Calculation Policy for Mathematics

September 2016

About our Calculation Policy

The following calculation policy has been devised to meet requirements of the National Curriculum 2014 for the teaching and learning of mathematics, and is also designed to give pupils a consistent and smooth progression of learning in calculation across the federation.

Age Stage Expectations:

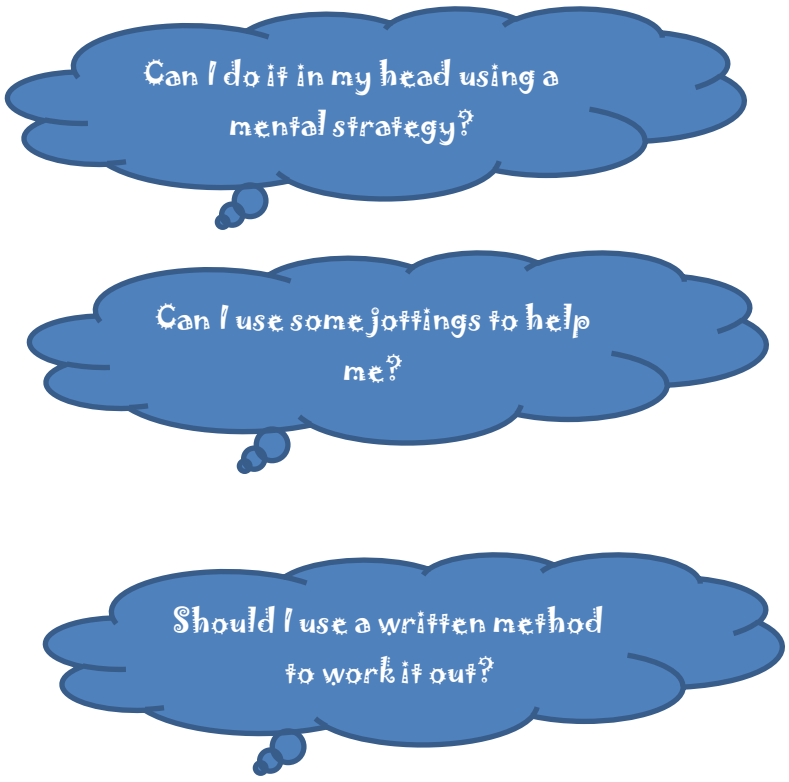
This policy is a progressive document and it is vital that the pupils are taught appropriate methods to support them with their understanding of calculation according to the developmental stage they are at. Children should only be moved on to the next stage when they are ready. This may mean they are working above or below the expectations set out for their age group in the National Curriculum.

Providing a Context for Calculation:

It is important that any type of calculation is given a real life context. This combined with a problem solving approach will help build children's understanding of the purpose of calculation, and help them recognise when to use certain operations and methods when faced with unfamiliar problems.

Choosing a Calculation Method:

Children need to be taught and encouraged to use the following processes in deciding what approach they will take to a calculation – this will help them select the most appropriate method for the numbers involved:

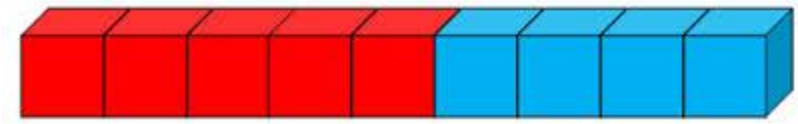


Addition

Vocabulary

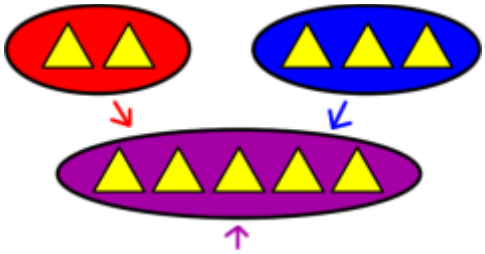
Add, addition, more, plus, increase, sum, total, altogether, double, how many more?, tens boundary, hundreds boundary, partition, inverse, 'carry', decimal places, decimal point

I can use equipment to show my calculation.



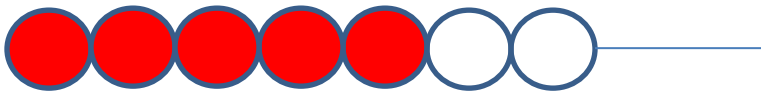
5 + 4 = 9

I can record an addition calculation using pictures.



2 + 3 = 5

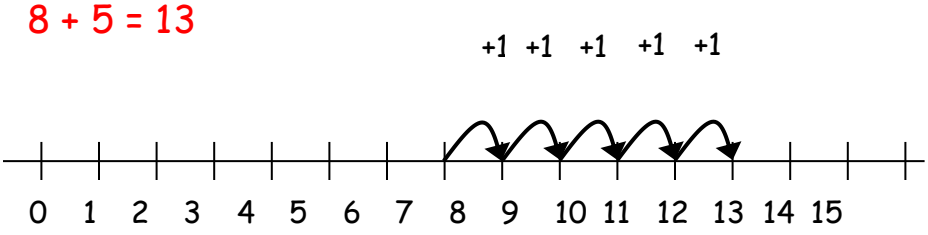
I can use a bead string to illustrate addition.



5 + 2 = 7

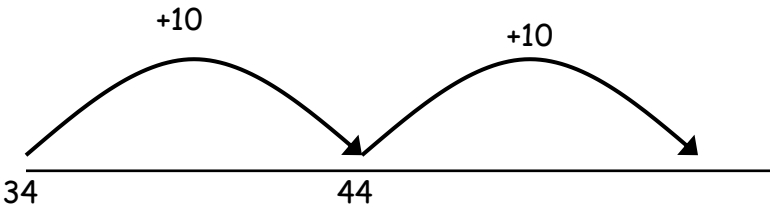
I can use a number line to count on in units.

8 + 5 = 13



I can use a number line or hundred square to help count on in 10s.

34 + 20 = 54

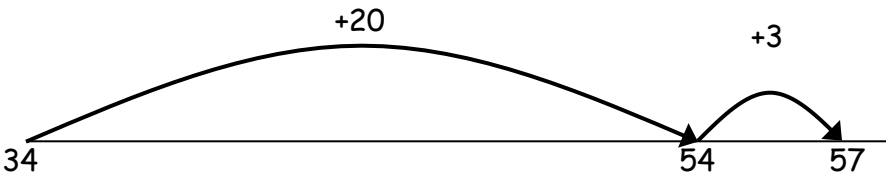


1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

I can use a number line or hundred square to count on in tens and units by partitioning.

34 + 23 = 57

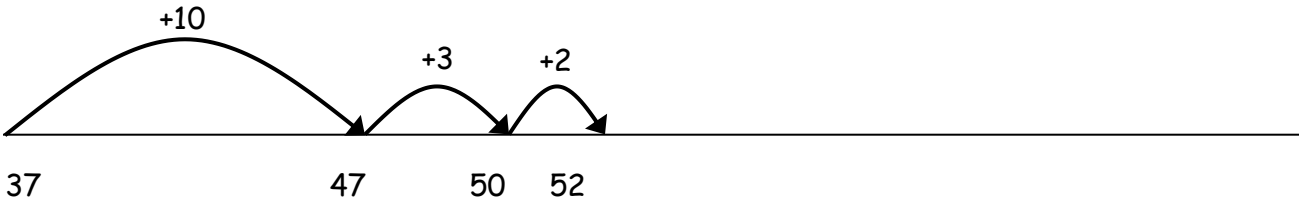
34 + 20 + 3 = 57



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

I can partition a number to bridge a multiple of 10.

37 + 15 = 52



I can add 2 and 3 digit numbers by partitioning.

63 + 16 = 79

63 + 16

60 3 10 6

3 + 6 = 9

60 + 10 = 70

70 + 9 = 79

375 + 167 = 542

375 +167

300 70 5 100 60 7

5 + 7 = 12

70 + 60 = 130

300 + 100 = 400

400 + 130 + 12 = 542

Add the units first in preparation for the compact method.

I can use an expanded column addition method.

215 + 176 = 391

```
  215
+ 176
   11   (5 + 6)
   80   (10 + 70)
  300   (200 + 100)
  391
```

I can use a compact column addition method with 'carrying'.

625 + 48 = 673

```
  625
+  48
  673
   1
```

I can add numbers with more than 4 digits including decimals

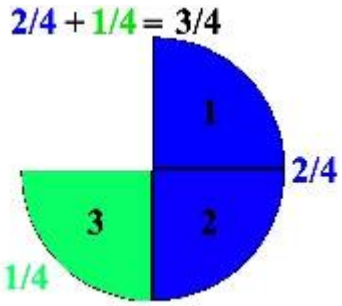
23.361 + 9.08 + 59.77 + 1.3 = 93.511

```
  23.361
   9.080
  59.770
+  1.300
  93.511
   2 1 2
```

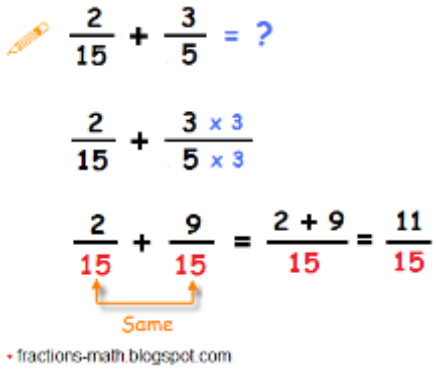
Empty decimal places need to be filled with a zero to show the place value in each column.

Adding Fractions

I can add fractions with the same denominator.



I can add fractions with denominators that are multiples of the same number.



I can add fractions with different denominators and mixed numbers using the concept of equivalent fractions.

$$\frac{6}{4} + \frac{5}{3}$$

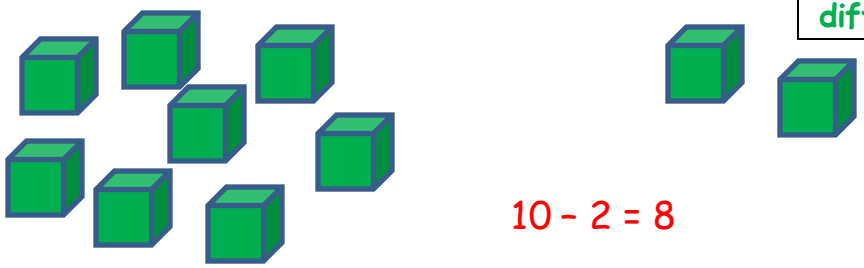
$$= \frac{18}{12} + \frac{20}{12}$$

$$= \frac{38}{12}$$

Vocabulary
Subtract, take away, minus, decrease, count back, how many are left?, how many less?, half, halve, inverse, difference between

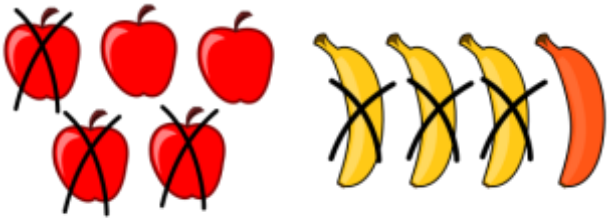
Subtraction

I can use equipment to show my calculation.



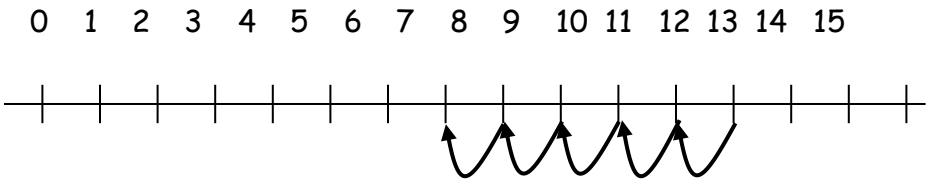
10 – 2 = 8

I can record a subtraction calculation using pictures.



5 - 3 = 2 3 - 4 = -1

I can use a numberline or a hundred square to count back when subtracting.

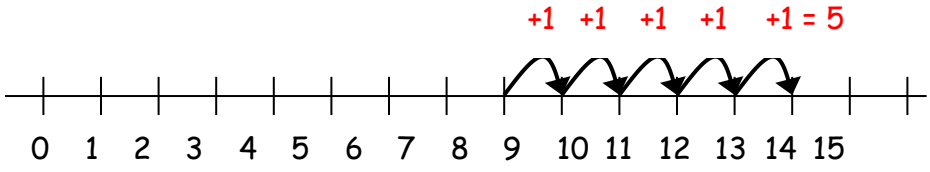


13 – 5 = 8

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

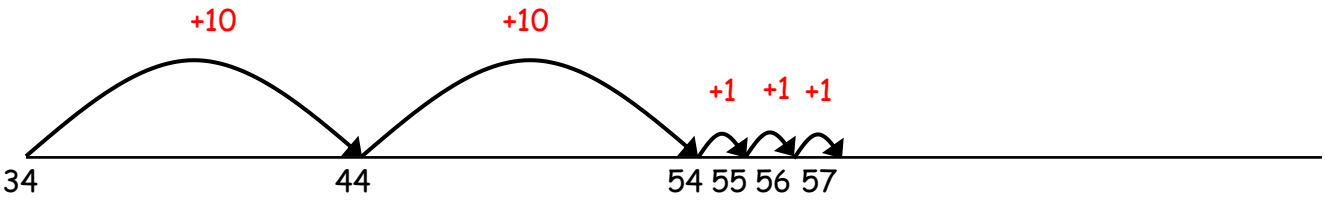
I can use a numberline or hundred square to find the difference between 2 numbers.

13 - 8 = 5



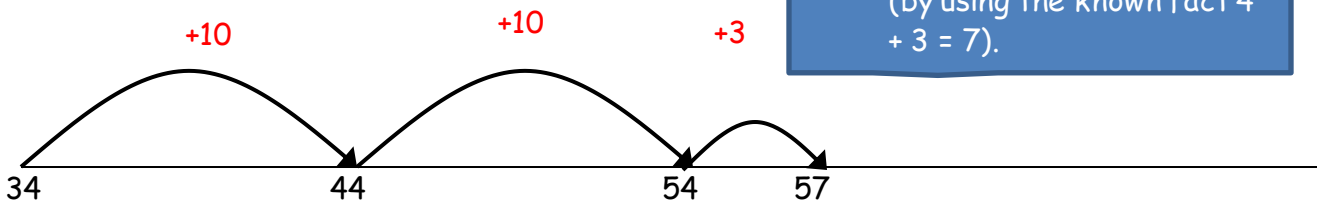
Children will begin to use empty number lines starting with the smallest number and counting on.

57 - 34 = 23



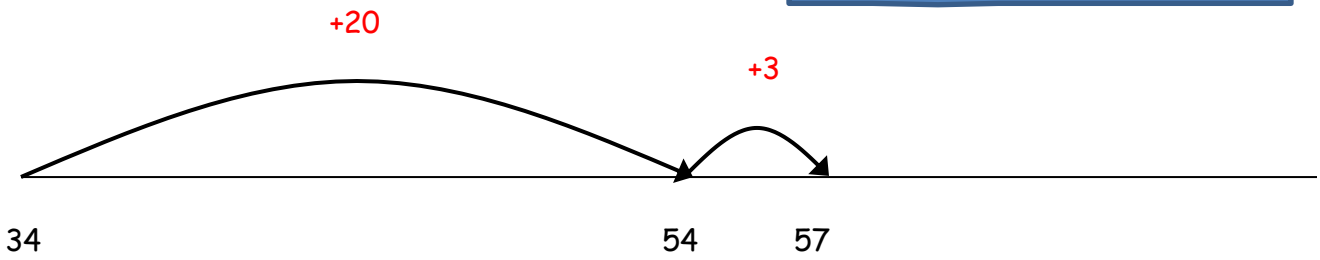
10 + 10 + 3 = 23

- ✓ First counting on in tens and ones.
- ✓ Then helping children to become more efficient by adding the units in one jump (by using the known fact 4 + 3 = 7).



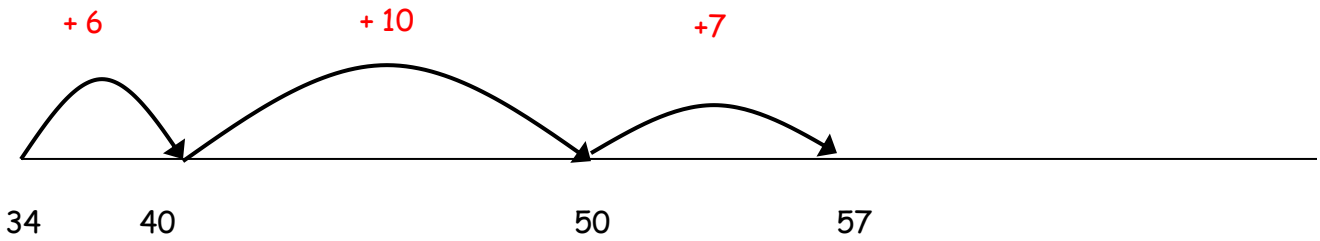
20 + 3= 23

- ✓ Followed by adding the tens in one jump and the units in one jump.



6 + 10 + 7 = 23

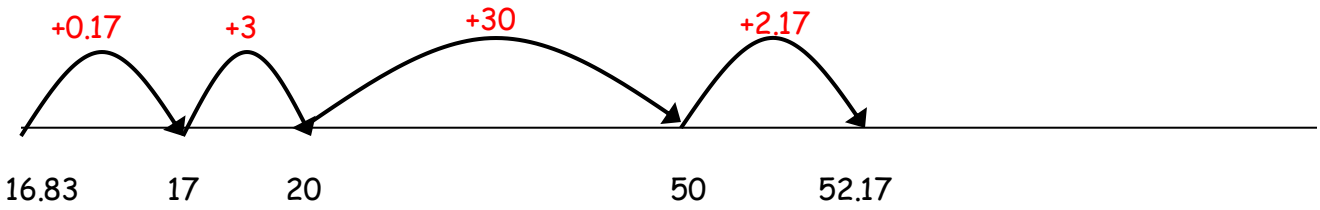
- ✓ Bridging through ten can help children become more efficient.



✓ This empty numberline method can be used for any subtraction sum including decimals.

52.17 – 16.83 = 35.34

0.17 + 3 + 30 + 2.17 = 35.34



I can use compact decomposition to solve subtraction sums.

✓ This should only be taught when the children have a very secure understanding of place value.

Partitioning and decomposition

754 – 86 = 668

✓ This could be demonstrated by the teacher to lead in to a compact method, or taught to the children first.

754 =
- 86

Step 1 700 + 50 + 4
- 80 + 6

Step 2 700 + 40 + 14 *(adjust from T to U)*
- 80 + 6

Step 3 600 + 140 + 14 *(adjust from H to T)*
- 80 + 6
600 + 60 + 8 = 668

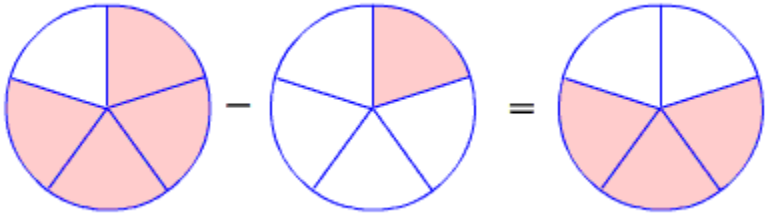
This would then be recorded as compact decomposition

6141
~~75~~ 754
- 86
668

Subtracting Fractions

I can subtract fractions with the same denominator.

$$\frac{4}{5} - \frac{1}{5} = \frac{3}{5}$$



I can subtract fractions with denominators that are multiples of the same number.

$$\frac{7}{8} - \frac{5}{16} = ?$$

$$\frac{7 \times 2}{8 \times 2} - \frac{5}{16} = \frac{14}{16} - \frac{5}{16} = \frac{9}{16}$$

I can subtract fractions with different denominators and mixed numbers using the concept of equivalent fractions.

$$2\frac{3}{8} - 1\frac{4}{5} = \frac{19}{8} - \frac{9}{5}$$

$$= \frac{95}{40} - \frac{72}{40}$$

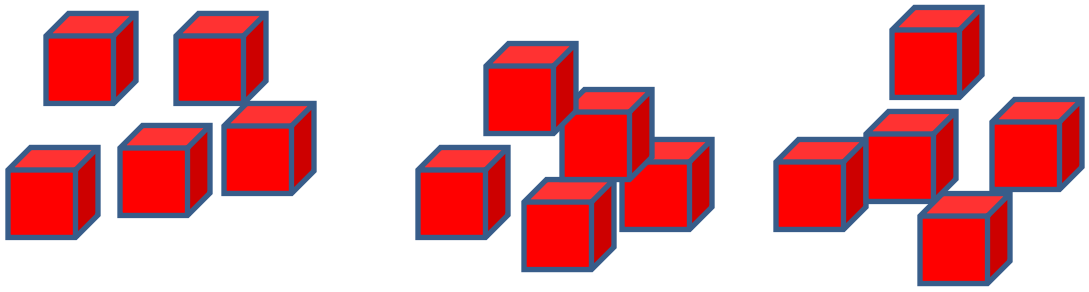
$$= \frac{23}{40}$$

- ✓ Use knowledge of equivalent fractions to ensure both fractions have the same denominator.

Multiplication

Vocabulary
Lots of, groups of, times, product, multiply, multiple of, repeated addition, array, row, column, double, commutative, square, factor, integer, grid method

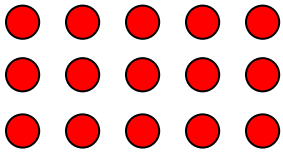
I can place objects in equal groups.



3 lots of 5 = 15 3 x 5 = 15

I can count in 2s, 5s and 10s.

I can understand multiplication as repeated addition using arrays.



5 + 5 + 5 = 15

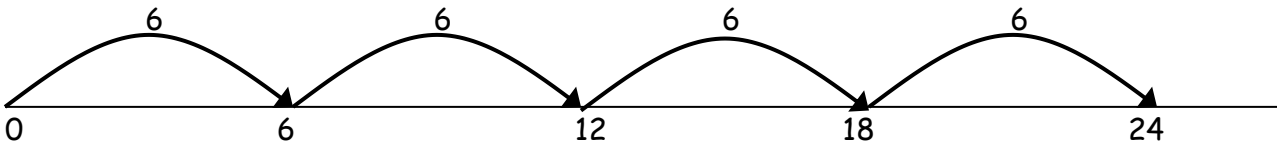
3 x 5 = 15

3 + 3 + 3 + 3 + 3 = 15

5 x 3 = 15

I can understand multiplication as repeated addition using a numberline.

4 x 6 = 24

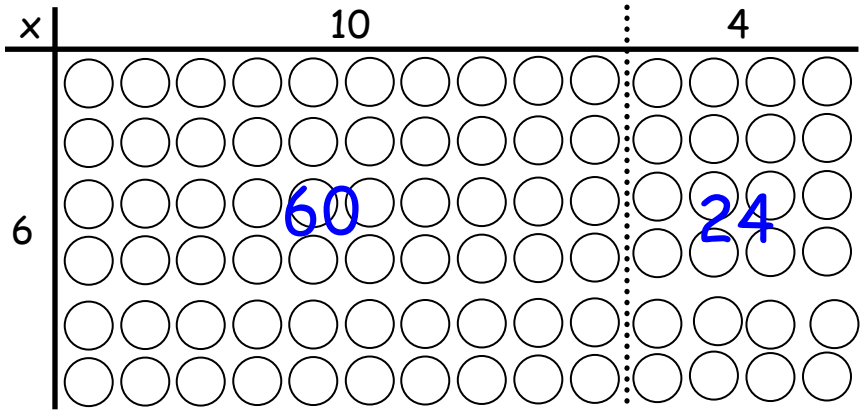


6 + 6 + 6 + 6

I can multiply 2-digits by a single digit number using a grid.

Children will continue to use arrays where appropriate leading into the grid method of multiplication.
This can be used a model for teachers to help introduce children to the grid method.

14 x 6 = 84



(6 x 10) + (6 x 4)

60 + 24

84

Children will approximate first
23 x 8 is approximately 25 x 8 = 200

x	20	3
8	160	24

160
+ 24
184

23 x 8 = 184

I can use grid multiplication to multiply numbers up to a 4 digits by a 2 digit number including decimals.

x	300	70	2
20	6000	1400	40
4	1200	280	8

372 x 24 = 8928

6000
+ 1400
+ 1200
+ 280
+ 40
+ 8
8928
1

4.92 x 3

Children will approximate first

4.92 x 3 is approximately 5 x 3 = 15

x	4	0.9	0.02
3	12	2.7	0.06

12.00
+ 2.70
+ 0.06
14.76

4.92 x 3 = 14.76

I can use a compact multiplication method.

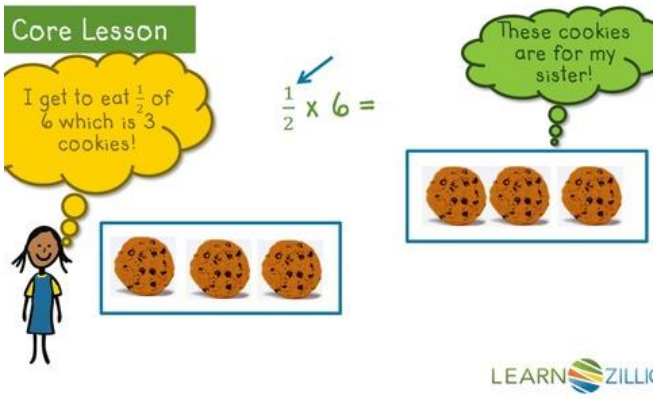
24 x 37

24
X 37
168
720
888

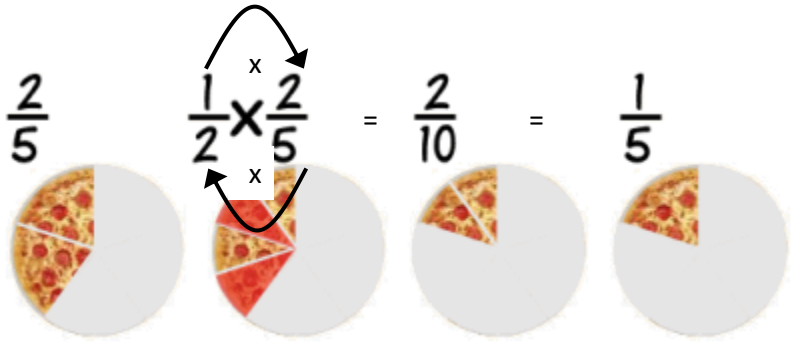
24 x 37 = 888

Multiplying Fractions

I can multiply proper fractions and mixed numbers by whole numbers using pictures and apparatus.

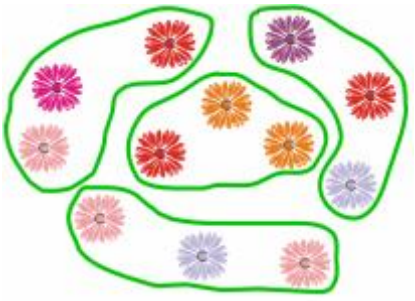


I can multiply simple pairs of proper fractions writing the answer in its simplest form.



Division

I can group and share small quantities using practical apparatus.



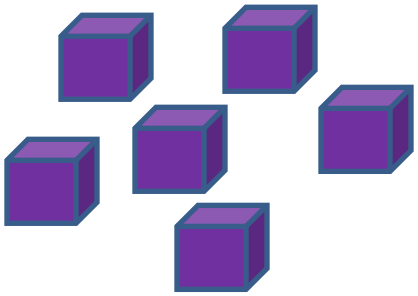
12 ÷ 3 = 4

12 ÷ 4 = 3

Vocabulary
Share, share equally, equal groups of, lots of, array, divide, divided by, division, grouping, left over, inverse remainder, quotient, divisor, prime number, prime factor, composite number (non-prime)

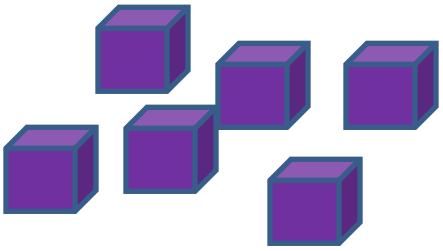
How many groups of 3 can you make from 12?
If you share 12 flowers between 4 people, how many do they get each?

I can find ½ of a group of objects.



½ of 12 is 6

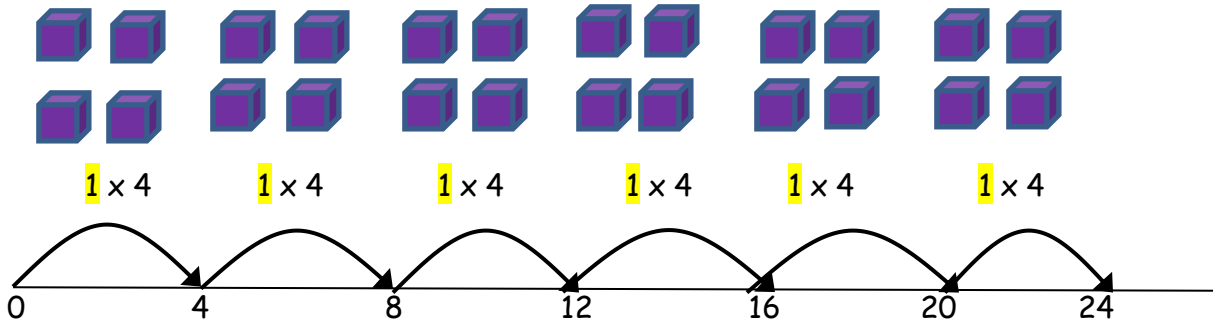
12 ÷ 2 = 6



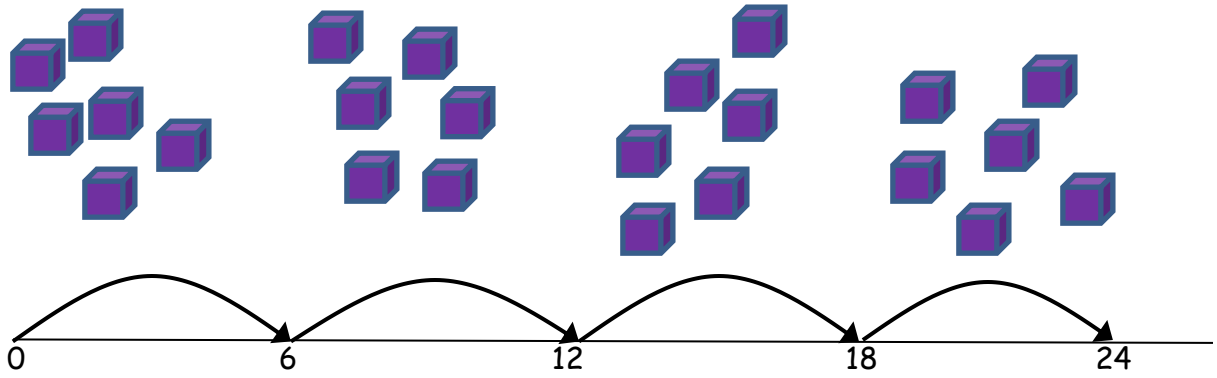
I understand both sharing and grouping as division.

24 ÷ 4 = 6

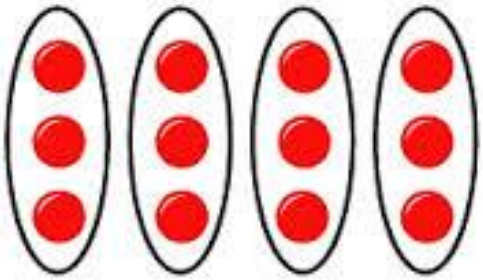
How many groups of 4 are there in 24?



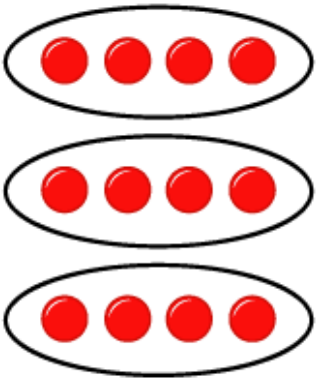
What is 24 shared in to 4 equal groups?



I can group objects using an array.



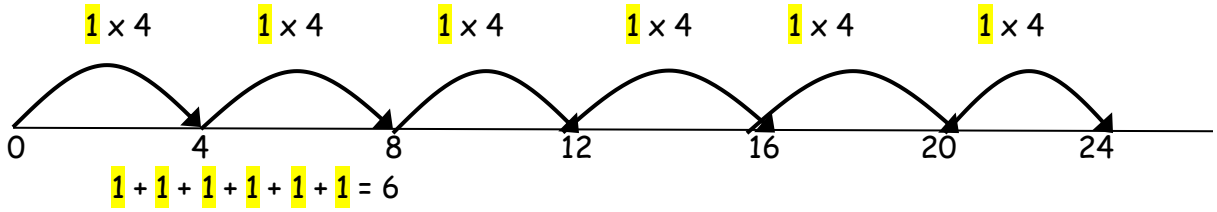
12 ÷ 3 = 4



12 ÷ 4 = 3

I can understand division as repeated addition using a number line.

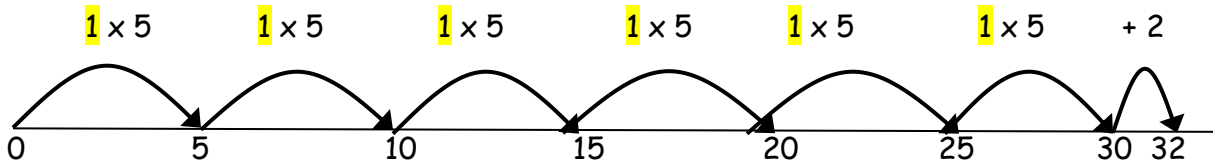
24 ÷ 4 = 6



1 + 1 + 1 + 1 + 1 + 1 = 6

I can use a number line to find a remainder.

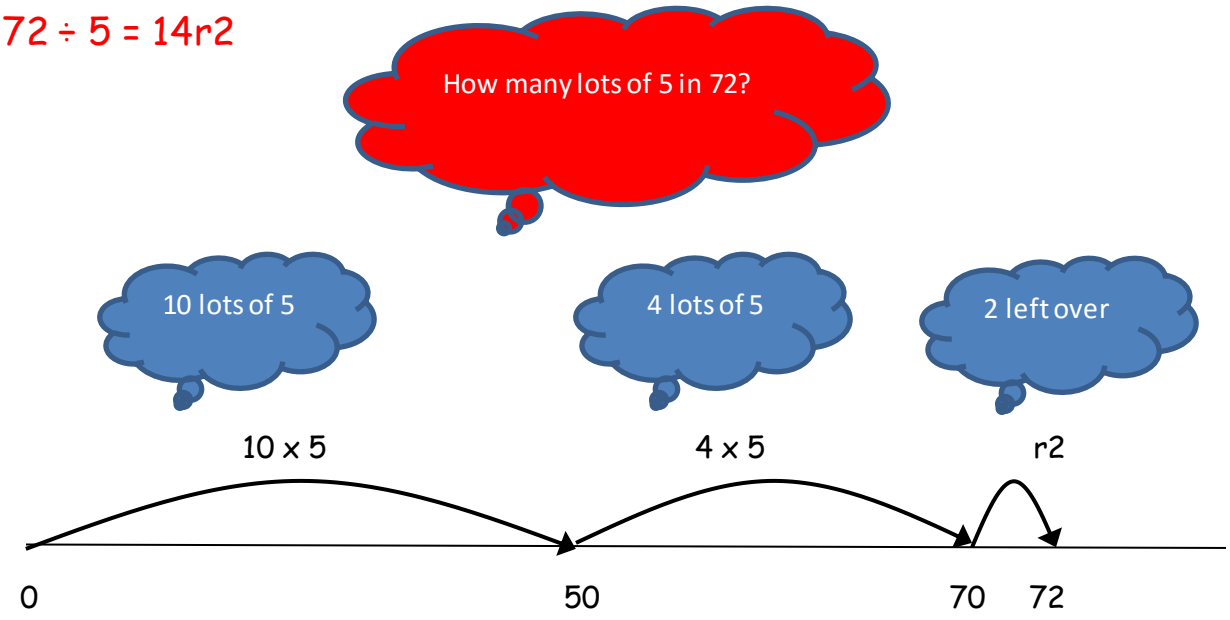
32 ÷ 5 = 6r2



1 + 1 + 1 + 1 + 1 + 1 = 6 r2

I can divide a number by using a blank number line and grouping the divisor.

72 ÷ 5 = 14r2



I can use a compact division method.

291 ÷ 3 = 97

$$3\overline{)291}\quad 97$$

I can use a compact division method showing the remainder as a decimal.

2.4 ÷ 5 = 0.48

$$5\overline{)2.^{2}4^{4}0}\quad 0.48$$

Dividing Fractions

Divide proper fractions by whole numbers.

$$\frac{2}{3} \div 6 = \frac{2}{3} \div \frac{6}{1}$$

$$= \frac{2}{3} \times \frac{1}{6}$$

$$= \frac{2}{18}$$

$$= \frac{1}{9}$$

- ✓ Reverse the numerator and denominator of the divisor and then multiply.