Understand the difference between equal and unequal groups.

The ____ have been grouped.
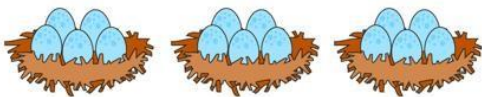
We can represent equal groups as repeated addition.

There are 3 groups of 5.

$5 + 5 + 5$

3×5

$5 + 5 + 5 = 3 \times 5$

We can represent repeated addition using a multiplication expression.
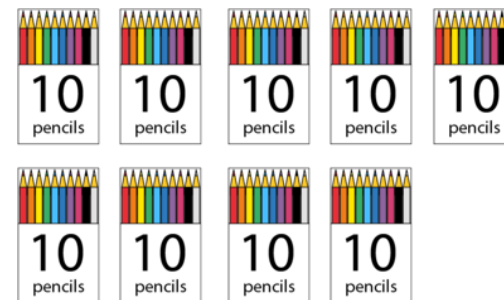
The 3 represents the number of groups.

The 5 represents the number of eggs in each group.

15 represents the total number of eggs.

The ____ represents the number of groups.

The ____ represents the number of ____ in each group.

____ represents the total number of ____.

9×10

We can skip count in multiples of ____ to work out the total amount.

10, 20, 30, 40 … there are 90 pencils altogether.

7×2

Notice how the representations allow the children to see each of the numbers (i.e. 10 pencils and 9 packets).

Multiplication and Division

Year 2

Grouping problems: missing factors and division

Vocabulary:

Multiplication   Division   Factor   'divided by'   Represents   Skip Counting

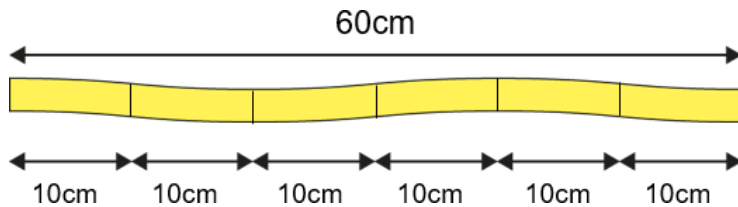Multiplication facts   Groups   Amount   Size

$3 \times 5 = 15$

$15 \div 5 = 3$

We can solve division problems by finding missing factors.

The 15 represents the number of biscuits.

The 5 represents the number of biscuits in each bag (group).

The 3 represents the number of bag (groups).

We can use ÷ to mean 'divided by'

We can use our knowledge of times tables to help solve division problems.

60cm

10cm   10cm   10cm   10cm   10cm   10cm

$6 \times 10 = 60$

$60 \div 10 = 6$

The 60cm represents the length of the ribbon.

The 10 represents the size of each piece.
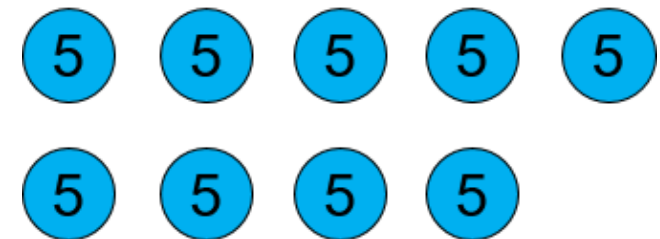
The 6 represents the number of pieces we can make.

$45 \div 5 = 9$

5 5 5 5 5

5 5 5 5

Multiplication and Division

Year 3

Multiplication and Division Structures

Identify that multiplication is commutative.

4 x 5 = 5 x 4

Factor times factor is equal to product.

The order of the factors does not affect the product.

Making groups of

Removing groups of

Receiving a share

Giving a share
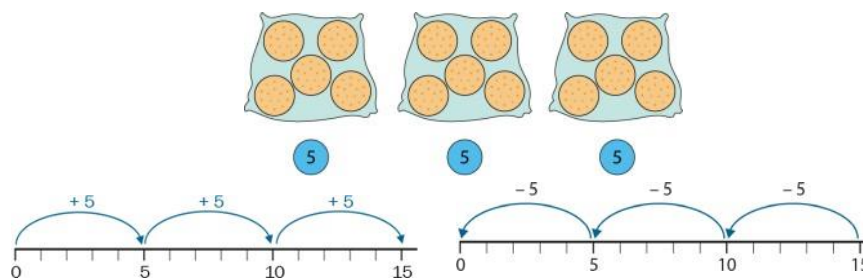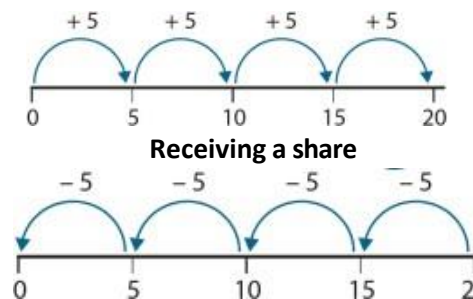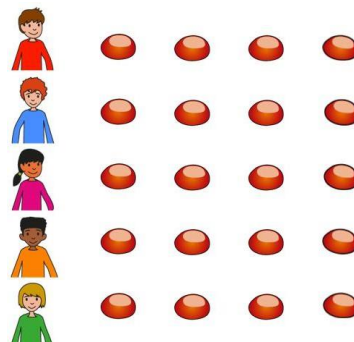
Division equations can be used to represent 'grouping' problems.

We can use multiplication facts to find the number of groups.

(Quotitive division)

15 divided into groups of 5 is equal to 3.
5 + 5 + 5 = 15
15 − 5- 5 − 5 = 0
15 ÷ 5 = 3

Division equations can be used to represent 'sharing' problems.

We can use multiplication facts to find the size of groups.

(Partitive division)

Four fives are four each.
20 divided between 5 is equal to 4 each.
20 ÷ 5 = 4
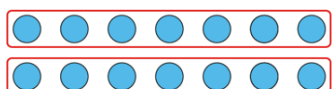
14 ÷ 2 = 7

14	
7	7

The same equation can be represented in both grouping and sharing contexts.

7 times 2 is 14, so 14 ÷ 2 = 7

14 ÷ 2 = 7

14						
2	2	2	2	2	2	2

Multiplication and Division

Year 4

Multiplying and Dividing by 10 and 100

Vocabulary:

Multiply   Divide   Unitise   Ten/Hundred times   Bigger   Smaller   One-tenth the size   One-hundredth the size   Gattegno chart   Factor   Product   Multiple   Groups of   Inverse

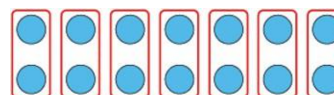| 1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9

Develop language in order to multiply and divide by 10 or 100.

80 is ten times bigger than 8.
8 is ten times smaller than 80.
80 is ten times the size of 8
8 is one-tenth the size of 80.

800 is one hundred times bigger than 8.
8 is one hundred times smaller than 800.
800 is on hundred times the size of 8
8 is one-hundredth the size of 80.

$8 \times 1 = 8$
8×1 ten $-$ 8 tens
8×1 hundred = 8 hundreds

Generalisations

All multiples of 10 have a ones digit of zero.

All multiples of 100 have both a tens and ones digit of zero.

To find the inverse of ___times as many, you divide by ____.

If one factor if made ___times bigger/smaller then the product will be ten times bigger/smaller

8 made ____times the size is ____.
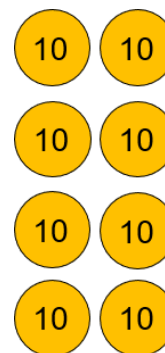
ten times the size
x10

1,000s	100s	10s	1s
			8
		8	0

÷10
one-tenth of the size

one hundred times the size
x100

1,000s	100s	10s	1s
			8
	8	0	0

÷100
one-hundredth of the size
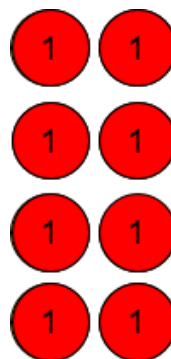
$8 \times 1 = 8$ $8 \times 10 = 80$ $8 \times 100 = 800$

8 groups of ____is ____.

Multiplication and Division

Year 4

Manipulating the Multiplicative Relationship
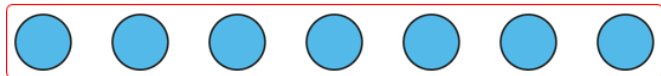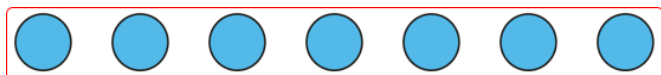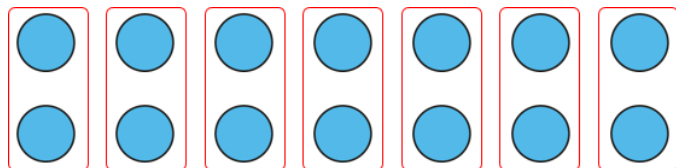
$$2 \times 7 = 7 \times 2$$

Understand that multiplication is commutative and the factors can be

2 groups of 7 is equal to 14.

2, 7 times is equal to 14.

2 groups of 7 is equal to 7, two times.

$$2 \times 7 = 14$$
$$7 \times 2 = 14$$

7   7
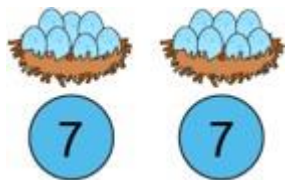
The 2 represents ____.

The 7 represents ____.

The 14 represents ____.

2   2   2   2   2   2   2
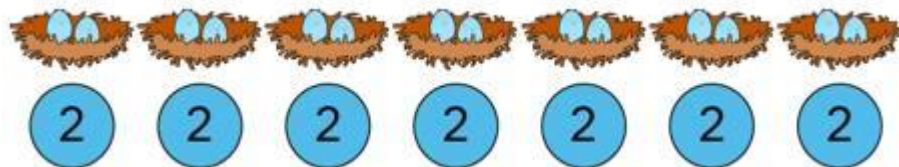
Match equations to representations and contexts.

$2 \times 7 = 14$

2 groups of 7
7   7

$14 \div 7 = 2$

2 groups of 7
7   7

$7 \times 2 = 14$

7 groups of 2
2   2   2   2   2   2   2

$14 \div 2 = 7$

7 groups of 2
2   2   2   2   2   2   2

Vocabulary:

Multiplication   Distributive Law   Adjacent   Multiples   Factors   Partitioning
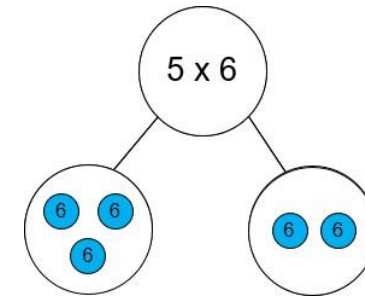Equations   Expressions   Arrays   Part-whole model   Difference

$0 × 6 = 0$
$1 × 6 = 6$ $+6$
$2 × 6 = 12$ $+6$
$3 × 6 = 18$ $+6$
$4 × 6 = 24$ $+6$
$5 × 6 = 30$ $+6$
$6 × 6 = 36$
$7 × 6 = 42$
$8 × 6 = 48$
$9 × 6 = 54$
$10 × 6 = 60$
$11 × 6 = 66$
$12 × 6 = 72$

$6 × 0 = 0$
$6 × 1 = 6$ $+6$
$6 × 2 = 12$ $+6$
$6 × 3 = 18$ $+6$
$6 × 4 = 24$ $+6$
$6 × 5 = 30$ $+6$
$6 × 6 = 36$
$6 × 7 = 42$
$6 × 8 = 48$
$6 × 9 = 54$
$6 × 10 = 60$
$6 × 11 = 66$
$6 × 12 = 72$

Adjacent multiples of _____ have a difference of _____.

4 × 6 + 6

Five sixes is one more six than four sixes.

5 x 6

6 6
6
6 6

$3 × 6 + 2 × 6 = 5 × 6$

5 is equal to 3 plus 2, so 5 sixes is equal to 3 sixes plus 2 sixes.
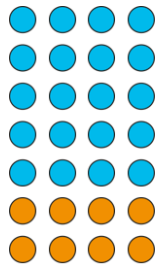
7 = 5 + 2
$7 × 4 = 5 × 4 + 2 × 4$
$= 20 + 8$
$= 28$

We can partition one of the factors to make calculations easier.

$13 × 7 = 91$
10   3
7
70   21
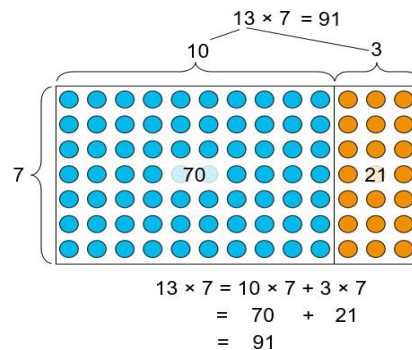
$13 × 7 = 10 × 7 + 3 × 7$
$=   70   +   21$
$=   91$
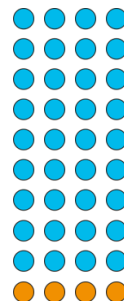
9 = 10 − 1
$9 × 4 = 10 × 4 − 1 × 4$
$= 40 − 4$
$= 36$

We can partition the factors in different ways to make calculations easier.

$16 × 5 = 80$
10   6
5   50   30

$16 × 5 = 10 × 5 + 6 × 5$
$= 50 + 30$
$= 80$

$16 × 5 = 80$
8   8
5   40   40
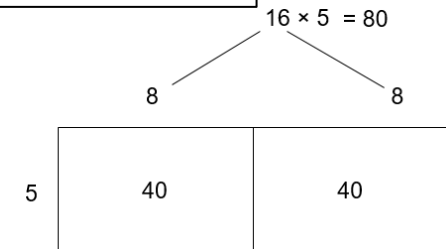
$16 × 5 = 8 × 5 + 8 × 5$
$= 40 + 40$
$= 80$

Multiplication and Division

Year 5

Multiplying and Dividing by 10 and 100 (1)

$8 \div 10 =$

$0.8 \div 10 =$

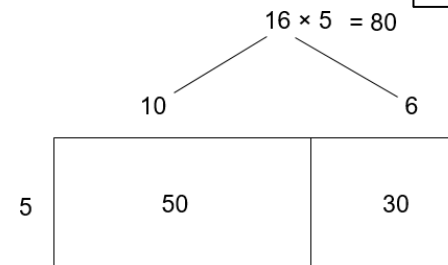| 1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

$\div 10$
$\div 10$
one-tenth the size

We can multiply and divide a number by 10.

$0.08 \times 10 =$

$0.8 \; \times 10 =$

1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

$\times 10$
$\times 10$
ten times the size
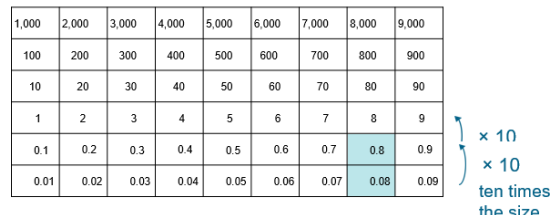
8, made one-tenth the size is 0.8.

8 divided by 10 is 0.8.

First we had 8 ones, now we have 8 tenths.

$8 \div 10 = 0.8$

one-tenth of the size
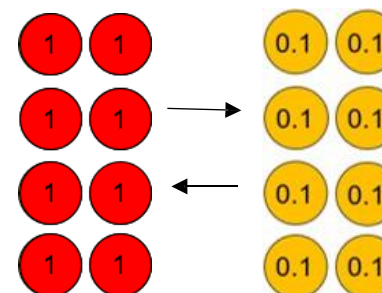
$0.8 \times 10 = 8$

ten times the size

$8 \div 100 = 0.08$

one-hundredth of the size

**We can multiply and divide a number by 100.
Multiplying by 100 is the same as
multiplying/dividing by 10 twice.**

8, made 100 times smaller is 0.08.

8 divided by 100 is 0.08.

First we had 8 ones, now we have 8 hundredths
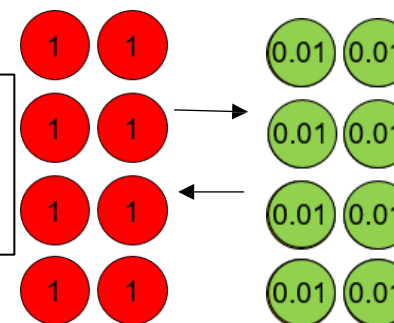
$0.08 \times 100 = 8$

one hundred times the size

Multiplication and Division

Year 5

Multiplying and Dividing by 10 and 100 (2)

1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

$3.6 \times 10 = 36$

$36 \div 10 = 3.6$

ten times the size

x10   x10

100s	10s	1s	0.1s
		1	8
	1	8	0

÷10   ÷10

one-tenth of the size

$18 \div 10 = 1.8$

one-tenth of the size

1.8 is one-tenth the size of 18

18 divided by 10 is 1.8.

___divided by 10/100 is equal to___.

___is one-tenth/hundredth the size of ___.

___multiplied by 10/100 is equal to___.

___is 10/100 times the size of ___.

$1.8 \times 10 = 18$

ten times the size

We can multiply and divide numbers with digits greater than 0 by 10 or 100.

Generalisation

To multiply by 10, move each digit one place to the left.

To multiply by 100, move each digit two places to the left.

To divide by 10, move each digit one place to the right.

Vocabulary:

Multiply   Divide   Unitise   Ten/Hundred times   Bigger   Smaller   One-tenth the size
One-hundredth the size   Gattegno chart   Factor   Product   Multiple   Groups of
Inverse   Ones   Tens   Hundreds   Tenths   Hundredths

1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000
100	200	300	400	500	600	700	800	900
10	20	30	40	50	60	70	80	90
1	2	3	4	5	6	7	8	9
0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09

$0.27 \times 10 = 2.7$

$2.7 \div 10 = 0.27$

0.27 is one-tenth the size of 2.7

2.7 divided by 10 is 0.27.

ten times the size

x10   x10   x10

10s	1s	0.1s	0.01s
	0 • 4	4
	4 • 4	

÷10   ÷10   ÷10

one-tenth of the size

$4.4 \div 10 = 0.44$

one-tenth of the size

___divided by 10/100 is equal to__.

___is one-tenth/hundredth the size of __.

___multiplied by 10/100 is equal to__.
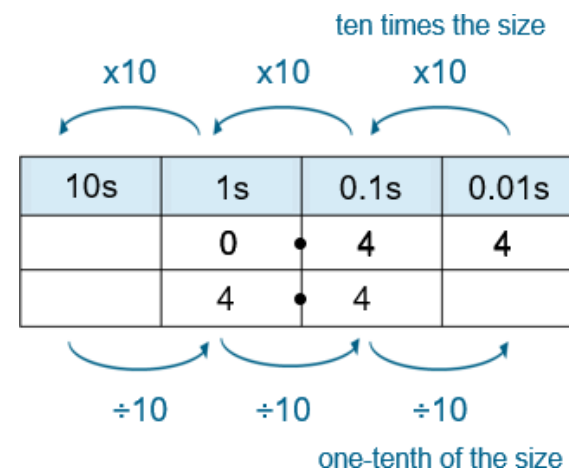
___is 10/100 times the size of __.
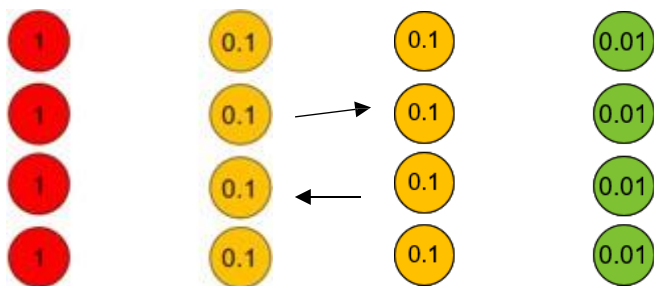
$0.44 \times 10 = 4.4$

ten times the size

We can multiply and divide numbers with digits greater than 0 by 10 or 100.

Generalisation

To multiply by 10, move each digit one place to the left.

To multiply by 100, move each digit two places to the left.

To divide by 10, move each digit one place to the right.
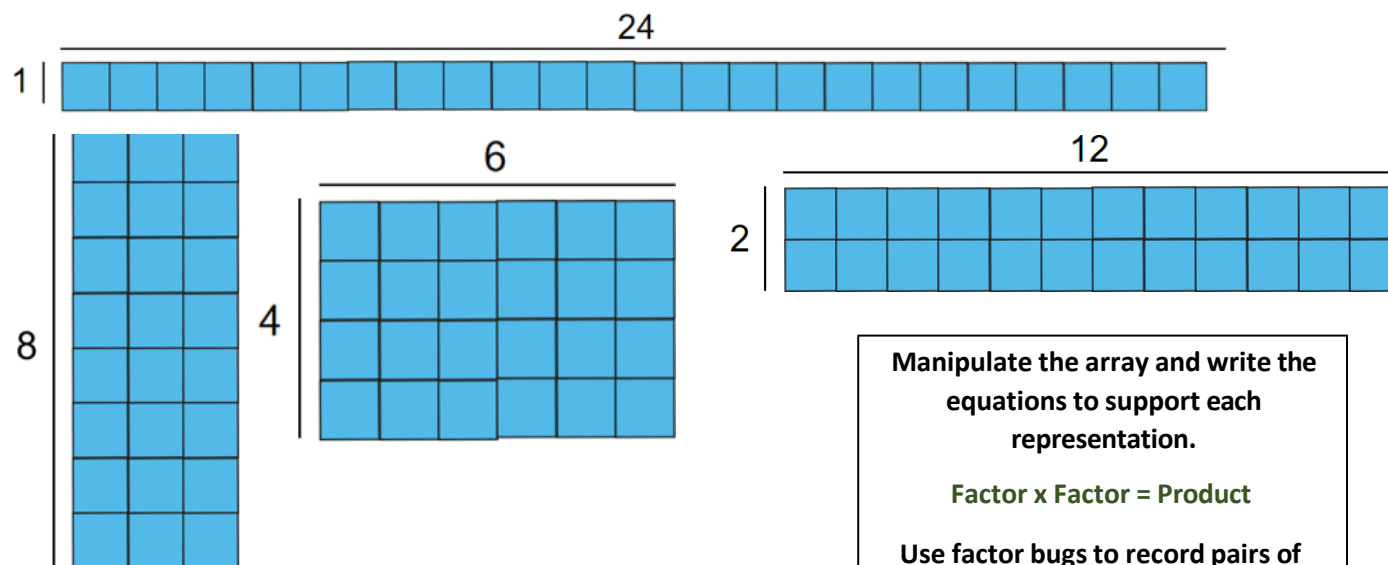
Vocabulary:

Factor   Multiple   Composite   Square   Prime   Common Factor   Prime Factor

Factor Bug   Array   Positive Integer   Working Systematically

Factor x Factor = Product   Dividend ÷ Divisor = Quotient

24

1 |

6

2

12

$8 \times 3 = 24$

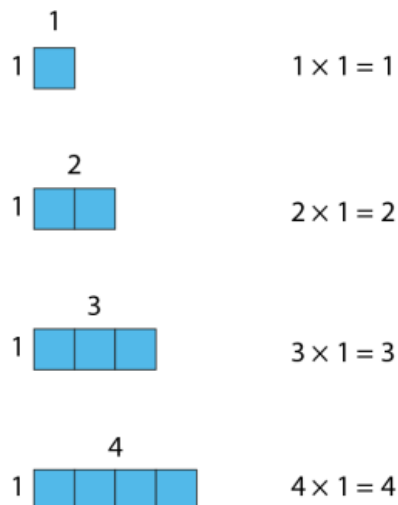$4 \times 6 = 24$

$2 \times 12 = 24$

$1 \times 24 = 24$

8

4

There are ____ tiles. There are ____ rows and ____ columns. So ____ and ____ are factors of ____.

Generalise: Numbers that have more than two factors are composite numbers.

Manipulate the array and write the equations to support each representation.

Factor x Factor = Product

Use factor bugs to record pairs of factors.

1

1   ☐ $1 \times 1 = 1$

2

1   ☐☐ $2 \times 1 = 2$

3

1   ☐☐☐ $3 \times 1 = 3$

4

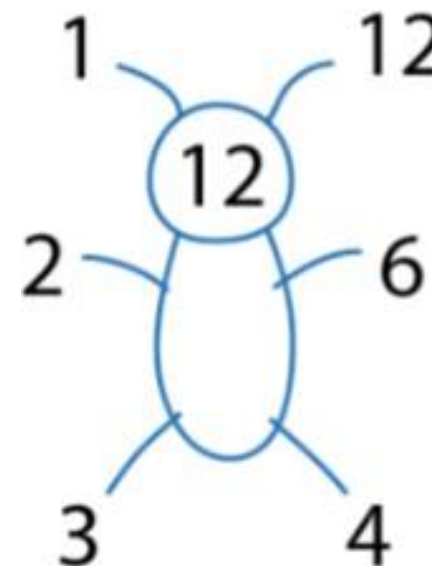1   ☐☐☐☐ $4 \times 1 = 4$

Generalise:

When one is a factor, the product is equal to the other factor.

All positive integers have a factor of 1.

Every positive integer is a factor of itself.

The smallest factor of a positive integer is always 1. The largest factor of a positive integer is always itself.

1   12

12

2   6

3   4

Multiplication and Division

Year 5

Find Factors and Multiples

1   2   3   4   5   6

Make connections with factors and times tables. Make connections with factors of factors

_____is a factor of ____because it is in the ____times table.

Nine is a factor of all of these numbers.

Three is a factor of nine which means it is also a factor of all of these numbers.

Extend this to square numbers, and prime numbers recognising the number of factors.

×	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

Is 9 a factor of 54?

$54 ÷ 9 = 6$

9 and 6 are factors of 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

Use factor bugs to find

common factors   and   prime factors.

2

3

Introduce Multiples

____is a factor of ____because ____x ____= ____.
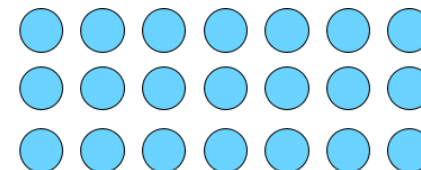
____ is a multiple of ____because ____x ____= ____

____is a factor of ____because ____÷ ____= ____.
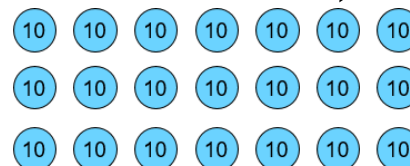
____ is a multiple of ____because ____÷ ____= ____

7 × 3 = 21

Make statements about factors and multiples whilst increasing the amount of each counter in the array.
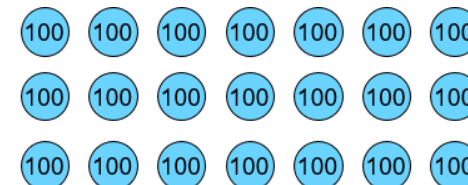
____represents the number of counters in each row.

____represents the total value of the counters in each column.

____represents the total value of the counters.

3, 7, 10, 21 and 70 are factors of 210.

210 is a multiple of 3, 7, 10, 21 and 70.

Identify Common Multiples using 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

Factors of 100 can be applied to contexts

1 — 100
100
2 — 50
4 — 25
5 — 20
10   10

7 × 30 = 210

70 × 3 = 210

10 x 21 = 210

7 × 300 = 2,100

700 × 3 = 2,100

100 x 21 = 2,100

Multiplication and Division

Year 5

Multiply using a Formal Written Method (1)

34 chairs

2 rows

Move between representations of dienes and expanded written multiplication.
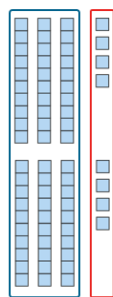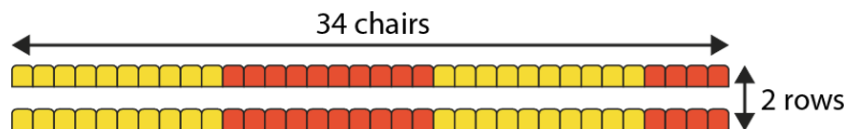
10s	1s
3	4
×	2

Use dienes to represent context as repeated addition and move to multiplication.
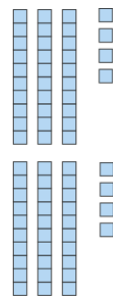
34 = 30 + 4
34 × 2 = 30 × 2 + 4 × 2
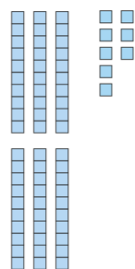
10s	1s
3	4
×	2
	8

2 × 4 ones = 8 ones
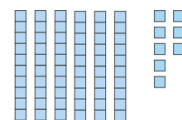
10s	1s
3	4
×	2
	8
6	0

2 × 4 ones = 8 ones
2 × 3 tens = 6 tens

321 × 3 =   963

100s	10s	1s
3	2	1
×		3
		3
	6	0
9	0	0
9	6	3

3 3 × 1 ones = 3 ones
6 0 3 × 2 tens = 6 tens
9 0 0 3 × 3 hundreds = 9 hundreds

3 2 1
×   3
9 6 3
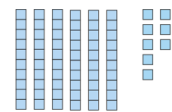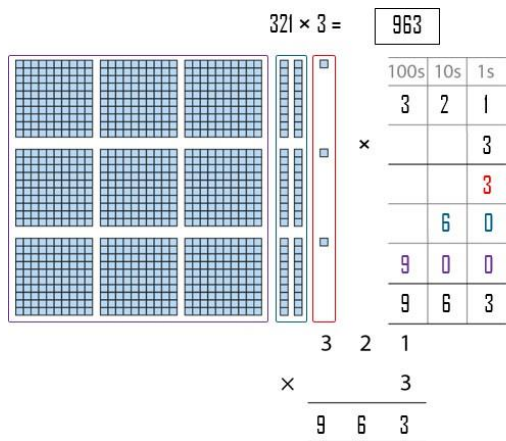
Represent 3 digit by 1 digit multiplication without exchanges using dienes, moving from expanded layout to compact layout.

10s	1s
3	4
×	2
6	8

Move between representations of expanded layout and compact layout.

10s	1s
3	4
×	2
	8
6	0
6	8

2 × 4 ones = 8 ones
2 × 3 tens = 6 tens

Multiplication and Division

Year 5

Multiply using a Formal Written Method (2)
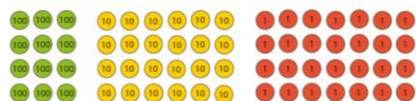
$367 \times 4 = \boxed{}$

	1,000s	100s	10s	1s
		3	6	7
×				4

Represent 3 digit by 1 digit multiplication with exchanges using place value counters, moving from expanded layout to compact layout.

$367 \times 4 = \boxed{}$

$367 \times 4 = \boxed{}$

	1,000s	100s	10s	1s
		3	6	7
×				4
			2	8

4×7 ones = 28 ones
= 2 tens + 8 ones
4×6 tens = 24 tens
= 2 hundreds + 4 tens
4×3 hundreds = 12 hundreds
= 1 thousand + 2 hundreds

	1,000s	100s	10s	1s
		3	6	7
×				4
			2	8
		2	4	0
	1	2	0	0

$367 \times 4 = \boxed{367 \times 4 = \text{ }}$

$367 \times 4 = \boxed{1,468}$

	1,000s	100s	10s	1s
		3	6	7
×				4
			2	8

$367 \times 4 = \boxed{}$

	1,000s	100s	10s	1s
		3	6	7
×				4
			2	8
		2	4	0

4×7 ones = 28 ones
= 2 tens + 8 ones
4×6 tens = 24 tens
= 2 hundreds + 4 tens

4×7 ones = 28 ones
= 2 tens + 8 ones

Move from expanded layout to compact layout.

$$\begin{array}{r} 3\ 6\ 7 \\ \times \quad\ 4 \\ \hline 1\ 4\ 6\ 8 \\ 2\ \ 2 \end{array}$$

If there are 10 or more ones, we must regroup ones into tens and ones.

If there are 10 or more tens, we must regroup into hundreds and tens.

If there are 10 or more hundreds, we must regroup into thousands and hundreds.

Multiplication and Division

Year 5

Divide using a Formal Written Method (1)

84	÷	4	=	21	$\begin{array}{r} 2\ \ 1 \\ 4\overline{)8\ \ 4} \end{array}$
dividend	÷	divisor	=	quotient	$\dfrac{\text{quotient}}{\text{divisor}\overline{)\text{dividend}}}$

Use sticks to represent partitive (sharing) context where the dividend is divisible (to give a whole number). Skip count in multiples of the divisor.

84 sticks shared equally between 4 children. How many sticks each?

$$84 \div 4 = \boxed{}$$

Step 1 – write the divisor and dividend:

10s 1s

$4\overline{)8\quad 4}$

Remove a group of 4 each time before sharing.

One four is one each. That's four.

Two fours is two each. That's eight.

Eight divided between 4 is equal to two each.

Each child gets two sticks.

Step 2 – share the 10s:

10s 1s

$\begin{array}{r} 2 \\ 4\overline{)8\quad 4} \end{array}$

8 tens ÷ 4 = 2 tens

8 tens divided by 4 is equal to 2 tens.

Step 3 – share the 1s:

10s 1s

$\begin{array}{r} 2\quad 1 \\ 4\overline{)8\quad 4} \end{array}$

8 tens ÷ 4 = 2 tens
4 ones ÷ 4 = 1 one

Add the partial quotients to find the quotient.

2 tens + 1 one = 21

8 tens ÷ 4 = 2 tens
4 ones ÷ 4 = 1 one

10s   1s

$\begin{array}{r} 2\quad\ 1 \\ 4\overline{)} \end{array}$

72 sticks shared equally between 3 children. How many sticks each?

$$72 \div 3 = \boxed{}$$

Step 1 – write the divisor and the dividend:

$3\overline{)7\ \ {}^{1}2}$

Step 2 – share the 10s:

$3\overline{)7\ \ 2}^{\ 2}$
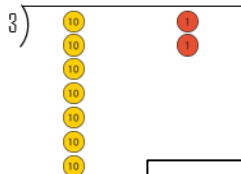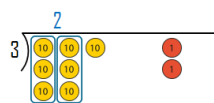
7 tens ÷ 3 = 2 tens r 1 ten

Step 3 – exchange:

$3\overline{)7\ \ {}^{1}2}^{\ 2}$
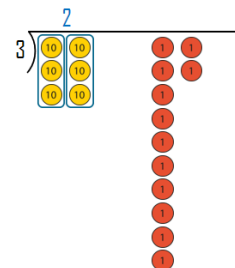
7 tens ÷ 3 = 2 tens r 1 ten

$$72 \div 3 = \boxed{24}$$

Step 4 – share the 1s:

$3\overline{)7\ \ {}^{1}2}^{\ 2\ \ 4}$

7 tens ÷ 3 = 2 tens r 1 ten
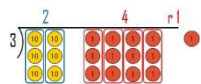12 ones ÷ 3 = 4 ones

Use sticks and place value counters to represent partitive (sharing) context where the dividend is divisible (to give a whole number) though requires an exchange from the tens. Skip count in multiples of the divisor.

If dividing the tens gives a remainder of one or more ten, we must exchange the remaining tens for ones.

$$73 \div 3 = \boxed{24\ r\ 1}$$

$3\overline{)7\ \ {}^{1}3}^{\ 2\ \ 4\ r1}$

7 tens ÷ 3 = 2 tens r 1 ten
13 ones ÷ 3 = 4 ones r 1 one

Apply the same representations though this time include a remainder.

Then extend to division of 3 digits by one digit and where there can be no hundreds cannot be shared.

If dividing the hundreds gives a remainder of one or more hundred, we must exchange the remaining hundreds for tens.

$$612 \div 4 = \boxed{153}$$

$4\overline{)6\ \ {}^{2}1\ \ {}^{1}2}^{\ 1\ \ 5\ \ 3}$
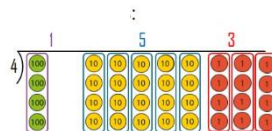
6 hundreds ÷ 4 = 1 hundred r 2 hundreds
2 hundreds = 20 tens
21 tens ÷ 4 = 5 tens r 1 ten
1 ten = 10 ones
12 ones ÷ 4 = 3 ones

Addition, Subtraction, Multiplication and Division

Year 6

Quantify additive and multiplicative relationships

**Vocabulary:**

Additive   Multiplicative   Relationship   Represents Compose Combine   Total

More than   Less than   Plus +   Minus -   Equal to =   Addition   Subtraction   Divide ÷

Multiply x   One-_____of   Equation   Expression   Bar Model   Whole   Part

Difference   Multiplier   Unknown   Sequence

Addend + Addend = Sum   Factor x Factor = Product (Multiplicand x Multiplier = Product)
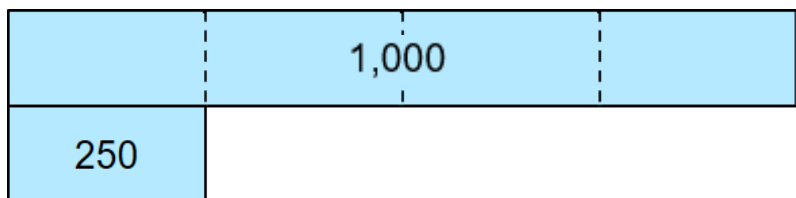
Minuend – Subtrahend = Difference   Dividend ÷ Divisor = Quotient
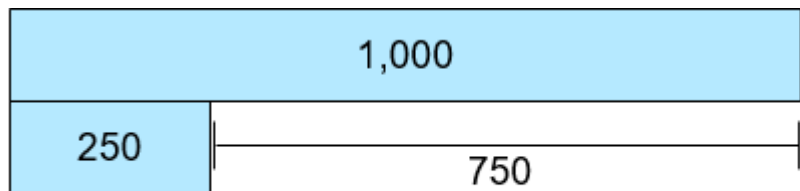
| 1,000 |
| 250 |
| 750 |

250 + 750 = 1,000   1,000 – 750 = 250

| 1,000 |
| 250 |

250 x 4 = 1,000   1000 ÷ 4 = 250

The relationship between two numbers can be expressed both additively and multiplicatively.

+ ☐

250 → 1,000

– ☐

1000 is ___more than 250.

250 is ____less than 1000.

x ☐

250 → 1,000

÷ ☐
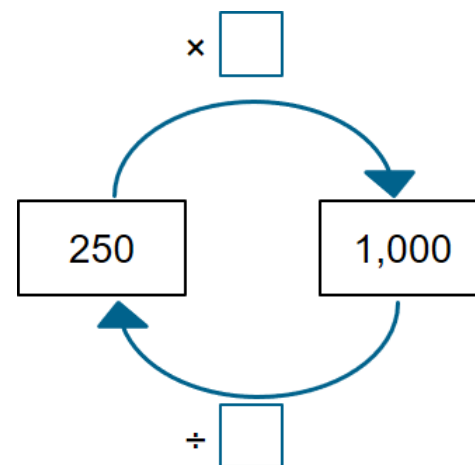
1000 is ___times the size of 250.

250 is one-_____of 1000.

To find one-quarter of a number, we divide by 4.

+ 0.4   + 0.4

| | 1.2 | 1.6 | |

– 0.4   – 0.4

Finding the difference can help calculate the unknown terms in a sequence.

Finding the known multiplier can help calculate the unknown terms in a sequence.

x 100   x 100

| | 6 | 600 | |

÷ 100   ÷ 100

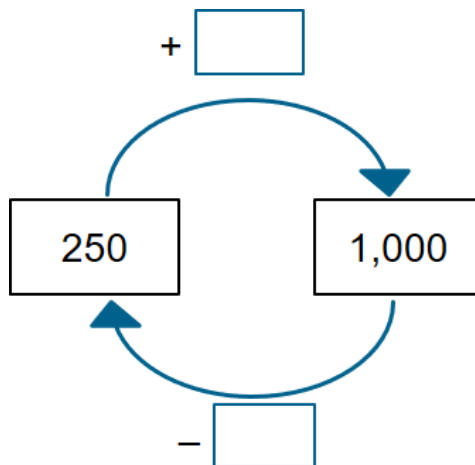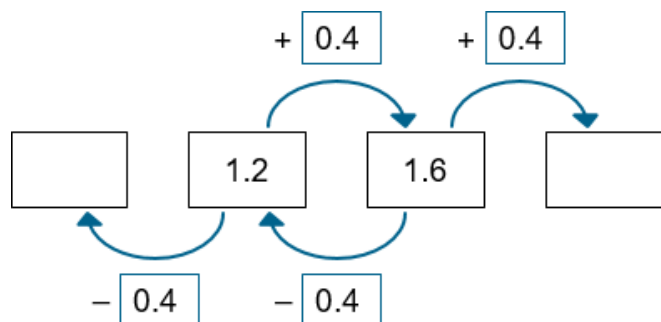| Addition, Subtraction, Multiplication and Division **Year 6** **Quantify additive and multiplicative relationships**	**Vocabulary:** Additive Multiplicative Relationship Represents Compose Combine Total More than Less than Plus + Minus - Equal to = Addition Subtraction Divide ÷ Multiply x One-_____of Equation Expression Bar Model Whole Part Difference Multiplier Unknown Sequence Addend + Addend = Sum Factor x Factor = Product (Multiplicand x Multiplier = Product) Minuend – Subtrahend = Difference Dividend ÷ Divisor = Quotient

$\frac{1}{3}$ of ? = 10

10

$\frac{1}{3}$ of ? = 10

Calculate the unknown whole by recognising how many parts the whole has been divided into.

30		
10	10	10

$\frac{1}{3}$ of 30 = 10

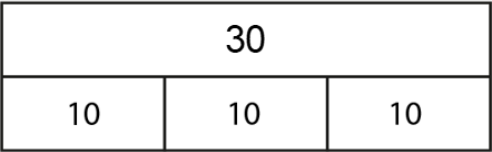| Addition and Subtraction	Vocabulary:
Year 6	Additive Multiplicative Relationship Represents Equation Unknown Re-arrange Inverse Place Value Properties Commutative Associative Distributive Compensation
Derive Related Calculations	Addend + Addend = Sum Factor x Factor = Product (Multiplicand x Multiplier = Product) Minuend – Subtrahend = Difference Dividend ÷ Divisor = Quotient

$252 = 3 \times 84$	$252 = 3 \times 84$	$252 = 3 \times 84$
$2{,}520 = 30 \times \boxed{}$	$\boxed{} = 3 \times 85$	$252 = 3 \times 60 + 3 \times \boxed{}$

Manipulate an equation to solve another. Pupils could:

- rearrange the terms;
- rewrite using inverse operations;
- apply place value;
- use the properties of division that correspond to the commutative, associative or distributive property of multiplication;
- use the compensation property.

Additive examples

Multiplicative examples

$625 - 148 = 477$	$625 - 148 = 477$	$625 - 148 = 477$
$6{,}250 - 1{,}480 = \boxed{}$	$625 - 70 - \boxed{} = 477$	$625 - 248 = \boxed{}$

$14.8 + 7.6 = 22.4$	$14.8 + 7.6 = 22.4$	$14.8 + 7.6 = 22.4$
$1{,}480 + \boxed{} = 2{,}240$	$\boxed{} - 7.6 = 14.8$	$12.8 + \boxed{} = 22.4$

$4{,}800 \div 25 = 192$	$4{,}800 \div 25 = 192$	$4{,}800 \div 25 = 192$
$25 \times 192 = \boxed{}$	$4{,}800 \div 250 = \boxed{}$	$4{,}800 \div 5 \div 5 = \boxed{}$

Vocabulary:

Additive   Multiplicative   Relationship   Represents   Equation   Unknown   Scale-factor   Ratio   Ratio Table   ___times the size   one-___the size of   Vertical   Horizontal

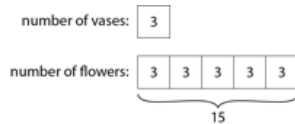Factor x Factor = Product (Multiplicand x Multiplier = Product)

Dividend ÷ Divisor = Quotient

number of vases: 1

number of flowers: 1 1 1 1 1

5

$1 \times 5 = 5$

$5 \div 5 = 1$

$5 \times \frac{1}{5} = 1$

number of vases: 3

number of flowers: 3 3 3 3 3

15
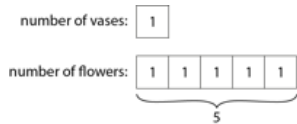
$3 \times 5 = 15$

$15 \div 5 = 3$

$15 \times \frac{1}{5} = 3$
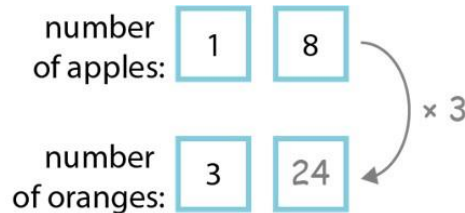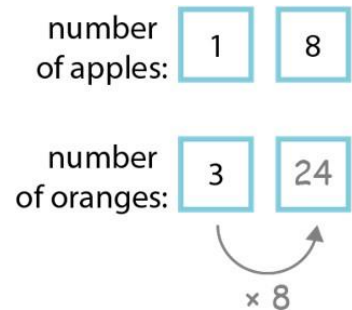
Ratio table to compare sets of information.

For every ___, there are ___.

For every 1 litre of petrol, you can drive 7 miles.

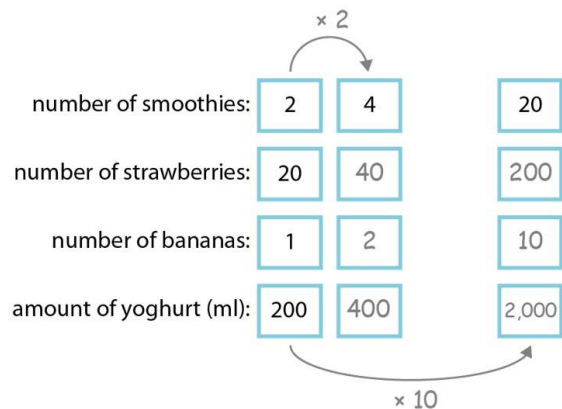**For every 7 miles you will drive, you need 1 litre of petrol.**

Extend sequences using knowledge of patterns based on ratio table.

Litres of petrol	1	2	3	4	5	6	7	8	9	10
Miles driven	7	14	21	28	35	42	49	56	63	70

number of apples: 1   8

number of oranges: 3   24

× 8

number of apples: 1   8

number of oranges: 3   24

× 3

Explore vertical and horizontal relationship between numbers.

For every ___, there are ___.

× 2

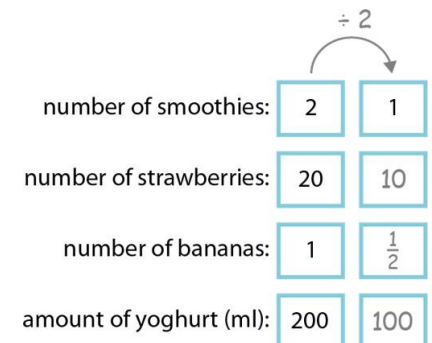| number of smoothies:	2	4		20
number of strawberries:	20	40		200
number of bananas:	1	2		10
amount of yoghurt (ml):	200	400		2,000

× 10

Identify the scale-factor in order to find unknown values.

___is ___times the size of ___.

Therefore I must multiply/divide by ___.

___is one-___the size of ___.

÷ 2

number of smoothies:	2	1
number of strawberries:	20	10
number of bananas:	1	$\frac{1}{2}$
amount of yoghurt (ml):	200	100

Addition and Subtraction

Year 6

Solve Problems with Two Unknowns

B

| r | b |

$$B = \boxed{r} + \boxed{b}$$
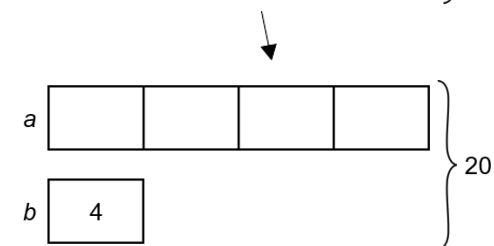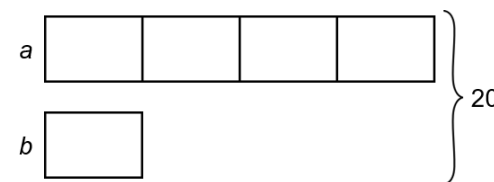
B

| p | y |

$$B = \boxed{p} + \boxed{y}$$

Use Cuisenaire to find 2 bars of total length that are equal to another.

There is more than one solution to the problem.
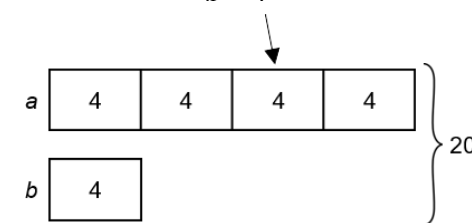
There can be infinite solutions to a problem.

$$5 \times \boxed{} = 10 \times \boxed{}$$

Solve multiplicative problems with two unknowns when the total is known.

v

a | | | | }
b | } 20

a | | | | }
b | 4 } 20

one part = 20 ÷ 5 = 4

b = 4

a | 4 | 4 | 4 | 4 }
b | 4 } 20
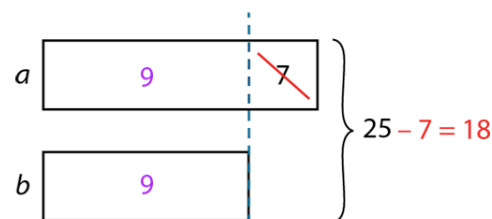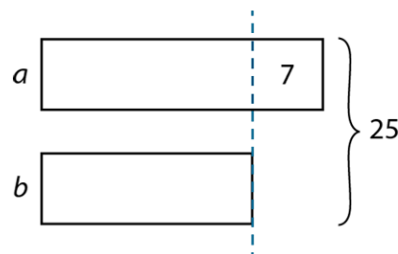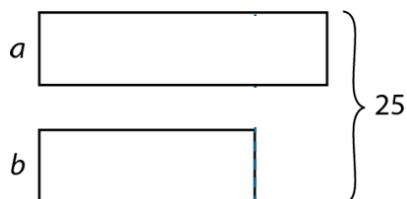
one part = 20 ÷ 5 = 4

b = 4

a = 4 × 4 = 16

The two numbers are 16 and 4.

Solve additive problems with two unknowns when the total is known.

a | | }
b | | } 25

a | | 7 }
b | | } 25 →

a | 9 | 7 }
b | 9 | } 25 – 7 = 18

b = 18 ÷ 2 = 9

a = 9 + 7 = 16

The two numbers are 9 and 16.