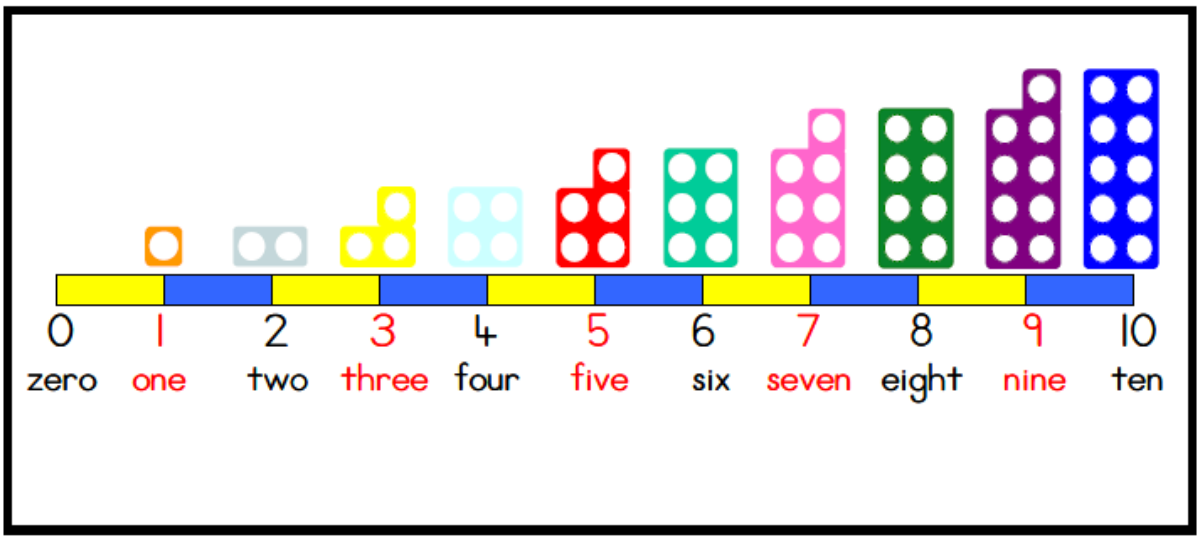
11 x 50 = 11 x 5 x 10
11 x 5 = 55
55 x 10= 550

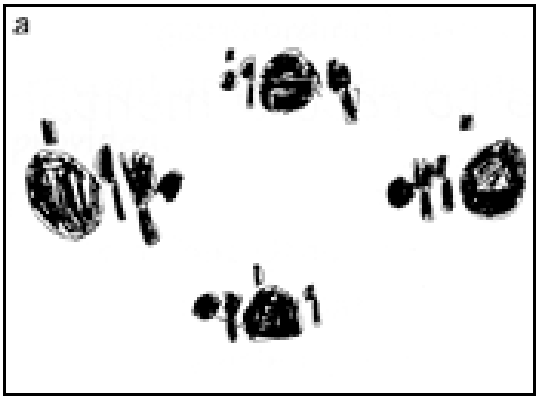
MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED.
THEY ARE NOT REPLACED BY WRITTEN METHODS.

THE FOLLOWING ARE STANDARDS THAT WE EXPECT THE MAJORITY OF PUPILS TO ACHIEVE.

Reception and Year 1

Pupils will experience equal groups of objects and will count in 1s, 2s and 10s and begin to count in 5s. They will work on practical problem solving activities involving equal sets or groups.





Year 2

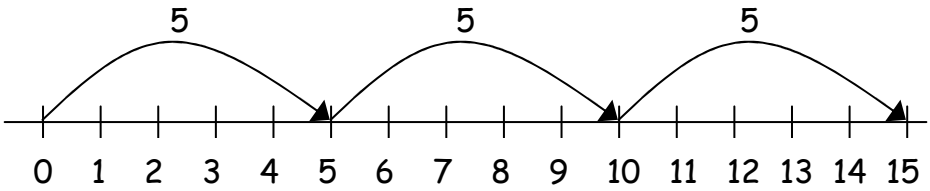
Pupils will develop their understanding of multiplication and use jottings to support calculation:

- ✓ **Repeated addition**

3 times 5 is 5 + 5 + 5 = 15 or 3 lots of 5 or 5 x 3

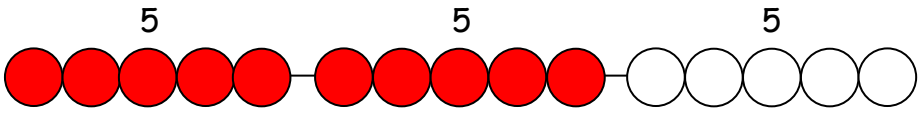
Repeated addition can be shown easily on a number line:

5 x 3 = 5 + 5 + 5



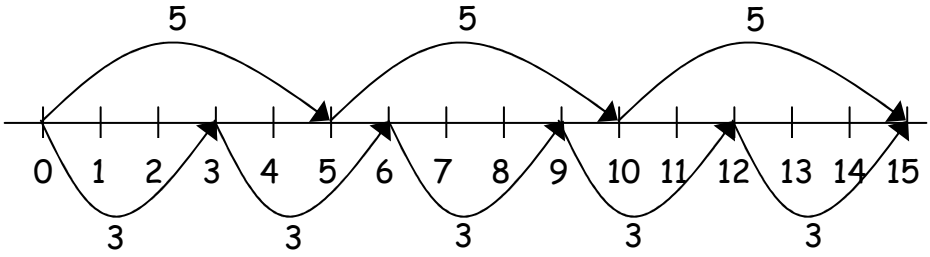
and on a bead bar:

5 x 3 = 5 + 5 + 5



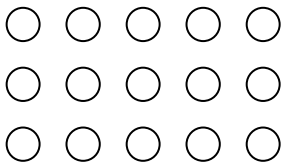
✓ **Commutative**

Pupils should know that 3 x 5 has the same answer as 5 x 3. This can also be shown on the number line.



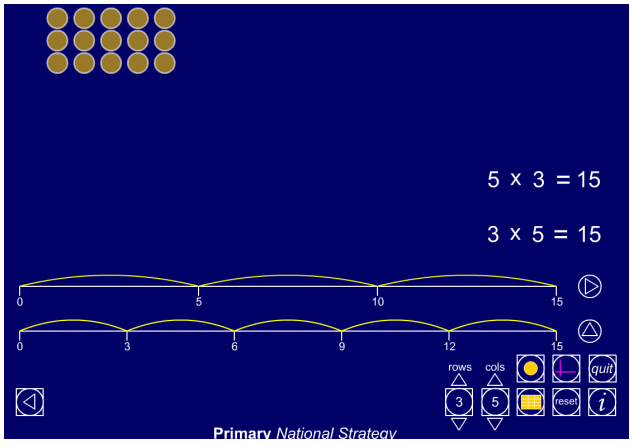
✓ **Arrays**

Pupils should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



5 x 3 = 15

3 x 5 = 15



Multiplication Facts 0.8.exe

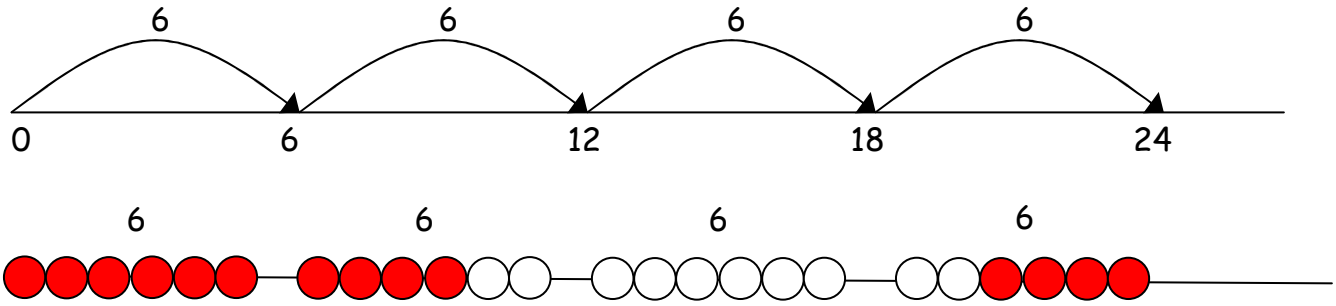
Year 3

Pupils will continue to use:

✓ **Repeated addition**

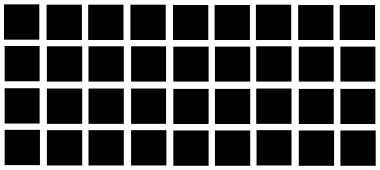
4 times 6 is 6 + 6 + 6 + 6 = 24 or 4 lots of 6 or 6 x 4

Pupils should use number lines or bead bars to support their understanding.



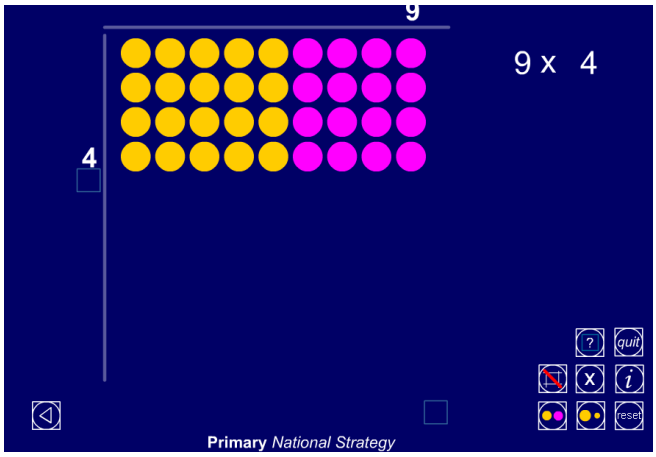
✓ **Arrays**

Children should be able to model a multiplication calculation using an array. This knowledge will support with the development of the grid method.



9 x 4 = 36

9 x 4 = 36



Pupils will also develop an understanding of

✓ **Scaling**

e.g. Find a ribbon that is 4 times as long as the blue ribbon

5 cm

20 cm

✓ **Using symbols to stand for unknown numbers to complete equations using inverse operations**

□ x 5 = 20 3 x △ = 18 □ x O = 32

✓ **Partitioning**

38 x 5 = (30 x 5) + (8 x 5)
= 150 + 40
= 190

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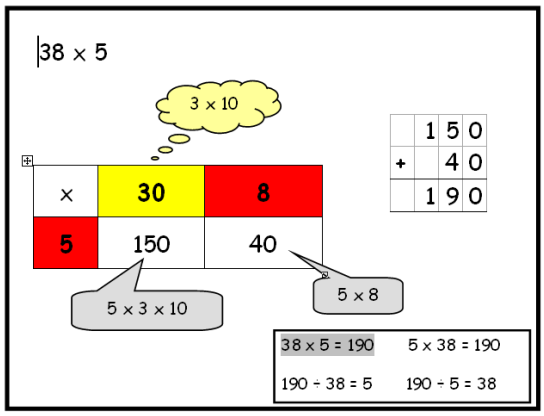
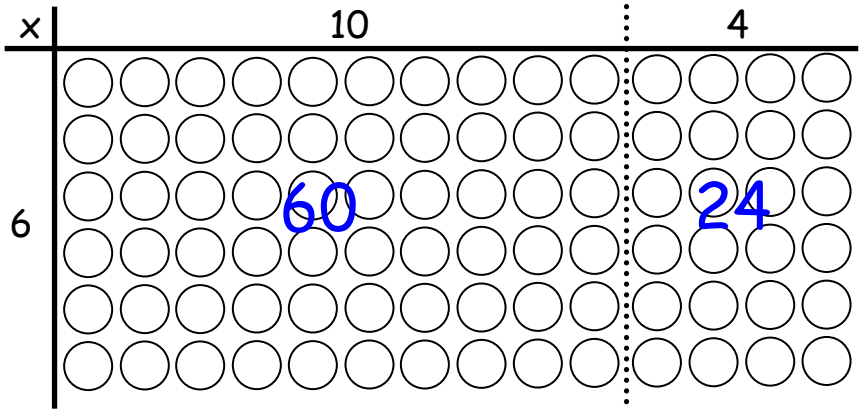


Year 4

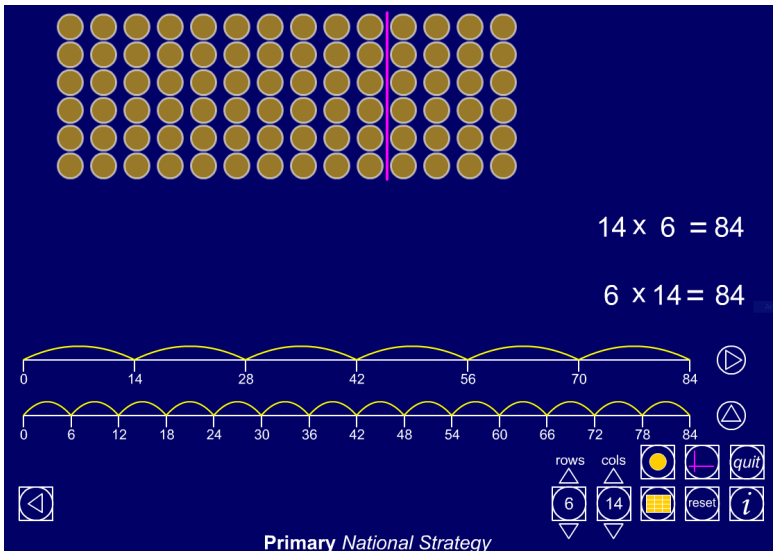
Pupils will continue to use arrays where appropriate leading into the grid method of multiplication.



(6 x 10) + (6 x 4)

60 + 24

84



Multiplication Facts 0.8.exe

Grid method

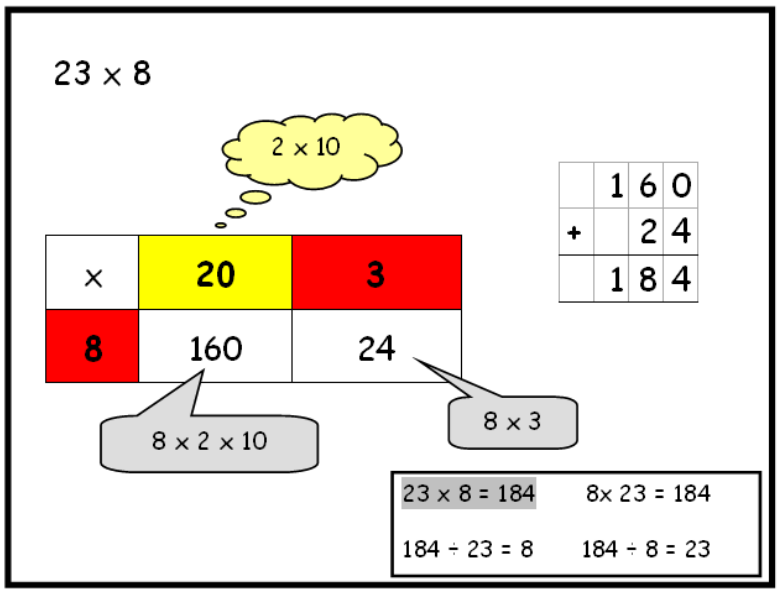
TU x U
(Short multiplication – multiplication by a single digit)

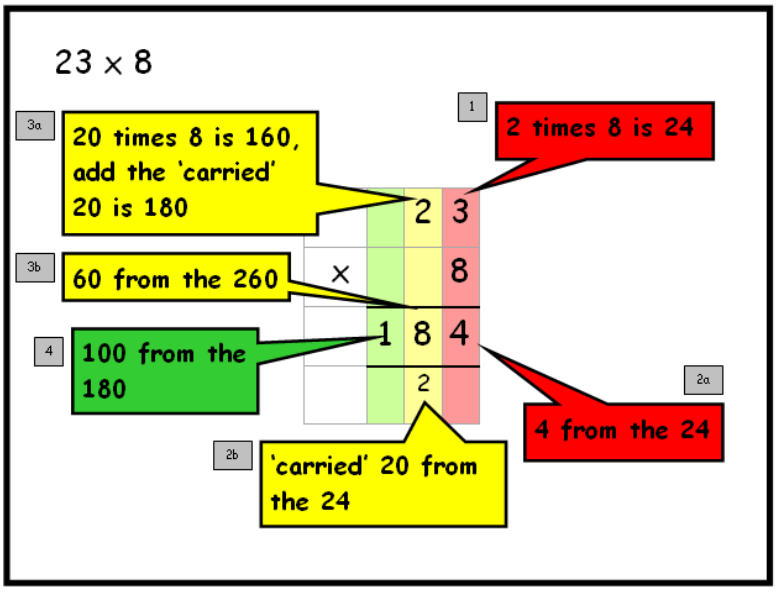
23 x 8

Children will approximate first
23 x 8 is approximately 25 x 8 = 200

x	20	3
8	160	24

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





Year 5

Grid method

HTU x U
(Short multiplication – multiplication by a single digit)

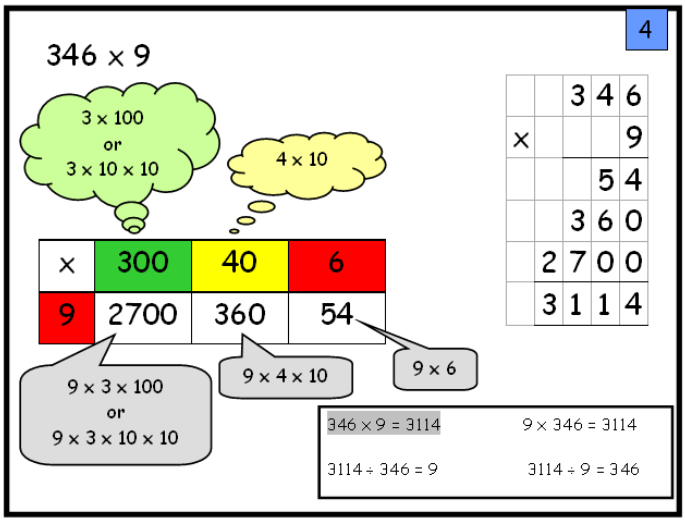
346 x 9

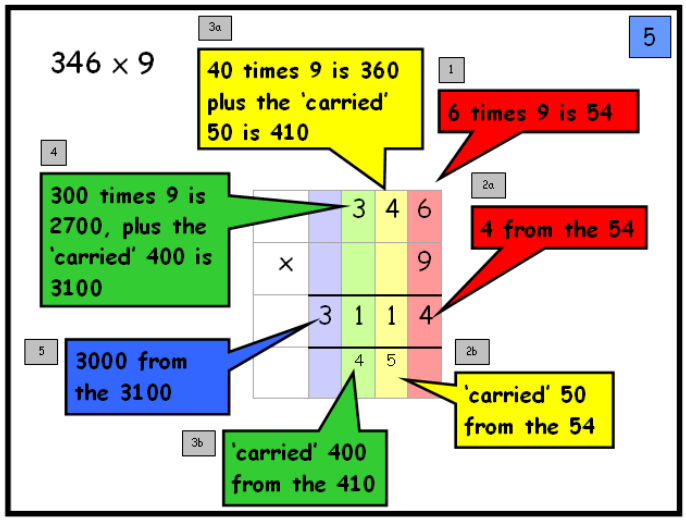
Children will approximate first
346 x 9 is approximately 350 x 10 = 3500

x	300	40	6
9	2700	360	54

2700
+ 360
+ 54
3114

1 1





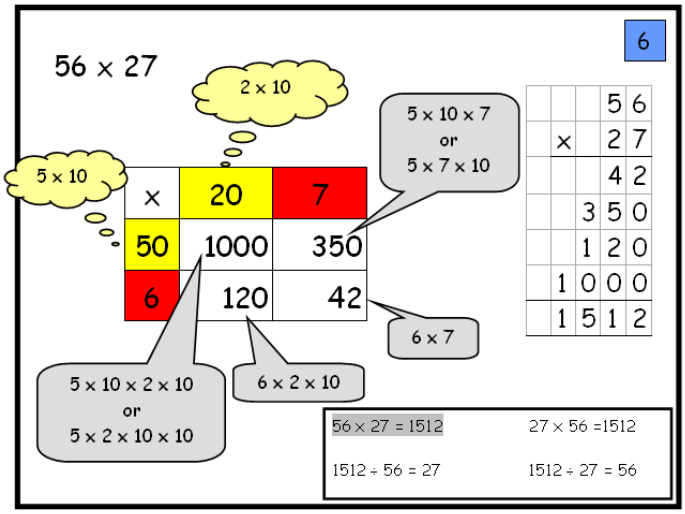
TU x TU
(Long multiplication – multiplication by more than a single digit)

56 x 27

Children will approximate first
56 x 27 is approximately 60 x 30 = 1800

x	20	7
50	1000	350
6	120	42

1000
+ 350
+ 120
+ 42
1512



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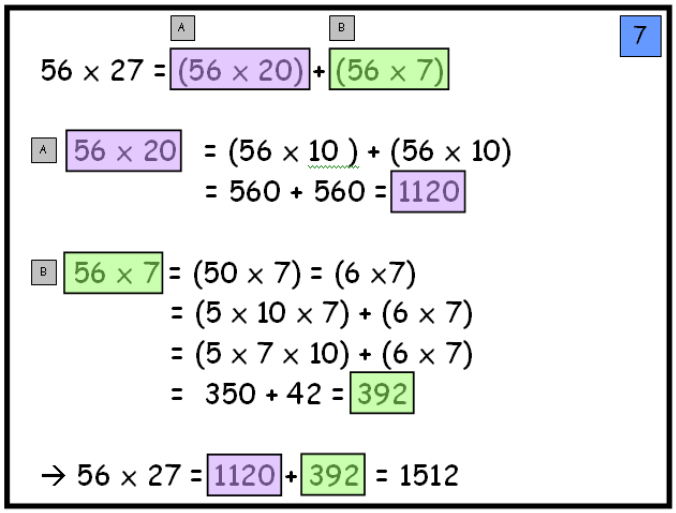
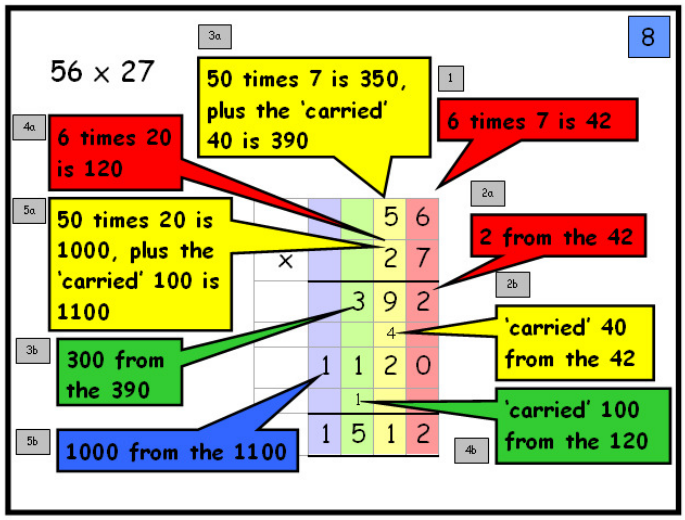




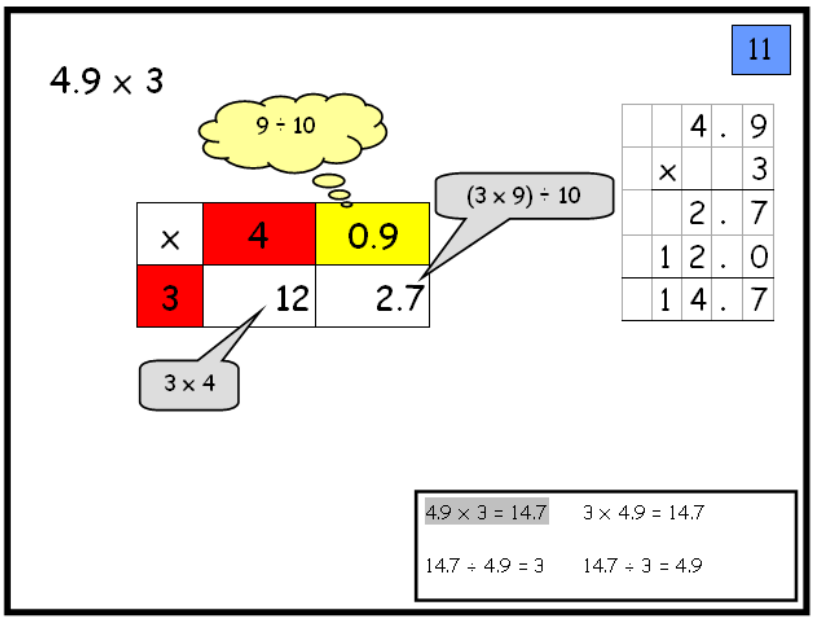
Using similar methods, they will be able to multiply decimals with one decimal place by a single digit number, approximating first. They should know that the decimal points line up under each other.

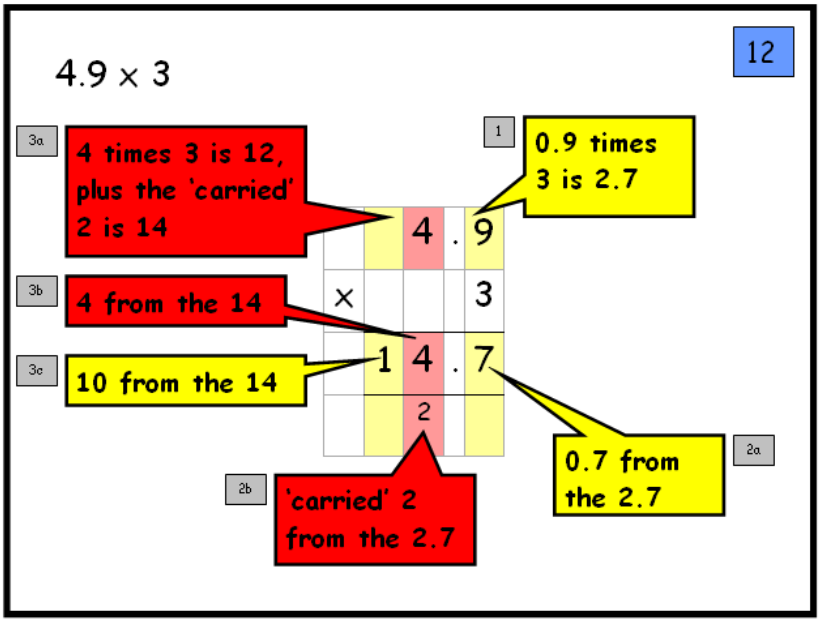
e.g. 4.9 x 3

Pupils will approximate first
4.9 x 3 is approximately 5 x 3 = 15

x	4	0.9
3	12	2.7

$$\begin{array}{r} 12 \\ +\ 2.7 \\ \hline 14.7 \end{array}$$





Year 6

ThHTU x U
(Short multiplication – multiplication by a single digit)

4346 x 8

Children will approximate first
4346 x 8 is approximately 4346 x 10 = 43460

x	4000	300	40	6
8	32000	2400	320	48

32000
+ 2400
+ 320
+ 48
34768

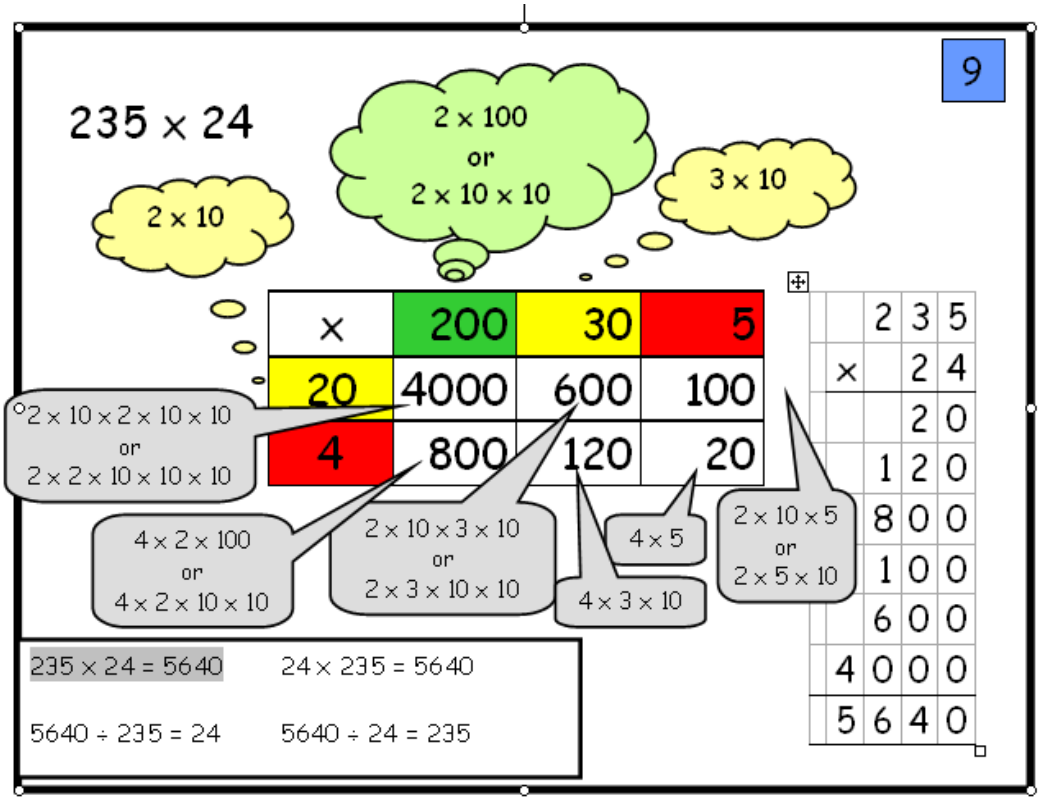
HTU x TU
(Long multiplication – multiplication by more than a single digit)

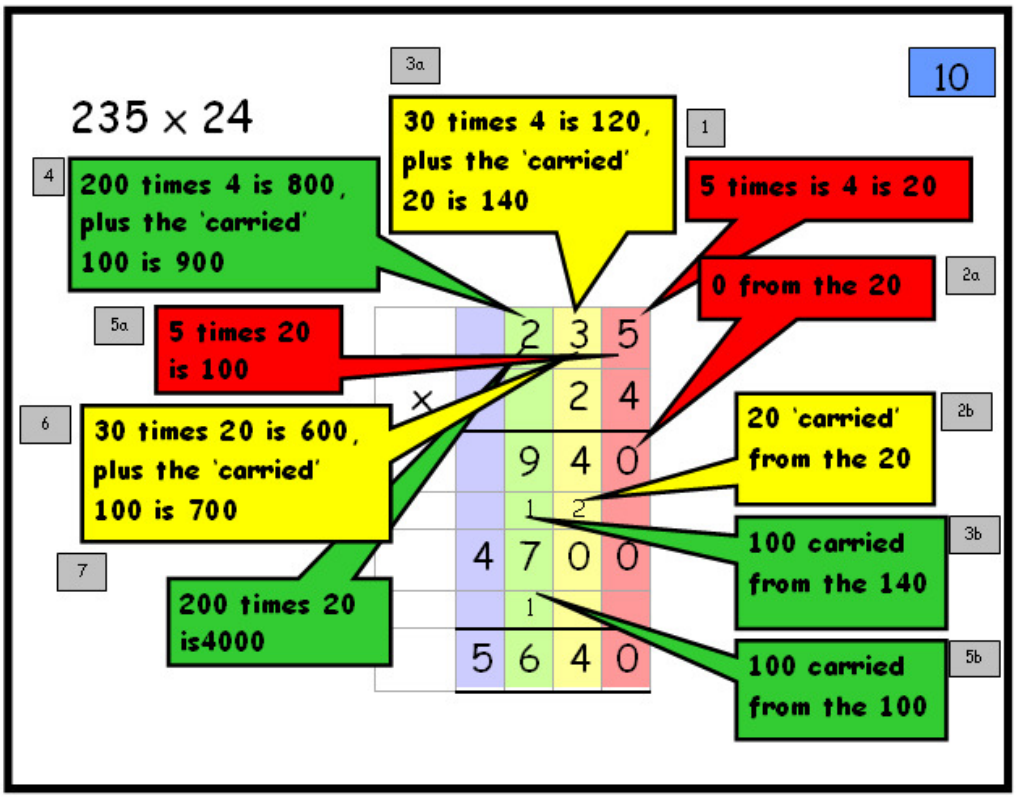
235 x 24

Children will approximate first
235 x 24 is approximately240 x 20 = 4800

x	200	30	5
20	4000	600	100
4	800	120	20

4000
+ 600
+ 100
+ 800
+ 120
+ 20
5640
1





Using similar methods, they will be able to multiply decimals with up to two decimal places by a single digit number and then two digit numbers, approximating first. They should know that the decimal points line up under each other.

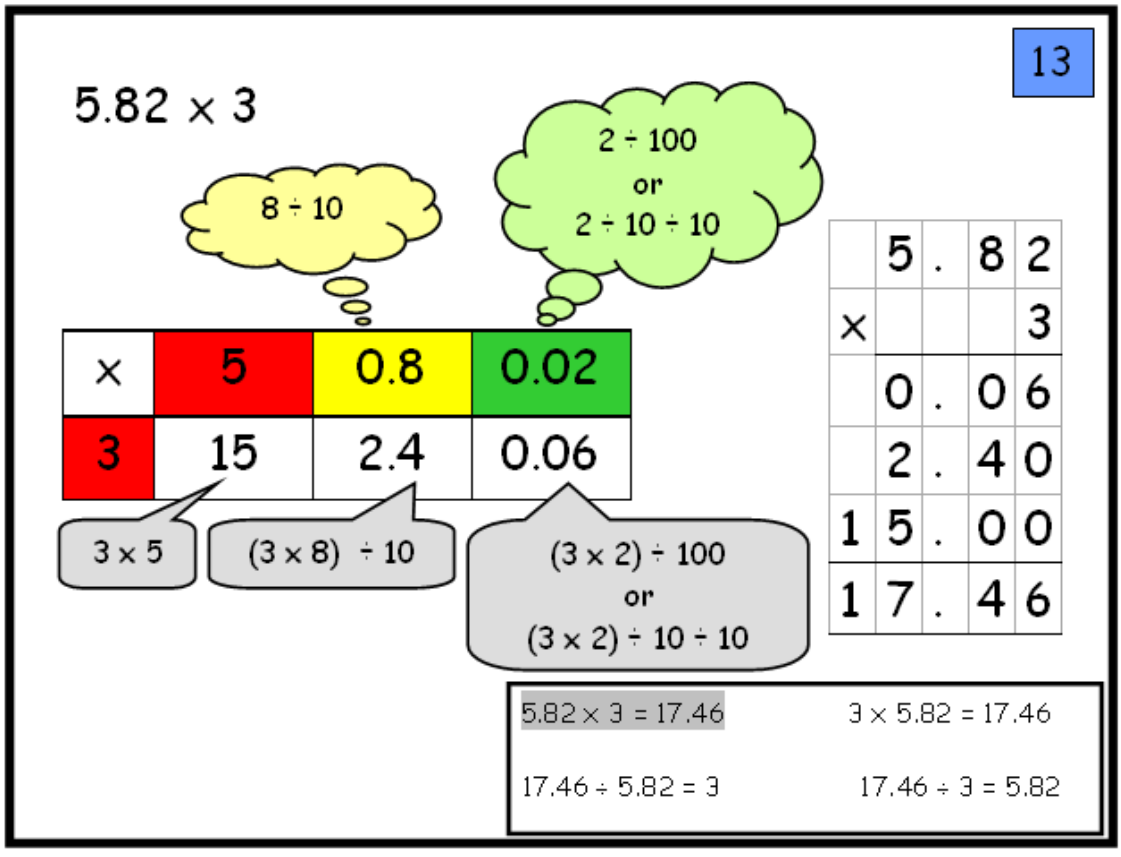
For example:

5.82 x 3

Children will approximate first
5.82 x 3 is approximately 6 x 3 = 18

x	5	0.8	0.02
3	15	2.4	0.06

15
+ 2.4
+ 0.06
17.46



By the end of year 6, children will have a range of calculation methods, mental and written. Selection will depend upon the numbers involved.

Pupils should not be made to go onto the next stage if:

1) **they are not ready.**
2) **they are not confident.**

Pupils should be encouraged to approximate their answers before calculating.

Pupils should be encouraged to consider if a mental calculation would be appropriate before using written methods.

A COMPLETE SET OF WRITTEN METHODS POSTERS FOR THE FOUR RULES ARE` AVAILABLE FROM THE LEA

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