How we teach the four operations

@

St Peter's Church of England (Aided) Primary School

At St Peter's, maths is fun and relevant, encouraging children to be independent thinkers, mathematical talkers and problem solvers.

We aim to develop procedural fluency in maths through deep and meaningful conceptual understanding.

The written strategies in this booklet are taught consistently alongside a range of mental strategies allowing children to identify the strategy ***they*** wish to use.

Our Maths Vocabulary

Addition Sum Total Add Plus Increase Altogether	***Subtraction*** Subtract Less Minus Find the difference Difference between Fewer Take away
Multiplication Multiply Times Lots of Product Repeated addition	***Division*** Divided by Groups of Share Share equally Remainder

Addition

Early Addition Skills

Counting objects reliably

↓

Adding one more

↓

Combining two groups

3 2 5

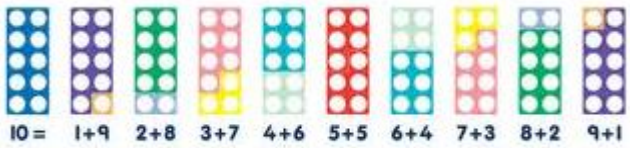
↓

Understand that addition can be done in any order

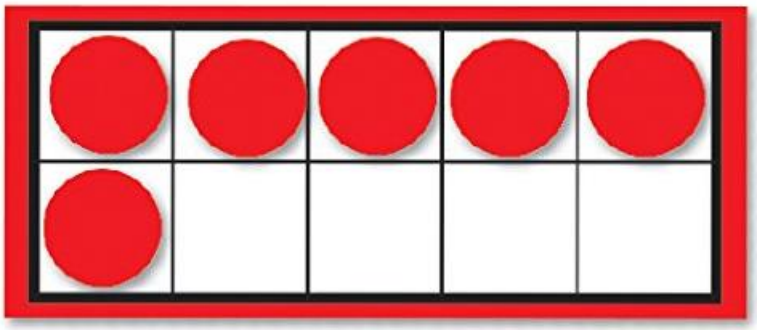
4 + 6 = 10 6 + 4 =10 10 = 6 + 4 10 = 4 + 6

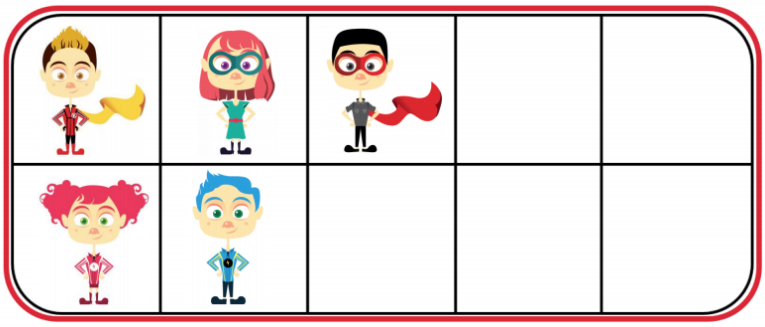
↓

Know number bonds within 10



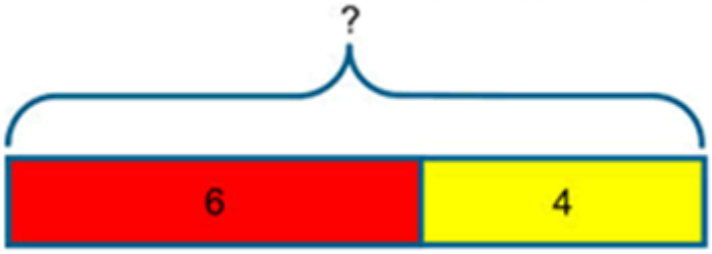
Use a 'Ten Frame' to identify number bonds





Record addition as a number sentence using symbols

Represent problems in a bar model



6 + 4 = 10

On Monday Bob collects 6 apples. On Tuesday he collects 4 apples. How many apples does he collect altogether?

Understand addition is the inverse of subtraction and derive related facts

$8 + 2 = 10$ $10 - 2 = 8$

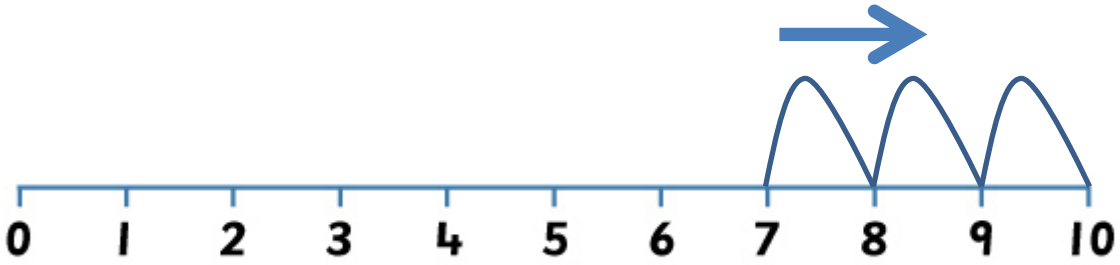
Use the inverse to calculate unknown amounts

$9 + \square = 10$

Addition on a Number Line (labelled and unlabelled

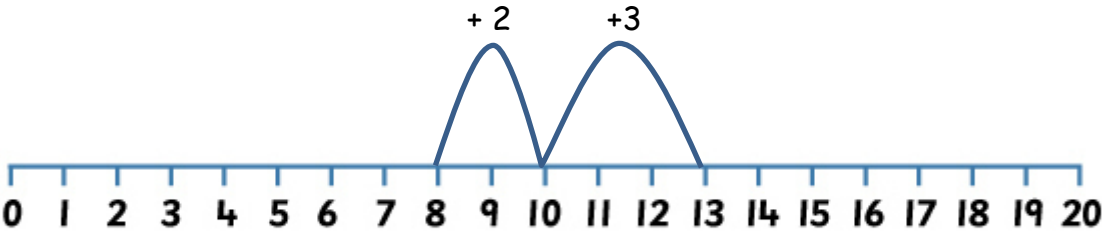
Counting on in jumps of 1

$7 + 3 = 10$



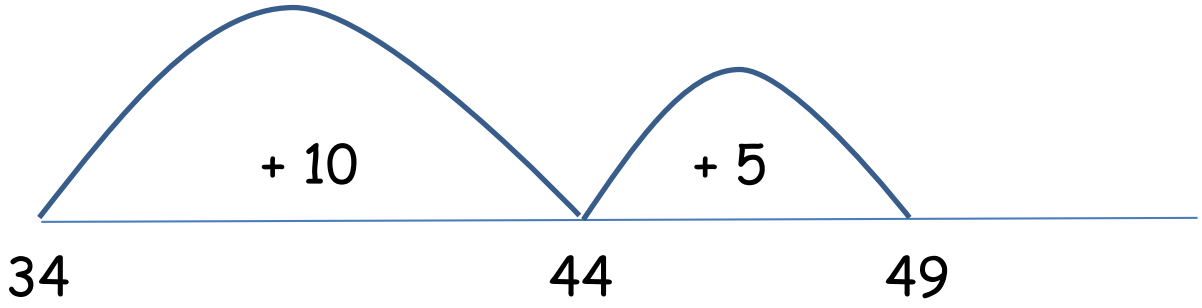
Use partitioning when ***bridging*** a multiple of 10

$8 + 5 = 13$

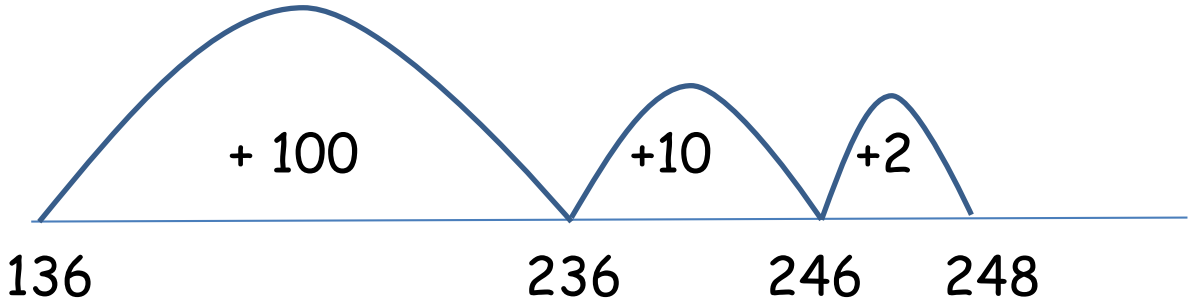


To partition numbers and count on in tens and ones

34 + 15 = 49

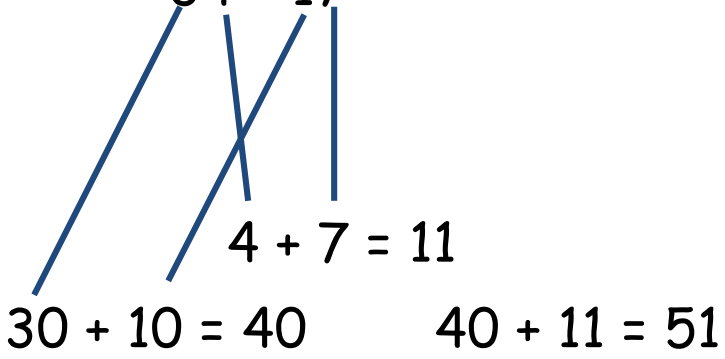


136 + 112 = 248



Partitioning and Re-combining

34 + 17 =



Column Addition

Expanded column addition

34

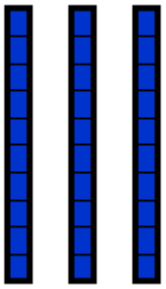
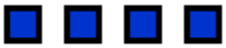
15 +

9 (4 + 5)

40 (30 + 10)

49

Represent addition with Dienes

Hundreds	Tens	Ones
		
		

We need to group the ones together, 4 + 5 = 9.

Then we need to group the tens, 3 tens + 1 ten = 4 tens (40).

40 + 9 = 49

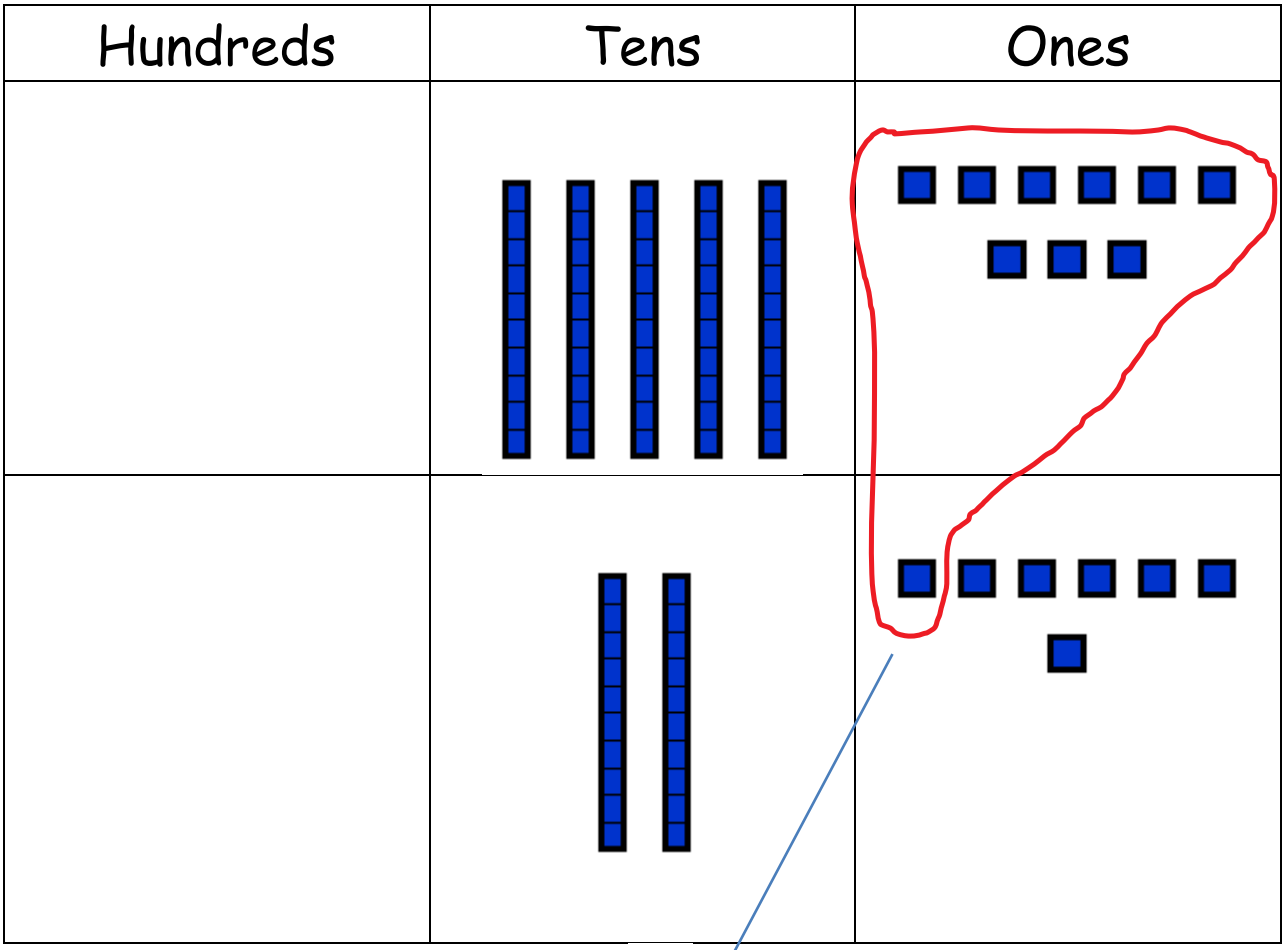
Compact column addition

59

27 +

86

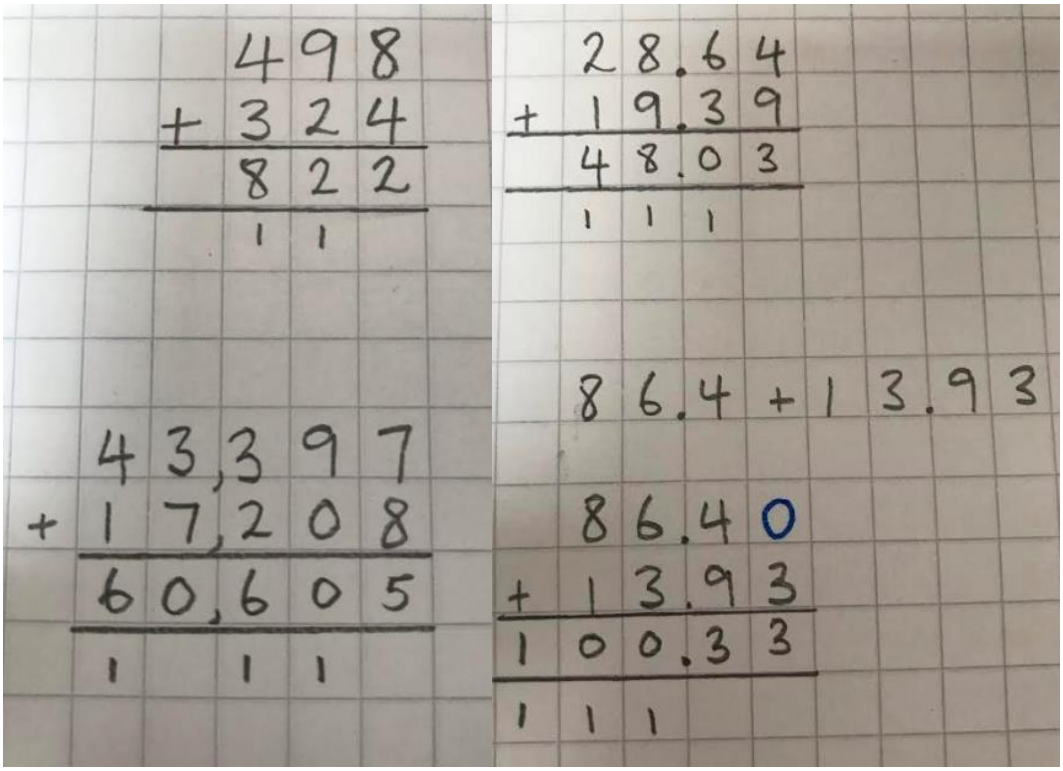
1



We then group our tens together, 5 tens + 2 tens + 1 ten = 8 tens (80)

9 + 7 = 16. Therefore, we need to '***regroup***' 10 ones as 1 ten and carry it into the tens column. We are left with 6 ones.

Compact method for addition - Examples



Compact column addition to add integers and decimals

28.7

26.5 +

55.2

1 1

Problem Solving – Examples (with Bar Models)

These are some prices in a fish and chip shop.

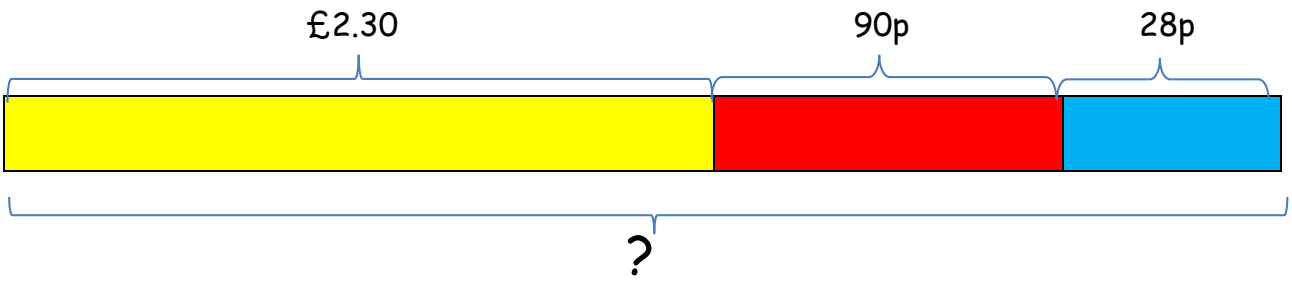
Fish £2.30	Peas 35p
Sausage £1.80	Curry sauce 40p
Chips (small bag) 60p	Bread roll 30p
Chips (large bag) 90p	Pickled onion 28p

Alfie buys one fish, a large bag of chips and a pickled onion.

How much does he pay?

£

1 mark

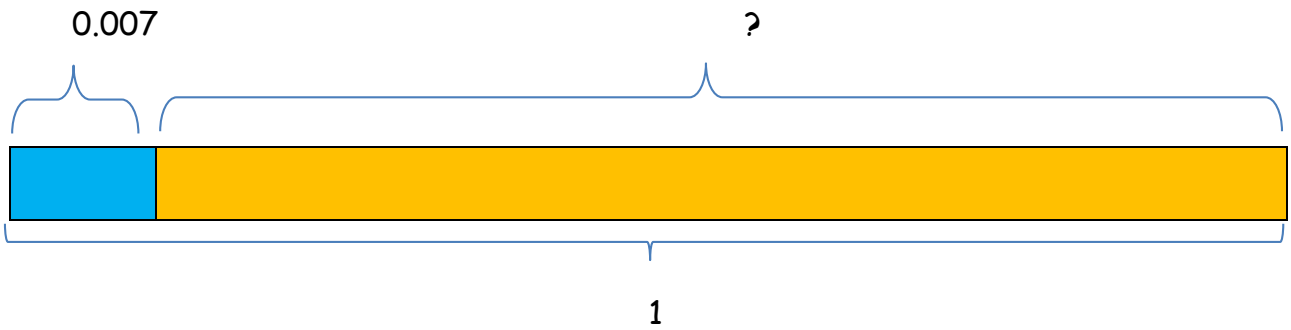


Two decimal numbers add together to equal 1

One of the numbers is 0.007

What is the other number?

1 mark



Subtraction

Early Subtraction Skills

Counting objects reliably

↓

Counting forwards and backwards, including over 10 boundaries

→ 8, 9, 10, 11, 12 → 22, 21, 20, 19, 18

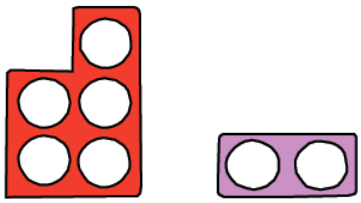
↓

Understand subtraction as taking away

6 – 2 = 4

↓

Understand subtraction as finding the difference



"The difference between 5 and 2 is 3"

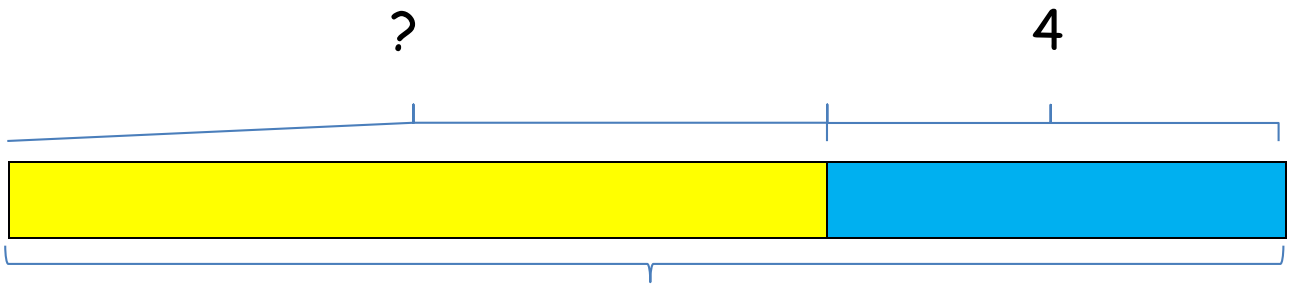
↓

Know and use number bonds within 10

Use a 'Ten frame' to identify and calculate with number bonds

Record subtraction as a number sentence using symbols

12 – 4= 8

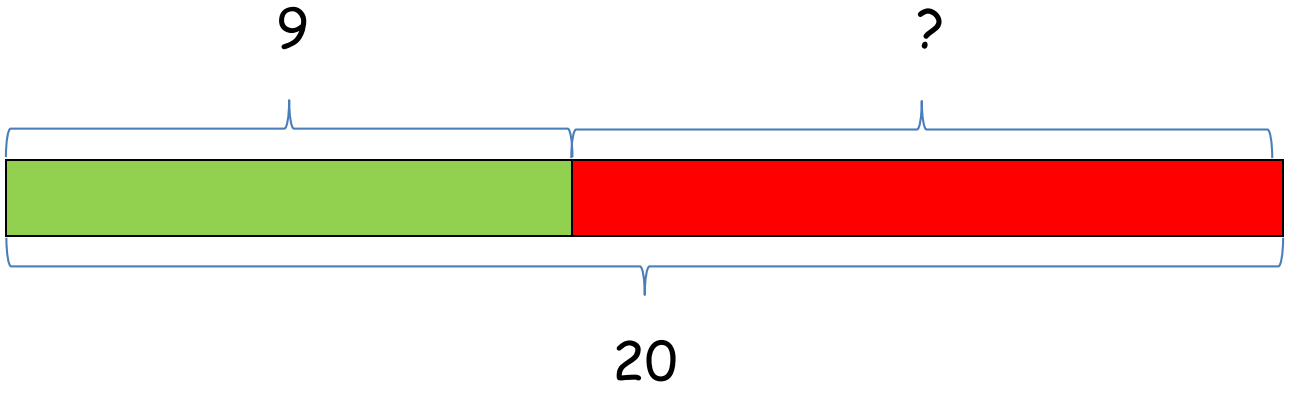


Understand subtraction is the inverse of addition and derive related facts

10 – 3 = 7 *so* 7 + 3 = 10 *and* 3 + 7 = 10

Use the inverse to calculate unknown amounts

20 - ▭ = 9

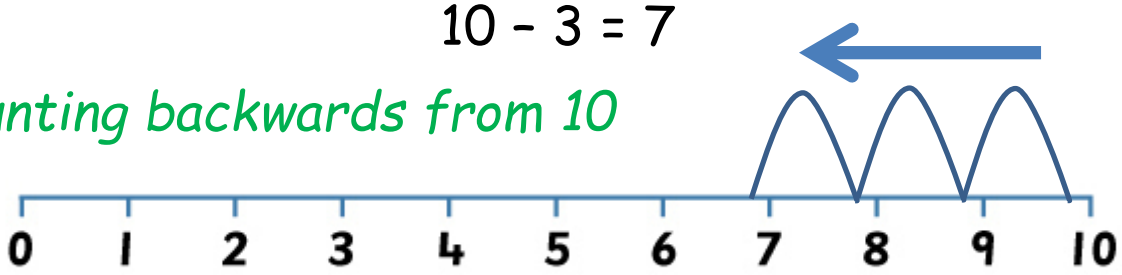


Subtraction on a Number Line (labelled and unlabelled)

Count forwards and backwards in jumps of 1

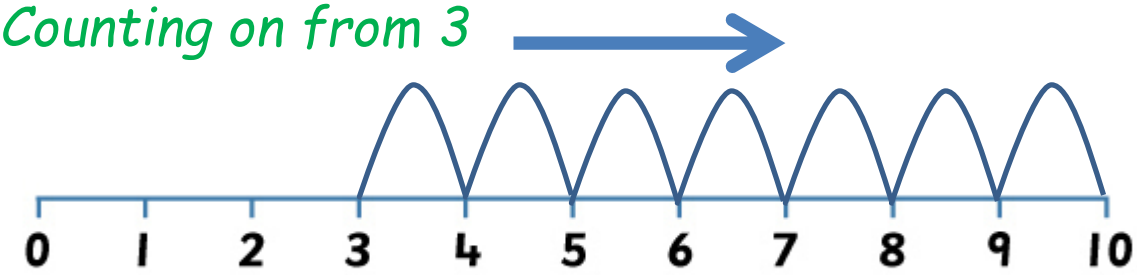
10 – 3 = 7

Counting backwards from 10



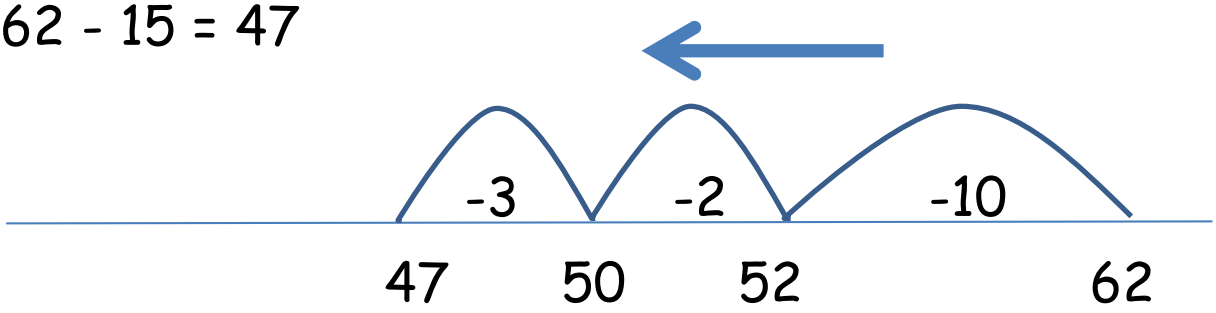
10 – 3 = 7

Counting on from 3



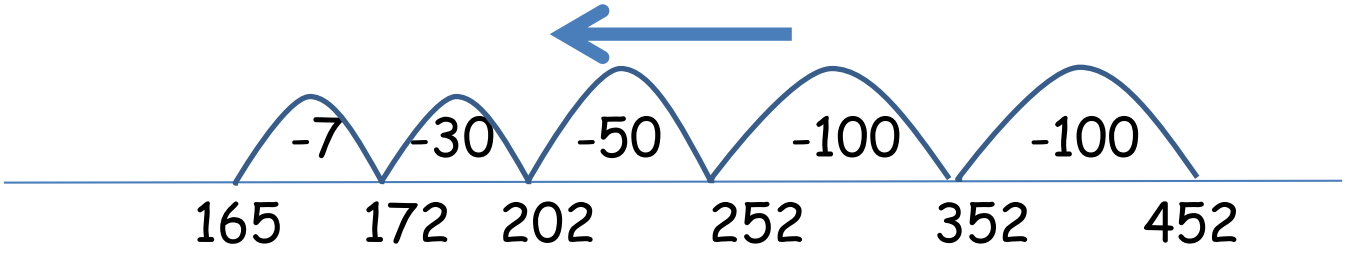
Using a number line to represent subtraction as 'taking away'

62 - 15 = 47



Using a number line to 'take' a 3 digit number from another 3 digit number

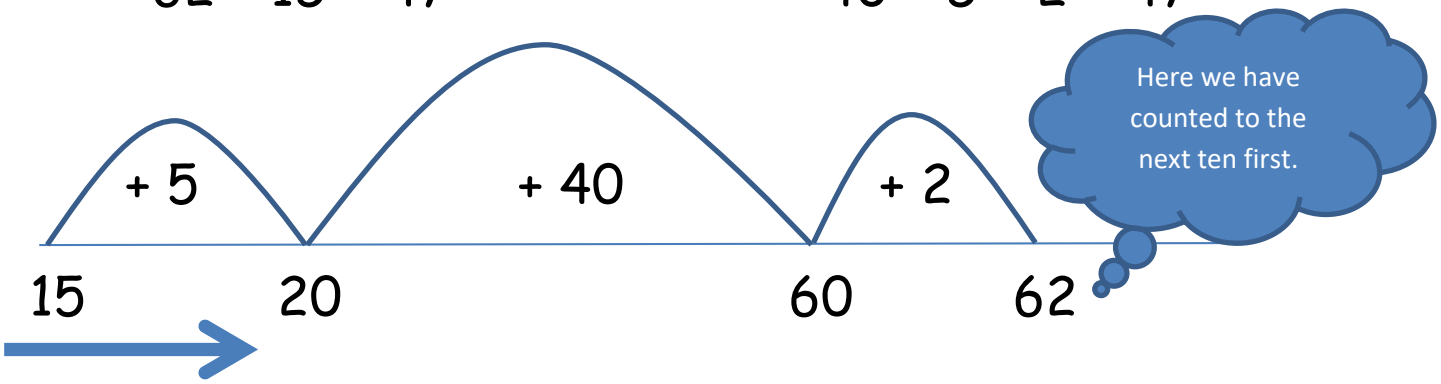
452 - 287 = 165



Using a number line to represent subtraction as 'finding the difference'

62 - 15 = 47

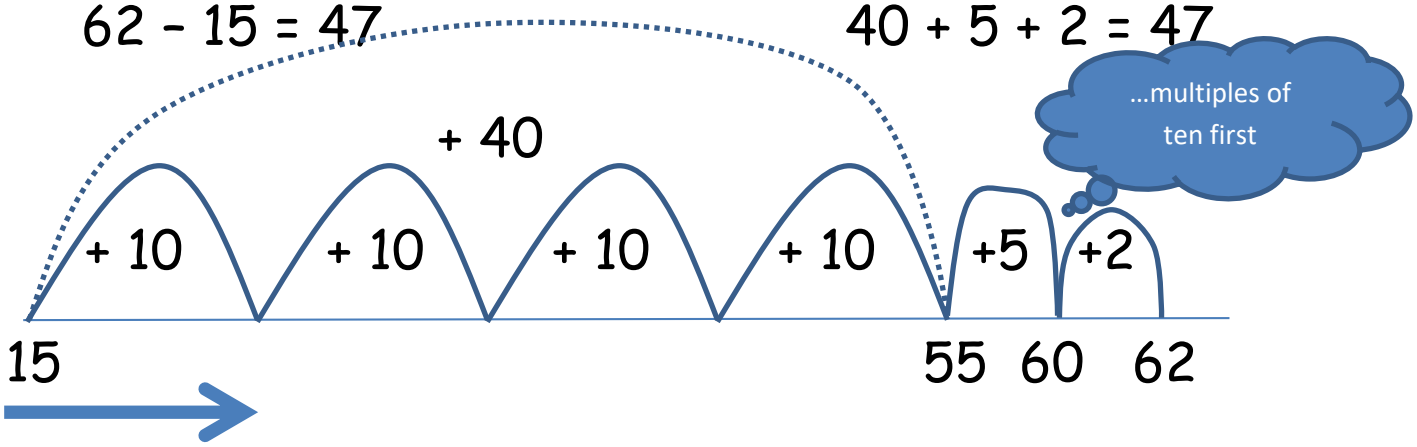
40 + 5 + 2 = 47



or...

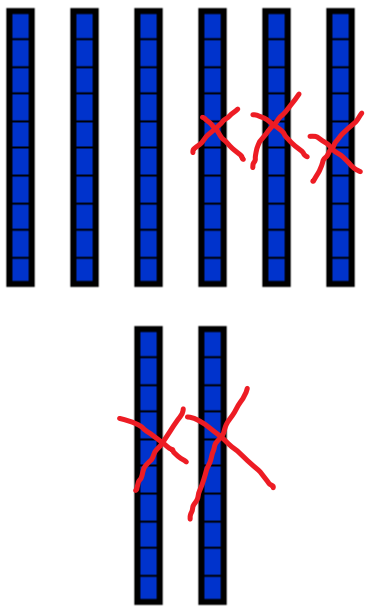
62 - 15 = 47

40 + 5 + 2 = 47



Column Subtraction

85 - 53 = 32

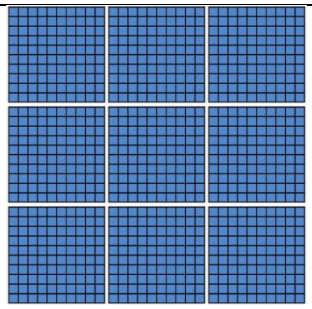
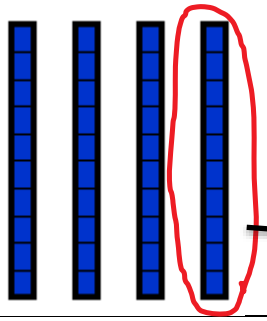
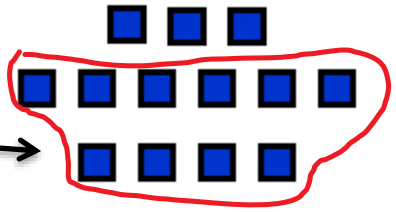
Hundreds	Tens	Ones
		

First you subtract 3 ones, leaving only 2 ones in the ones column.

Then you subtract 5 tens, leaving 3 tens.

80 – 50 = 30

943 - 627 = 316

Hundreds	Tens	Ones
		

First, because we can't subtract 7 ones from 3 ones, we regroup 1 ten into 10 ones - as shown above.

We then subtract 7 ones from 13 ones.

13 – 7 = 6

We then subtract the tens and hundreds column.

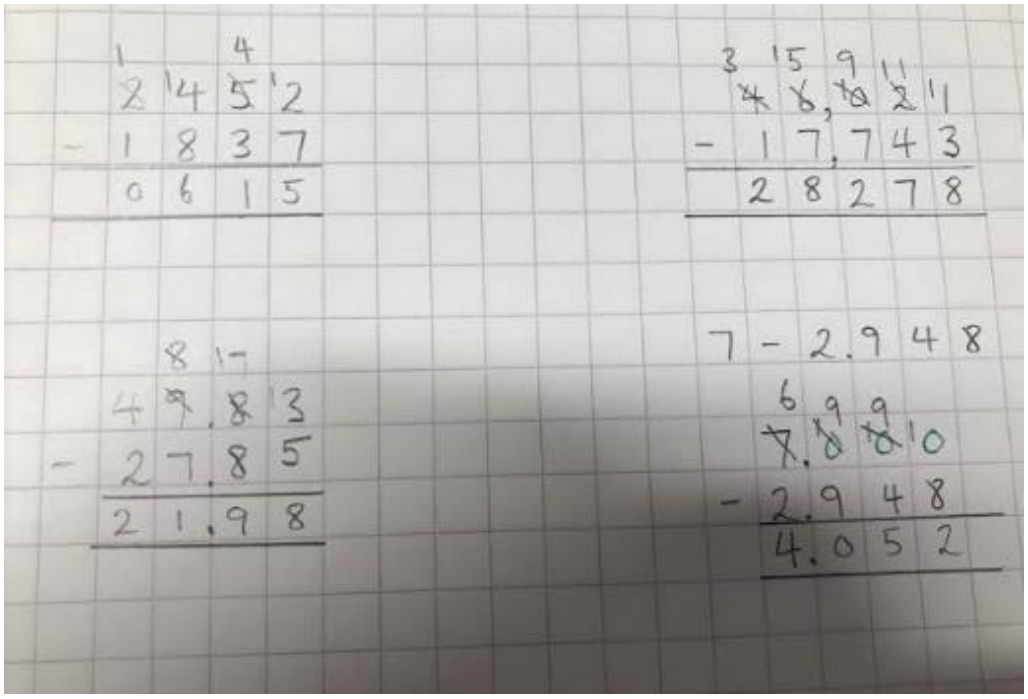
943 - 627 = 475

$$\begin{array}{r} {\scriptstyle 3\ \ 1} \\ 9\not{4}\,3 \\ -\ 3\ 2\ 7 \\ \hline 4\ 1\ 6 \end{array}$$

When we have a secure understanding of the mathematics involved, we will move onto writing the method as shown here.

Subtracting decimal numbers using compact column method

$$\begin{array}{r} {\scriptstyle 5\ \ 1} \\ 8\cancel{6}.7 \\ -\ 43.8 \\ \hline 42.9 \end{array}$$



Problem Solving – Examples (with Bar Models)

The children at Farmfield School are collecting money for charity.

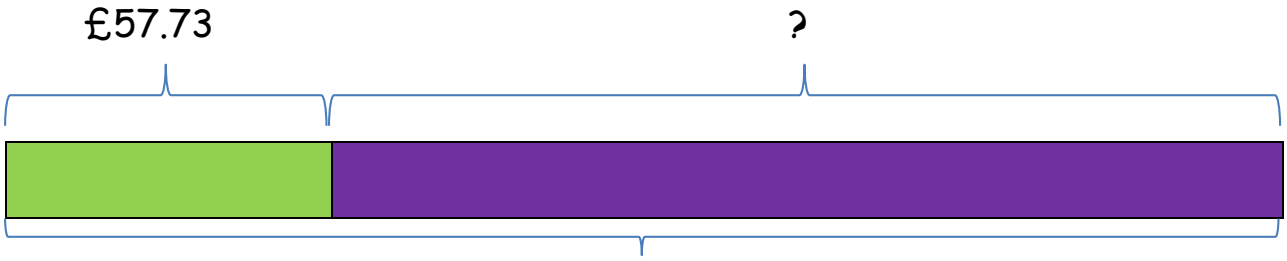
Their target is to collect £360

So far they have collected £57.73

How much **more** money do they need to reach their target?

£ _____

1 mark



£360

Liam, Sarah and Amy buy lunch at a salad bar.

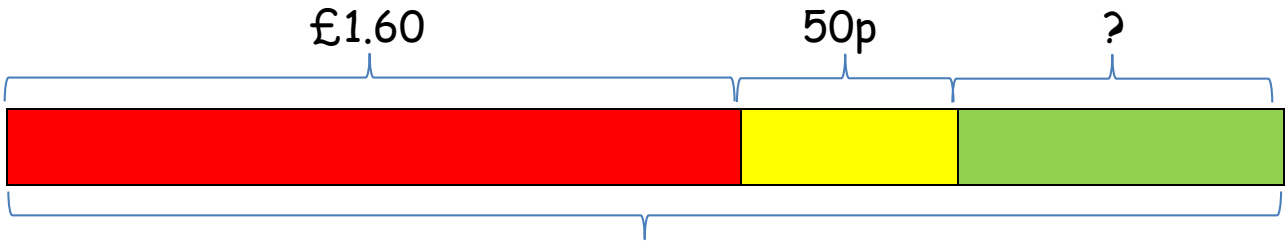
salad bar			
Salads		Desserts	
cheese	£1.20	banana	25p
egg	90p	apple pie	50p
tuna	£1.60	yogurt	35p

Liam has £2.50 to spend.

He buys a tuna salad and an apple pie.

How much money has he got left?

p _____



£2.50

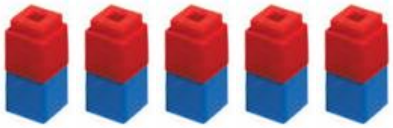
Multiplication

Early Multiplication Skills

Counting reliably in different sizes

5 10 15 20

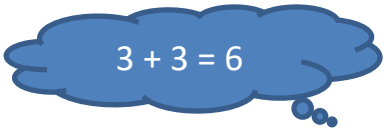
= 20

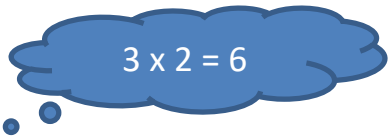


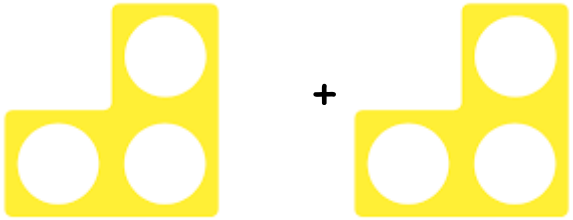
2 4 6 8 10

= 10

Understand doubling 2 equal groups

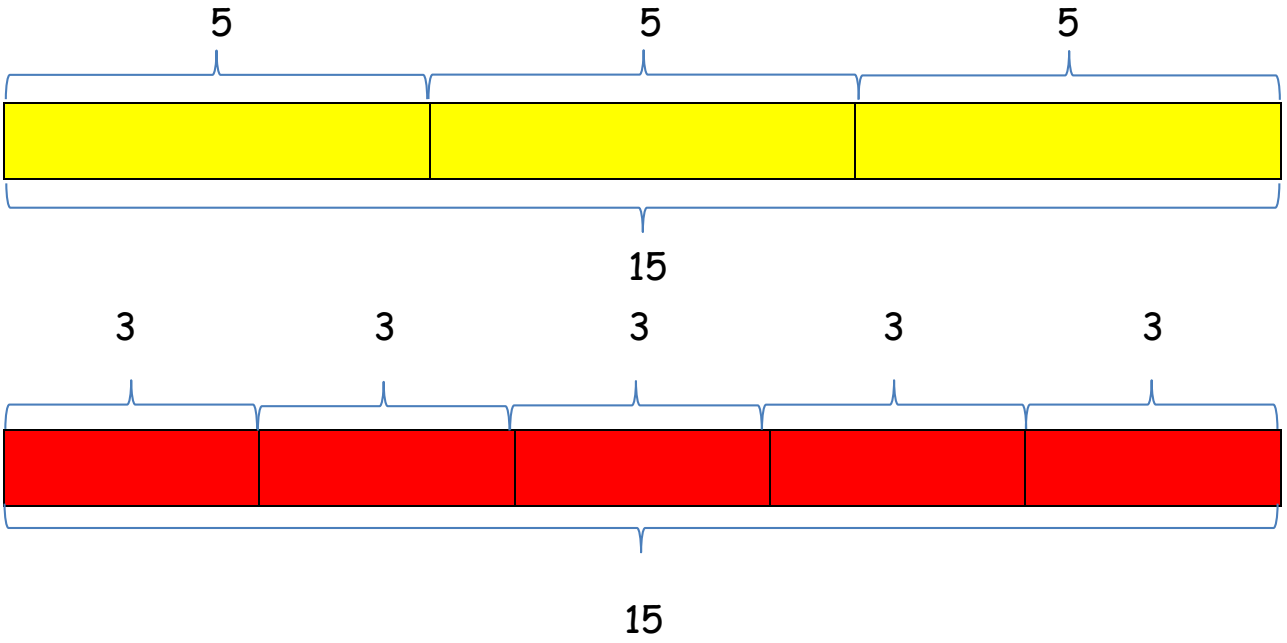




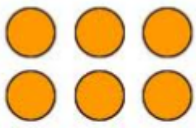


Understand multiplication as repeated addition

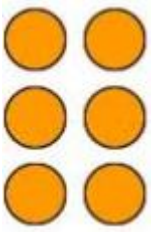
5 x 3 = 5 + 5 + 5 = 15



Understand the commutative nature of multiplication

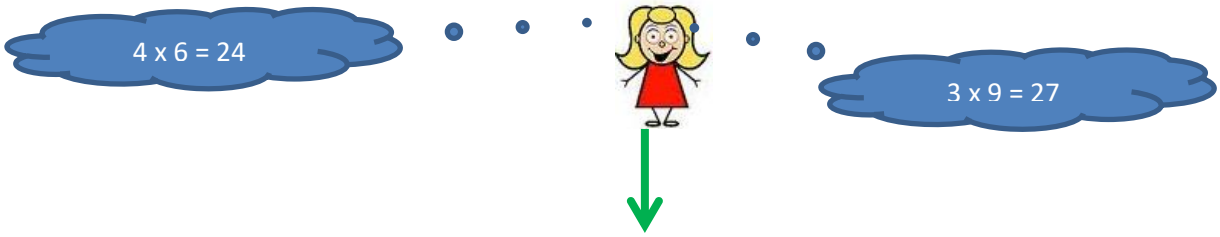


2 x 3 = 6



3 x 2 = 6

Know multiplication facts up to 12 x 12 *(National Curriculum statement for the end of Year 4)*



Understand that multiplication is the inverse of division

3 x 6 = 18

6 x 3 = 18

18 ÷ 6 = 3

18 ÷ 3 = 6

Multiply any number by 10, 100 and 1000 using our understanding of place value

63 x 10 = 630

Hundreds	Tens	One
	6	3
6	3	0

We put a zero in the ones column as a place holder.

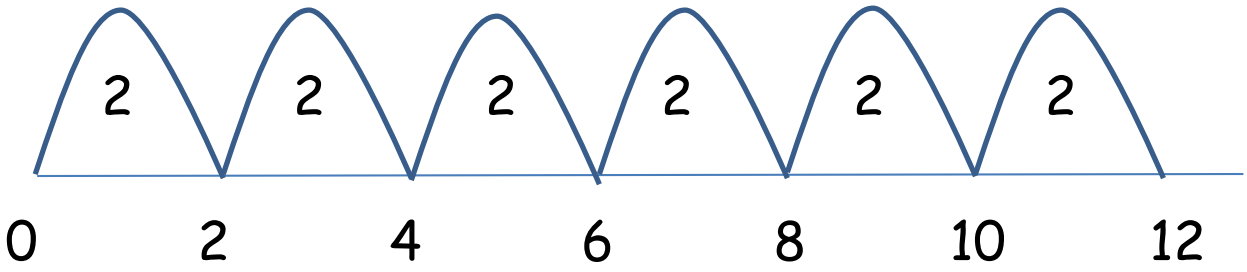
4.8 x 10 = 48

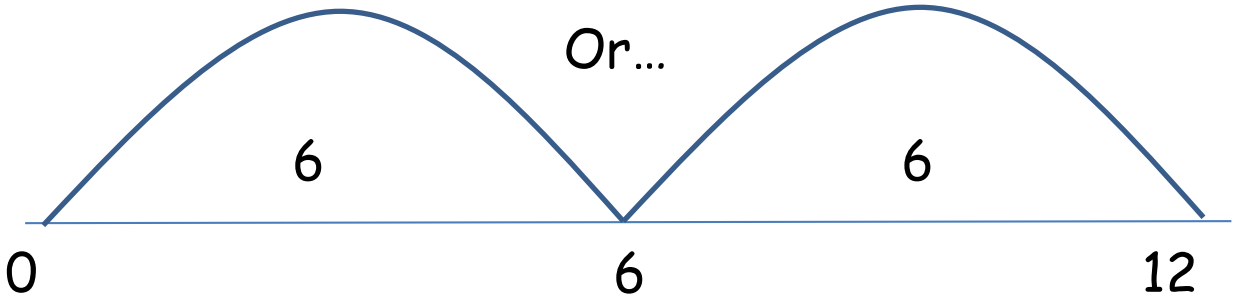
Tens	Ones	.	Tenths
	4	.	8
4	8	.	0

Multiplication on a Number Line

6 x 2 = 12

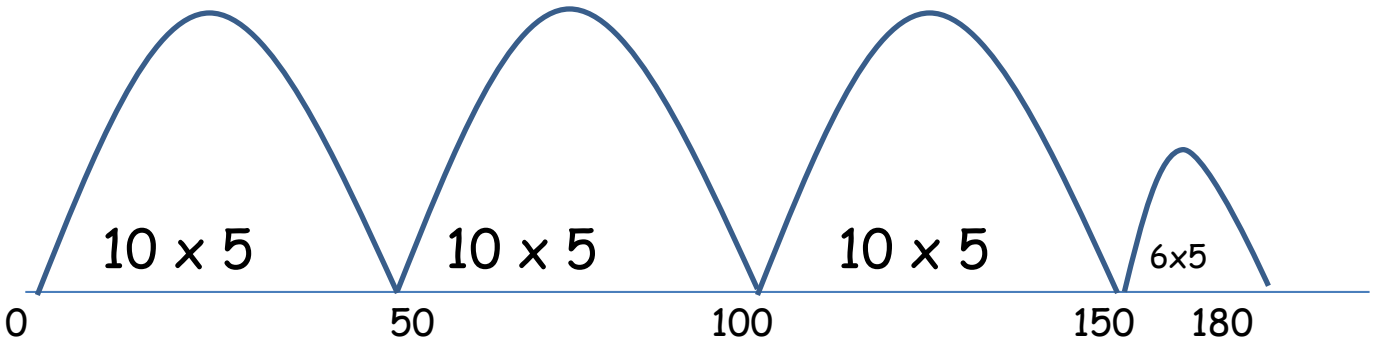
(one digit x one digit)





36 x 5 = 180

(2 digit x 1 digit)



Grid Method for Multiplication

17 x 4 = 68

(2 digit x 1 digit)

x	10	7
4	40	28

Step one: Partition the 2 digit number
e.g. 17 = 10 + 7

Step 3: Multiply 4 by 10 = 40

Step 2: Multiply 4 by 7 = 28

40
+ 28
68

Step 4: Add together you two answers from step 2 and step 3 to get your final answer
e.g. 40 + 28 = 68
Therefore, 17 x 4 = 68

136 x 5 = 680

(3 digit x 1 digit)

X	100	30	6
5	500	150	30

500
150
+ 30
680

46 x 13 = 598

(2 digit x 2 digit)

x	40	6
10	400	60
3	120	18

400
120
60
+ 18
598

16.4 x 6 = 98.4

(Grid Method to multiply decimals)

x	10	6	0.4
6	60	36	2.4

If I multiply 0.4 I get an answer of 4. I can then do 6 x 4 = 24

Because I multiplied by 10, I must divide the answer by 10. 24 ÷ 10 = 2.4

60
36
+ 2.4
98.4

Expanded Multiplication

243

x 7

21 (7 x 3)

280 (7 x 40)

1400 (7 x 200)

1701

1

We are following the same procedure in these two methods. We start by multiplying the ones, then the tens and finally the hundreds.

Short Multiplication

24 x 6 = 136

342 x 7 = 2394

24

x 6

2

144

342

x 7

2 1

2394

Long Multiplication

(2 digits x 2 digits)

24 x 16 = 384

```
  2
  24
x 16
 144
 240
 384
```

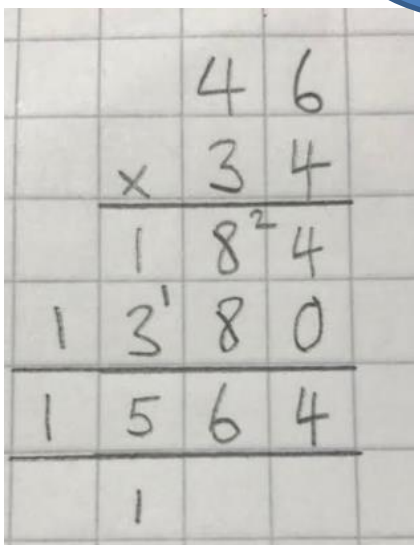
6 x 4 = 24 (regroup 20 into the tens column).
6 x 20 = 120 (add the 20 you regrouped earlier = 140)
10 x 24 = 240.
144 + 240 = 384

(3 digits x 2 digits)

124 x 26 = 3224

```
  1 2
  124
x  26
  744
 2480
 3224
 1 1
```

6 x 4 = 24 (carry 20 into the tens column).
6 x 20 = 120 (add the 20 you carried earlier = 140)
6 x 100 = 600 (add the 100 you carried earlier = 700)
20 x 124 = 2480
744 + 2480 = 3224



Problem Solving – Examples (with Bar Models)

A shop sells candles.

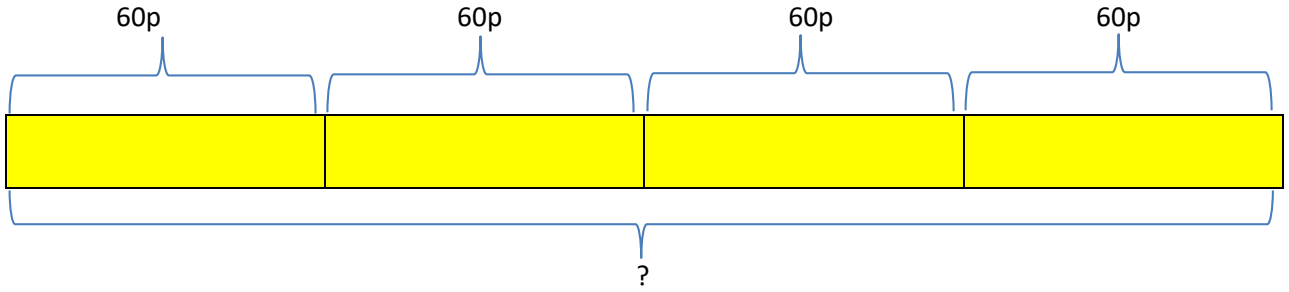
plain candles
35p each

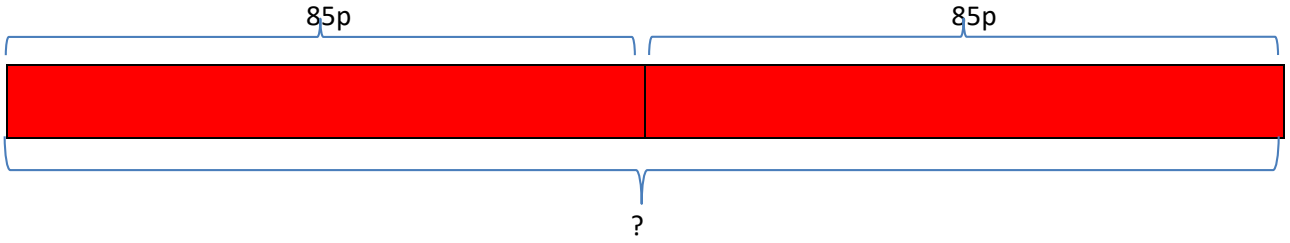
star candles
60p each

stripe candles
85p each

Sapna buys **4** star candles and **2** stripe candles.

How much does she pay **altogether**?





Division

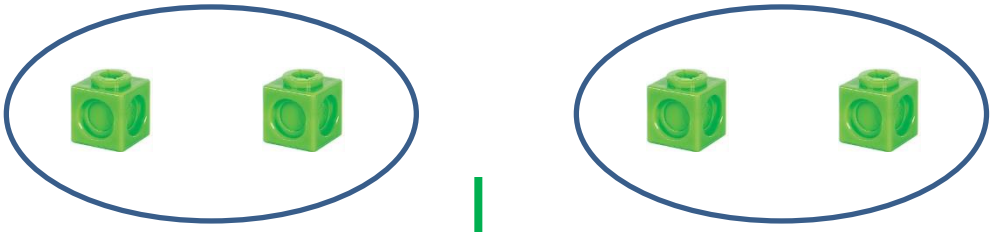
Early Division Skills

Counting reliably in different sizes

↓

Understand halving as 2 equal groups

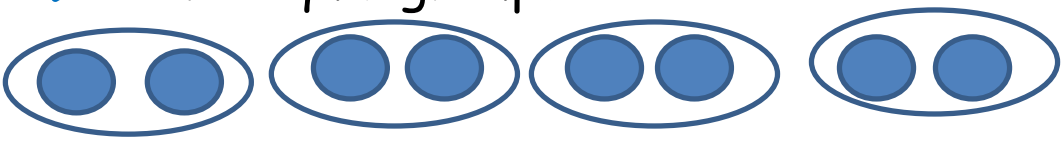
Half of 4 = 2 $\quad\quad$ 4 ÷ 2 = 2



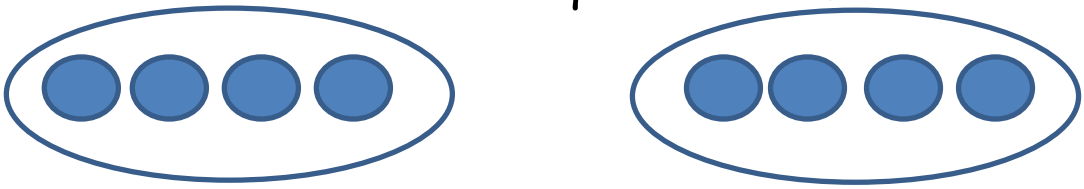
↓

Understand division as sharing and grouping

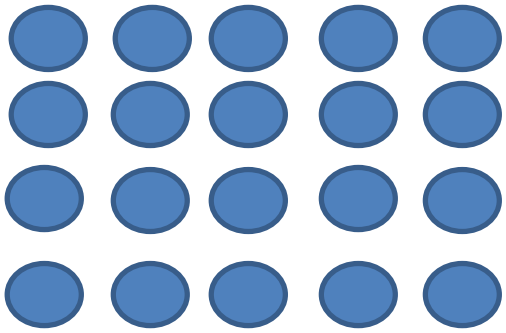
8 ÷ 4 = 2 → 8 in 4 equal groups



8 ÷ 2 = 4 → 8 shared into 2 equal sets of 4



Grouping

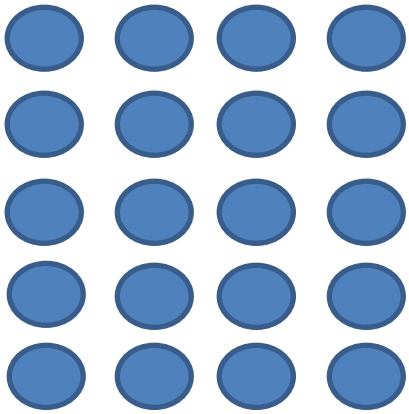


20 ÷ 5= 4

4 groups of 5 = 20

20 in groups of 5 gives 4 groups

Sharing



20 ÷ 5= 4

5 sets of 4 = 20

20 in 5 sets gives 4 in each set

Record division as a number sentence using symbols

Understand that division is the inverse of multiplication

24 ÷ 6 = 4 24 ÷ 4 = 6 6 x 4 = 24 4 x 6 = 24

Divide numbers by 10, 100 & 1000 using our understanding of place value

63 ÷ 10 = 6.3

Tens	Units	.	Tenths
6	3		
0	6	.	3

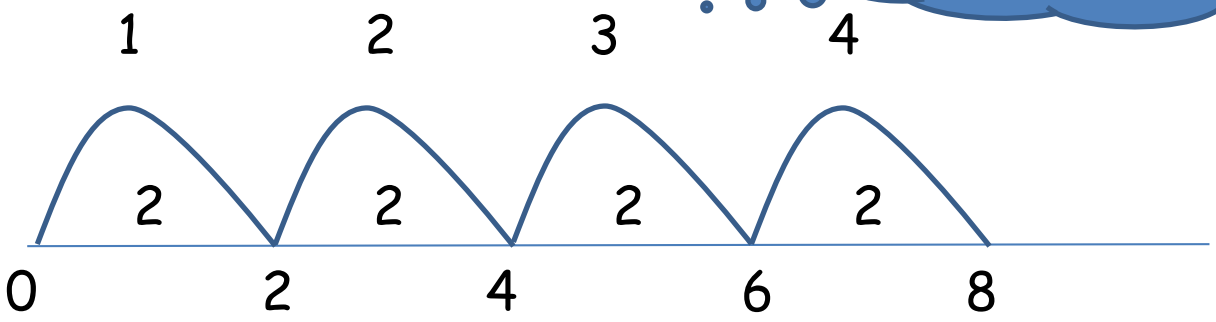
63 ÷ 100 = 0.63

Tens	Units	.	Tenths	Hundredths
6	3			
0	0	.	6	3

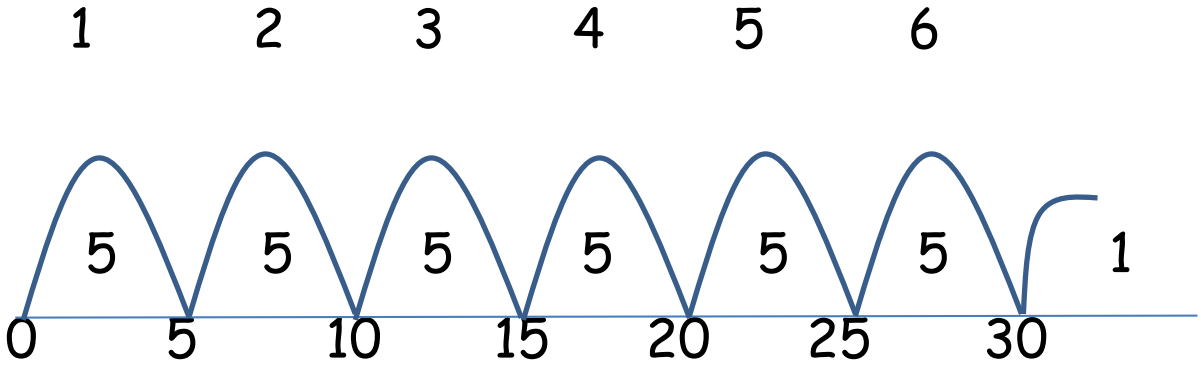
Division on a Number Line

$8 \div 2 = 4$

How many jumps of 2 do I need to reach 8?

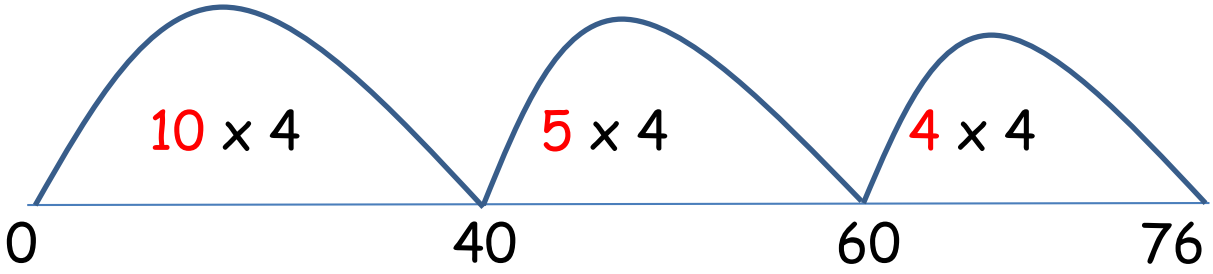


$31 \div 5 = 6$ remainder 1



Chunking on a Number Line

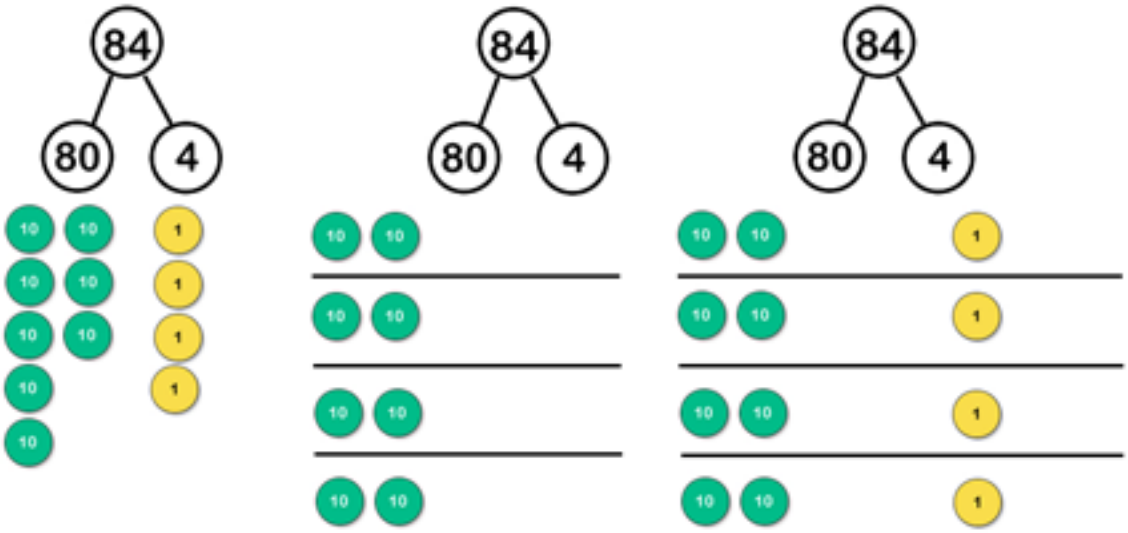
76 ÷ 4 = 19



10 + 5 + 4 = 19

Chunking with Place Value Counters

84 ÷ 4 = 21



Short Division

$98 \div 7 = 14$

$$\begin{array}{r} 1\ 4 \\ 7\overline{)\,9\ {}^{2}8} \end{array}$$

$432 \div 5 = 86\ r\ 2$

$$\begin{array}{r} 0\ 8\ 6\ r\ 2 \\ 5\overline{)\,4\ {}^{4}3\ {}^{3}2} \end{array}$$

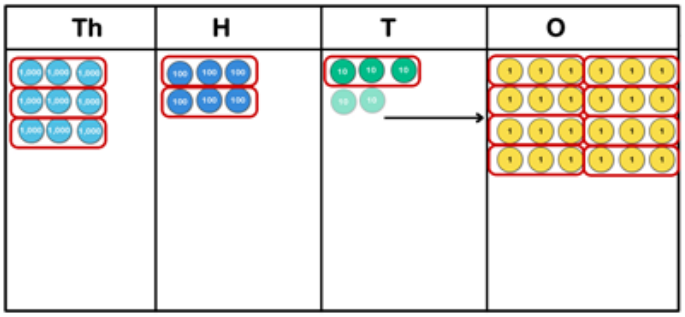
...or...

$432 \div 5 = 86.4$

$$\begin{array}{r} 0\ 8\ 6\ .\ 4 \\ 5\overline{)\,4\ {}^{4}3\ {}^{3}2\ .{}^{2}0} \end{array}$$

We can also represent short division pictorially or with concrete resources

$$3\overline{)9\,6\,5^{2}4}\quad 3\ 2\ 1\ 8$$



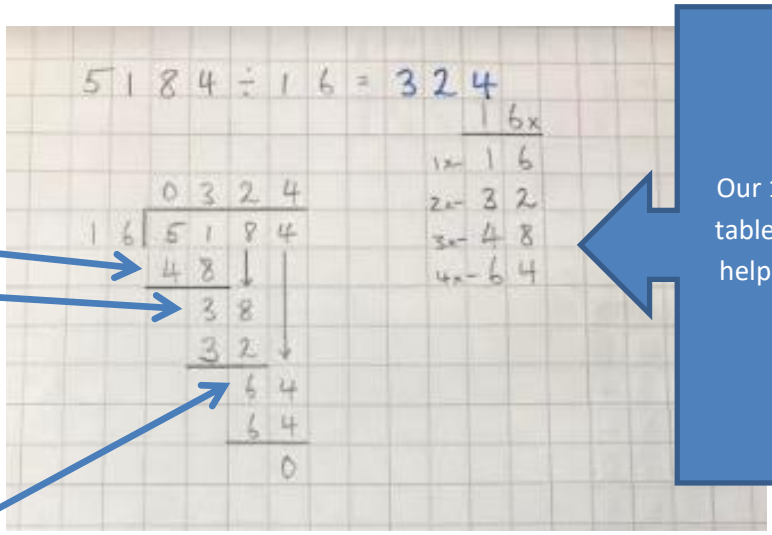
Long Division

Step 1:

5 ÷ 16 is less than 1 so we carry the 5 to make 51 ÷ 6 = 3 r 3

3 x 16 = 48

Here is our remainder 3.



Our 16 x tables to help us!

Step 2:

We bring the 8 down to join the remainder 3 and make 38.

38 ÷ 16 = 2 r 6

Here is our remainder 6.

Step 3:

We now bring the 4 down to join the remainder 6 and make 64.

64 ÷ 16 = 4

Problem Solving – Examples

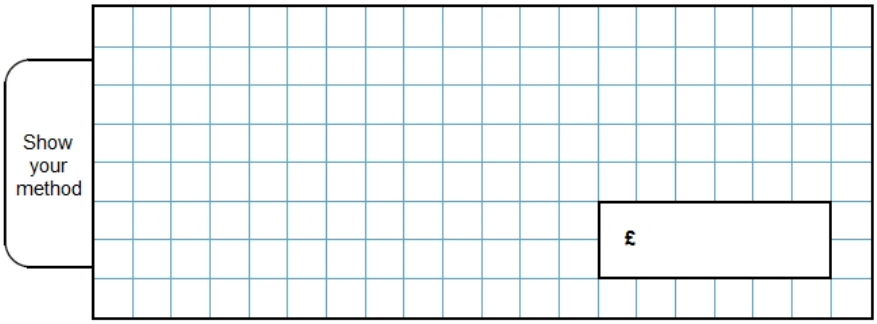
Large pizzas cost £8.50 each.

Small pizzas cost £6.75 each.

Five children together buy one large pizza and three small pizzas.

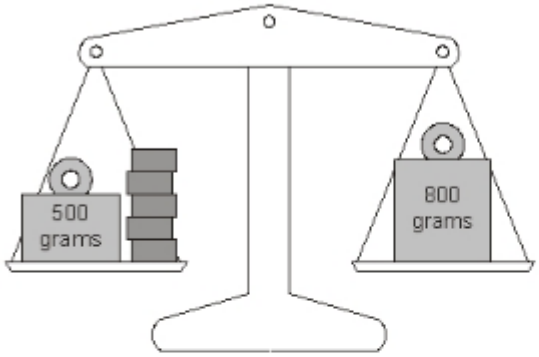
They share the cost equally.

How much does each child pay?

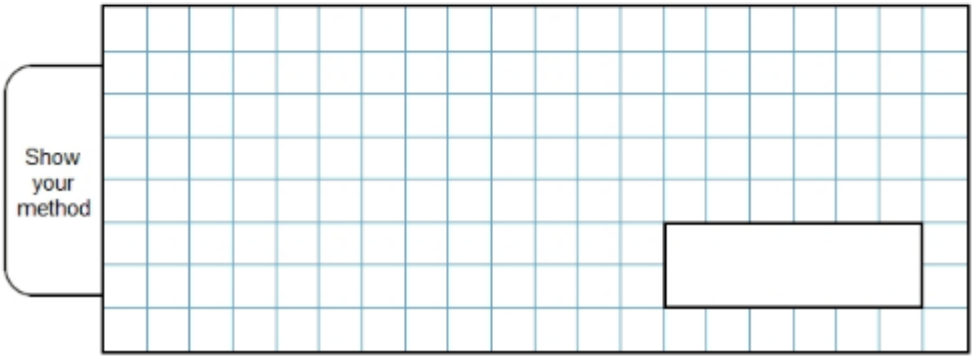


Lin has five blocks which are all the same.

She balances them on the scale with two weights.



Calculate the weight of **one** block.



Glossary of Mathematical Terms

Arrays	A set of objects or symbols arranged in rows or columns.
Bar Model	A way of representing a maths problem pictorially
Bridging	Where a calculation requires you to cross a multiple of ten.
Commutative	The order of the numbers in a calculation can be reversed e.g. 2 + 4 = 6 and 4 + 2 = 6.
Dienes Blocks	Wooden or plastic cubes, rods and flats used to support children in learning place value.
Difference	The result of subtracting one number from another. How much one number 'differs' from another.
Digit	Any of the numerals between 0-9
Factor	Numbers we can multiply together to get another number
Integer	A whole number
Inverse	Reverse operations e.g. addition and subtraction are inverse operations
Multiple	A number is added to itself a number of times
Number Bonds	Two numbers that total a whole number
Number Sentence	A written calculation including an equals sign
Numicon	a teaching resource designed to help children visualise numbers
Partitioning	Splitting a number into the value of each digit
Place Value	The value of each digit in a number depending on its position
Product	The result of multiplying numbers together
Re-combining	Adding partitioned numbers back together

Regrouping	Changing 10 ones for 1 ten, or 10 tens for 1 hundred etc
Remainder	The amount 'left over' after a division calculation
Sum	To add together
Tens Frame	two-by-five rectangular **frames** into which objects, e.g. counters, are placed to show numbers less than or equal to **ten**
Total	The sum of a set of numbers