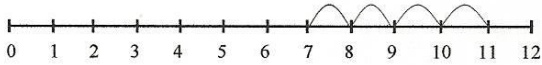


A D D I T I O N

Stage 1 -

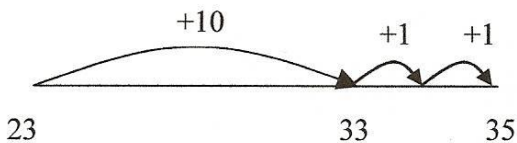
Using number lines to count on ones.

$$7 + 4 = 11$$



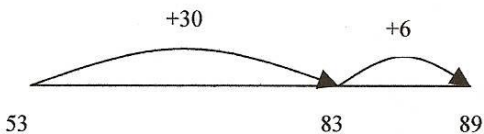
Stage 2 -

$$\begin{aligned} 23 + 12 &= 23 + 10 + 1 + 1 \\ &= 33 + 1 + 1 \\ &= 35 \end{aligned}$$



Stage 3 -

Partition into tens and ones and recombine.



Stage 4 -

$$83 + 42 = 125$$

$$\begin{array}{r} 80 + 3 \\ + 40 + 2 \\ \hline 120 + 5 = 125 \end{array}$$

Progress to:

$$\begin{array}{r} 83 \\ +42 \\ \hline 5 \\ \hline 120 \\ \hline 125 \end{array}$$



Stage 5 -

Formal method, showing numbers carried underneath.

$$\begin{array}{r} 358 \\ + 73 \\ \hline 431 \\ 11 \end{array}$$

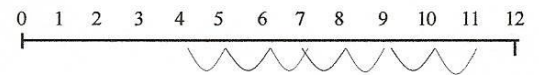
Extend to numbers with any number of digits and decimals with 1 and 2 decimal places.

S U B T R A C T I O N

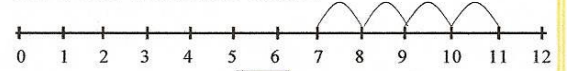
Stage 1 -

Using number lines to count back in ones.

$$11 - 7 = 4$$



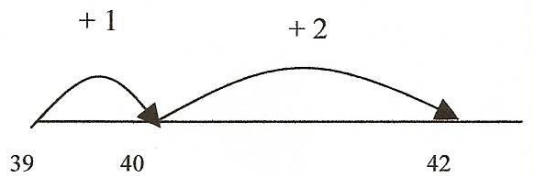
Counting on, using a number line, to find the difference between 7 and 11.



Stage 2 -

Find a small difference by counting up.

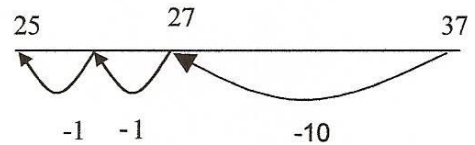
$$42 - 39 = 3$$



Stage 3 -

Counting back in tens and ones.

$$\begin{aligned} 37 - 12 &= 37 - 10 - 1 - 1 \\ &= 27 - 1 - 1 \\ &= 25 \end{aligned}$$



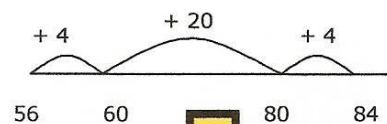
Progressing to taking larger jumps with the units.



Stage 4 -

Complementary addition (counting up from the smaller number to the larger number)

$$84 - 56 = 28$$



Stage 5 -

Decomposition

$$\begin{array}{r} \overset{8}{\cancel{8}} \overset{1}{2} \\ - \overset{3}{3} \overset{8}{8} \\ \hline 54 \end{array} \quad \begin{array}{r} \overset{2}{\cancel{8}} \overset{4}{\cancel{4}} \overset{1}{2} \\ - \overset{1}{1} \overset{7}{7} \overset{8}{8} \\ \hline 174 \end{array}$$

Progress to using decomposition with decimals.

MULTIPLICATION

Stage 1 -

Pictures and symbols

There are 3 sweets in one bag.

How many sweets are there in 5 bags?

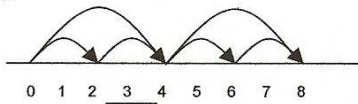


Stage 2 -

Arrays and repeated addition

$\bullet \bullet \bullet \bullet$ 4×2 or $4 + 4$
 $\bullet \bullet \bullet \bullet$
 2×4

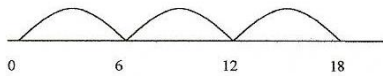
$2 + 2 + 2 + 2$



Stage 3 -

Number lines

E.g. 6×3



Partitioning

E.g. $15 \times 2 = 70$

$$\begin{array}{r} \times \quad 10 \quad 5 \\ 2 \quad 20 \quad 10 \\ \hline = 30 \end{array}$$

Stage 4 -

Grid method

E.g. $35 \times 2 = 70$

$$\begin{array}{r|l} \times & 30 & 5 \\ 2 & 60 & 10 \\ \hline & = 70 \end{array}$$

E.g. $123 \times 3 = 369$

$$\begin{array}{r|l} \times & 100 & 20 & 3 \\ 3 & 300 & 60 & 9 \\ \hline & = 369 \end{array}$$

Stage 5 -

Grid method

72×38

$$\begin{array}{r|l} \times & 70 & 2 \\ 30 & 2100 & 60 \\ 8 & 560 & 18 \\ \hline & = 2160 \\ & = 578 + \\ & \underline{2738} \\ & 1 \end{array}$$

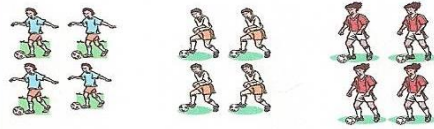
Progressing to using the grid method for decimals.

DIVISION

Stage 1 -

Pictures / marks

12 children get into teams of 4 to play a game. How many teams are there?



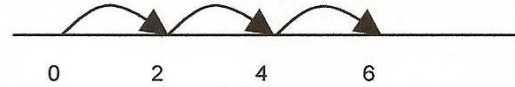
Stage 2 -

Sharing - 6 sweets are shared between 2 people.

How many do they have each? ($6 \div 2$)



Grouping - There are 6 sweets. How many people can have 2 each? (How many 2's make 6?)



Stage 3 -

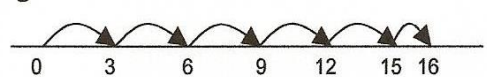
Division with remainders

$16 \div 3 = 5 \text{ r}1$

Sharing - 16 shared between 3, how many left over?

Grouping - How many 3's make 16, how many left over?

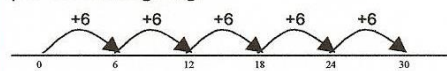
e.g.



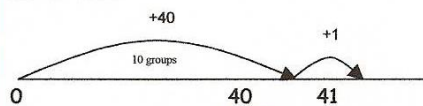
Stage 4 -

$30 \div 6$ can be modelled as:

Grouping - counting on in 6's until you reach the number you are dividing. E.g.



$41 \div 4 = 10 \text{ r}1$



Stage 5 -

Using chunking for division.

$$\begin{array}{r} 8 \overline{) 146} \\ \underline{- 80} \\ 66 \\ \underline{- 40} \\ 26 \\ \underline{- 24} \\ 2 \end{array} \quad \begin{array}{l} (8 \times 10) \\ (8 \times 5) \\ (8 \times 3) \end{array} \quad \begin{array}{l} \text{Total all the} \\ \text{'chunks' of} \\ 8 \text{ to find the} \\ \text{answer.} \end{array}$$

Answer: 18 r 2

This method can also be used when dividing larger numbers and decimals, and when there is a remainder.

Moving to formal long multiplication and long division