Addition 1

4 four **+** plus **2** two **=** equals **6** six

3 + 3 = 6

5 + 1 = 6

8 + 4 = 12

14 + 3 = 17

In addition, two or more numbers are joined to get one number called the sum or total.

Addition 2

132 + 63 = 195
addend   addend   sum

The numbers to be added together are called addends.
Addition Key Words: plus, add, sum, total.

To add larger numbers vertical or column addition can be used.
Numbers are written underneath each other according their place value.
The numbers are added vertically, starting with the ones column
then moving left column by column.

Adding vertically without trading (carrying, regrouping)

132 + 63 =

H	T	O
1	3	2
	6	3
1	9	5

(+)

3564 + 2305 =

Th	H	T	O
3	5	6	4
2	3	0	5
5	8	6	9

(+)

Adding vertically with trading (carrying, regrouping)

175 + 48 =

H	T	O
1	7	5
	4	8
2	2	3

(+)

7586 + 1945 =

Th	H	T	O
7	5	8	6
1	9	4	5
9	5	3	1

(+)

When a column adds up to more than ten, the **tens** go into the
next column left and the **ones** stay in their own column.

Subtraction 1

6 **-** **2** **=** **4**
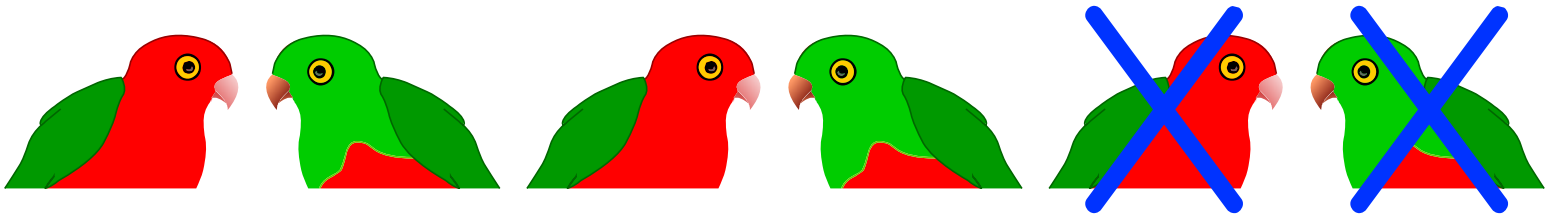
six **minus** **two** **equals** **four**
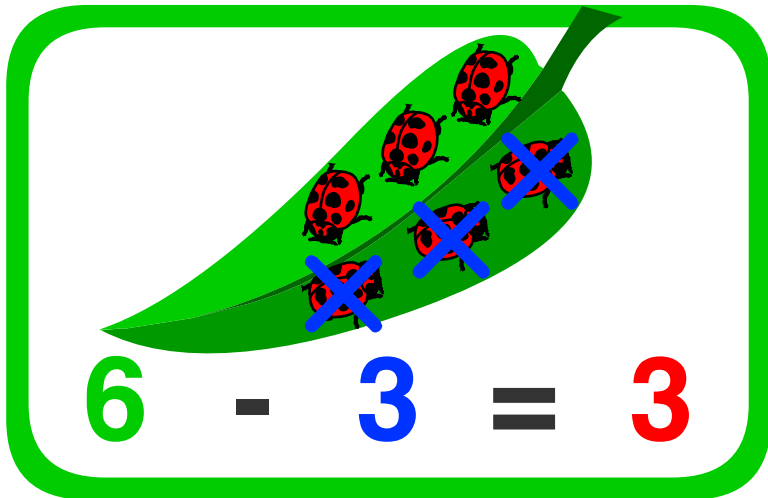
6 **-** **3** **=** **3**
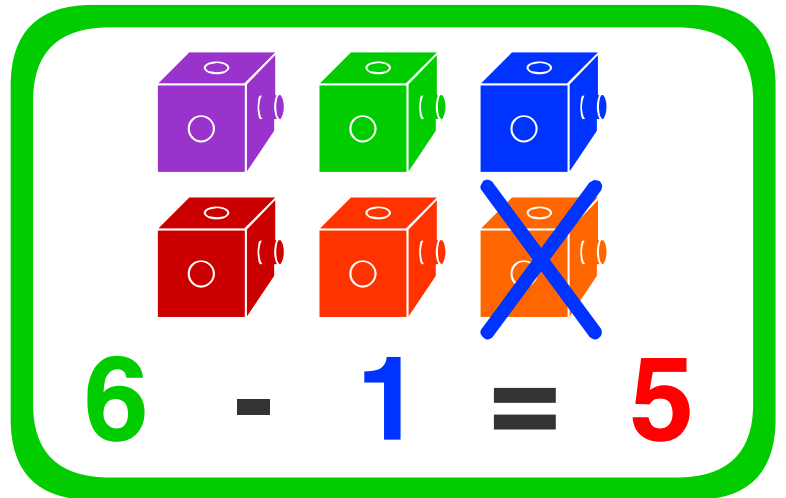
6 **-** **1** **=** **5**
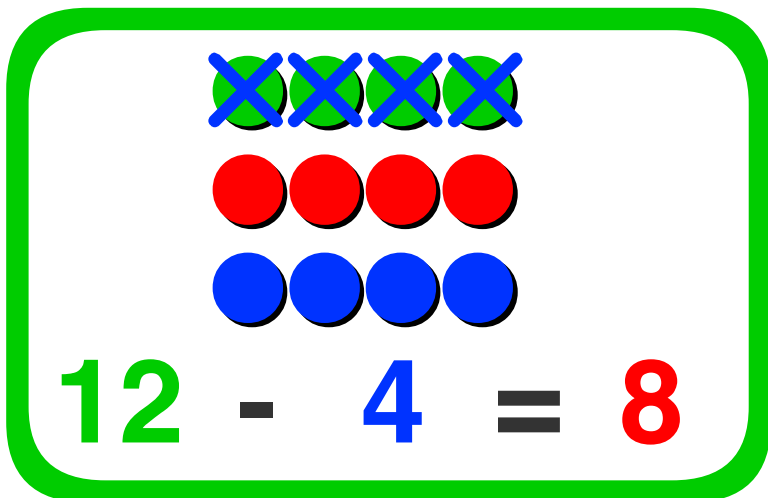
12 **-** **4** **=** **8**
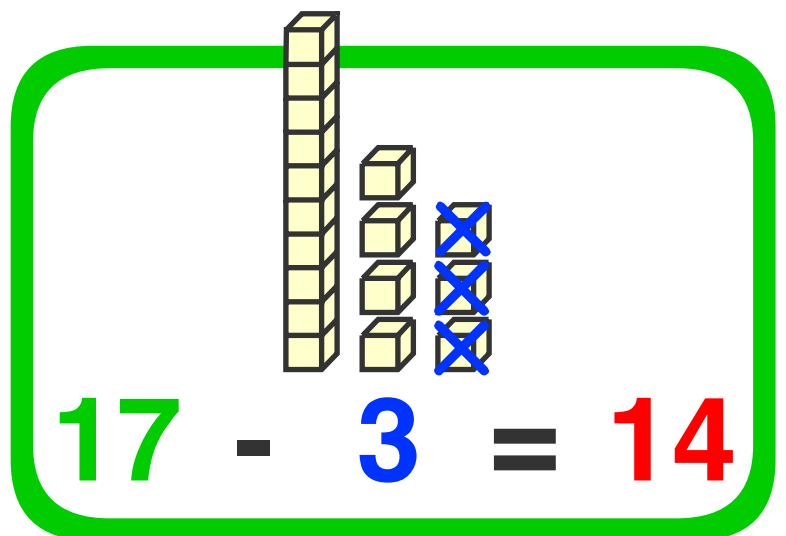
17 **-** **3** **=** **14**

In subtraction, one quantity is taken away from another to find the difference.

Subtraction 2

178 - **32** = **146**

minuend   subtrahend   difference
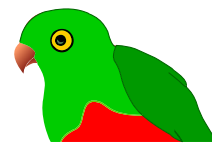
Subtraction Key Words: minus, subtract, deduct, take away, less, difference, decrease, fewer than, reduce.

To subtract larger numbers vertical or column subtraction can be used. Numbers are written underneath each other according their place value. The numbers are subtracted vertically, starting with the ones column then moving left column by column.

Subtracting vertically without trading (regrouping, borrowing)

178 - 32 =

H	T	O
1	7	8
-	3	2
1	4	6

3564 - 2301 =

Th	H	T	O
3	5	6	4
- 2	3	0	1
1	2	6	3

Subtracting vertically with trading (regrouping, borrowing)

345 - 68 =

H	T	O
3̶ 2 / 13	4̶ 3 / 15	5
-	6	8
2	7	7

7523 - 2945 =

Th	H	T	O
7̶ 6 / 14	5̶ 4 / 11	2̶ 1 / 13	3
- 2	9	4	5
4	5	7	8

When the bottom digit is greater than the top digit, trade (borrow) a **ten** from the next column left and / mark it down by one.

Count on, count back

Addition - count on.

7 8 9

6

8 9 10 11

7

6 + 3 = 9

4 + 7 = 11
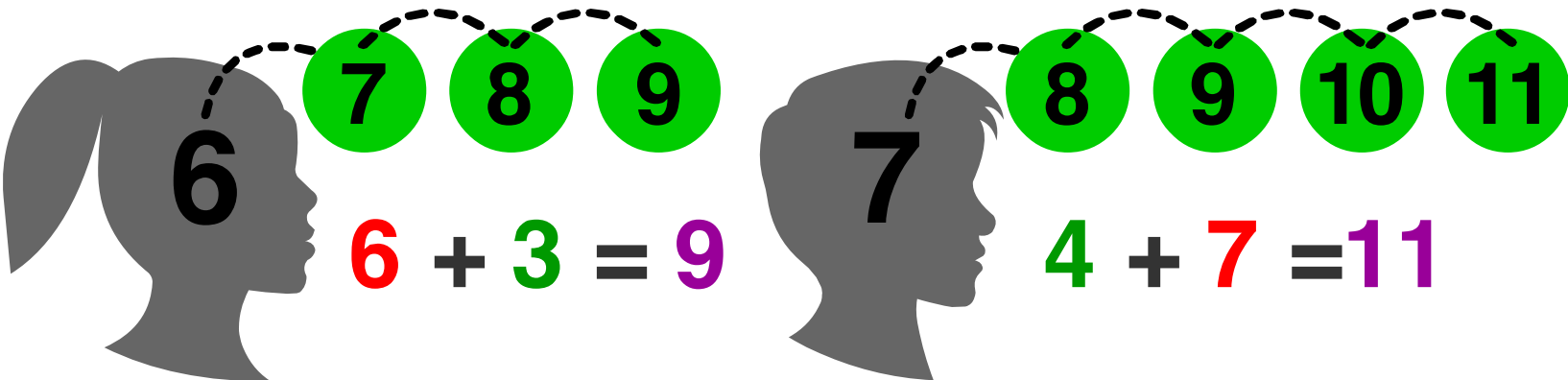
In addition, you don't need to count the **larger number**, just count on.

13 + 5 = 18

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

Subtraction - count back.

6 7 8

9

7 8 9 10

11

9 - 3 = 6

11 - 4 = 7
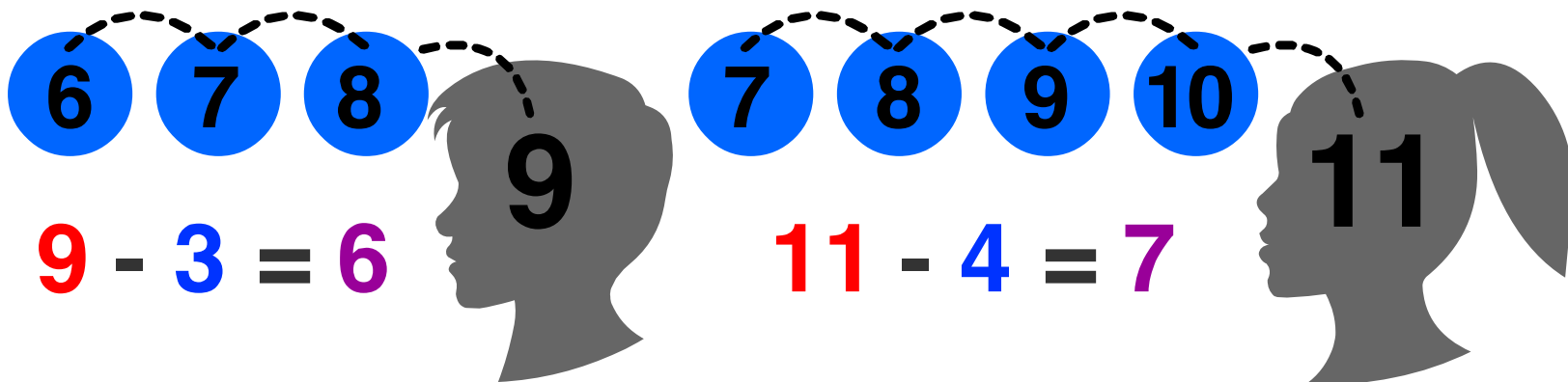
In subtraction, count back.

13 - 5 = 8

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

A strategy for addition and subtraction.

Doubles and near doubles

A strategy that uses doubles facts to make addition easier.
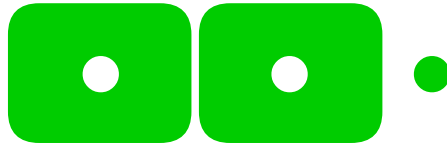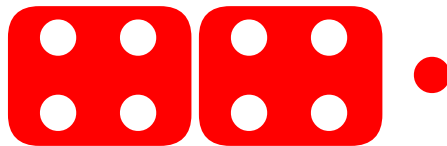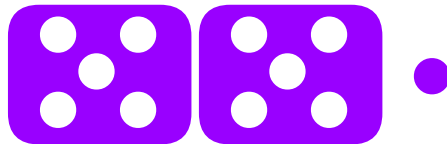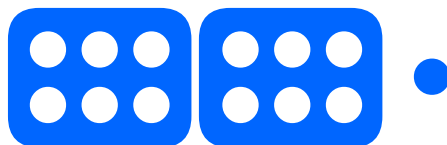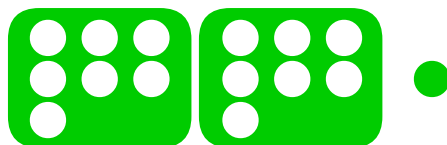
doubles		near doubles
1 + 1 = 2		1 + 2 = 3
2 + 2 = 4		2 + 3 = 5
3 + 3 = 6		3 + 4 = 7
4 + 4 = 8		4 + 5 = 9
5 + 5 = 10		5 + 6 = 11
6 + 6 = 12		6 + 7 = 13
7 + 7 = 14		7 + 8 = 15
8 + 8 = 16		8 + 9 = 17
9 + 9 = 18		9 + 10 = 19
10 + 10 = 20		10 + 11 = 21

Look for the patterns going down.

Extensions

A strategy to extend easy number facts to larger numbers using multiplying by 10.

Addition
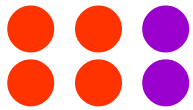
$4 + 2 = 6$

$40 + 20 = 60$

$400 + 200 = 600$

$4000 + 2000 = 6000$
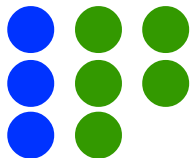
$3 + 5 = 8$

$30 + 50 = 80$

$300 + 500 = 800$

$3000 + 5000 = 8000$
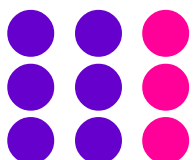
$6 + 3 = 9$

$60 + 30 = 90$

$600 + 300 = 900$

$6000 + 3000 = 9000$

Subtraction
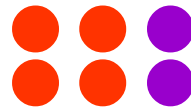
$6 - 4 = 2$

$60 - 40 = 20$

$600 - 400 = 200$

$6000 - 4000 = 2000$
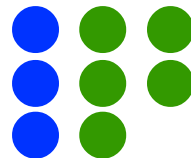
$8 - 3 = 5$

$80 - 30 = 50$

$800 - 300 = 500$

$8000 - 3000 = 5000$
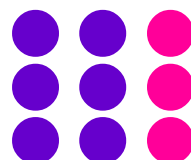
$9 - 6 = 3$

$90 - 60 = 30$

$900 - 600 = 300$

$9000 - 6000 = 3000$

Look for the patterns.

Inverse operations

**Inverse operations are opposite or reverse operations.
Addition and subtraction are inverse operations.
An addition fact will give a subtraction fact and vice versa.**

Addition ← **inverse** → **Subtraction**

$4 + 2 = 6$
$2 + 4 = 6$
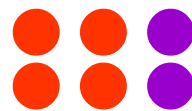
$6 - 4 = 2$
$6 - 2 = 4$
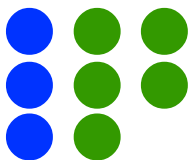
$3 + 5 = 8$
$5 + 3 = 8$
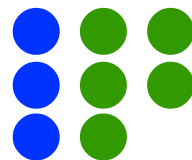
$8 - 3 = 5$
$8 - 5 = 3$
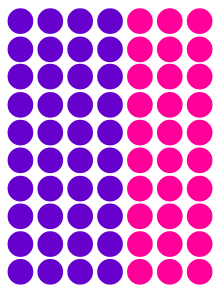
$40 + 30 = 70$
$30 + 40 = 70$
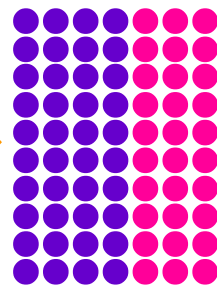
$70 - 40 = 30$
$70 - 30 = 40$

$$\begin{array}{r} 256 \\ + 423 \\ \hline 679 \end{array} \qquad \begin{array}{r} 679 \\ - 423 \\ \hline 256 \end{array}$$

**You can use addition facts to check subtraction, or
use subtraction facts to check addition.**

Jump strategy

A strategy that adds or subtracts a number in jumps according to place value.
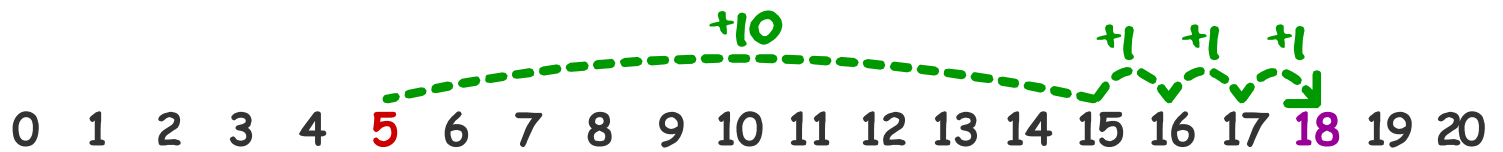
$$5 + 13 \text{ in jumps} = 5 + 10 + 1 + 1 + 1 = 18$$
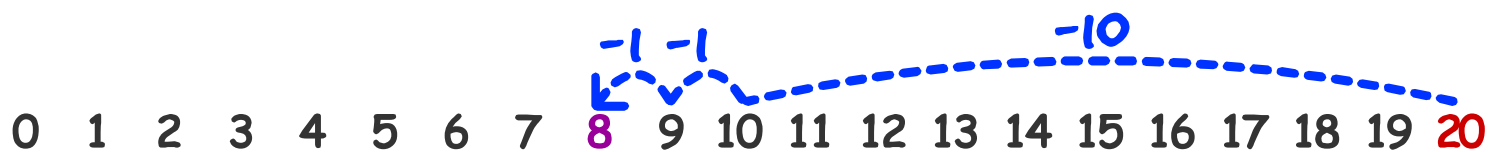
$$20 - 12 \text{ in jumps} = 20 - 10 - 1 - 1 = 8$$

The jump strategy on a hundreds chart.

53 +
35
—
88

In addition:

- to add 10s, go down the rows.
- to add 1s, go right across the columns.

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

In subtraction:

- to subtract 10s, go up the rows.
- to subtract 1s, go left across the columns.

39 -
34
—
5

Split strategy (partitioning)

A strategy that splits (partitions) numbers into their place values to make calculations easier.

May be written in different ways.

Addition

$$45 + 33$$
$$= 40 + 5 + 30 + 3$$
$$= 70 + 8$$
$$= 78$$

$$245 + 633$$
$$= 800 + 70 + 8$$
$$= 878$$

$$
\begin{array}{r}
245 \\
+\ 633 \\
\hline
800 \\
70 \\
8 \\
\hline
878 \\
\end{array}
$$

Subtraction

$$78 - 45$$
$$= 70 + 8 - 40 + 5$$
$$= 30 + 3$$
$$= 33$$

$$878 - 245$$
$$= 600 + 30 + 3$$
$$= 633$$

$$
\begin{array}{r}
878 \\
-\ 245 \\
\hline
600 \\
30 \\
3 \\
\hline
633 \\
\end{array}
$$

Start with the largest place value.

Reordering

An addition strategy that changes the order of addends to make calculations easier.

$$132 + 63 = 195$$

addend   addend   sum

**This strategy is based on the commutative law, rule or property.
That is, in addition the sum will remain the same regardless of the order of the addends.**

$$2 + 17 = 17 + 2$$
$$= 19$$

$$20 + 32 + 843 = 843 + 32 + 20$$
$$= 895$$

$$
\begin{array}{r}
433 \\
12 \\
+\ 554 \\
\hline
\end{array}
\qquad\Rightarrow\qquad
\begin{array}{r}
554 \\
433 \\
+\ 12 \\
\hline
999 \\
\hline
\end{array}
$$

Start with the larger numbers.

Compensation, change methods

In compensation, one number is rounded to ten or a hundred then the answer is adjusted to compensate for the change.

Round
$$56 + 38 = 56 + 40 - 2$$
$$= 96 - 2$$
$$= 94$$
Adjust

Round
$$94 - 38 = 94 - 40 + 2$$
$$= 54 + 2$$
$$= 56$$
Adjust

Round
$$623 + 198 = 623 + 200 - 2$$
$$= 823 - 2$$
$$= 821$$
Adjust

Round
$$786 - 298 = 786 - 300 + 2$$
$$= 486 + 2$$
$$= 488$$
Adjust

Change methods are similar but the second number (not the answer) is adjusted to compensate for the change.

$$
\begin{array}{r}
56 \\
+ 38 \\
\hline
\end{array}
\quad
\begin{array}{c}
-2 \rightarrow \\
+2 \rightarrow
\end{array}
\quad
\begin{array}{r}
54 \\
+ 40 \\
\hline
94
\end{array}
$$

$$
\begin{array}{r}
94 \\
- 38 \\
\hline
\end{array}
\quad
\begin{array}{c}
+2 \rightarrow \\
+2 \rightarrow
\end{array}
\quad
\begin{array}{r}
96 \\
- 40 \\
\hline
56
\end{array}
$$

$$
\begin{array}{r}
726 \\
+ 197 \\
\hline
\end{array}
\quad
\begin{array}{c}
-3 \rightarrow \\
+3 \rightarrow
\end{array}
\quad
\begin{array}{r}
723 \\
+ 200 \\
\hline
923
\end{array}
$$

$$
\begin{array}{r}
923 \\
- 197 \\
\hline
\end{array}
\quad
\begin{array}{c}
+3 \rightarrow \\
+3 \rightarrow
\end{array}
\quad
\begin{array}{r}
926 \\
- 200 \\
\hline
726
\end{array}
$$

Addition Opposite Change

Subtraction Same Change

Rainbow Facts
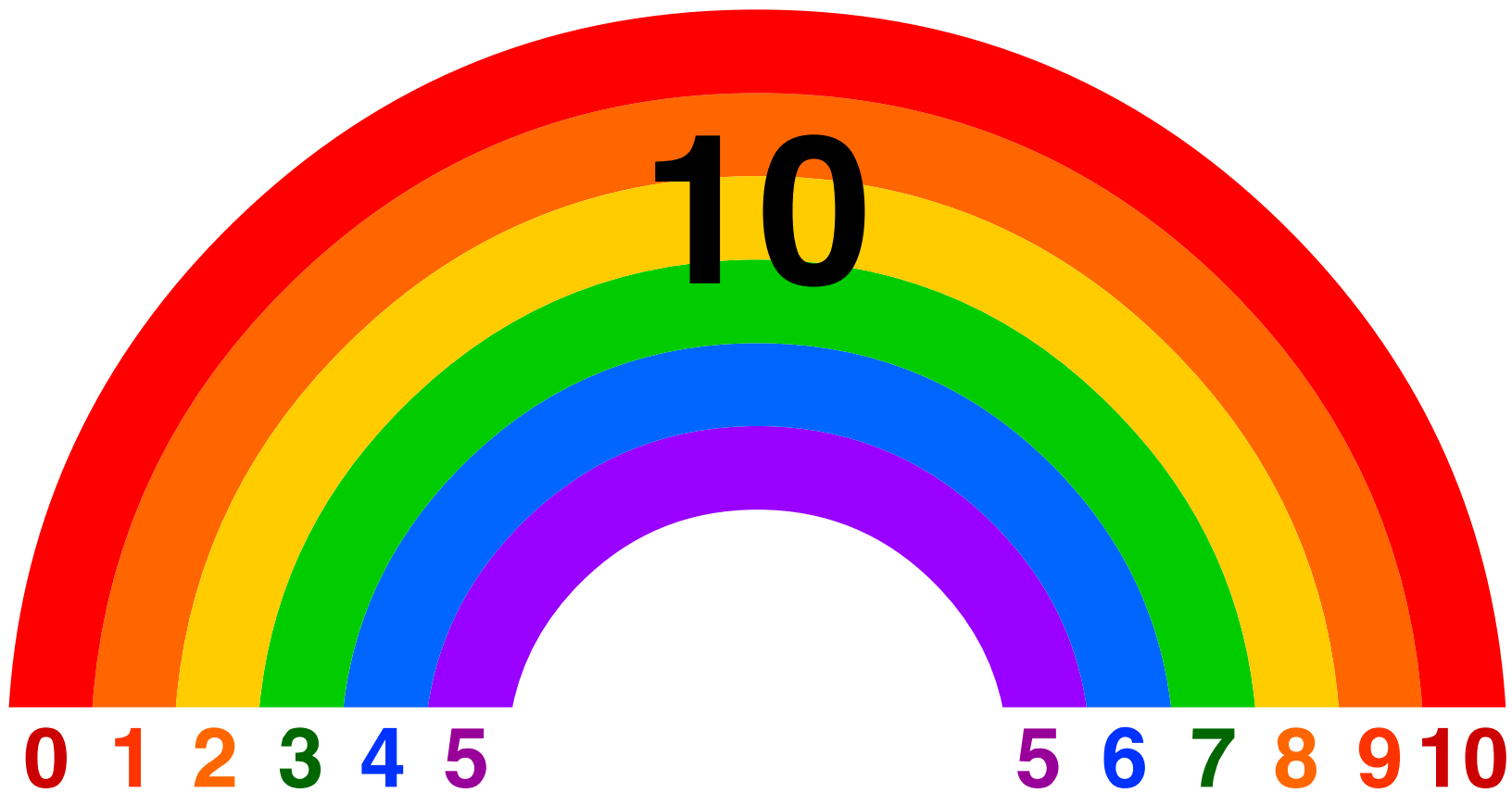
$$0 + 10 = 10 \qquad 10 + 0 = 10$$

$$1 + 9 = 10 \qquad 9 + 1 = 10$$

$$2 + 8 = 10 \qquad 8 + 2 = 10$$

$$3 + 7 = 10 \qquad 7 + 3 = 10$$

$$4 + 6 = 10 \qquad 6 + 4 = 10$$

$$5 + 5 = 10 \qquad 5 + 5 = 10$$

Addition Table

**Read across and down
to find the sum of any two green numbers.**

+	1	2	3	4	5	6	7	8	9	10
1	2	3	4	5	6	7	8	9	10	11
2	3	4	5	6	7	8	9	10	11	12
3	4	5	6	7	8	9	10	11	12	13
4	5	6	7	8	9	10	11	12	13	14
5	6	7	8	9	10	11	12	13	14	15
6	7	8	9	10	11	12	13	14	15	16
7	8	9	10	11	12	13	14	15	16	17
8	9	10	11	12	13	14	15	16	17	18
9	10	11	12	13	14	15	16	17	18	19
10	11	12	13	14	15	16	17	18	19	20

Look for the patterns.

Subtraction Table

Read across and down
to find the difference between any two blue numbers.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13
8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12
9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11
10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9
12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8
13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7
14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5	6
15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4	5
16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3	4
17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2	3
18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1	2
19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0	1
20	-19	-18	-17	-16	-15	-14	-13	-12	-11	-10	-9	-8	-7	-6	-5	-4	-3	-2	-1	0

Look for the patterns.

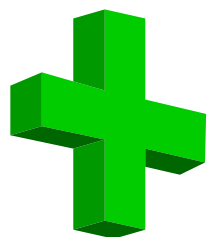# Addition properties
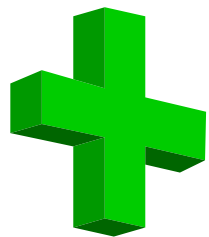
Commutative property
- in addition, numbers may be added in any order.

$$a + b = b + a$$

$$6 + 2 = 8$$
or
$$2 + 6 = 8$$
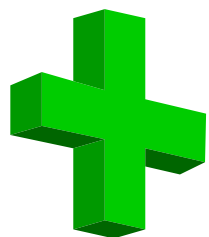
Associative property
- in addition, no matter how the numbers are grouped, the answer will always be the same.

$$(a + b) + c = a + (b + c)$$

$$(4 + 2) + 6$$
gives the same total as
$$4 + (2 + 6)$$

Additive identity property of 0
- adding zero won't change a number,
- when zero is added to a number the result is the number itself.

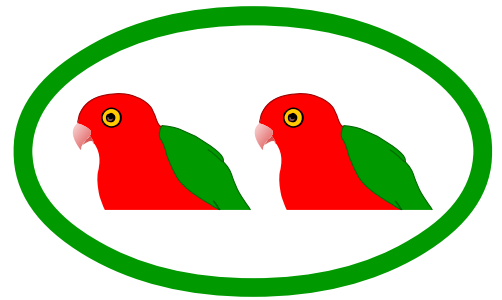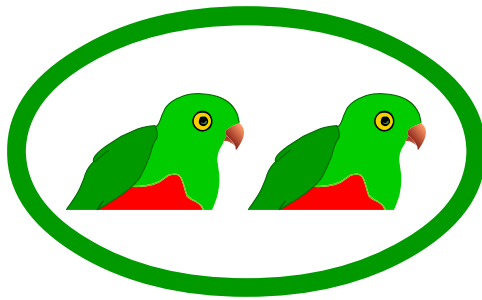$$a + 0 = a$$
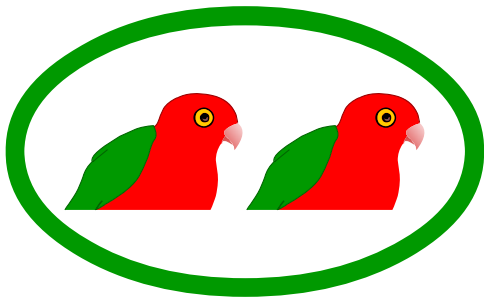
$$6 + 0 = 6$$
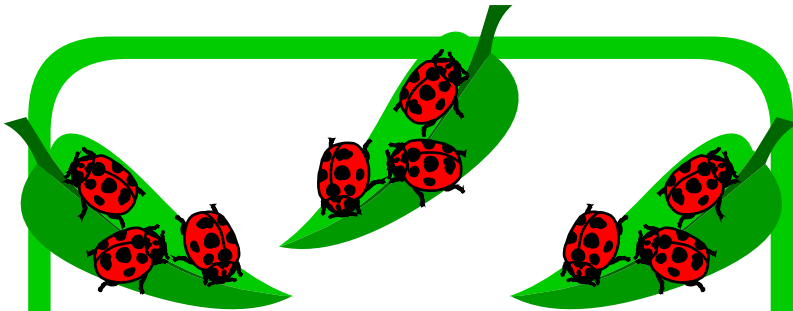or
$$0 + 6 = 6$$

Multiplication 1

groups of 2, 3 times = 6

2 **x** **3** **=** **6**

two   times   three   equals   six

3 **x** **3** **=** **9**

5 **x** **3** **=** **15**

8 **x** **2** **=** **16**
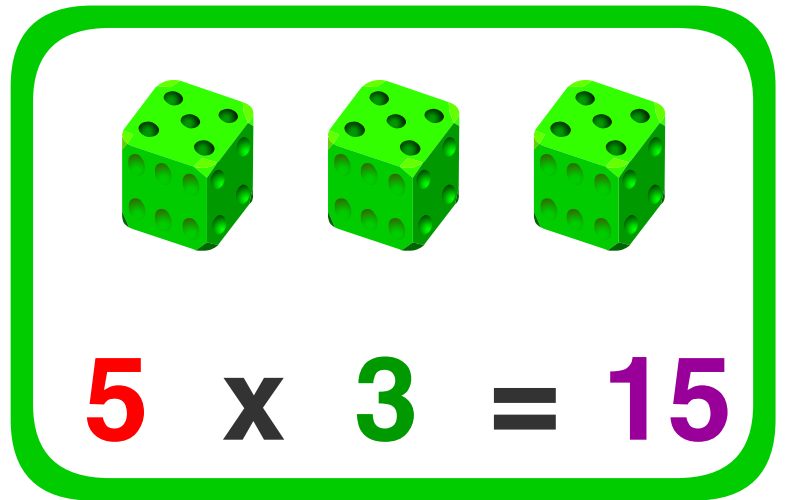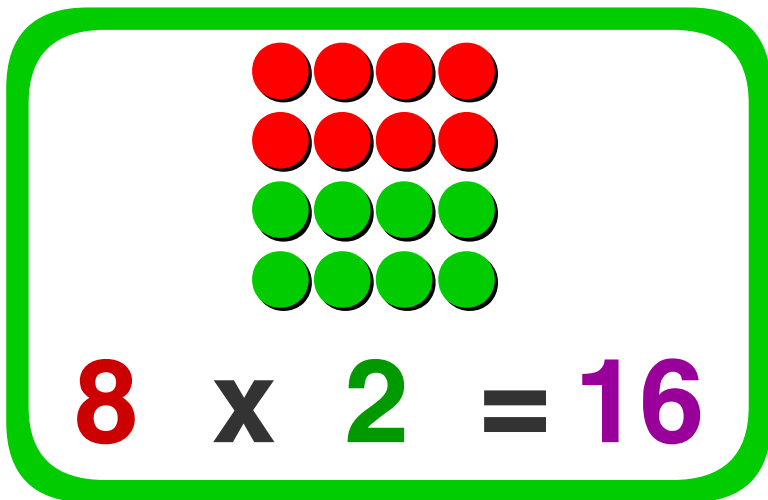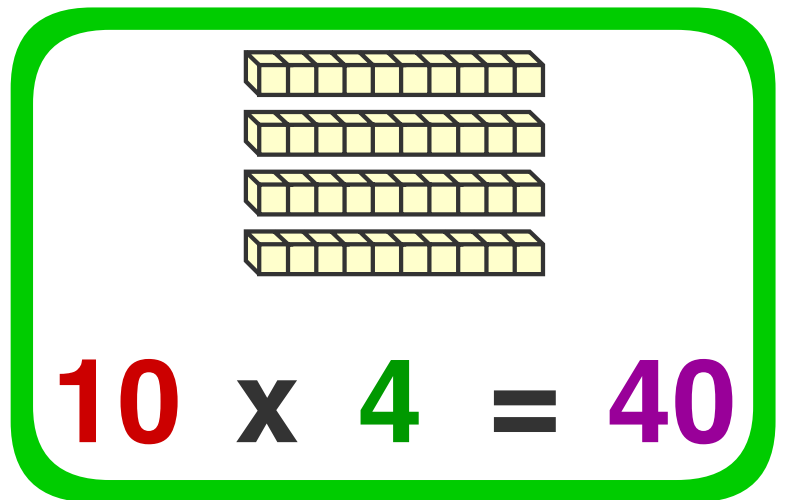
10 **x** **4** **=** **40**

Multiplication is a mathematical operation where a number is added to itself a number of times.

Multiplication 2

10 x **20** = **200**

multiplier   multiplicand   product

**Numbers may be multiplied in any order to get the product.
Multiplication Key Words: times, multiplied by, product.**

To multiply larger numbers a vertical algorithm can be used.
Numbers are written underneath each other according their place value.
The numbers are multiplied vertically, starting with the ones column
then moving left column by column.

Multiplying vertically without trading (carrying, regrouping)

132 x 3 =

	H	T	O
	1	3	2
x			3
	3	9	6

4234 x 2 =

	Th	H	T	O
	4	2	3	4
x				2
	8	4	6	8

Multiplying vertically with trading (carrying, regrouping)

153 x 6 =

	H	T	O
	1	5	3
x			6
	9	1	8
		3 ←	1 ←

1386 x 7 =

		2 ←	6 ←	4 ←
	Th	H	T	O
	1	3	8	6
x				7
	9	7	0	2

When a column is more than ten, the **tens** go into the **next column left**
and are **added to the answer,** the **ones** stay in their own column.