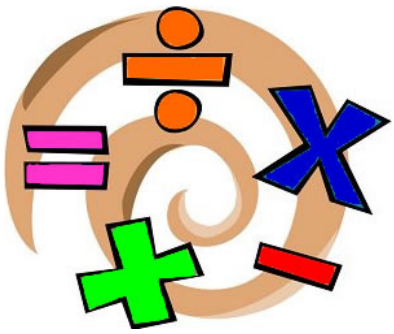
Totley All Saints

Growing & learning together!

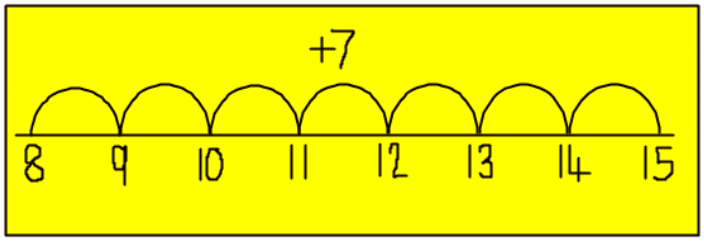
WRITTEN METHODS OF CALCULATION



E.Scarpello 2014

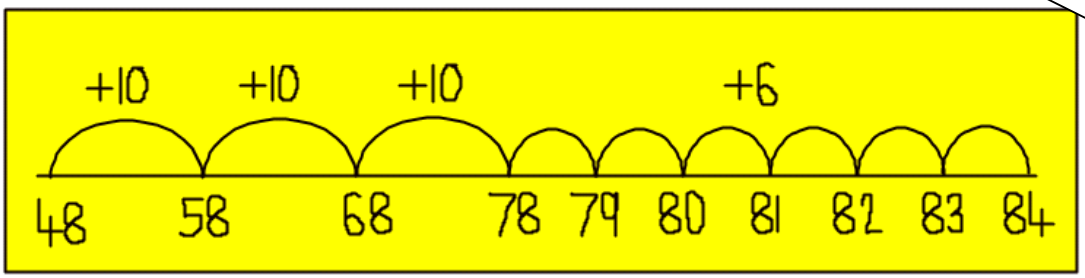
ADDITION

STAGE 1: NUMBER LINE



$8 + 7 = 15$

- Draw a number line from 8.
- Draw 7 hops.
- Count in 1s.
- 8 add 7 equals 15.

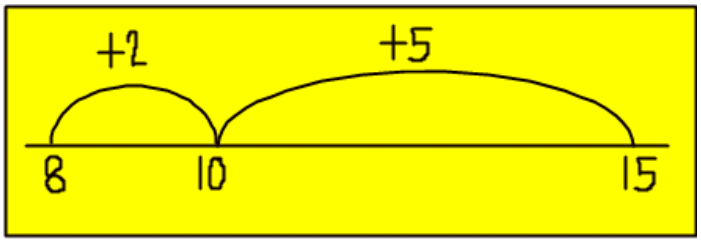


$48 + 36 = 84$

- Draw a number line from 48.
- Partition 36 (3 hops of 10 & 6 hops of 1).
- Add each part onto 48.
- 48 add 36 equals 84.

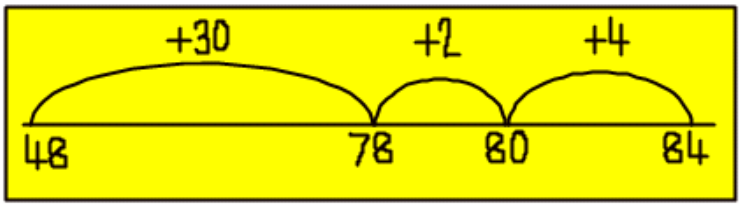
ADDITION

STAGE 1: NUMBER LINE

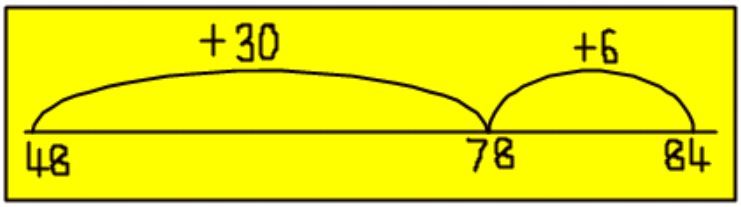


$8 + 7 = 15$

- Draw a number line from 8.
- Use number bonds to partition 7.
- Add 2 to make 10 & then add 5.
- 8 plus 7 equals 15



or



$48 + 36 = 84$

- Draw a number line from 48.
- Partition 36 (1 hop of 30 & partition 6 or make 1 hop of 6).
- Add each part onto 48
- 48 and 36 equals 84.

ADDITION

STAGE 2: PARTITIONING

$$\begin{array}{r} 47 \\ +\,76 \\ \hline \end{array} = \begin{array}{r} 40 + 7 \\ 70 + 6 \\ \hline 110 + 13 = 123 \end{array}$$

47 + 76 = 123

- **Write the numbers underneath each other (line up tens & units).**
- **Partition the tens & units.**
- **Add the tens.**
- **Add the units.**
- **Combine your totals.**

ADDITION

STAGE 3: EXPANDED COLUMNS

$$\begin{array}{r} 47 \\ +76 \\ \hline 13 \\ 110 \\ \hline 123 \end{array}$$

47 + 76 = 123

- **Write the numbers underneath each other (line up tens & units).**
- **Add the units.**
- **Add the tens.**
- **Combine your units & tens.**
- **Line up any hundreds.**

ADDITION

STAGE 4: COLUMN METHOD

47	258	366
+ 76	+ 87	+ 458
123	345	824
1 1	1 1	1 1

47 + 76 = 123

258 + 87 = 345

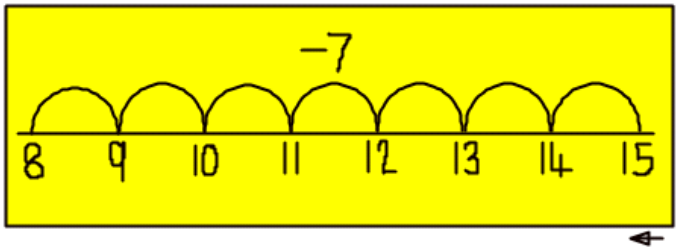
366 + 458 = 824

- **Write the numbers underneath each other (line up HTU).**
- **Add the units & carry the ten.**
- **Add the tens & carry the hundred.**
- **Add the hundreds.**

SUBTRACTION

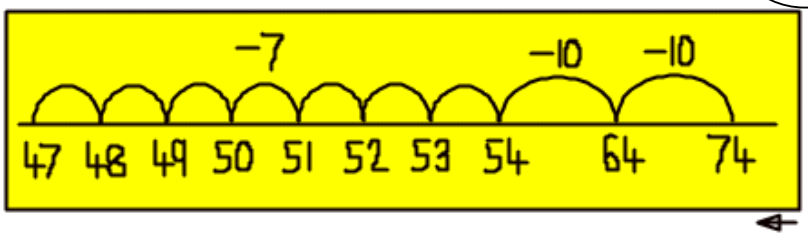
STAGE 1: NUMBER LINE

COUNTING BACK & PARTITIONING



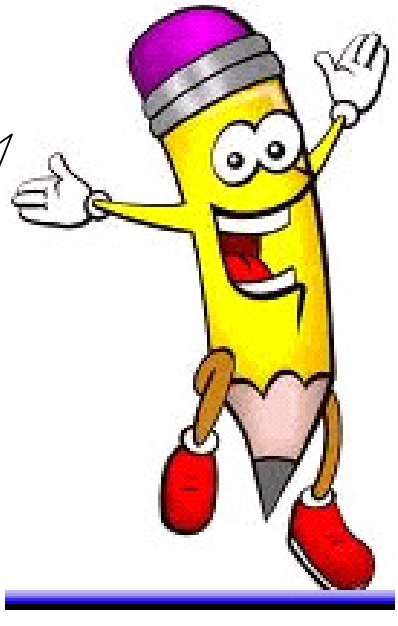
15 – 7 = 8

- Draw a number line back from 15.
- Draw 7 hops.
- Count back in 1s.
- 15 take-away 7 is 8.



74 – 27 = 47

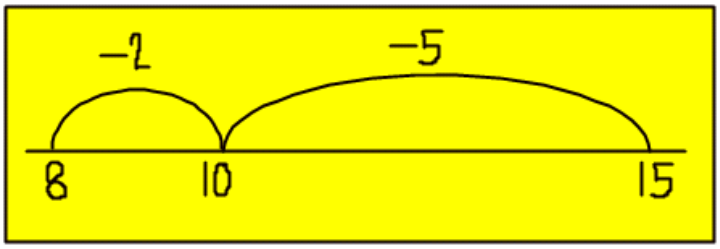
- Draw a number line back from 74.
- Partition 27 (2 hops of 10 & 7 hops of 1).
- Subtract each part from 74.
- 74 minus 27 equals 47.



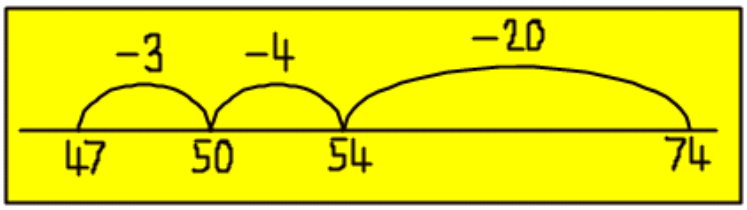
SUBTRACTION

STAGE 1: NUMBER LINE

BRIDGING



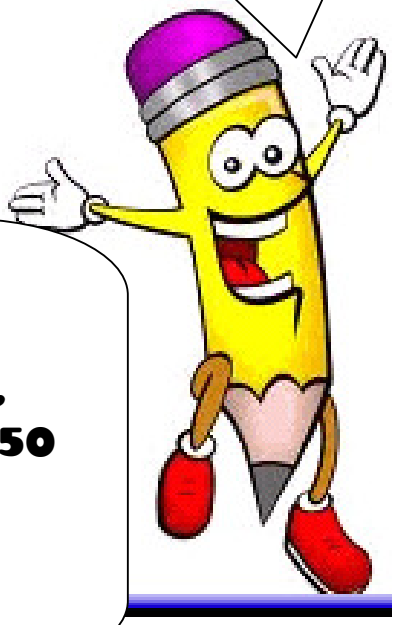
15 – 7 =8



or

74 – 27 = 47

- **Draw a number line back from 15.**
- **Partition 7, to subtract the 5 units in 15 & then the rest (2).**
- **15 minus 7 equals 8.**

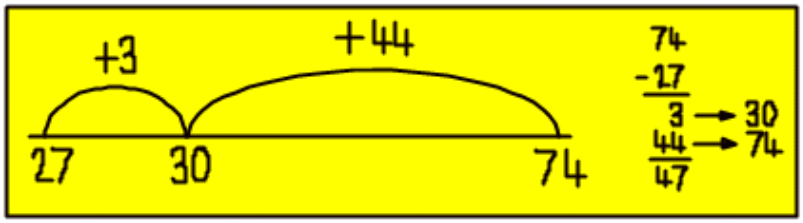


- **Draw a number line back from 74.**
- **Partition 27 (into 20 & 3 & 4 or, into 24 & 3, to bridge through 50 as you subtract).**
- **Subtract each hop.**
- **74 minus 27 is 47.**

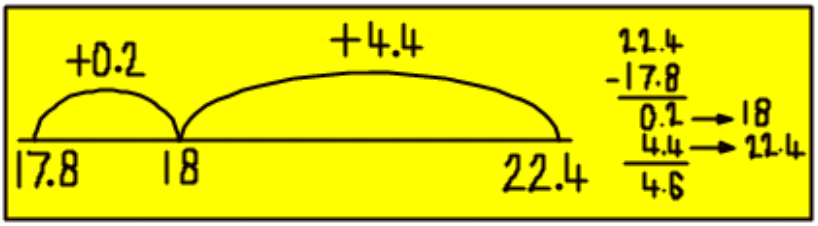
SUBTRACTION

STAGE 1: NUMBER LINE

BRIDGING



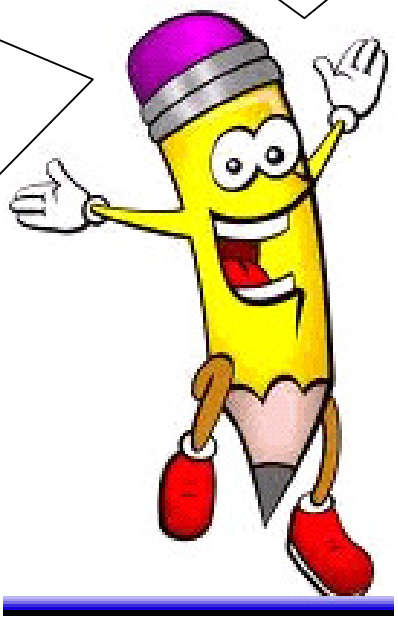
74 - 27 = 47



22.4 – 17.8 = 4.6

- Draw a number line from 27.
- Count on to 74, bridging through 30.
- You can keep track of the hops in a column.
- Combine your totals.

- Draw a number line from 17.8.
- Count on to 22.4, bridging 18 to find the difference.
- Keep track of the hops in a column.
- Combine your totals.



SUBTRACTION

STAGE 2: EXPANDED COLUMNS

$$\begin{array}{r} 70+4 \\ -20+7 \\ \hline \end{array} \qquad \begin{array}{r} \overset{6}{\cancel{70}}\overset{14}{\cancel{+4}} \\ -20+7 \\ \hline 40+7 \end{array}$$

74 - 27 = 47

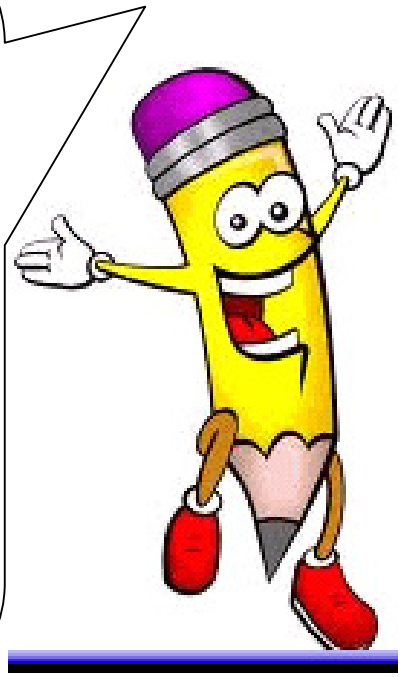
741 – 367 = 374

$$\begin{array}{r} 700+40+1 \\ -300+60+7 \\ \hline \end{array} \qquad \begin{array}{r} \overset{6}{\cancel{700}}\overset{13}{\cancel{+40}}\overset{11}{\cancel{+1}} \\ -300+60+7 \\ \hline 300+70+4 \end{array}$$

563 – 278 = 285

$$\begin{array}{r} \overset{4}{\cancel{500}}\overset{15}{\cancel{60}}\overset{13}{\cancel{3}} \\ -200+70+8 \\ \hline 200+80+5 \end{array}$$

- **Partition into HTU.**
- **Line up HTU underneath each other in columns.**
- **Adjust your units or tens or if needed.**
- **Subtract your units, then tens & hundreds.**
- **Combine your HTU totals.**



SUBTRACTION

STAGE 3: COLUMN METHOD

$$\begin{array}{r} 563 \\ -\ 241 \\ \hline 322 \end{array}$$

$$\begin{array}{r} {\scriptstyle 4\ 16} \\ 5\cancel{6}3 \\ -\ 271 \\ \hline 292 \end{array}$$

No decomposition or adjustment:

563 - 241 = 322

Adjustment from the hundreds to the tens:

563 – 271 = 292

$$\begin{array}{r} {\scriptstyle 4\ 15\ 13} \\ 5\cancel{6}\cancel{3} \\ -\ 278 \\ \hline 285 \end{array}$$

$$\begin{array}{r} {\scriptstyle 4\ 9\ 13} \\ 5\cancel{0}\cancel{3} \\ -\ 278 \\ \hline 225 \end{array}$$

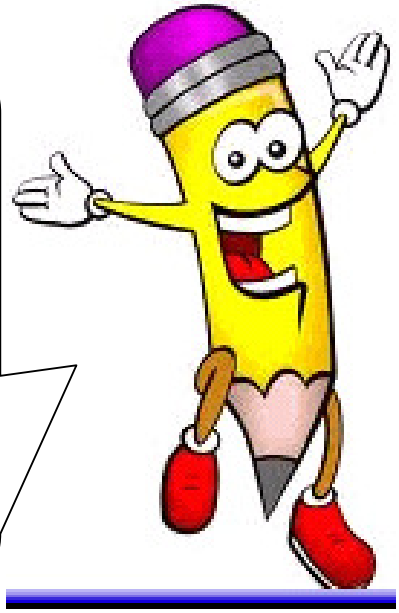
Adjusting hundreds to the tens & tens to the ones:

563 – 278 = 285

Dealing with zeros when adjusting:

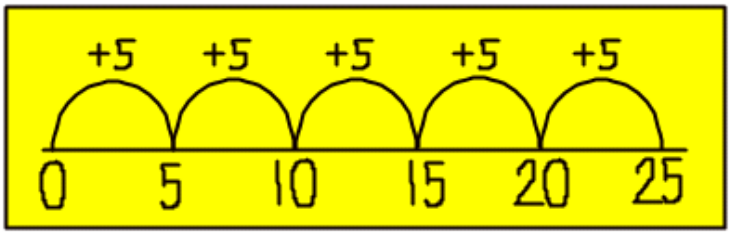
503 – 278 = 225

- **Write the numbers underneath each other (line up HTU).**
- **Adjust hundreds, tens & units if needed.**
- **Subtract the units, then tens & hundreds.**



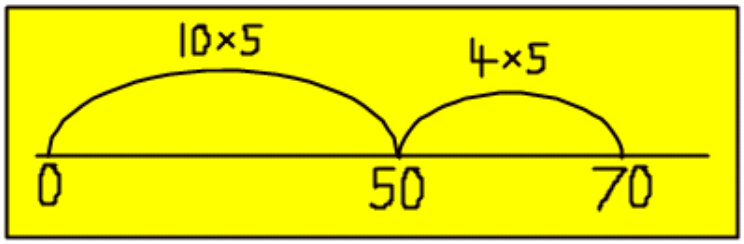
MULTIPLICATION

STAGE 1: NUMBER LINE



$5 \times 5 = 25$

- Draw a number line starting at 0.
- Draw 5 hops.
- Count on in 5s.
- 5 hops of 5 make 25.

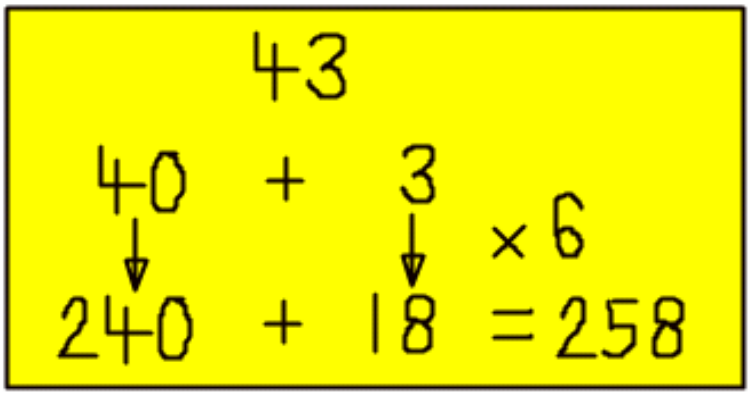


$14 \times 5 = 70$

- Draw a number line starting at 0.
- Partition 14 (1 hop of 10x5 & 1 hop of 4x5).
- Multiply each part & add to the total.
- 14 multiplied by 5 equals 70.

MULTIPLICATION

STAGE 2: MENTAL PARTITIONING



43 x 6 = 258

- **Partition 43 into its tens & units.**
- **Multiply 40 by 6 & then multiply 3 by 6.**
- **Combine your totals.**
- **43 multiplied by 6 equals 258.**

MULTIPLICATION

STAGE 3: EXPANDED COLUMNS

38 x 7 = 266

30+8
× 7
56 8×7= 56
210 30×7=210
266

38
× 7
56
210
266

- Partition 38 into tens & units.
- Line up the units & multiply them.
- Multiply the tens by 7.
- Combine your totals.
- Keep track of your steps at the side.

- Multiply the units by 7.
- Multiply the tens by 7.
- Combine your totals.

MULTIPLICATION

STAGE 4: SHORT MULTIPLICATION

$$\begin{array}{r} 38 \\ \times\ \ 7 \\ \hline 266 \\ \hline 5 \end{array}$$

38 x 7 = 266

- **Line up the units & multiply them carrying tens below the tens column.**
- **Multiply 30 by 7 (remember the tens carried).**
- **38 multiplied by 7 is 266.**

MULTIPLICATION

STAGE 4: LONG MULTIPLICATION

FOR 2-DIGIT & 3-DIGIT PRODUCTS

a. T U × T U

b. T U × T U

56 × 27 = 1512

56 x 27 is approximately 60 x 30 = 1800

- Multiply 6 by 7 to make 42 (carry the 4 tens below).
- Multiply the 5 tens by 7 to make 35 tens (remember the 4 tens you carried below). 56x7 is 392.
- On the next line, write a 0 to remember you are multiplying by 20, not 2.
- Multiply 6 by 2 tens (carry hundreds below).
- Multiply the 5 tens by 2 tens (remember the hundred you carried below).
- Combine the totals.

a. HTU × TU

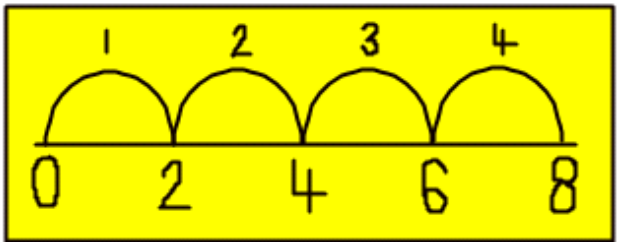
b. HTU × TU

286 × 29 = 8294

- Multiply 286 by 9 to make 2574 (carry tens & hundreds below the line).
- Multiply 286 by 20 to make 5720 (record a 0 to remember you are multiplying by 20, not 2 & again, carry below the line).
- Combine the totals.

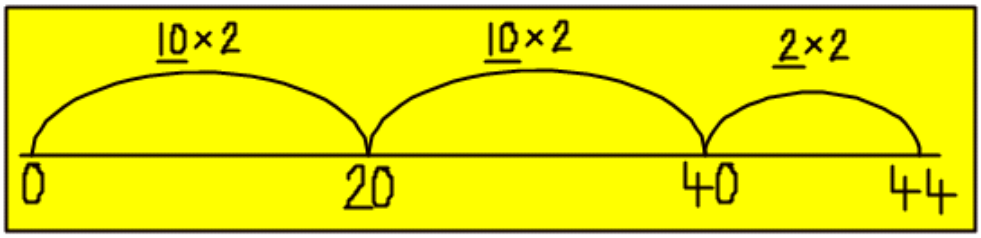
DIVISION

STAGE 1: NUMBER LINE



$8 \div 2 = 4$

- Draw a number line starting at 0.
- Count on in 2s until you reach 8.
- Count how many hops it took.
- 8 divided by 2 is 4.

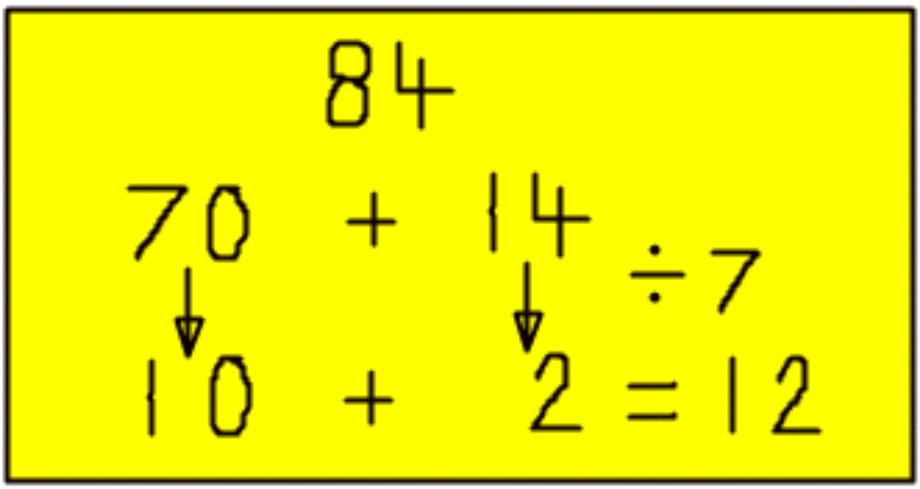


$44 \div 2 = 22$

- Draw a number line starting at 0.
- Partition 44 (2 hops of 10x2 & 1 hop of 2x4).
- Add up the multiples of 2 to see how many it took.
- 44 divided by 2 equals 22.

DIVISION

STAGE 2: MENTAL PARTITIONING



84 ÷ 7 = 12

- Partition 84 into ten multiples of 7 (70), & the rest (14).
- Divide 70 by 7 & then 14 by 7.
- Combine your totals.
- 84 divided by 7 equals 12.

DIVISION

STAGE 3: SHORT DIVISION

TWO-DIGIT NUMBERS

$$
\begin{array}{r}
20+7 \\
3\overline{)60+21}
\end{array}
$$

$81 \div 3 = 27$

Then shortened to:

$$
\begin{array}{r}
27 \\
3\overline{)8^{2}1}
\end{array}
$$

- **Mentally partition 81 into tens & units.**
- **Ask yourself 'How many threes divide into 80 so that the answer is a multiple of 10?'**
- **Partition 81 into 60 & 21, and divide each part by 3.**
- **Combine your totals.**
- **Move onto the shorter method when you are ready.**

DIVISION

STAGE 3: SHORT DIVISION

THREE-DIGIT NUMBERS

291 ÷ 3 = 97

$$3\overline{)290+1} = 3\overline{)270+21}$$
$$90+7$$

Then shortened to:

$$3\overline{)29^{2}1}$$
$$97$$

- **Ask yourself 'How many threes in 290?' (The answer must be a multiple of 10.)**
- **Count in multiples of 10; 30, 60, 90 (there are 90 threes in 270).**
- **Divide the remaining 21 by 3.**
- **Combine your totals.**
- **Move onto the shorter method when you are ready.**

DIVISION

STAGE 4: LONG DIVISION

CHUNKING

560 ÷ 24 = 23 r 8

$$
\begin{array}{r|l}
 & 560 \\
\hline
240 & (\times 10) \\
\hline
320 & \\
240 & (\times 10) \\
\hline
80 & \\
48 & (\times 2) \\
\hline
32 & \\
24 & (\times 1) \\
\hline
8 &
\end{array}
\qquad 23 \text{ r } \frac{8}{24}
$$

$10 \times 24 = 240$
$5 \times 24 = 120$
$2 \times 24 = 48$

- **Multiply the divisor by multiples of 10 to find the two multiples that 'trap' the HTU dividend. For 560 ÷ 24, start by multiplying 24 by 10, 20, 30, … to find that 24 x 20 = 480 and 24 x 30 = 720. The multiples of 480 and 720 trap the number 560.**
  This tells us that the answer to 560 ÷ 24 is between 20 and 30.
- **Start the division by first collecting some multiples of 24 in a magic box (x10, x5, x2). these will be taken off the number in chunks, starting with the largest possible multiple.**
- **Keep taking off chunks until all multiples of 24have been subtracted.**
- **Combine all the multiples subtracted.**
- **Show your remainder as a fraction.**

DIVISION

STAGE 4: LONG DIVISION

$432 \div 15 = 28 \text{ r } 4/5$

```
    28 r 12
15 | 432
     300   15x20
     ---
     132
     120   15x8
     ---
      12
```

```
    28 r 12/15 4/5
15 | 432
     300
     ---
     132
     120
     ---
      12
```

- Start by multiplying 15 by multiples of 10 to get an estimate; 15 × 20 = 300 & 15 × 30 = 450, so the answer lies between 20 and 30 packs.
- Start by subtracting 300 from 432.
- Calculate how many multiples of 15 remain in 132.
- Combine your multiples.
- The quotient 28, with a remainder of 12, lies between 20 & 30, as predicted.

- How many packs of 15 can we make from 432 biscuits?

- When you are ready, lose the jottings by the side.
- Show your answer as a fraction.

Totley All Saints CofE Primary School

Enjoy Achieve Learn Succeed Share

Believe Aspire Support Grow Care

Written methods of calculation for each year group:

ADDITION

Y1	Y2	Y3	Y4 Y5 Y6
Stage 1 Number Line	**Stage 2** Partitioning	**Stage 3** Expanded Columns	**Stage 4** Column Method

SUBTRACTION

Y1	Y2	Y3	Y4 Y5 Y6
Stage 1 Number Line Counting back & Partitioning	**Stage 1** Number Line Bridging	**Stage 2** Expanded Columns	**Stage 3** Column Method

MULTIPLICATION

Y1	Y2	Y3	Y4 Y5 Y6
Stage 1 Number Line	**Stage 2** Mental Partitioning	**Stage 3** Expanded Columns	**Stage 4** Short & Long Multiplication

DIVISION

Y1 Y2	Y3	Y4 Y5 Y6	
Stage 1 Number Line	**Stage 2** Mental Partitioning	**Stage 3** Short Division	**Stage 4** Long Division

Please note: some children may need work in previous or subsequent stages, as appropriate to their needs.