



MATHEMATICS

Calculation Guidance

for Parents

Multiplication

&

Division

Learning Together

MULTIPLICATION

Prerequisite skills:

- Partitioning
- Doubling and halving / Multiplying by 10
- Multiplication facts / calculation strategies
- Understanding multiplication as an array (this links to the grid method)

Stage 1: Mental method, using partitioning:

$$\begin{aligned}
 38 \times 7 &= (30 \times 7) + (8 \times 7) \\
 &= 210 + 56 \\
 &= \underline{\underline{266}}
 \end{aligned}$$

Stage 2: Grid method:

- *The mental method from which written methods are developed involves partitioning, and then multiplying the tens and ones separately.*
- *It is common to start with the tens when working mentally.*
- *A useful way of recording intermediate steps is the 'grid' method.*
- *This relates to finding the area of a rectangle.*

$$38 \times 7$$

X	30	8
7	30x7=210	8x7=56

$$210 + 56 = \underline{\underline{266}}$$

Stage 3: Extended to bigger numbers

E.g. 56×27

Estimate: 1800 because $60 \times 30 = 1800$

$$56 \times 27 = (50 + 6) \times (20 + 7)$$

X	50	6
20	(50x20) 1000	(6x20) 120
7	(50x7) 350	(6x7) 42

$$1000+350+120+42 = \underline{\underline{1512}}$$

Extended to decimals

E.g. 23.5×12

Estimate: $25 \times 10 = 250$

$$23.5 \times 12 = (20 + 3 + 0.5) \times (10 + 2)$$

X	20	3	0.5
10	200	30	5
2	40	6	1

$$200+40+30+6+5+1 = \underline{\underline{282}}$$

Stage 4: Vertical format, expanded working

- *Eventually, children may be introduced to a vertical format. They should first practise this with calculations they can do mentally. **Children should describe what they do by referring to the actual values of the digits in the columns.***
- *The method is then extended to multiplying by two-digit numbers.*

$$\begin{array}{r}
 38 \\
 \times 7 \\
 \hline
 210 \quad (30 \times 7 = 210) \\
 \quad 56 \quad (8 \times 7 = 56) \\
 \hline
 266 \\
 \hline
 = \underline{266}
 \end{array}$$

link to the grid method:

$$38 \times 7$$

X	30	8
7	210	56

$$\begin{array}{r}
 56 \\
 \times 27 \\
 \hline
 1000 \quad (50 \times 20 = 1000) \\
 \quad 120 \quad (6 \times 20 = 120) \\
 \quad 350 \quad (50 \times 7 = 350) \\
 \quad \quad 42 \quad (6 \times 7 = 42) \\
 \hline
 1512 \\
 \quad 1 \\
 \hline
 = \underline{1512}
 \end{array}$$

link to the grid method:

$$56 \times 27 =$$

X	50	6
20	1000	120
7	350	42

Stage 5: Vertical format, compact working

- *The method is made more compact by combining steps.*
- *If after practice, children cannot use the compact method without making errors, they should return to the expanded format.*

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

7 multiplied by 8 is 56, put 6 in the units column of the answer line and carry 50 into the tens' column (5 tens) We do this because there might be some more tens. 7 multiplied by 30 is 210. I need to add the 10 to the 5 tens to make 60. I can put '6' in the tens column. I then have 200 to put into the hundreds column.

$$\begin{array}{r} 56 \\ \times 27 \\ \hline 1120 \\ 392 \\ \hline 1512 \\ 1 \end{array}$$

(56 x 20)
(56 x 7)

$20 \times 6 = 120$ (put the 20 in the answer line, carry the 100) $20 \times 50 = 1000$ (+the carried 100) = 1120 in the answer line.

$7 \times 6 = 42$ (put 2 in the answer line and carry the 40) $7 \times 50 = 350$ (+the carried 40) = 392 in the answer line

$$1120 + 392 = 1512$$



DIVISION

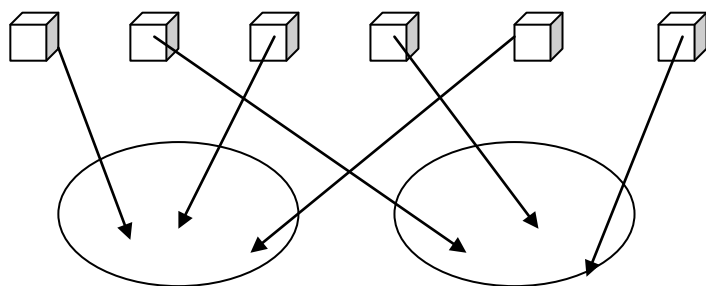
Understanding two models of division

Understanding division as:

1. **SHARING equally** occurs when a quantity is shared out equally into a given number of portions, and we can work out how many are in each portion.

Vocabulary → divided between

E.g. $6 \div 2$ (share 6 sweets between 2 children)



Sharing can be carried out using practical apparatus.

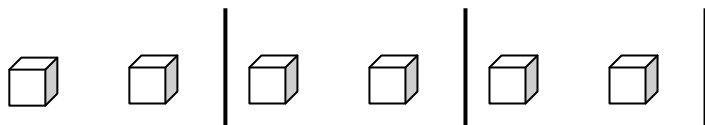
If children only understand the sharing model of subtraction they will need very good knowledge of tables in order to carry out division

2. GROUPING (or repeated subtraction)

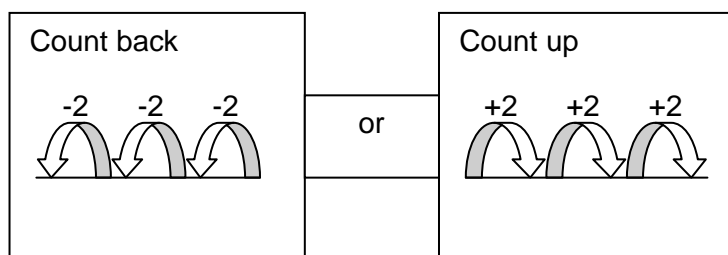
Occurs when we are asked to find how many groups of a given size are equivalent to the original quantity. For example how many groups of 2 marbles are in a set of 6 marbles, the calculation:

$$6 \div 2 \quad (\text{how many 2s in 6?})$$

Vocabulary → divided into groups of



Shown/calculated on a number line:

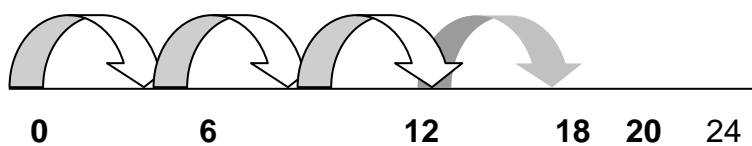


- ***KS1 tends to focus on “sharing” because this is a word and a concept that children understand and also it is the picture suggested by halving.***

IT IS ESSENTIAL THAT CHILDREN UNDERSTAND GROUPING (REPEATED SUBTRACTION) IN ORDER TO UNDERSTAND METHODS TAUGHT LATER ON

Stage 1. Informal written method- counting up on the number line in repeated groups of the divisor.

*A box holds 6 eggs. I have 20 eggs, how many boxes do I need?
(20÷6)*

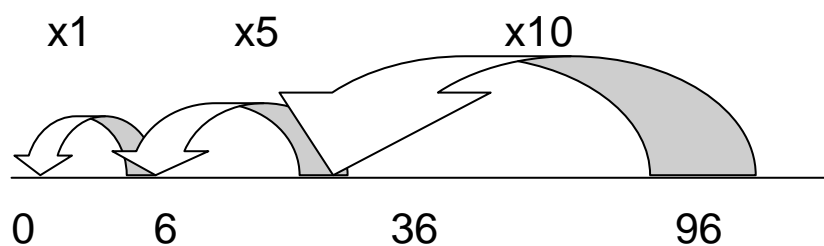


$20 \div 6 = 3 \text{ r } 2$, so I will need **4 boxes.**

Stage 2: Informal written method- counting back on the number line in chunks of the divisor

*If eggs are packed in boxes of 6 how many do I need to pack 96 eggs?
(96÷6)*

$96 \div 6 =$



$96 \div 6 = 16$ **(16 boxes)**

Help box
$10 \times 6 = 60$
$5 \times 6 = 30$
$2 \times 6 = 12$
$1 \times 6 = 6$

Stage 3: Progressing to an expanded vertical method:

e.g. $234 \div 9$

$$\begin{array}{r}
 234 \\
 - \quad \underline{90} \\
 144 \\
 - \quad \underline{90} \\
 54 \\
 - \quad \underline{45} \\
 9 \\
 \underline{\quad 9} \\
 \quad \quad 0
 \end{array}$$

$\rightarrow 234 \div 9 = 26$

Model as number line first so you are building on what they know.

Help Box

$10 \times 9 = 90$

$5 \times 9 = 45$

- ***The vertical layout does not require children to use decomposition method of subtraction! Encourage use of a jottings box to use a number line for subtraction they cannot do mentally***
- ***The key fact box can be extended when dealing with larger numbers e.g. 20x, 50x***