Progression in Calculation Workshop
Key Stage 2

Aims

- To increase understanding of how we teach maths at school.

- To improve confidence in applying the methods we use at school.

Good practice in Maths

- Children need to learn maths in a real life context.

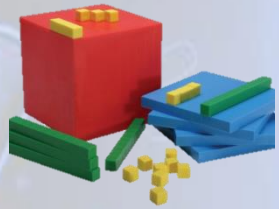
5 x 3 = 15
There are 5 fields with 3 sheep in each.
How many sheep are there in total?

- Children need to be able to explain how they have calculated something using a method that suits them.

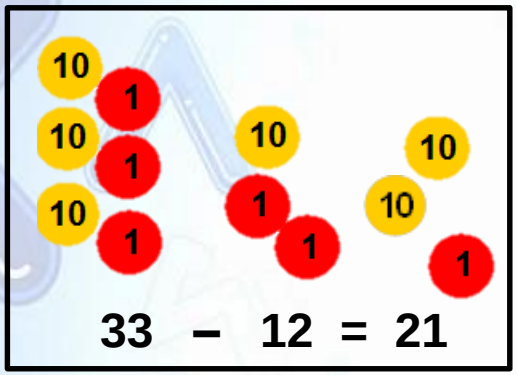
- Written calculations, are taught only when the children are ready.

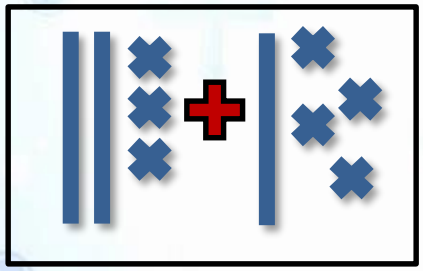
Structures of Learning

Concrete



Pictorial





Abstract

24 – 8 = 16

15 + 7 = 22

Four Operations

Addition

+

Multiplication

×

Subtraction

-

Division

÷

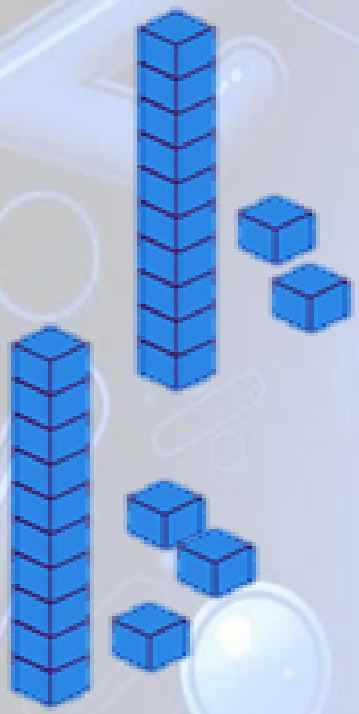
Addition

+

Addition strategies we teach:

Partitioning
Using parts of a number

12 + 13 = 25



12 = 10 + 2

13 = 10 + 3

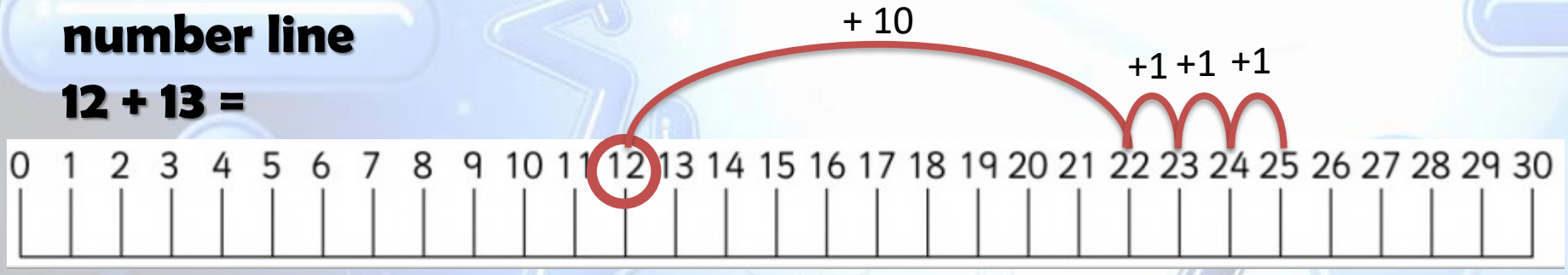
10 + 10 = 20

2 + 3 = 5

20 + 5 = 25

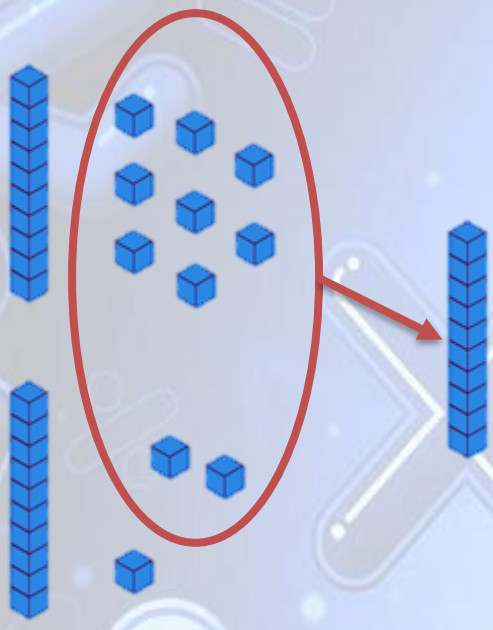
Partitioning with a number line

12 + 13 =



Partitioning
Using parts of a number

18 + 13 = 31



18 = 10 + 8

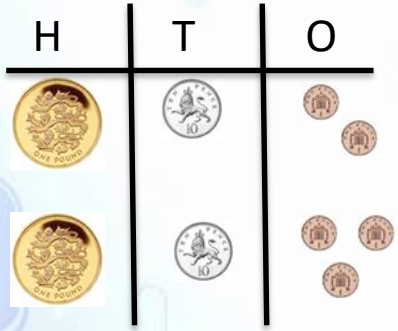
13 = 10 + 3

10 + 10 = 20

8 + 3 = 11

20 + 11 = 31

112 + 113 = 225



Expanded column addition

124 + 222 = 346

	H	T	O
	100	20	4
+	200	20	2
	300 +	40 +	6
			346

24 + 27 = 51

	T	O
	20	4
+	20	7
	40+	11
		51

Compact column addition

$$\begin{array}{r} 124 \\ +\ 222 \\ \hline 346 \end{array}$$

$$\begin{array}{r} 24 \\ +\ 27 \\ \hline 51 \\ {\scriptstyle 1} \end{array}$$

Expanded column addition – decimals

33.5 + 12.2 = 45.7

	T		O		th
	30		3	.	5
+	10		2	.	2
	40	+	5	+ .	7

45.7

2.4 + 3.7 = 6.1

	O		th
	2		4
+	3		7
	5	+	11

6.1

Compact column addition - decimals

$$\begin{array}{r} 32.4 \\ +\ 22.3 \\ \hline 54.7 \end{array}$$

$$\begin{array}{r} 2.4 \\ +\ 2.7 \\ \hline 5.1 \\ {\scriptstyle 1} \end{array}$$

Subtraction

-

Subtraction strategies we teach:

Number line – Counting back

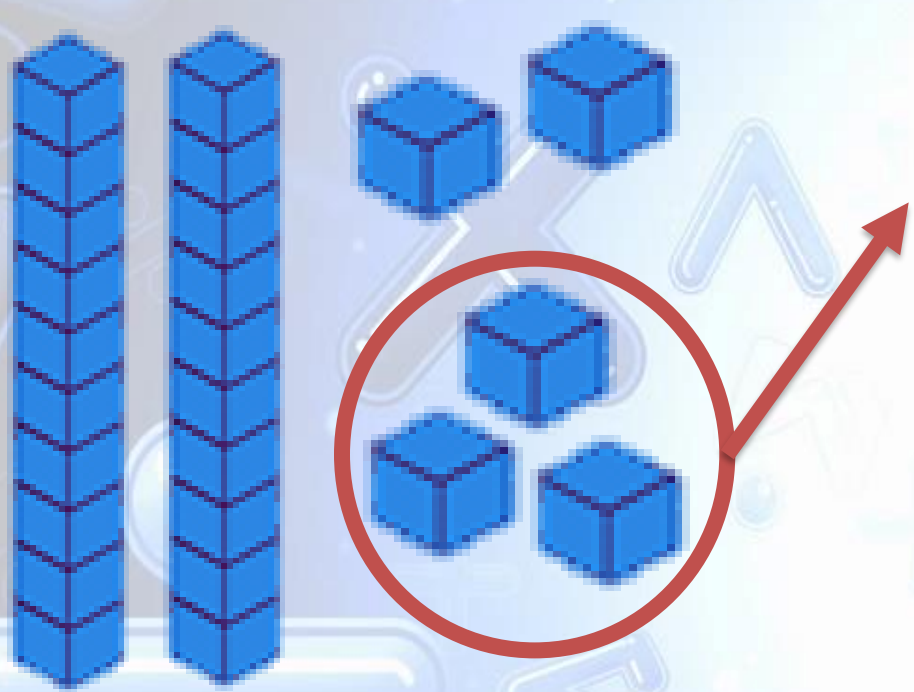
12 - 5 = 7

Number line – Counting on

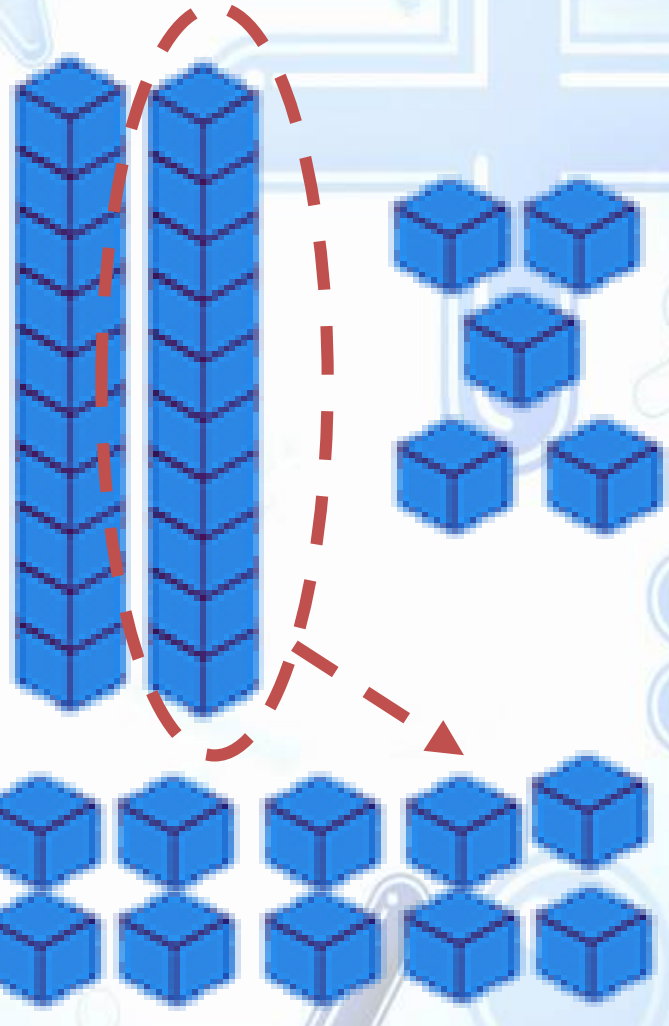
12 - 5 = 7

Subtraction strategies we teach:

25 – 3 = 22



25 – 8 = 17



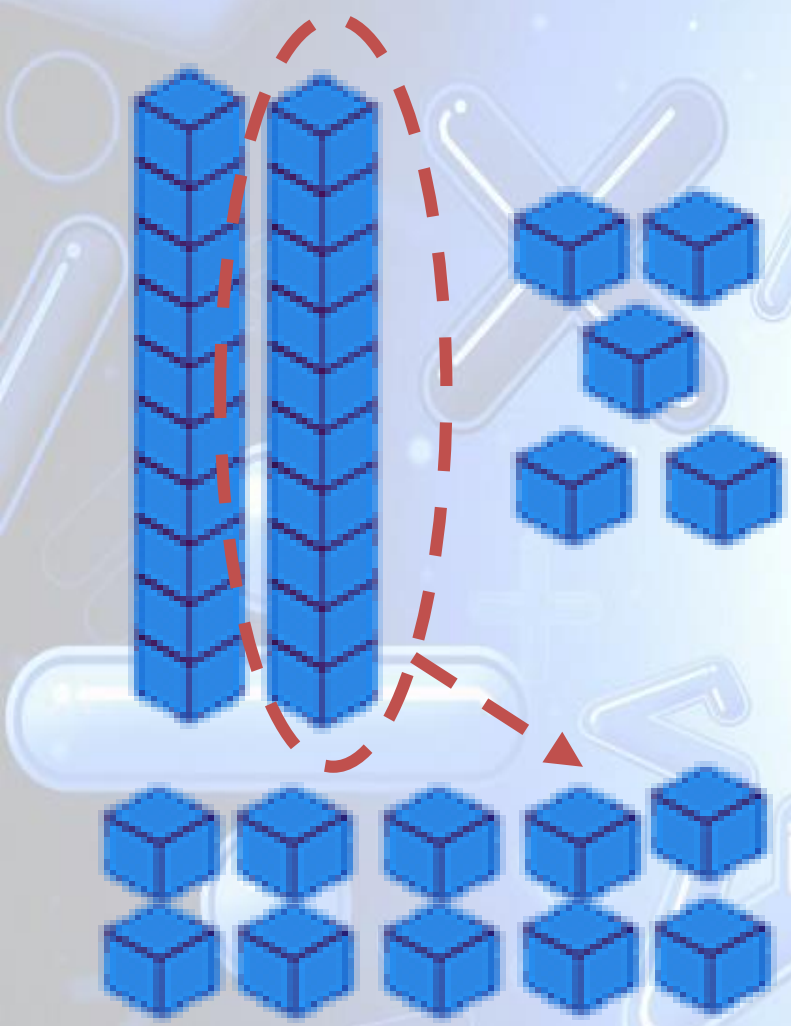
Expanded column subtraction
Without exchanging

135 – 124 = 11

	100	30	5
-	100	20	4
		10	1

Expanded column subtraction
With exchanging

25 – 8 = 17



$$\begin{array}{r} {\scriptstyle 10}\quad {\scriptstyle 1} \\ \cancel{20}\ \ 5 \\ -\quad\ \ 8 \\ \hline 10\ \ 7 \end{array}$$

Compact column subtraction

$$\begin{array}{r} 135 \\ -\ 124 \\ \hline 11 \end{array}$$

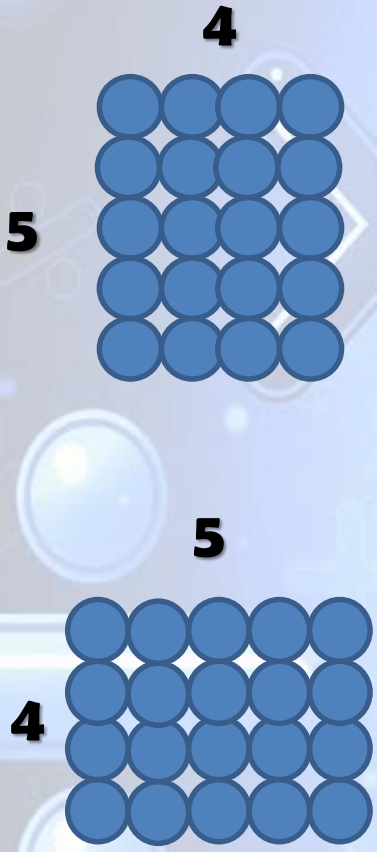
$$\begin{array}{r} {}^{1}\cancel{2}{}^{1}5 \\ -\ \ 8 \\ \hline 17 \end{array}$$

Multiplication

x

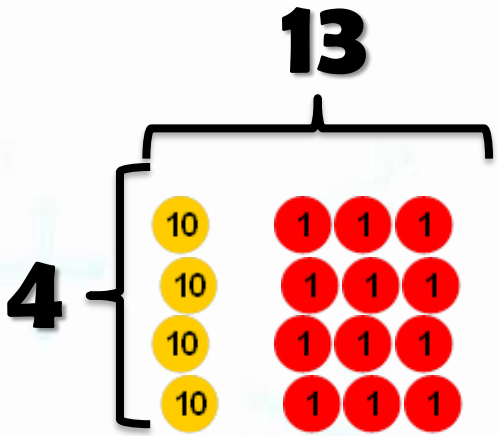
Multiplication strategies we teach:

Array



Array to Grid Method

13 x 4 = 52



40 + 12 = 52

Grid Method

13 x 4 = 52

x	10	3
4	40	12

40 + 12 = 52

135 x 45 = 6075

x	100	30	5
40	4000	1200	200
5	500	150	25

4000
1200
200
500
150
\+ 25
6075

Short Multiplication

$$\begin{array}{r} 2741 \\ \times \quad 6 \\ \hline 16446 \\ 4\ 2 \end{array}$$

1 x 6 = 6

40 x 6 = 240

700 x 6 = 4200

2000 x 6 = 12000

Long Multiplication

3124

x 26

18744

62480

81224

1 1 1

4 x 6 = 24

20 x 6 = 120

100 x 6 = 600

3000 x 6 = 18000

4 x 20 = 80

20 x 20 = 400

100 x 20 = 2000

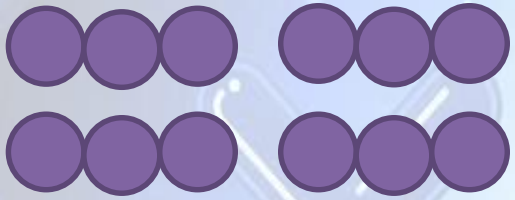
3000 x 20 = 60000

Division

÷

Dividing strategies we teach:

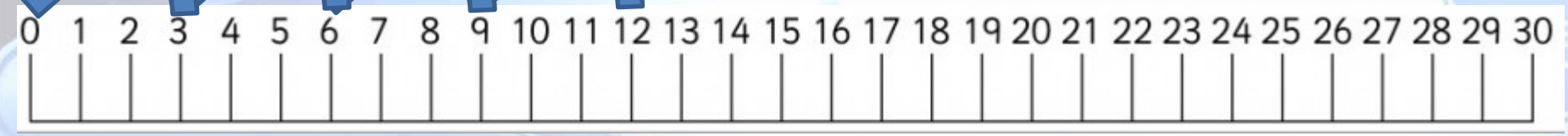
12 split into equal groups of 3



12 ÷ 3 = 4

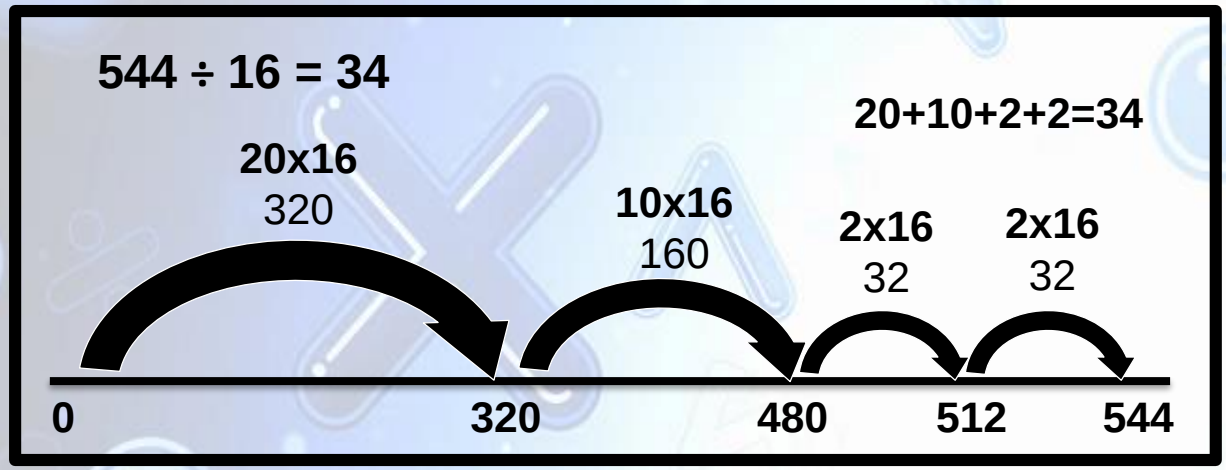
3 3 3 3

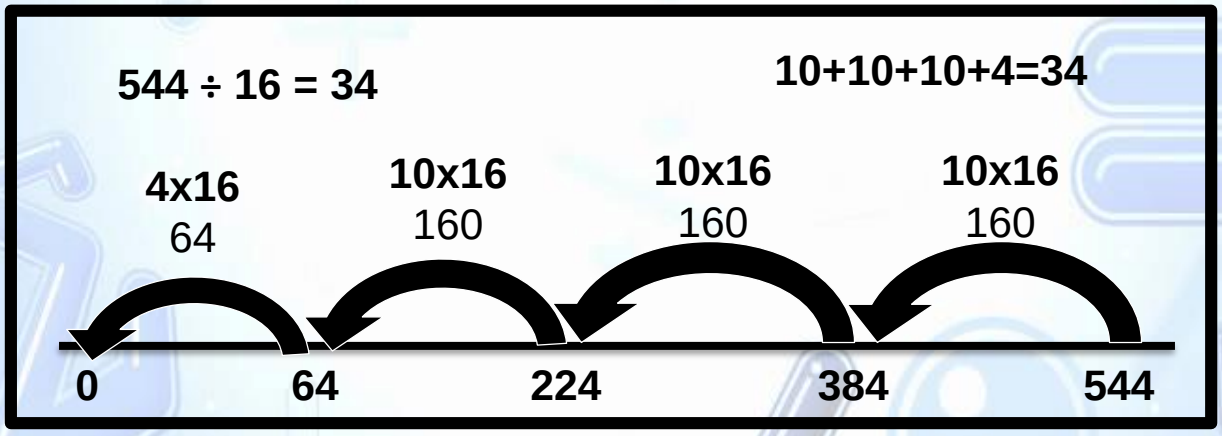
12 ÷ 3 = 4

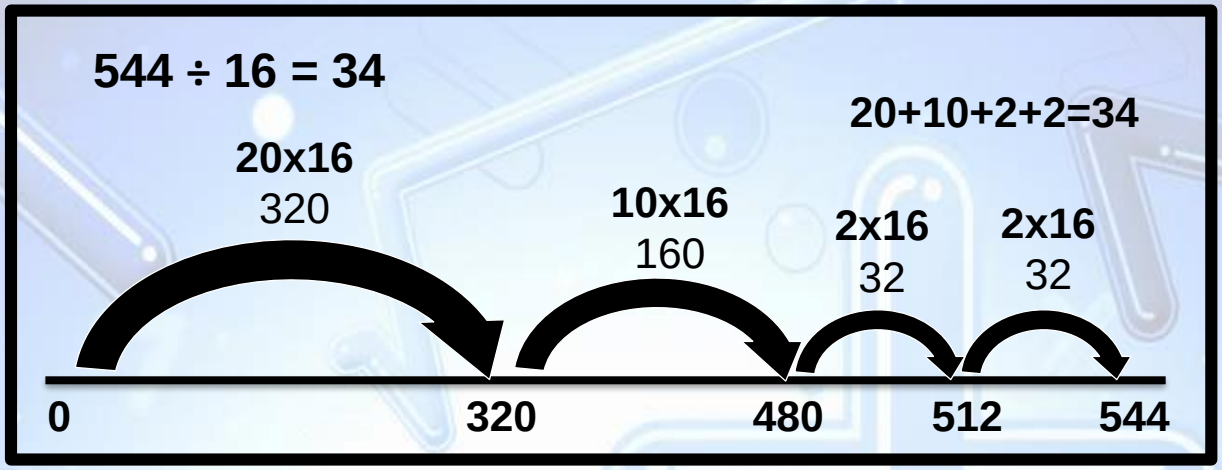


Dividing strategies we teach:
Chunking – Taking parts of the number

Pictorial

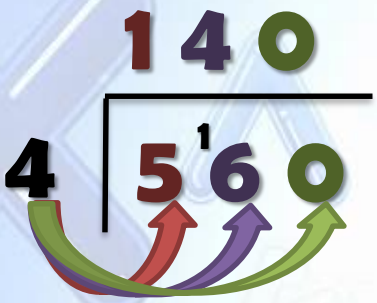






$$
\begin{array}{r|l}
16 & 544 \\
\multicolumn{2}{r}{34} \\
\hline
-\ 320 & \text{(20 x 16)} \\
\hline
224 & \\
-\ 160 & \text{(10 x 16)} \\
\hline
64 & \\
-\ 32 & \text{(2 x 16)} \\
\hline
32 & \\
-\ 32 & \text{(2 x 16)} \\
\hline
0 &
\end{array}
$$

Short Division

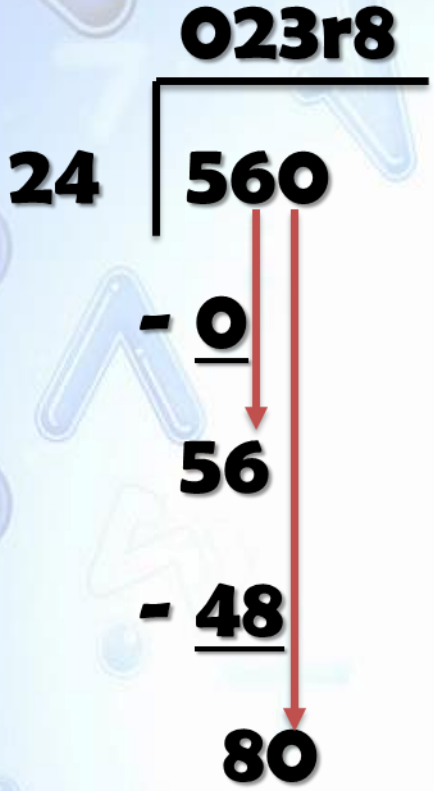


Groups of 4 in 5

Groups of 4 in 16

Groups of 4 in 0

D M S B
Long Division



Other things that will help:

- Read and write numbers as words (thirty six)
- Equals sign does not have to go at the end: 24 = 12 + 12
- Use the word ‘calculation’.