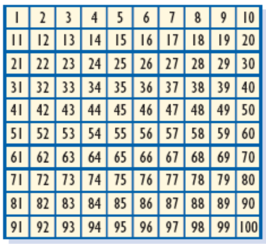
Cirrus Primary Academy Trust

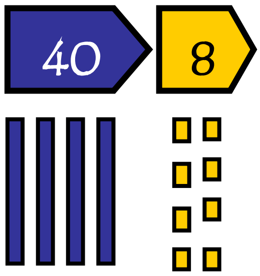
Calculation Policy

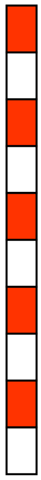
Addition:

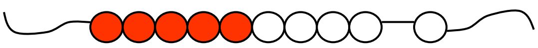
Models and Images

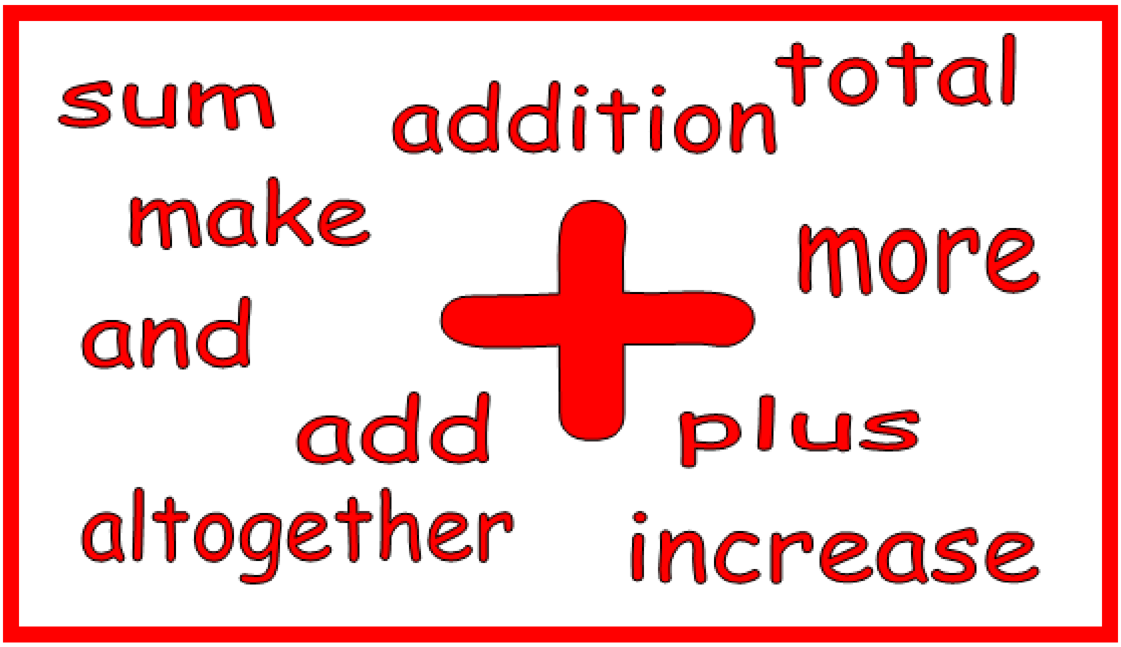
Counting apparatus
Place value apparatus
Digi-flips
Place value cards
Number tracks
Numbered number lines
Marked but unnumbered number lines
Empty number lines
Hundred square
Counting stick
Bead string
Models and Images charts
ITPs – Number Facts, Ordering Numbers, Number Grid, Counting on and back in ones and tens











Counting:

Year R (Early learning goal)
- Children count reliably with numbers from one to 20

Year 1
- count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number
- count, read and write numbers to 100 in numerals, count in different multiples including 1s, 2s, 5s and 10s

Year 2
- count in steps of 2s, 3s, and 5s from 0, and count in 1s and 10s from any number, forward or backward

Year 3
- count forward and backward in multiples of 1s, 2s, 3s, 4s, 5s, 8s, 10s, 50s, and 100s;
- count up and down in 10ths, 1/4s and 1/2s - recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10

Year 4
- count forward and backward in multiples of 1-10s, 25s, 50s, 100s and 1000s;
- count backwards through zero to include negative numbers;
- count up and down in 10ths, 100ths, 1/4s, and 1/2s - recognise that hundredths arise when dividing an object by a hundred and dividing tenths by ten

Year 5
- count forward or backward in multiples of 1-10s, 25s, 50s, 100s, 250s, 1000s, 10 000s, 100 000s and into negative numbers;
- Count in 10ths, 100ths, 1/4s and 1/2s.

Year 6
- count forward or backward in multiples of 1-10s, 25s, 50s, 100s, 250s, 500s, 1000s, 10 000s, 100 000s and into negative numbers.
- Count in 10ths, 100ths, 1/4s, 1/2s and in decimals such as 0.1s, 0.01s, 0.2s, 0.25s, 0.5s.

Recall of times tables and its associated division facts:

Year 2: 2, 5 and 10

Year 3: 2, 3, 4, 5, 6, 8, 10

Year 4: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Year 5: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Year 6: 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12

Use the following 100 squares to provide visual aid as children get used to the position of numbers in relation to each other in our number system when counting.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0
4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0
5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0
6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0
7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0
8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0
9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10

10	20	30	40	50	60	70	80	90	100
110	120	130	140	150	160	170	180	190	200
210	220	230	240	250	260	270	280	290	300
310	320	330	340	350	360	370	380	390	400
410	420	430	440	450	460	470	480	490	500
510	520	530	540	550	560	570	580	590	600
610	620	630	640	650	660	670	680	690	700
710	720	730	740	750	760	770	780	790	800
810	820	830	840	850	860	870	880	890	900
910	920	930	940	950	960	970	980	990	1000

100	200	300	400	500	600	700	800	900	1000
1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
2100	2200	2300	2400	2500	2600	2700	2800	2900	3000
3100	3200	3300	3400	3500	3600	3700	3800	3900	4000
4100	4200	4300	4400	4500	4600	4700	4800	4900	5000
5100	5200	5300	5400	5500	5600	5700	5800	5900	6000
6100	6200	6300	6400	6500	6600	6700	6800	6900	7000
7100	7200	7300	7400	7500	7600	7700	7800	7900	8000
8100	8200	8300	8400	8500	8600	8700	8800	8900	9000
9100	9200	9300	9400	9500	9600	9700	9800	9900	10000

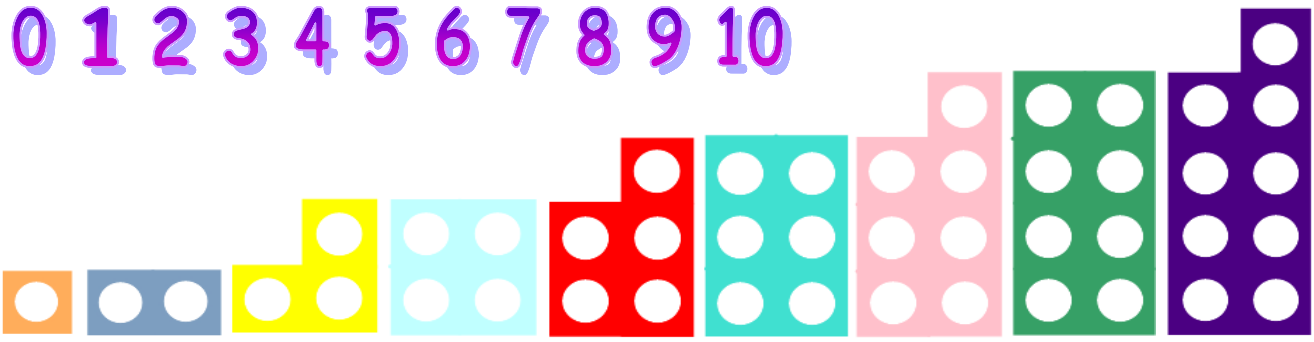
Provide children with opportunities to investigate and discover the patterns on a multiplication square. Allow them to realise the commutative nature of multiplication and how division facts can be derived from known multiplication facts.

X	0	1	2	3	4	5	6	7	8	9	10	11	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10	11	12
2	0	2	4	6	8	10	12	14	16	18	20	22	24
3	0	3	6	9	12	15	18	21	24	27	30	33	36
4	0	4	8	12	16	20	24	28	32	36	40	44	48
5	0	5	10	15	20	25	30	35	40	45	50	55	60
6	0	6	12	18	24	30	36	42	48	54	60	66	72
7	0	7	14	21	28	35	42	49	56	63	70	77	84
8	0	8	16	24	32	40	48	56	64	72	80	88	96
9	0	9	18	27	36	45	54	63	72	81	90	99	108
10	0	10	20	30	40	50	60	70	80	90	100	110	120
11	0	11	22	33	44	55	66	77	88	99	110	121	132
12	0	12	24	36	48	60	72	84	96	108	120	132	144

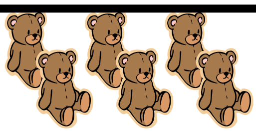
Reception

Early learning goal:
Children count reliably with numbers from 1 to 20, place them in order and say which number is one more than a given number.
Using quantities and objects, they add two single-digit numbers and count on to find the answer.

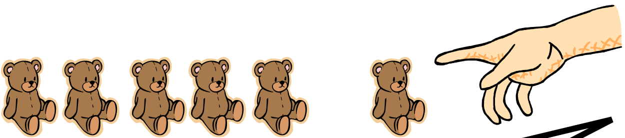
Recognise numerals 0 to 10.
Use Numicon activities to provide children with broad experiences of physically combining objects representing numbers with each other in order to make their calculating 'real'.



Count reliably up to 10 everyday objects.

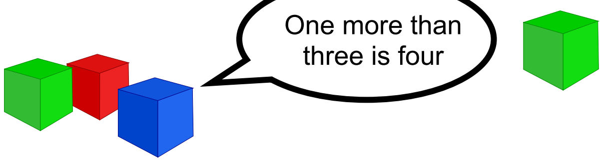


To find how many altogether, touch and drag them into a line one at a time whilst counting.



1, 2, 3, 4, 5, 6 … there are 6 teddies altogether.

Find one more than a number.

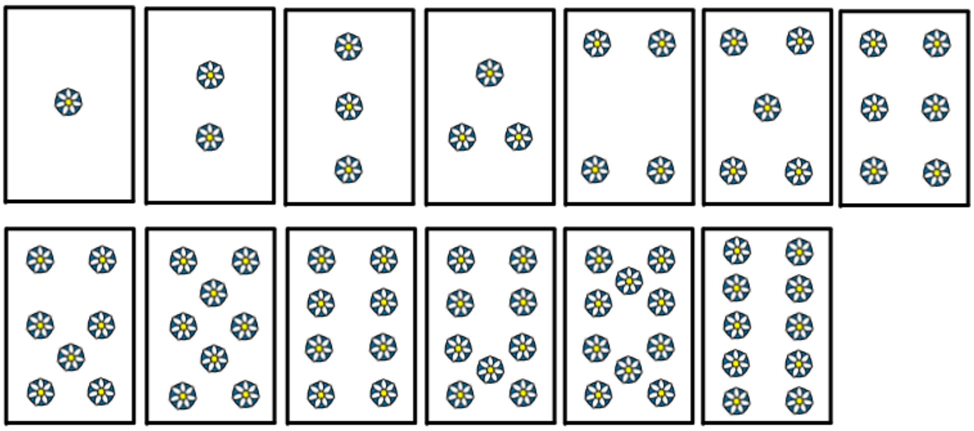


One more than three is four

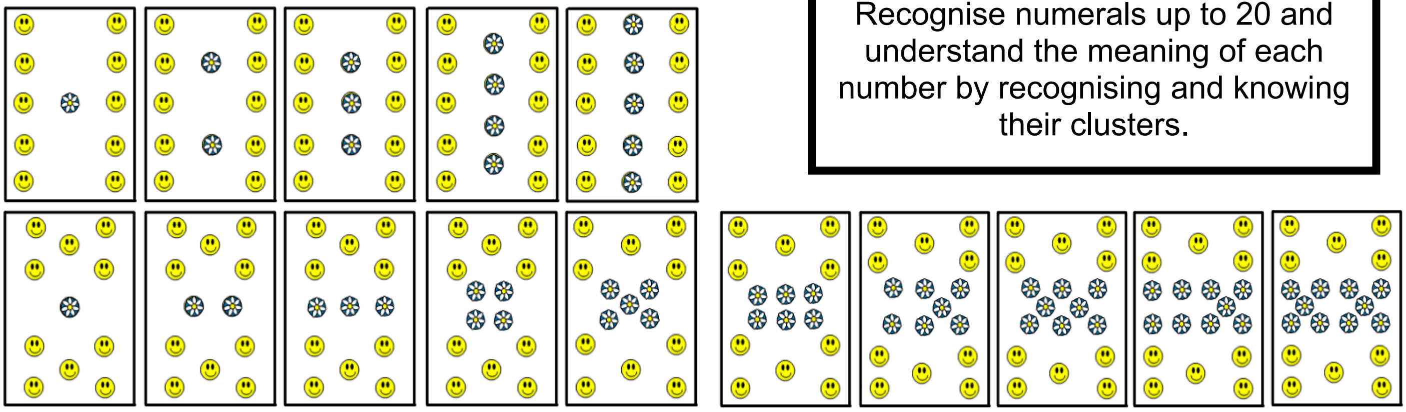
The number after three is four.

What is the number after……?

Recognise numerals 0 to 10 and understand the meaning of each number by recognising and knowing their clusters

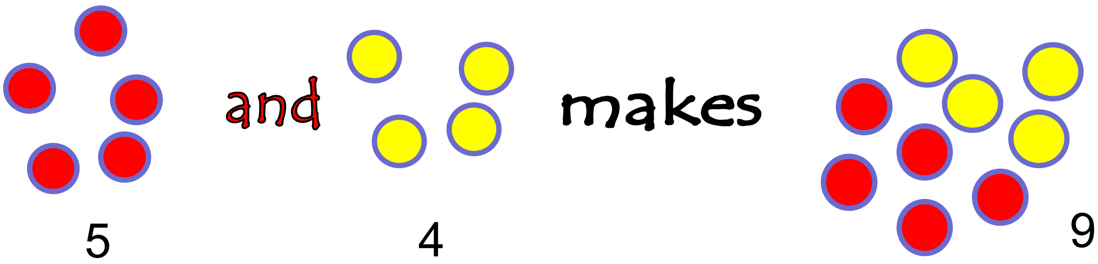


Recognise numerals up to 20 and understand the meaning of each number by recognising and knowing their clusters.

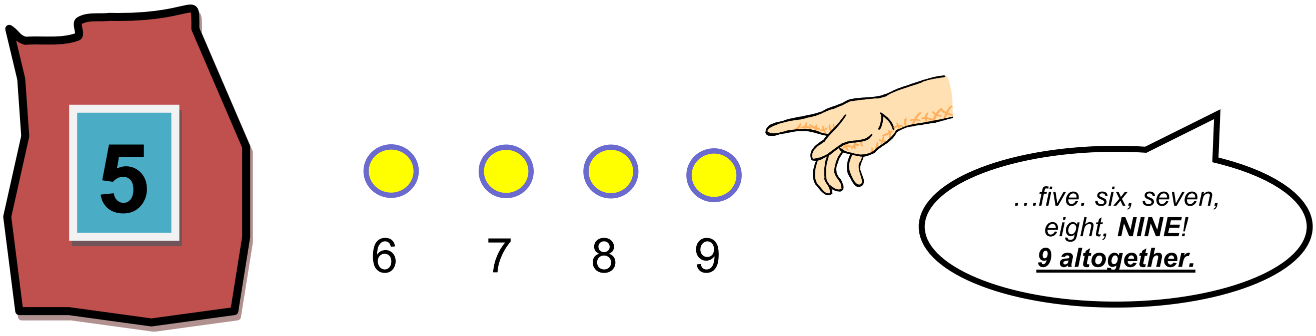


10 11 12 13 14 15 16 17 18 19 20

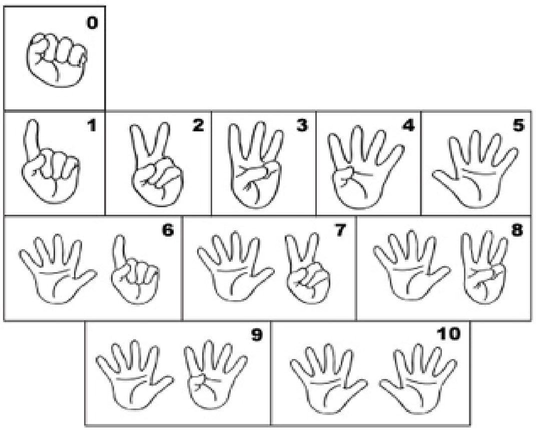
Begin to relate addition to combining two groups of objects and count all.

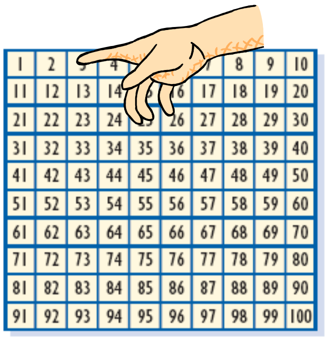


…then encourage counting on by covering up the larger group with a cloth or a number-card. Line up the second group and count from 5 by pointing at each one.

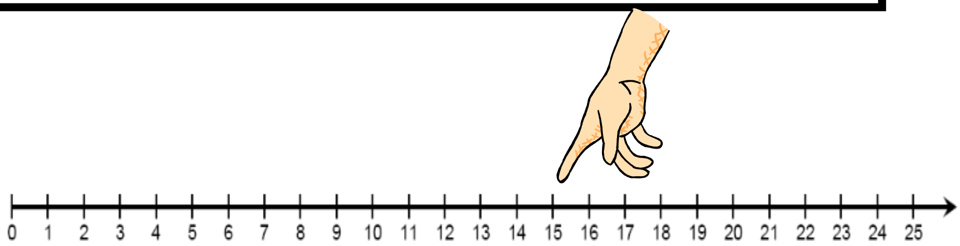


Children to begin to know by heart each of the number clusters on fingers in order to prepare them for mental addition.

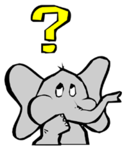




Count in ones as they become more familiar with using numbers on a number line and 100-square.
Children are to point to each number as they count.



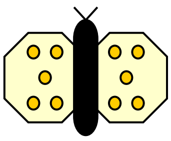
Begin to use the + and = signs to record mental calculations in a number sentence



$6 + 4 = 10$

Children begin to solve problems using doubling, halving, grouping and sharing.

$5 + 5 = 10$



Children show mental recall of number bonds to 10 and use these for problem solving. Some children show mental recall of number bonds to 20.

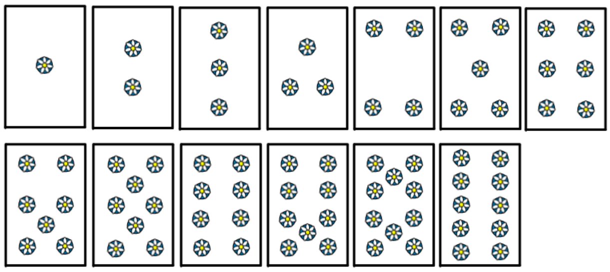
Year 1

Counting choir

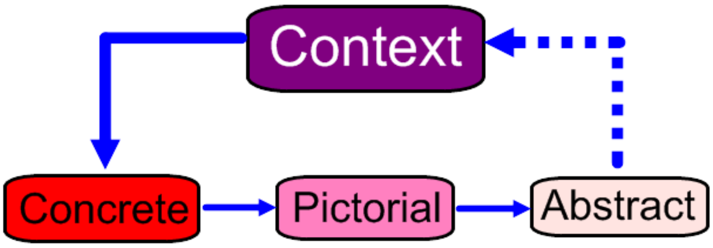
Count, read and write numbers to 100 in numerals, count in different multiples including ones, twos, fives and tens and recognise patterns with the help of a 100 square.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Continue with the use of cluster cards in order for children to develop the skill of decomposing and recomposing numbers mentally.



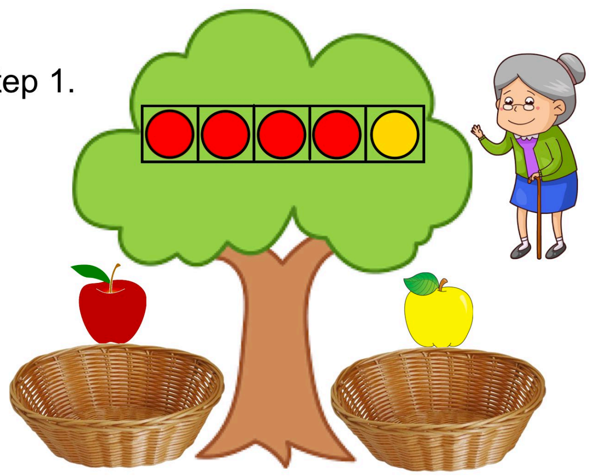
The introduction of a new mathematical concept should follow this cycle.



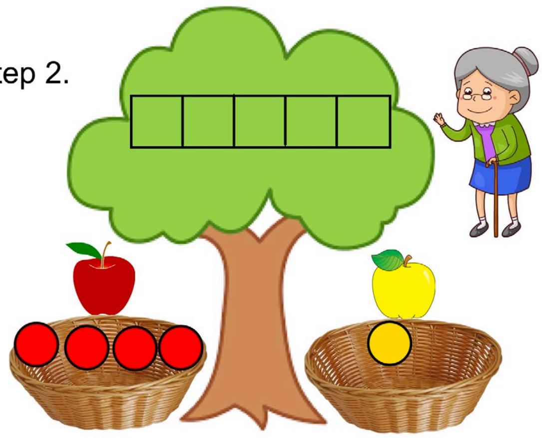
Introduction through a familiar context will engage learners immediately and provide the relevant links through their journey in understanding the concept taught.

Use the Part-Part-Whole model to partition single digit numbers and learn number bonds within 10.

Step 1.

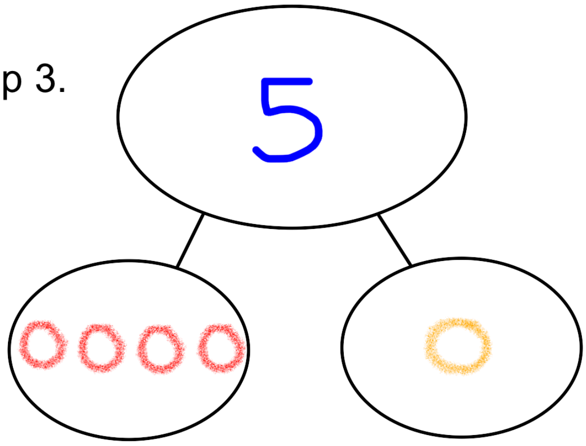


Step 2.



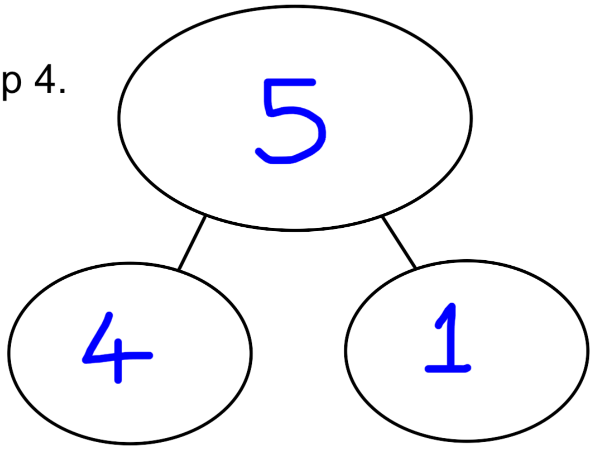
5 is the same as 4 and 1

Step 3.



5 is the same as 4 and 1

Step 4.

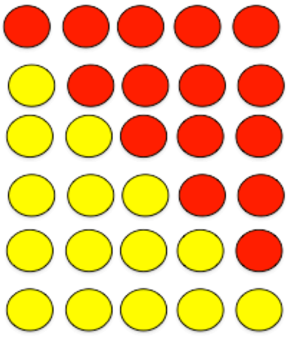


5 is the same as 4 and 1

Pupils to investigate this using variation of patterns.

<u>5 is the same as:</u>

Step 5.



0 yellow + 5 red
1 yellow + 4 red
2 yellow + 3 red
3 yellow + 2 red
4 yellow + 1 red
5 yellow + 0 red

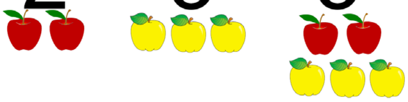
□ and □ make □

□ + □ = □

□ is the same as □ and □

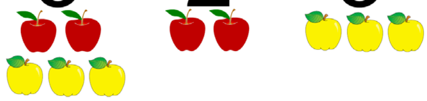
□ = □ + □

2 + 3 = 5

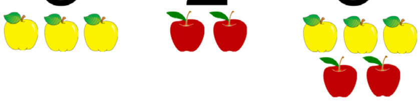


Know that addition is commutative and can be done in any order.

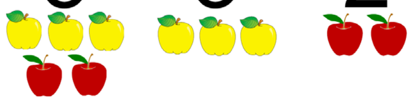
5 = 2 + 3



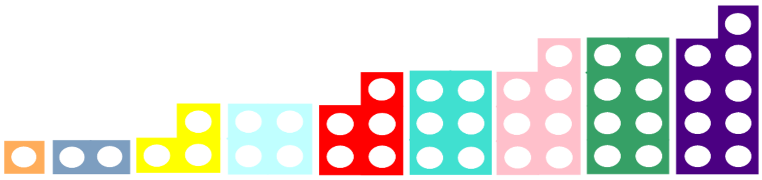
3 + 2 = 5

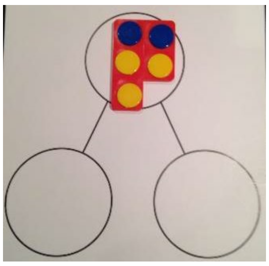


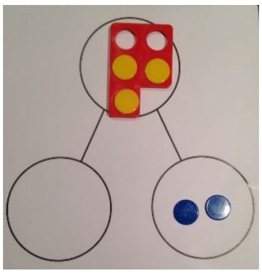
5 = 3 + 2

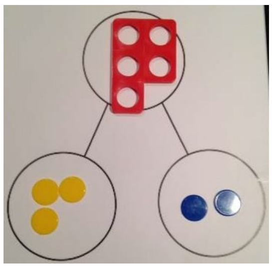


Continue with Numicon activities to embed knowledge of number bonds within 10.



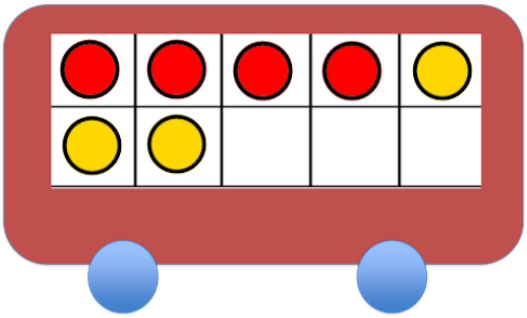




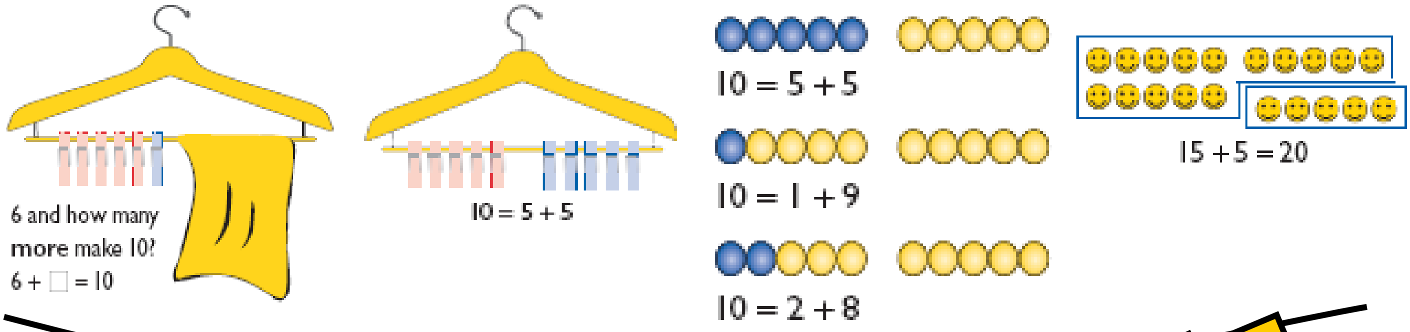


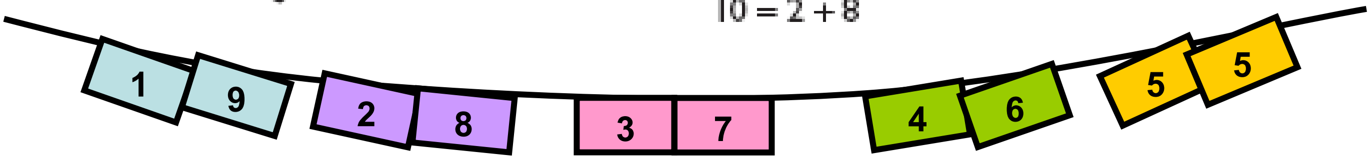
Children use ten-frames and double-sided counters to add two single digit numbers under ten.

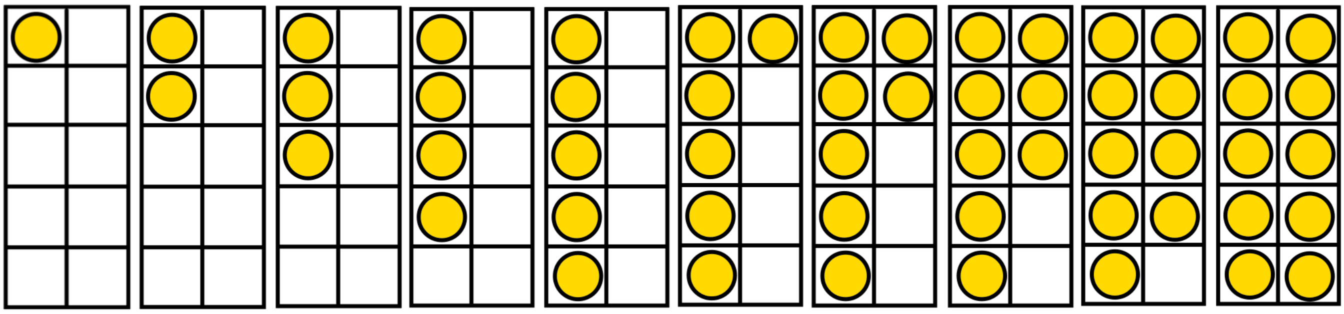
4 children on the bus, 3 children get on. How many altogether?



Know by heart all pairs of numbers with a total of 10 and recognise how this helps to work out totals to 20.





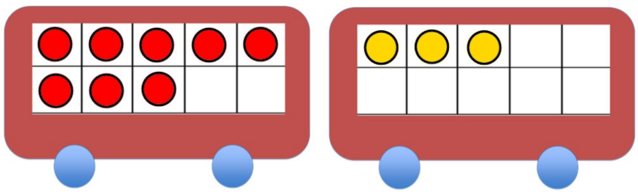


Children use ten-frames to add two single digit numbers making 10 first.

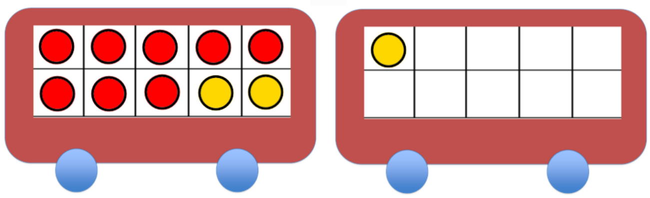
8 children on the bus, 3 children get on. How many altogether?

Children are simply required to write the number sentence and the answer once they'd moved the counters.

Step 1. 8 + 3

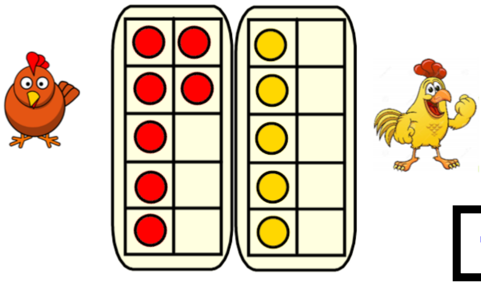


Step 2. 10 + 1 = 11

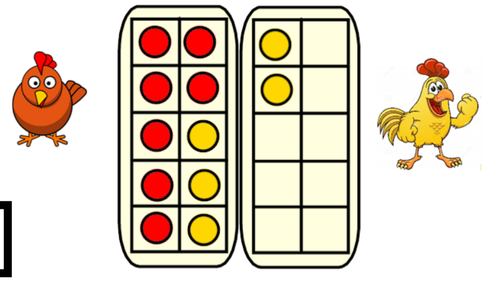


Ruby Red lays 7 eggs and Yasmine Yellow lays 5.
How many eggs have they laid altogether?

Step 1.



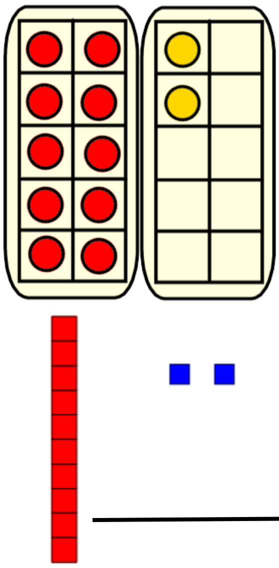
Step 2.



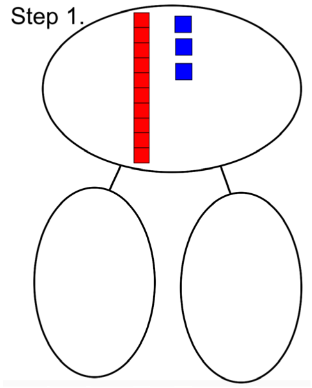
7 + 5 = 12

Link use of ten frames to Place Value first with PV cards and then Dienes.

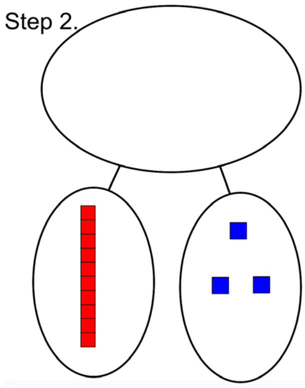
Children begin to partition tens and ones using
Dienes, arrow cards and the PPW model.



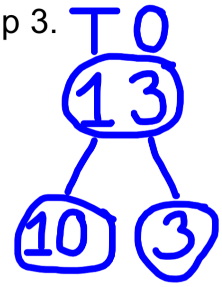
Step 1.



Step 2.

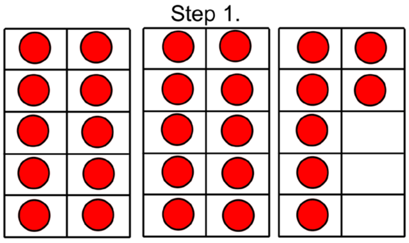


Step 3.

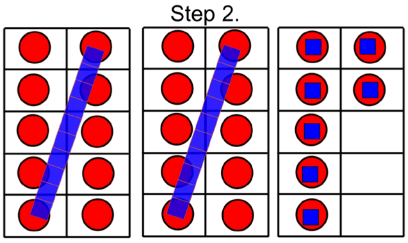


Making 27 using triple ten-frames, Dienes and Arrow cards.

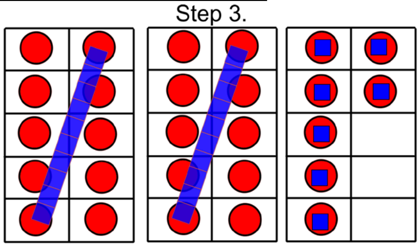
Step 1.



Step 2.



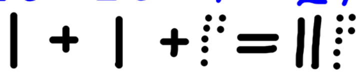
Step 3.



10 + 10 + 7 = 27

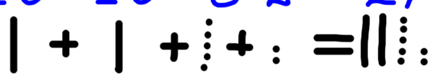
Step 4.

10 + 10 + 7 = 27



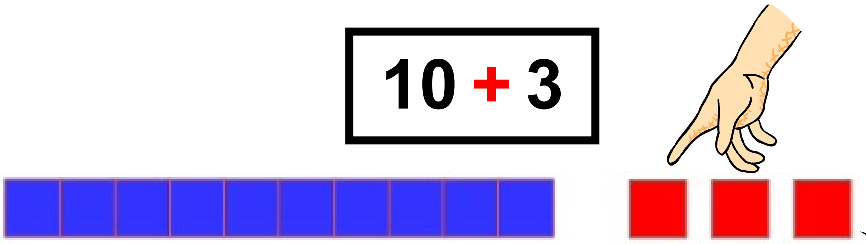
or

10 + 10 + 5 + 2 = 27



Children use the counting on method to add tens and ones and check if they predicted their answer correctly.

10 + 3



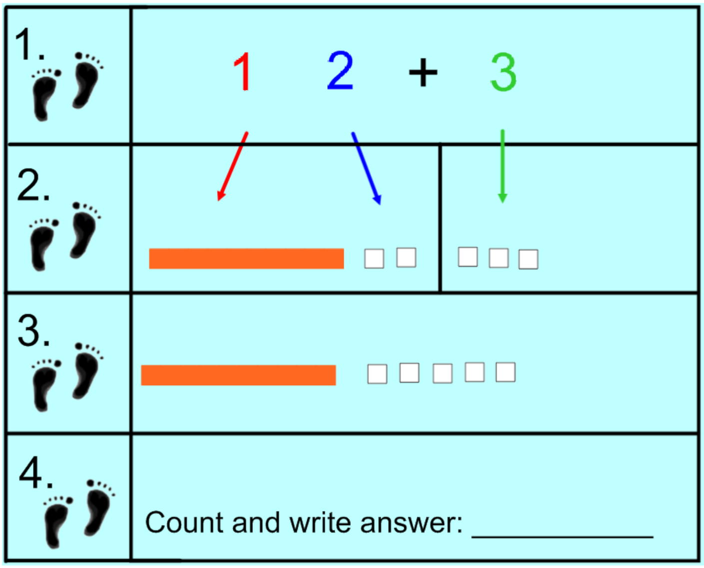
They count on from ten in ones as they point to each ones block.

…ten, eleven, twelve, thirteen!
13 altogether.

12 + 3

They choose tens and ones to make 12 first. The ones are then combined to be able to count the final total.

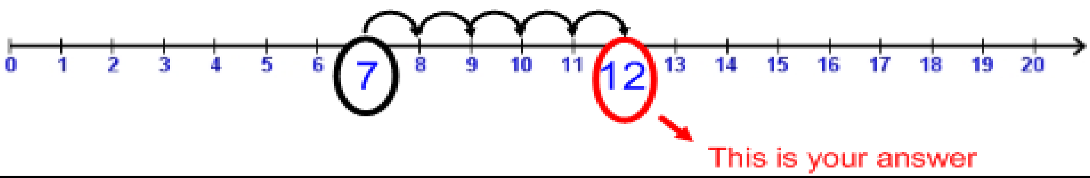
Children should by now pick up the pattern quickly and able to add the tens and ones without having to count these.



Progression in difficulty when adding on a number line using counting on.

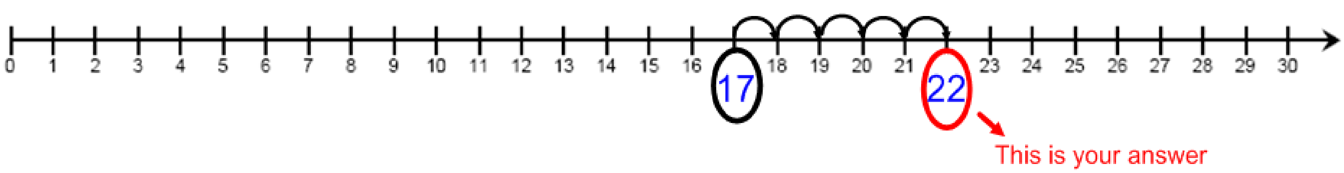
1. **1 digit + 1 digit**

$\cancel{7} + 5 =$



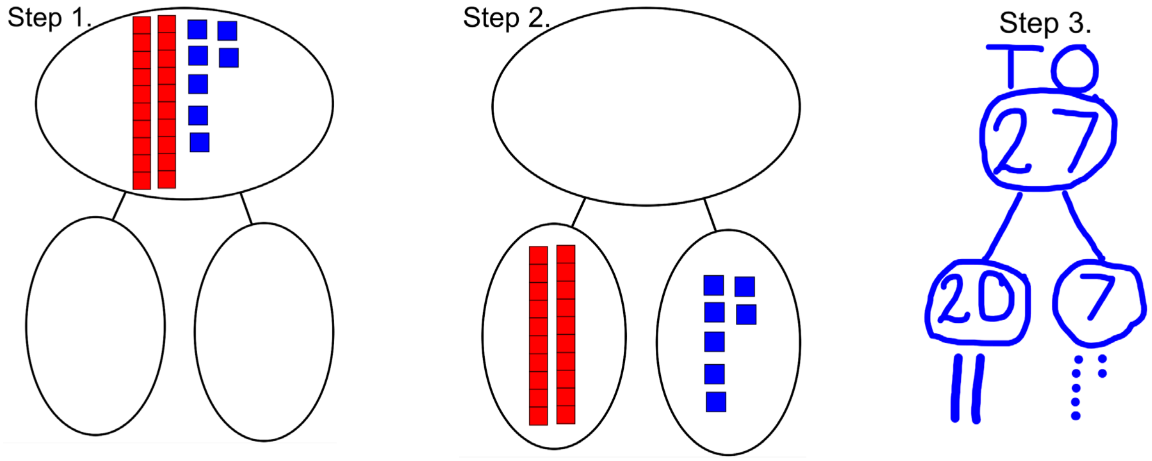
2. **2 digit + 1 digit**

$\cancel{17} + 5 =$



3. <u>2 digit + 2 digit</u>

Partition numbers in order to add two 2-digit numbers.

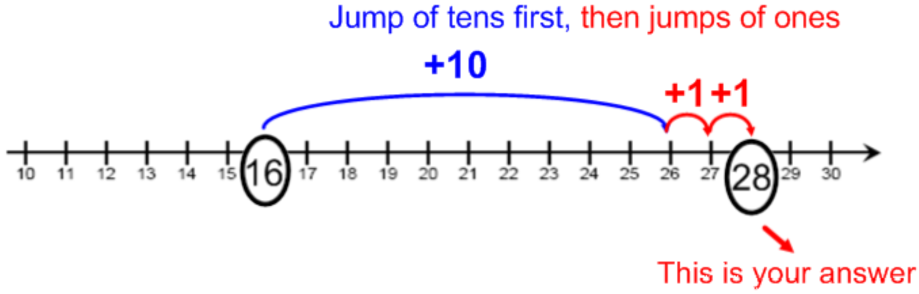


16 + 12 = 28

Partition your second number

T O
16 + 1 2 =

10 2



Please Note:
For this method to become successful and embedded, children must be able to add 10 and one from any given number using their knowledge of place value and having had plenty of experience with jumping in ones and tens on a 100 square.

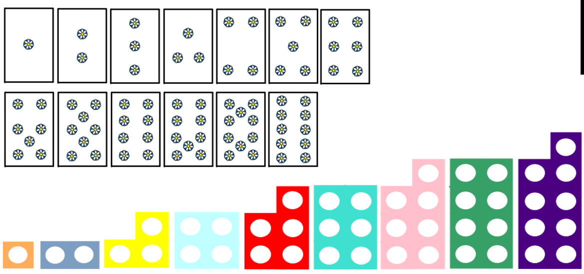
Year 2

Counting choir

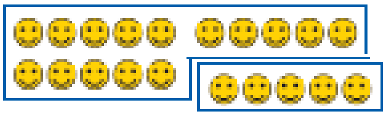
Count in steps of 2, 3, and 5 from 0 and from any of its multiples.
Count in tens and ones from any number, forward or backward.
Alternate the above counting within one session to help with calculating on a number line.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Continue with the use of cluster cards and Numicon activities.



Continue to practice the mental recall of all pairs of number bonds with a total of 10 and 20



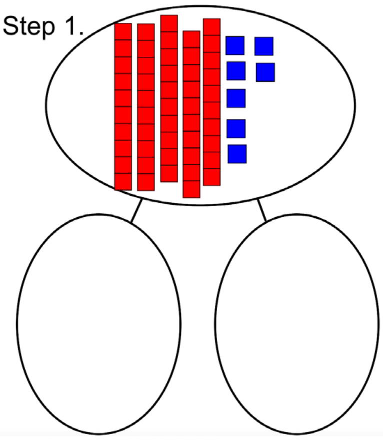
15 + 5 = 20

Know which digit changes when adding 1s or 10s to any number.

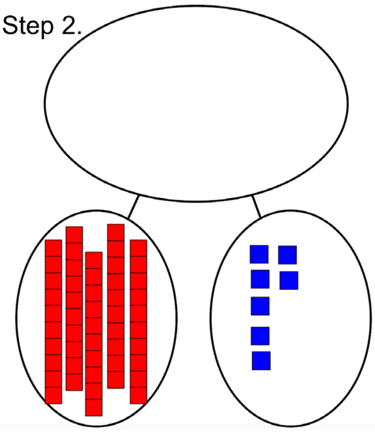
1<u>5</u> + 1 = 1<u>6</u>
<u>1</u>5 + 10 = <u>2</u>5

Continue with partitioning two digit numbers into their Tens and Ones

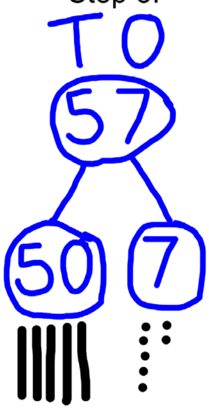
Step 1.



Step 2.



Step 3.

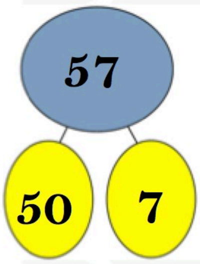


Vary the way numbers are partitioned.

$\boxed{57} = \boxed{5}$ tens and $\boxed{7}$ ones

$\boxed{57} = \boxed{50} + \boxed{7}$

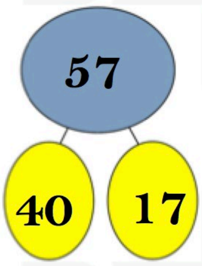
57	
Tens	Ones
5	7



$\boxed{57} = \boxed{4}$ tens and $\boxed{17}$ ones

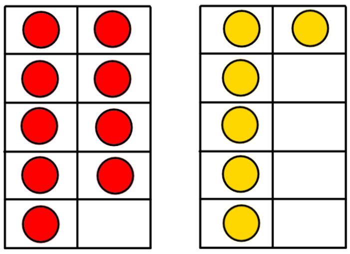
$\boxed{57} = \boxed{40} + \boxed{17}$

57	
Tens	Ones
4	17



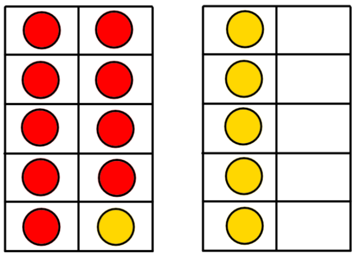
Use ten frames to add 2 or 3 single digit numbers and recognise how each number can be partitioned to make ten.

Step 1.



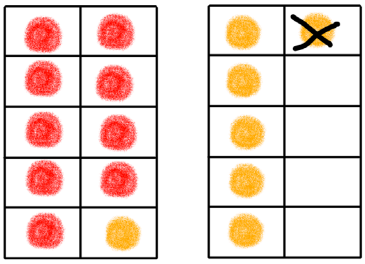
9 + 6 =

Step 2.



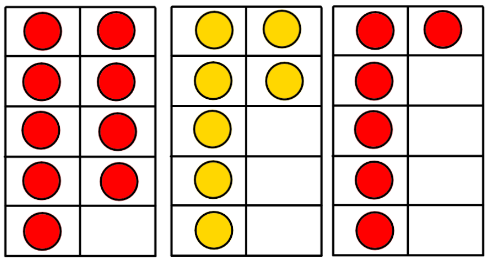
9 + 6 =
9 + 1 = 10
10 + 5 = 15

Step 3.



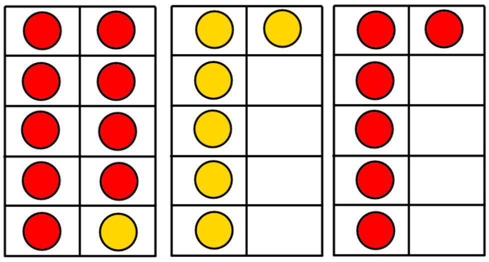
9 + 6
1 5
9 + 1 = 10
10 + 5 = 15

Step 1.



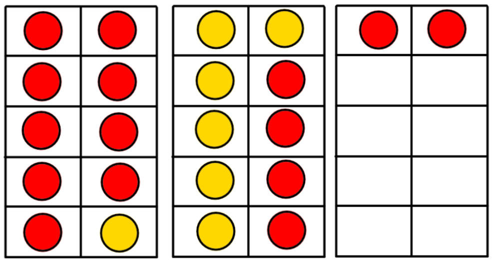
9 + 7 + 6 =

Step 2.



9 + 7 + 6 =
9 + 1 = 10

Step 3.

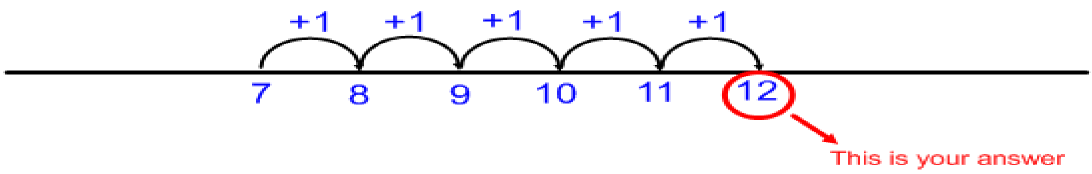


9 + 7 + 6 =
9 + 1 = 10
6 + 4 = 10
10 + 10 + 2 = 22

Children link this knowledge to adding on a blank number line

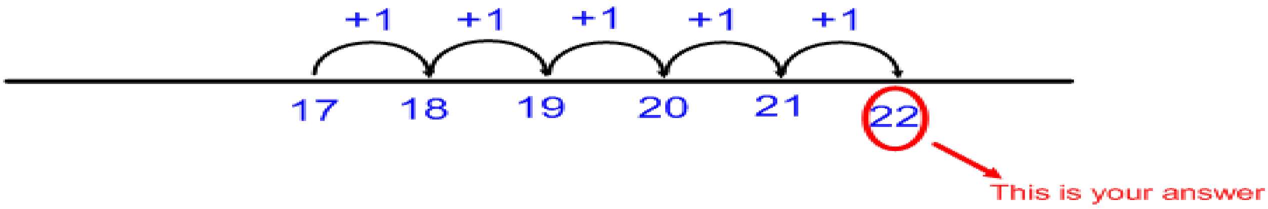
1. 1 digit + 1 digit

$\cancel{7} + 5 =$



2. 2 digit + 1 digit

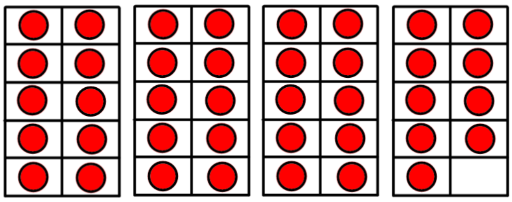
$\cancel{17} + 5 =$



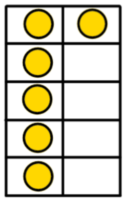
Children use their skills of adding single digit numbers on a ten frame to add 2 digit numbers to single digit, then 2 digit to 2 digit. Replace a ten frame with Dienes once links established.

1. 2 digit + 1 digit

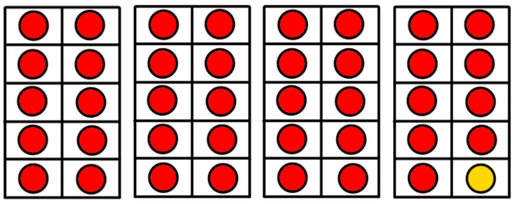
Step 1.



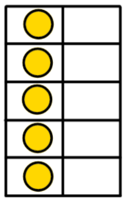
39 + 6 =



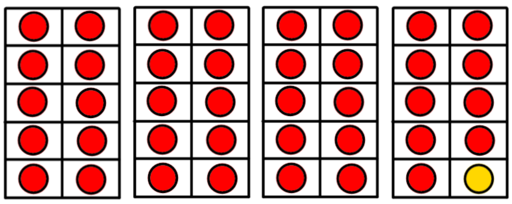
Step 2.



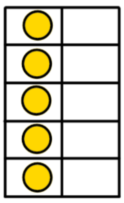
39 + 6 =
39 + 1 = 40

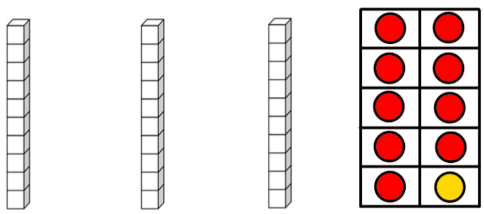


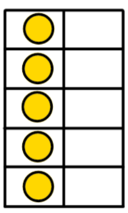
Step 3.



39 + 6 =
39 + 1 = 40
40 + 5 = 45



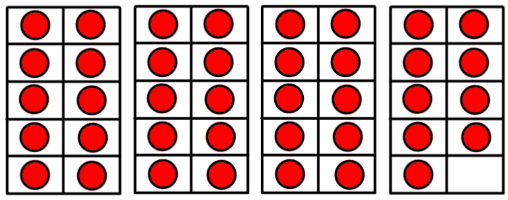




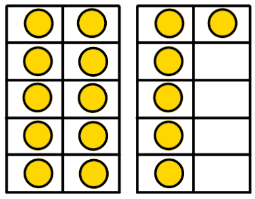
39 + 6 =
39 + 1 = 40
40 + 5 = 45

2. 2 digit + 2 digit

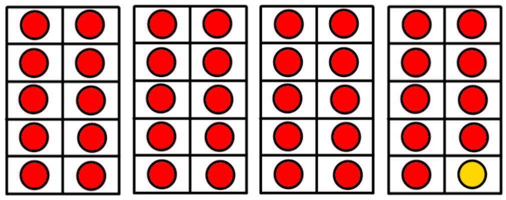
Step 1.



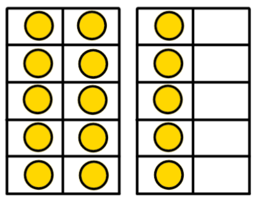
39 + 16 =



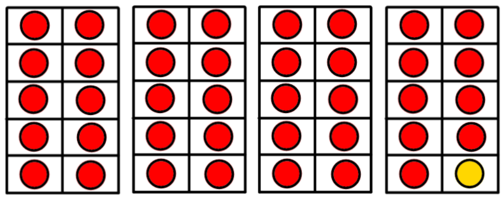
Step 2.



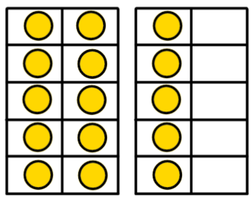
39 + 16 =
39 + 1 = 40

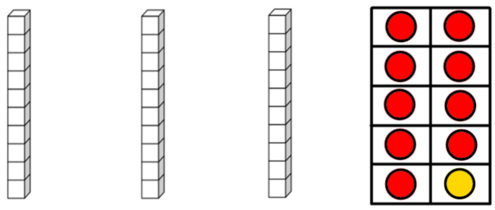


Step 3.

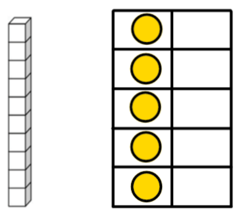


39 + 16 =
39 + 1 = 40
40 + 15 = 55





39 + 16 =
39 + 1 = 40
40 + 15 = 55

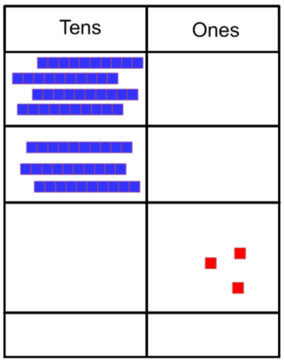


Children use the Place value grid to place Dienes into following the same layout as the written calculation. Begin by adding the ones first.
Please note that Column addition should be introduced together with apparatus using a Place Value grid to provide full understanding. Procedural method should be taught alongside conceptual.

Step 1.

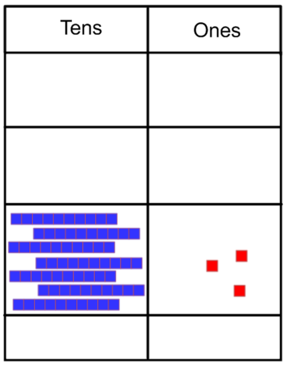
$$\begin{array}{cc} T & O \\ 4 & 2 \\ +\ 3 & 1 \\ \hline & \\ \hline \end{array}$$

Step 2.



$$\begin{array}{cc} T & O \\ 4 & 2 \\ +\ 3 & 1 \\ \hline & 3 \\ \hline \end{array}$$

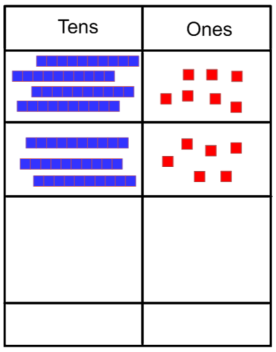
Step 3.



$$\begin{array}{cc} T & O \\ 4 & 2 \\ +\ 3 & 1 \\ \hline 7 & 3 \\ \hline \end{array}$$

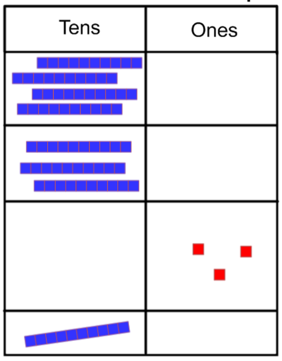
Children use Dienes to exchange 10 ones into a ten in order to understand the rules of carrying. Begin by adding the ones first.

Step 1.



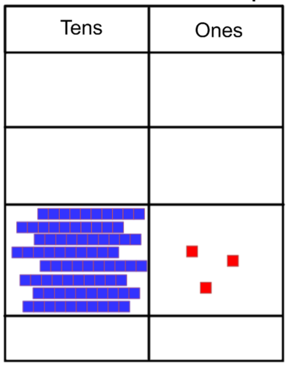
$$\begin{array}{cc} T & O \\ 4 & 7 \\ +\ 3 & 6 \\ \hline & \\ \hline \end{array}$$

Step 2.



$$\begin{array}{cc} T & O \\ 4 & 7 \\ +\ 3 & 6 \\ \hline & 3 \\ \hline 1 & \end{array}$$

Step 3.



$$\begin{array}{cc} T & O \\ 4 & 7 \\ +\ 3 & 6 \\ \hline 8 & 3 \\ \hline 1 & \end{array}$$

Mental method of addition using partitioning **<u>without</u>** exchange.

42 + 31 = 73

40 + 30 = 70

2 + 1 = 3

70 + 3 = 73

Mental method of addition using partitioning **<u>with</u>** exchange.

47 + 36 = 83

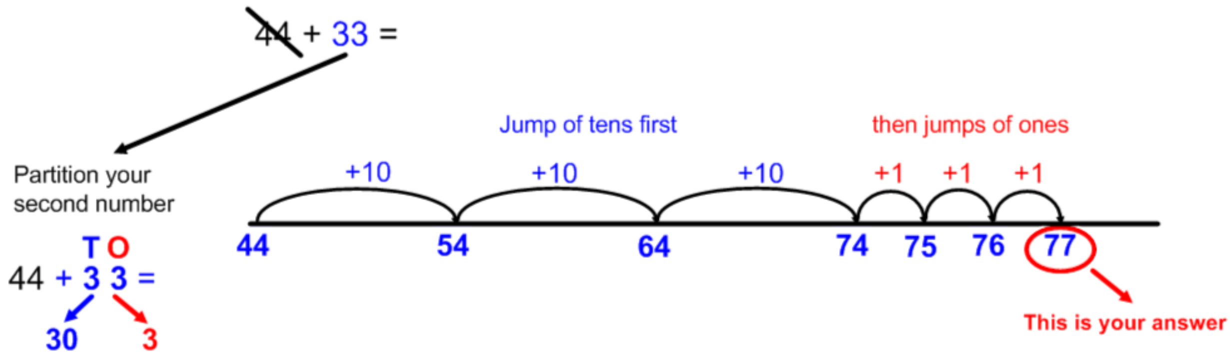
40 + 30 = 70

7 + 6 = 13

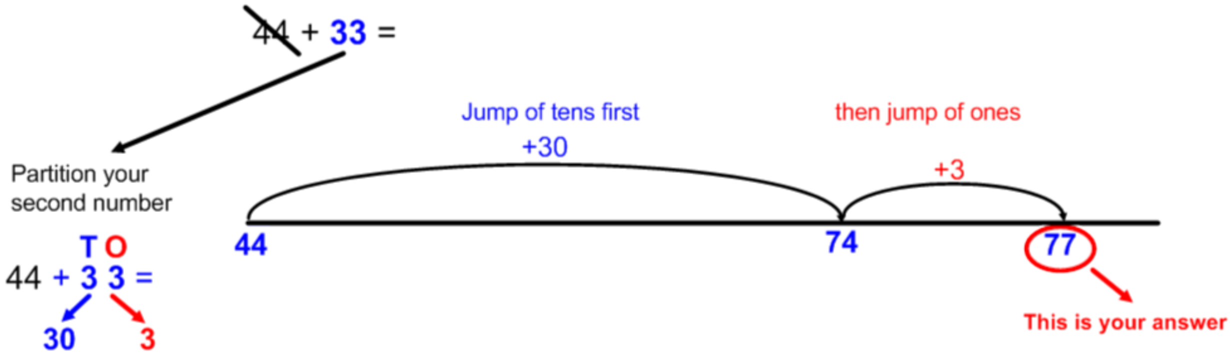
70 + 13 = 83

Children link this knowledge to adding on a blank number line

Addition without bridging 2 digit + 2 digit



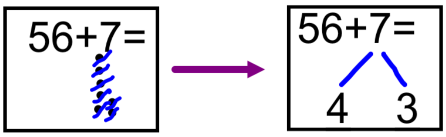
2 digit + 2 digit: They begin to combine their jumps



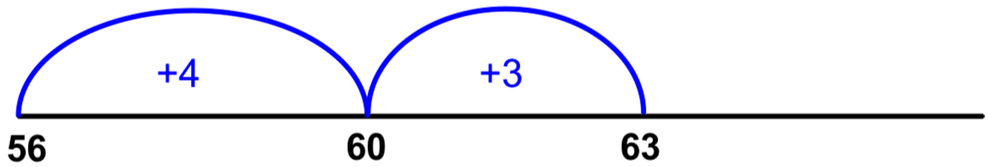
Begin bridging through 10.

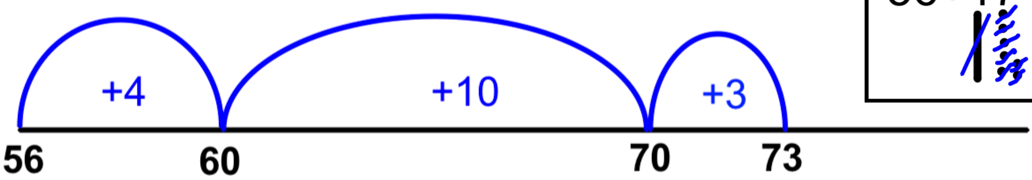
For children to be confident with this method they must be able to quickly decompose and recompose numbers. Suggested mental maths activity is the use of ten-frames, cluster cards and Numicon.

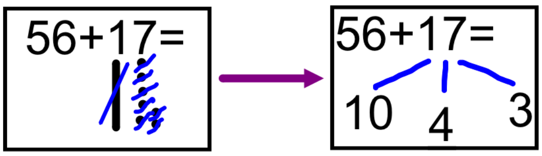
Addition using bridging 2 digit + 1 digit, then 2 digit + 2 digit



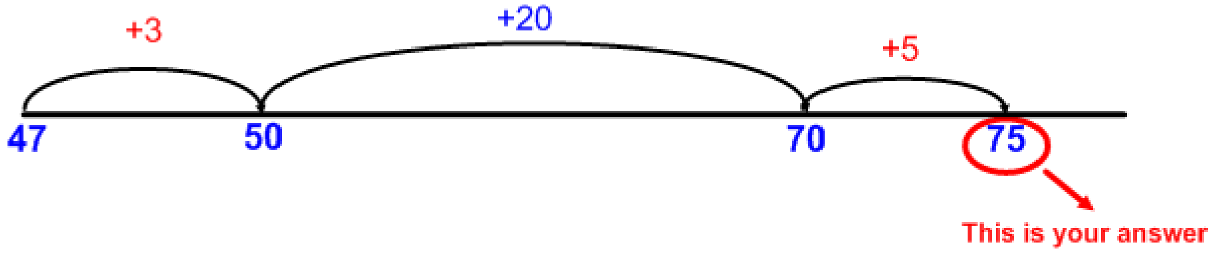
Children can use jottings to help keep track of how much they added, however the aim is that children use their knowledge of single digit partitioning to break down the addend into chunks when adding.



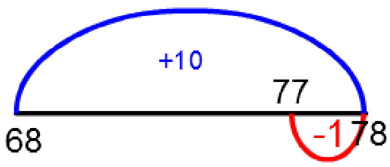




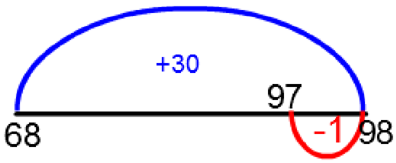
$\cancel{47} + 28 =$



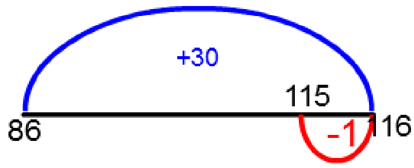
Round and adjust addition



68+9=77
68+10=78
78-1=77



68+29=97
68+30=98
98-1=97



86+29=115
86+30=116
116-1=115

Year 3, 4, 5 and 6:
Formal written method of addition

Begin with teaching this method without carrying.

Carried digits are recorded below the line, using the words ‘carry ten’ or ‘carry one hundred’ making constant reference to Place Value.

Later, extend to adding three-digit and two-digit numbers, two three-digit numbers and numbers with varied number of digits.

PLEASE NOTE THAT ONCE COLUMN ADDITION IS TAUGHT IT OFTEN BECOMES CHILDREN’S DEFAULT METHOD TO ADD NUMBERS EVEN IF A CALCULATION COULD BE SOLVED USING A MENTAL METHOD MUCH FASTER.

THEREFORE, KEEP PRACTISING VARIOUS MENTAL MATHS STRATEGIES FOR CALCULATIONS ALONGSIDE THE SHORT WRITTEN METHODS AND ENCOURAGE CHILDREN TO DECIDE ON THE MOST EFFICIENT METHOD FOR A PARTICULAR SET OF NUMBERS.

$$\begin{array}{rrr} & 4 & 2 \\ + & 3 & 1 \\ \hline & 7 & 3 \\ \hline \end{array}
\qquad
\begin{array}{rrr} & 4 & 7 \\ + & 3 & 6 \\ \hline & 7 & 3 \\ \hline & 1 & \end{array}
\qquad
\begin{array}{rrr} & 4 & 7 \\ + & 7 & 6 \\ \hline 1 & 2 & 3 \\ \hline 1 & 1 & \end{array}
\qquad
\begin{array}{rrr} 2 & 5 & 8 \\ + & 8 & 7 \\ \hline 3 & 4 & 5 \\ \hline 1 & 1 & \end{array}
\qquad
\begin{array}{rrrr} & 6 & 7 & 6 \\ + & 5 & 5 & 8 \\ \hline 1 & 2 & 3 & 4 \\ \hline & 1 & 1 & \end{array}$$

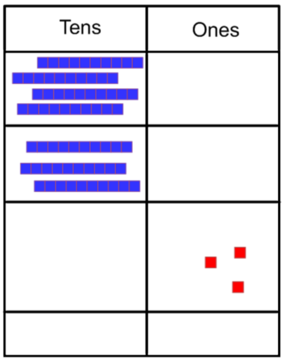
Column addition should be introduced together with apparatus using a Place Value grid to provide full understanding. Procedural method should be taught alongside conceptual.

Children use the Place value grid to place Dienes into following the same layout as the written calculation. Begin by adding the ones first.

Step 1.

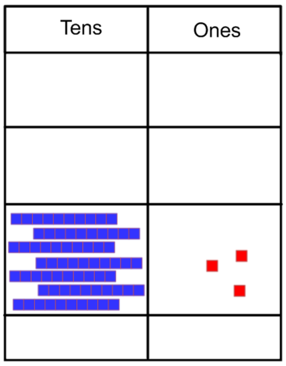
$$\begin{array}{rrr} & T & O \\ & 4 & 2 \\ + & 3 & 1 \\ \hline & & \\ \hline \end{array}$$

Step 2.



$$\begin{array}{rrr} & T & O \\ & 4 & 2 \\ + & 3 & 1 \\ \hline & & 3 \\ \hline \end{array}$$

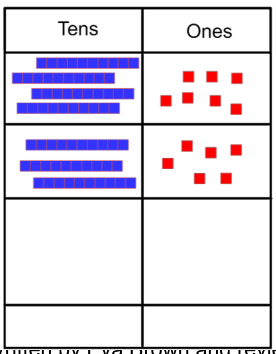
Step 3.



$$\begin{array}{rrr} & T & O \\ & 4 & 2 \\ + & 3 & 1 \\ \hline & 7 & 3 \\ \hline \end{array}$$

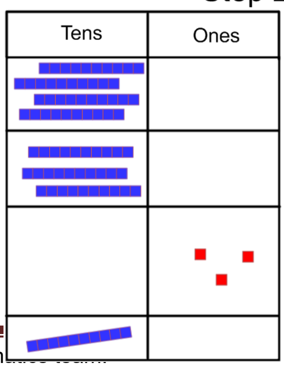
Children use Dienes to exchange 10 ones into a ten in order to understand the rules of carrying. Begin by adding the ones first.

Step 1.



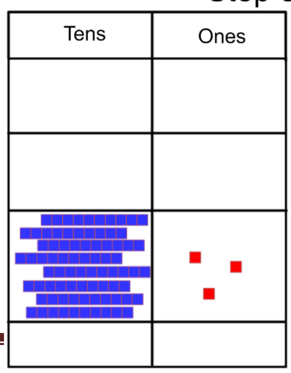
$$\begin{array}{rrr} & T & O \\ & 4 & 7 \\ + & 3 & 6 \\ \hline & & \\ \hline \end{array}$$

Step 2.



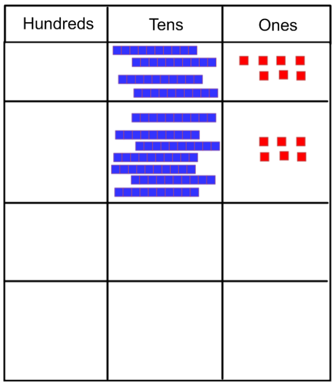
$$\begin{array}{rrr} & T & O \\ & 4 & 7 \\ + & 3 & 6 \\ \hline & & 3 \\ \hline & 1 & \end{array}$$

Step 3.



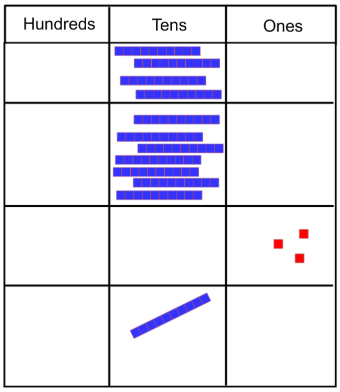
$$\begin{array}{rrr} & T & O \\ & 4 & 7 \\ + & 3 & 6 \\ \hline & 8 & 3 \\ \hline & 1 & \end{array}$$

Step 1.



$$\begin{array}{rrr} & 4 & 7 \\ + & 7 & 6 \\ \hline & & \end{array}$$

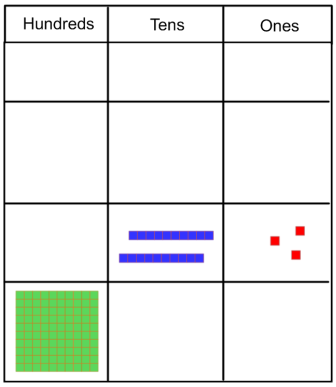
Step 2.



$$\begin{array}{rrr} & 4 & 7 \\ + & 7 & 6 \\ \hline & & 3 \\ \hline & 1 & \end{array}$$

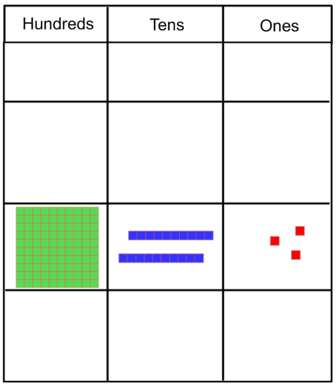
Children use Dienes to exchange 10 ones into a ten, then use hundreds to exchange 10 tens into 1 hundred.

Step 3.



$$\begin{array}{rrr} & 4 & 7 \\ + & 7 & 6 \\ \hline & 2 & 3 \\ \hline 1 & \cancel{1} & \end{array}$$

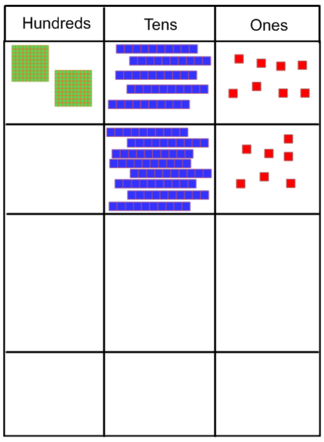
Step 4.



$$\begin{array}{rrr} & 4 & 7 \\ + & 7 & 6 \\ \hline 1 & 2 & 3 \\ \hline \cancel{1} & \cancel{1} & \end{array}$$

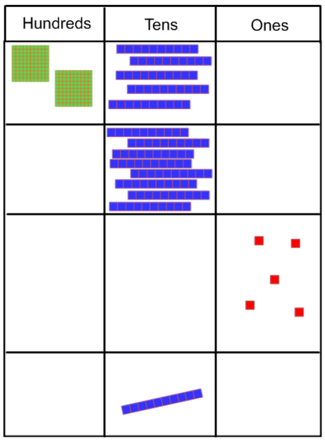
Adding 3 digit and a 2 digit number with carrying.

Step 1.



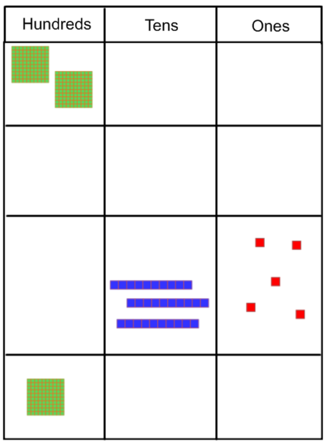
$$\begin{array}{rrrr} & 2 & 5 & 8 \\ + & & 8 & 7 \\ \hline & & & \end{array}$$

Step 2.



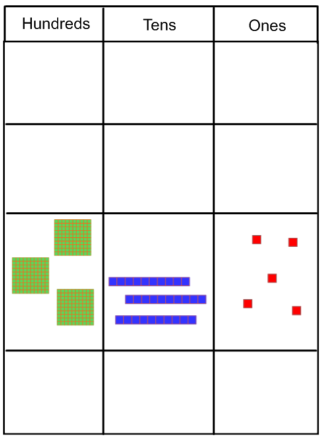
$$\begin{array}{rrrr} & 2 & 5 & 8 \\ + & & 8 & 7 \\ \hline & & & 5 \\ \hline & & 1 & \end{array}$$

Step 3.



$$\begin{array}{rrrr} & 2 & 5 & 8 \\ + & & 8 & 7 \\ \hline & & 3 & 5 \\ \hline & 1 & \cancel{1} & \end{array}$$

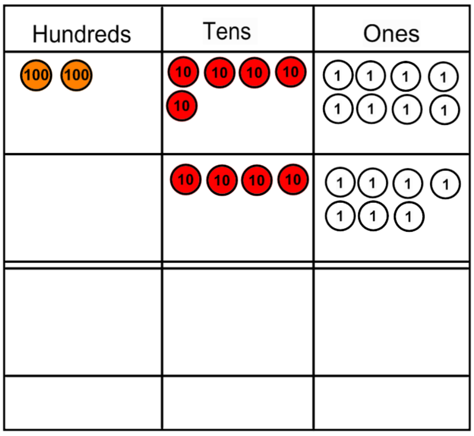
Step 4.



$$\begin{array}{rrrr} & 2 & 5 & 8 \\ + & & 8 & 7 \\ \hline & 3 & 3 & 5 \\ \hline & \cancel{1} & \cancel{1} & \end{array}$$

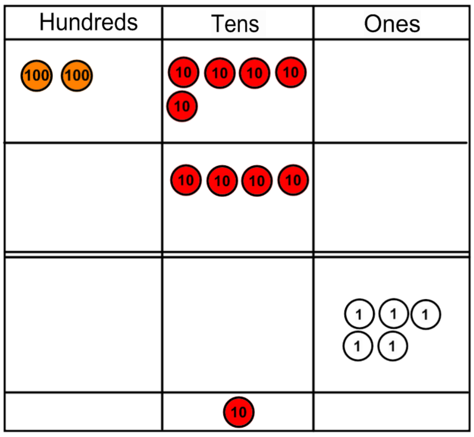
When they have sufficient understanding of what each digit in a number represents with the use of Dienes, children use Place Value counters to calculate larger numbers.

Step 1.



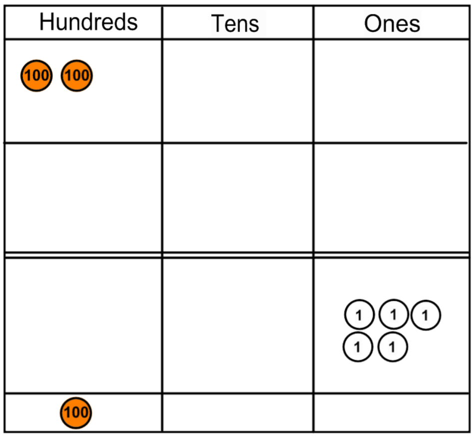
$$\begin{array}{r} 2\ 5\ 8 \\ +\ \ \ 4\ 7 \\ \hline \\ \hline \end{array}$$

Step 2.



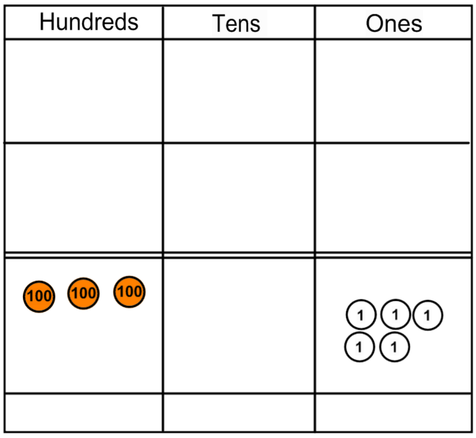
$$\begin{array}{r} 2\ 5\ 8 \\ +\ \ \ 4\ 7 \\ \hline 5 \\ \hline 1\ \ \ \end{array}$$

Step 3.



$$\begin{array}{r} 2\ 5\ 8 \\ +\ \ \ 4\ 7 \\ \hline 0\ 5 \\ \hline 1\ \cancel{1}\ \ \ \end{array}$$

Step 4.

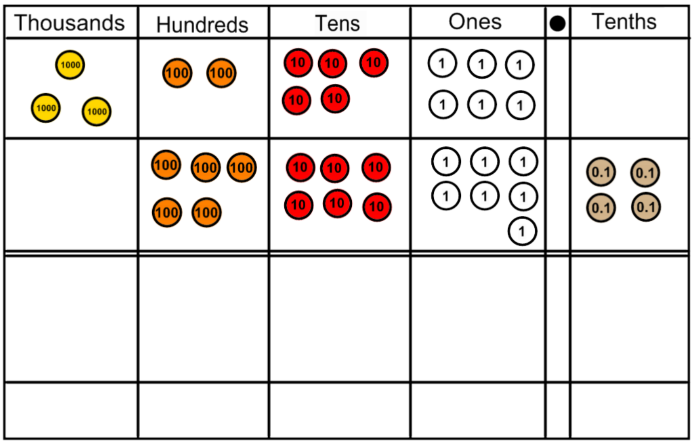


$$\begin{array}{r} 2\ 5\ 8 \\ +\ \ \ 4\ 7 \\ \hline 3\ 0\ 5 \\ \hline \cancel{1}\ \cancel{1}\ \ \ \end{array}$$

Extend this knowledge to much larger numbers which also includes decimals.

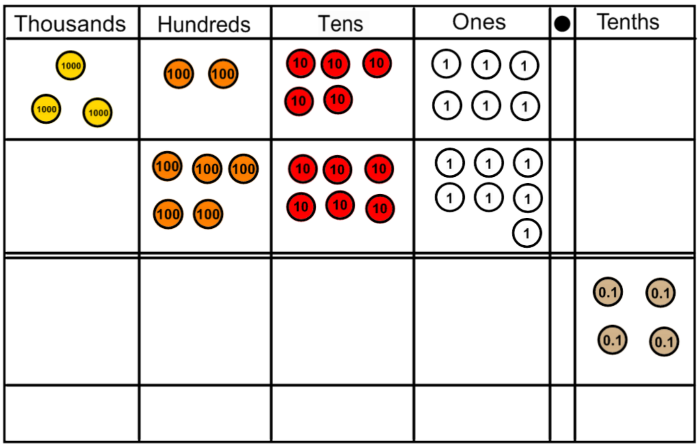
Step 1.

$$\begin{array}{r} 3\ 2\ 5\ 6\ \ \ \ \\ +\ \ 5\ 6\ 7\ .\ 4 \\ \hline \\ \hline \end{array}$$



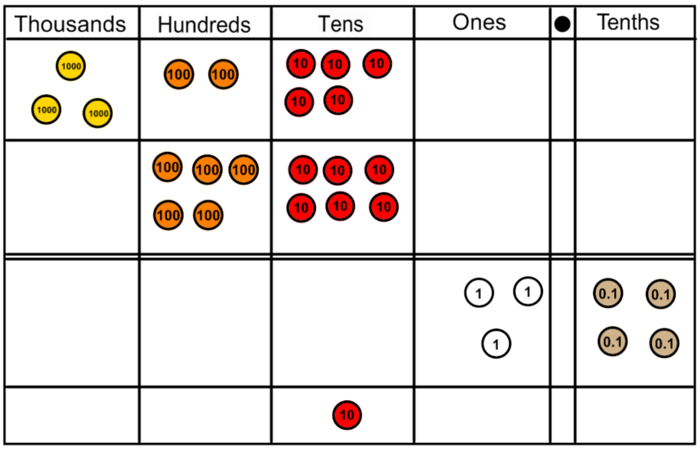
Step 2.

$$\begin{array}{r} 3\ 2\ 5\ 6\ \ \ \ \\ +\ \ 5\ 6\ 7\ .\ 4 \\ \hline .\ 4 \\ \hline \end{array}$$



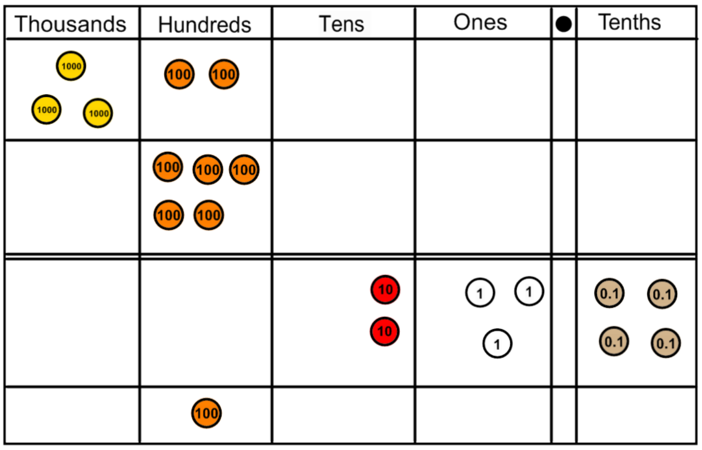
Step 3.

```
  3 2 5 6
+   5 6 7 . 4
        3 . 4
      1
```



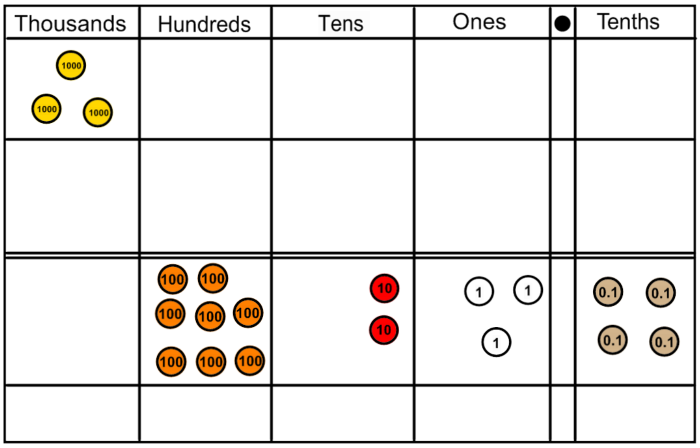
Step 4.

```
  3 2 5 6
+   5 6 7 . 4
      2 3 . 4
    1 ~~1~~
```



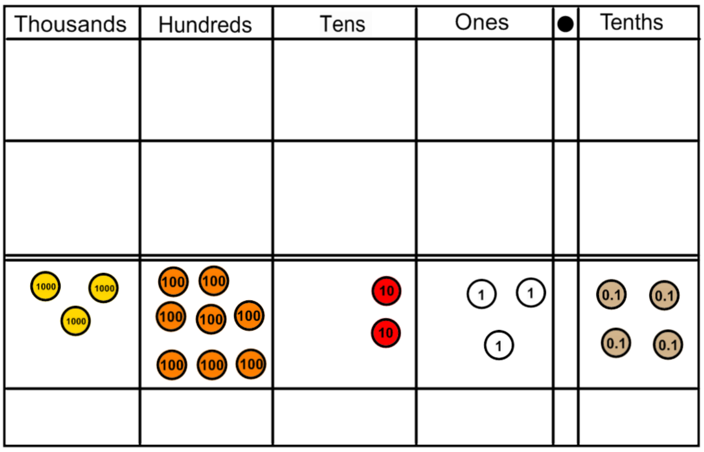
Step 5.

```
  3 2 5 6
+   5 6 7 . 4
    8 2 3 . 4
  ~~1~~ ~~1~~
```



Step 6.

```
  3 2 5 6
+   5 6 7 . 4
  3 8 2 3 . 4
  ~~1~~ ~~1~~
```



The above is just an example that shows the steps when using PV counters. The introduction of calculating with decimals however should take into account small steps in progression as shown below. Use PV counters every time until children are fully confident and understand why column addition works.

12.5 + 23.7

```
  1 2 . 5
+ 2 3 . 7
  3 6 . 2
  1
```

123.5 + 24.6

```
  1 2 3 . 5
    2 4 . 6
  1 4 8 . 1
    1
```

34.5 + 27.43

```
   3 4 . 5 0
+  2 7 . 4 3
   6 1 . 9 3
   1
```

Use a zero as a place holder.

34.5 + 7.43

```
   3 4 . 5 0
+    7 . 4 3
   4 1 . 9 3
   1
```

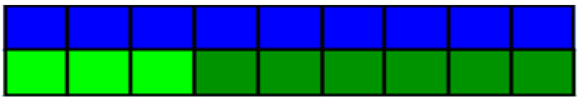
Use a zero as a place holder.

Column addition remains efficient when used with larger whole numbers and decimals. Once learned, the method is quick and reliable. Children should also be taught how to add several numbers with different numbers of digits using the column method and understanding the place value.

$$
\begin{array}{rcccccccc}
 & & & 2 & 5 & 8 & . & 8 & \\
 & & & & 8 & 7 & & & \\
 & 5 & 6 & 1 & 3 & 8 & & & \\
 & & & & & 4 & . & 5 & 9 \\
+ & & 9 & 3 & 2 & 1 & & & \\
\hline
 & 6 & 5 & 8 & 0 & 9 & . & 3 & 9 \\
\hline
 & \cancel{1} & & \cancel{2} & \cancel{2} & \cancel{1} & & &
\end{array}
$$

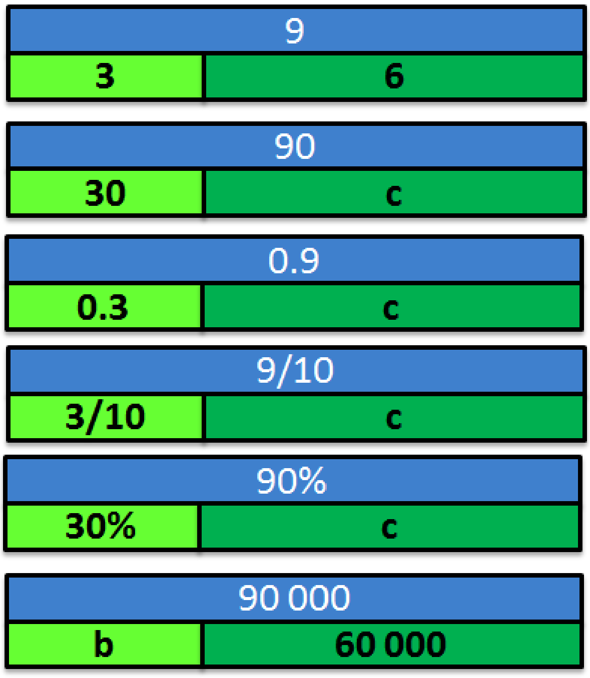
Problem solving involving addition using the bar model method

Generalisation – empty box questions (part-part whole model)



Children to write various number sentences to show the relationship between 9, 6 and 3?
e.g.
9 = 3 + 6; 6 + 3 = 9; 9 – 3 = 6
9 = 6 + 3; 3 + 6 = 9; 9 – 6 = 3

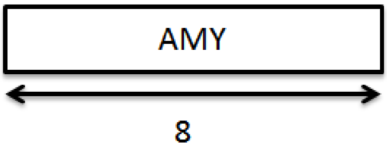
Children to write a set of statements about a, b and c?
e.g.
a = b + c; c + b = a; a – b = c
A = c + b; b + c = a; a – c = b



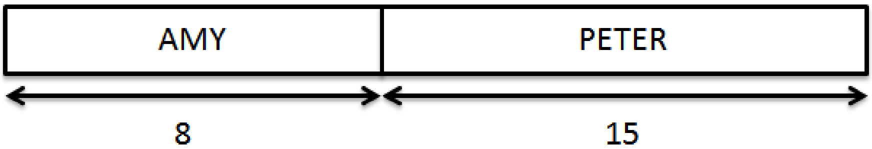
Vertical acceleration:
What other facts can be drawn from the very first set of statements written?
Children to investigate.

Amy has 8 sweets and Peter has 15 sweets.
How many sweets have they got altogether?

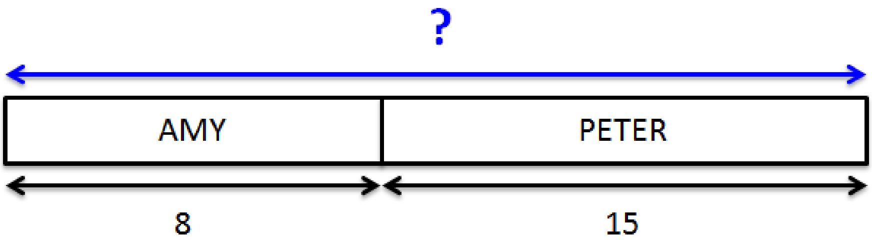
Step 1.



Step 2.



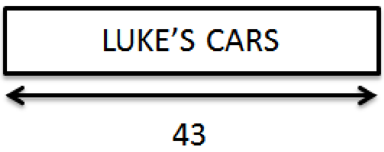
Step 3.



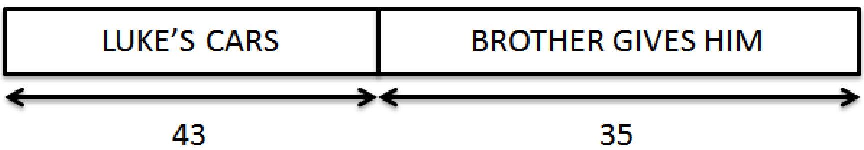
Step 4. **15 + 8 = 23**

Luke has 43 toy cars.
His brother gives him 35 more toy cars.
How many toy cars does he have altogether?

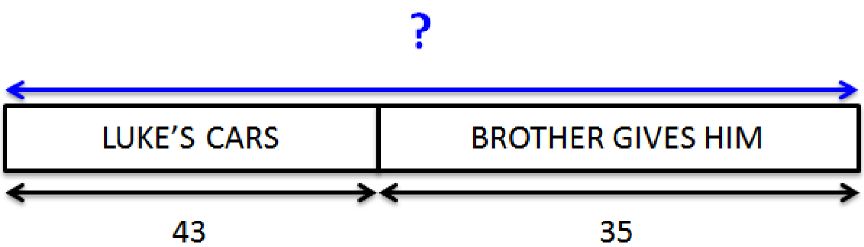
Step 1.



Step 2.



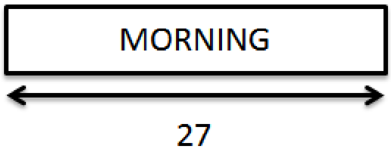
Step 3.



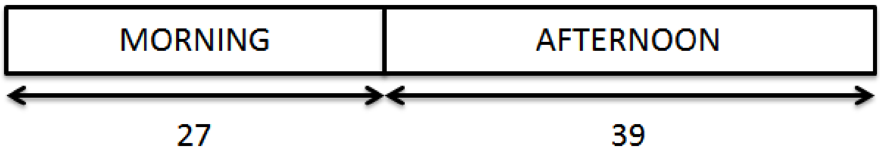
Step 4. **43 + 35 = 78**

Mrs Jones has 27 students in her morning dance club.
She has 39 students in her afternoon dance club.
How many students does she have in both classes altogether?

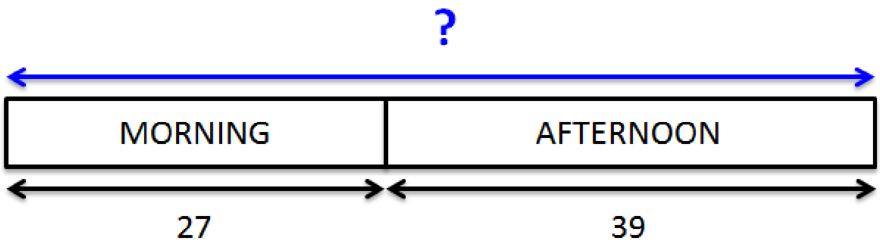
Step 1.



Step 2.



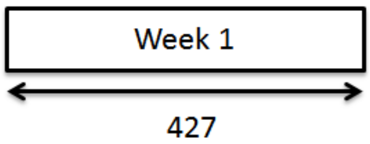
Step 3.



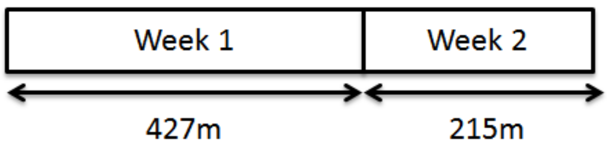
Step 4. **39 + 27 = 66**

A truck driver drove 427 miles one week, 215 miles the next and 312 during the third week.
How many miles did he drive altogether?

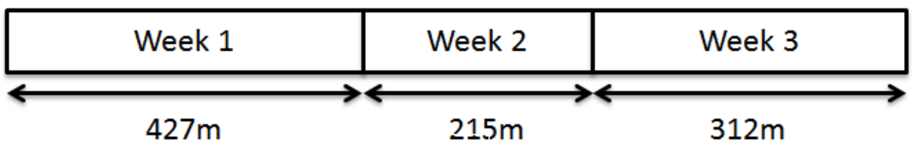
Step 1.



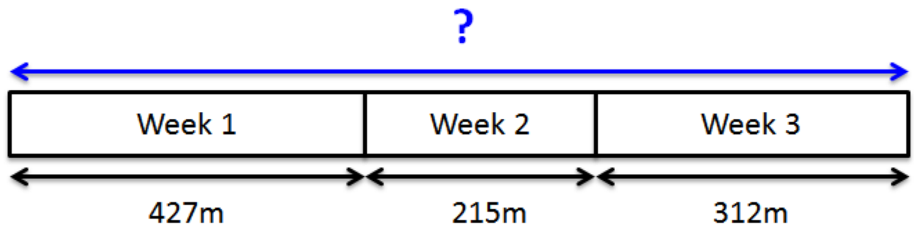
Step 2.



Step 3.



Step 4.

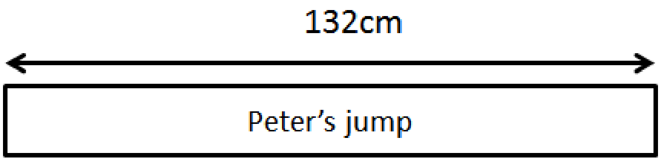


Step 5. **427m + 215m + 312m = 954m**

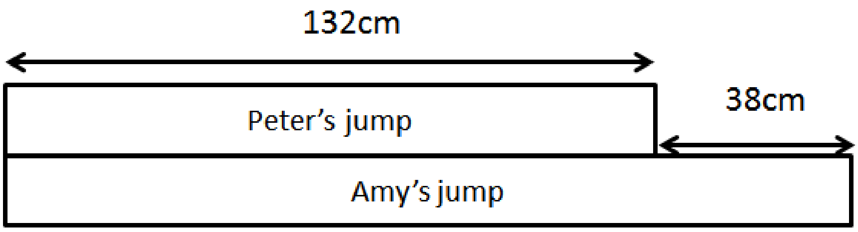
This type of question provides opportunities for children to compare two particular amounts.

Peter and Amy competes in a long distance jump.
Peter jumps 132cm. Amy jumps 38cm <u>longer</u> than Peter.
How many cm long is Amy's jump?

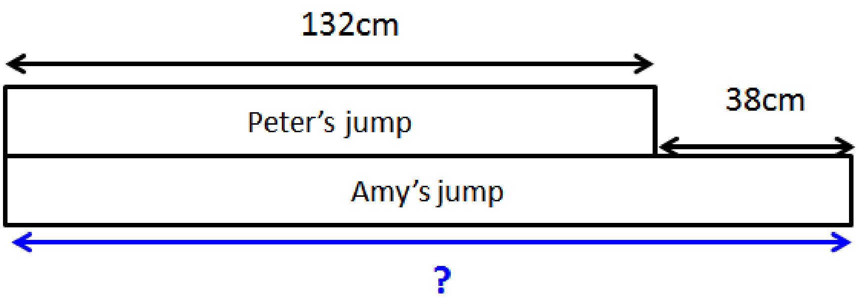
Step 1.



Step 2.



Step 3.



Step 4. **132cm + 38cm = 170cm**