



ENGLEFIELD CE PRIMARY SCHOOL

PROGRESSION IN CALCULATIONS POLICY

Sowing the seeds for a flourishing future

The following policy reflects our values and philosophy in relation to the provision and teaching of mathematics. At Englefield CE Primary School it is our aim to provide a high quality mathematics education, essential for everyday life, to enable all children to grow and flourish mathematically.

In order to do this, children need to be taught consistent and progressive calculation methods and the mathematical language associated with them. For this reason, staff follow this progression in calculation which is based on the National Curriculum for Key Stages 1 and 2 and White Rose Maths Calculation Guidance.

A child may be taught a calculation method from a lower age group if that enables mastery. They must not be accelerated through the content for higher year groups if they grasp a calculation method quickly.

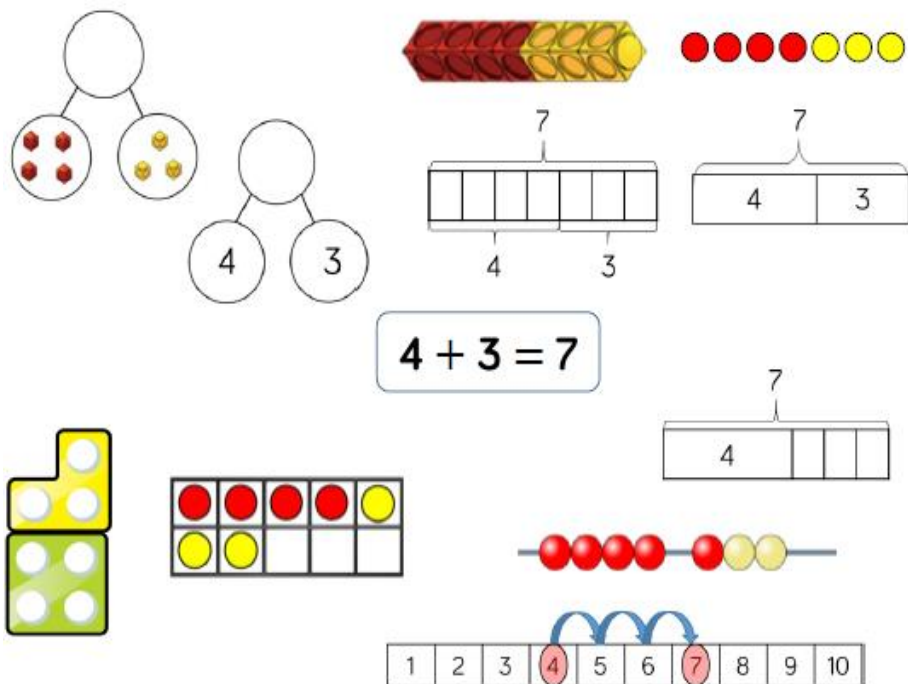
Addition	p 2 - 6
Subtraction	p 7 - 10
Times Tables	p 11 - 16
Multiplication	p 17 - 19
Division	p 20 – 27 (including fractions and percentages)

Management of Policy

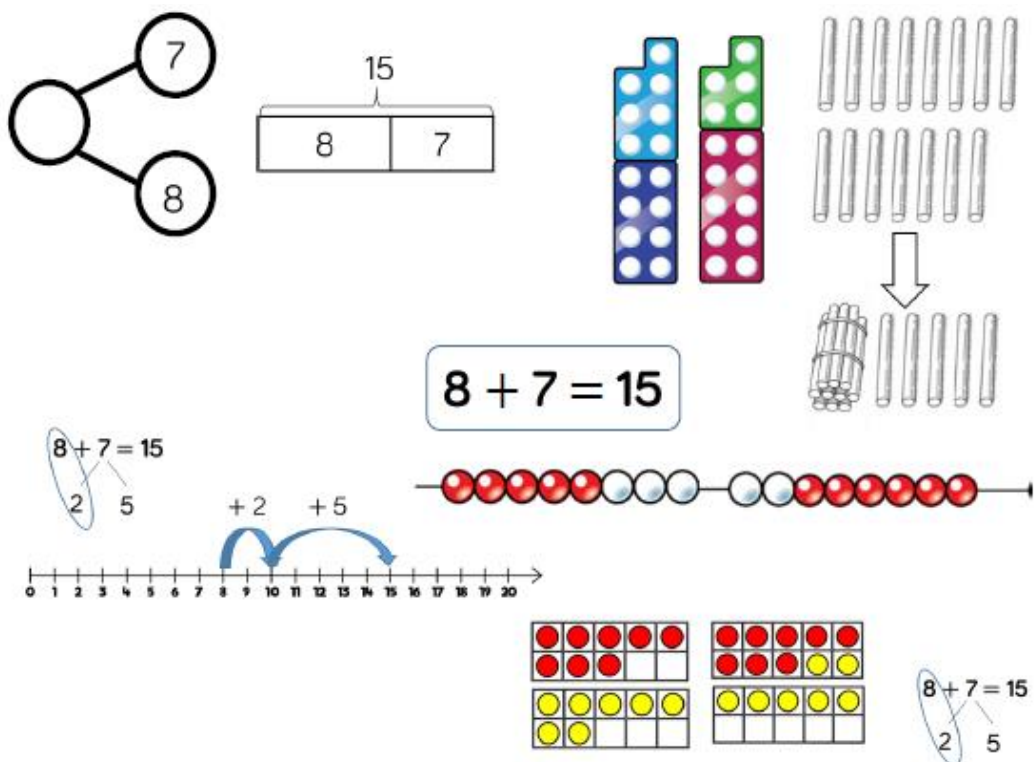
School:	This policy is implemented and managed by the Headteacher and all school teaching staff.
Governing Body:	The Governing Body (led by the Development Committee) will monitor, review and update this policy.
Review:	This policy will be reviewed in accordance with the agreed cycle of review or whenever there is a need to comply with new legislation or codes of practice, new initiatives, changes in the curriculum, developments in technology or changes to the physical environment of the school.
Approved:	July 2021
Next Review:	Summer 2023

Addition

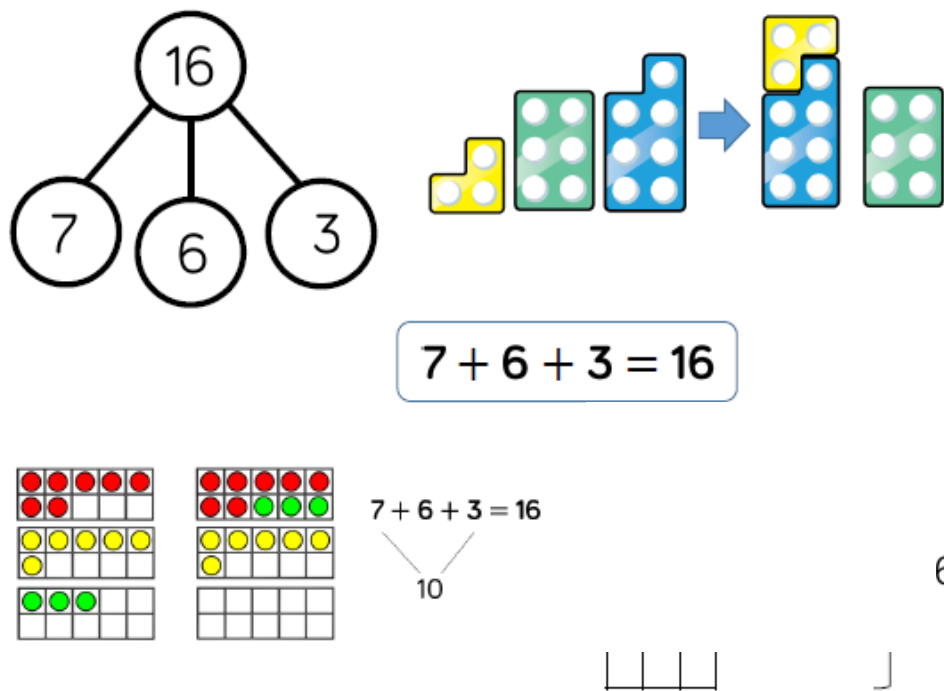
Year 1: Add 1 digit numbers within 10



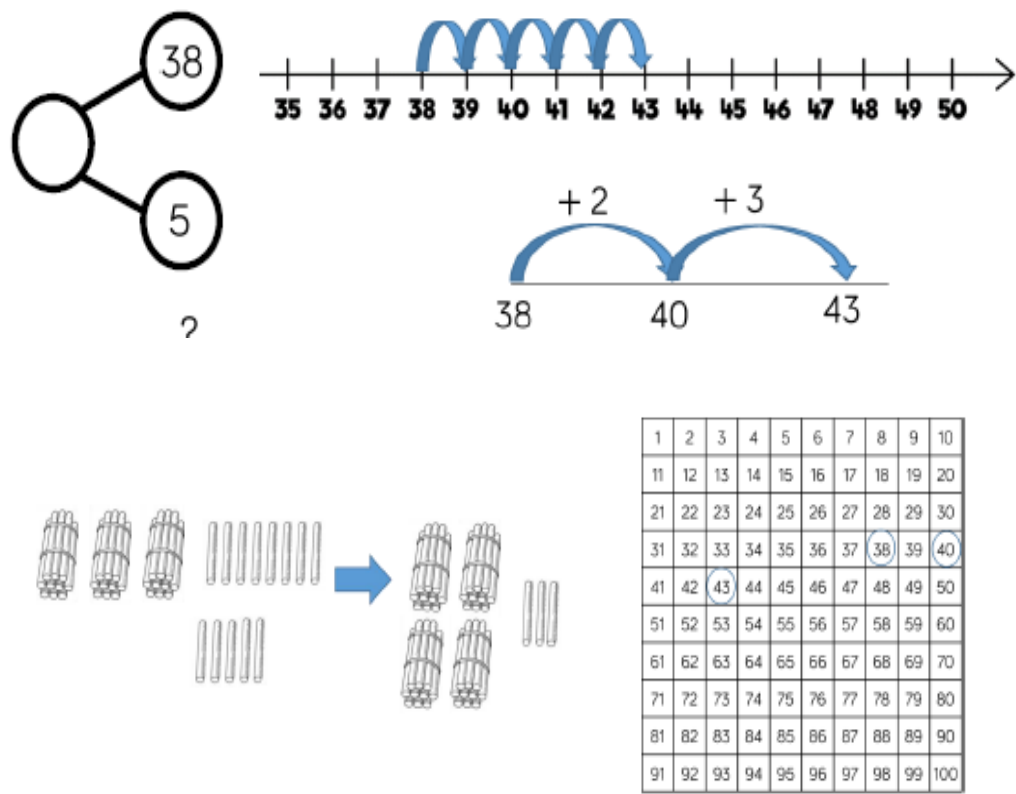
Year 1/2: Add 1 and 2 digit numbers to 20



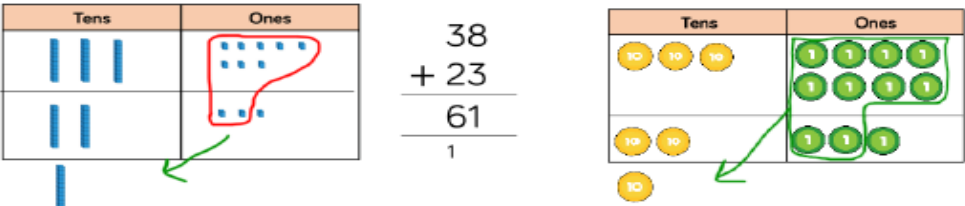
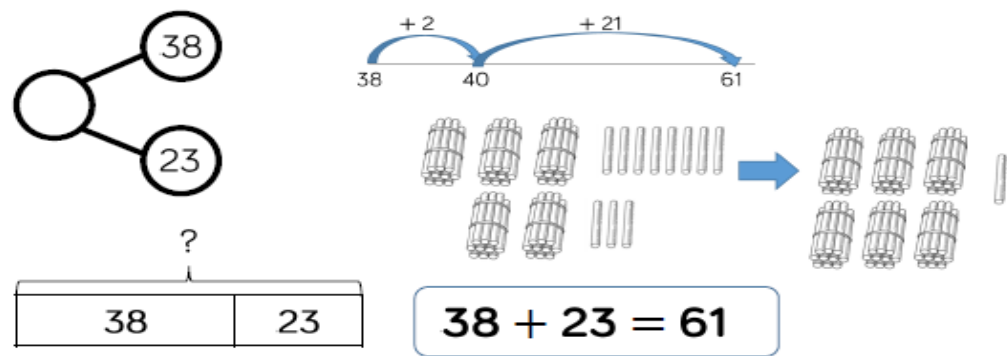
Year 2: Add 3 digit numbers



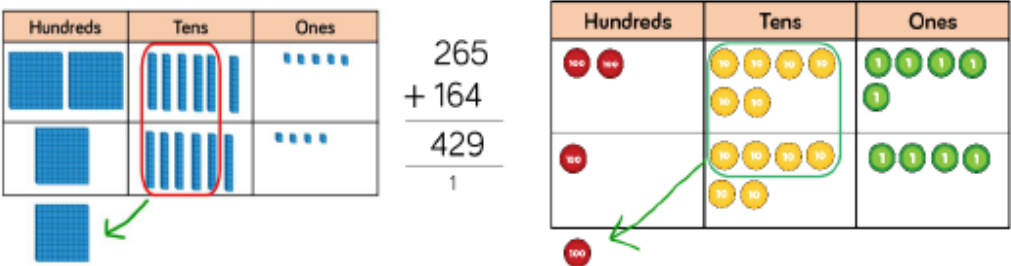
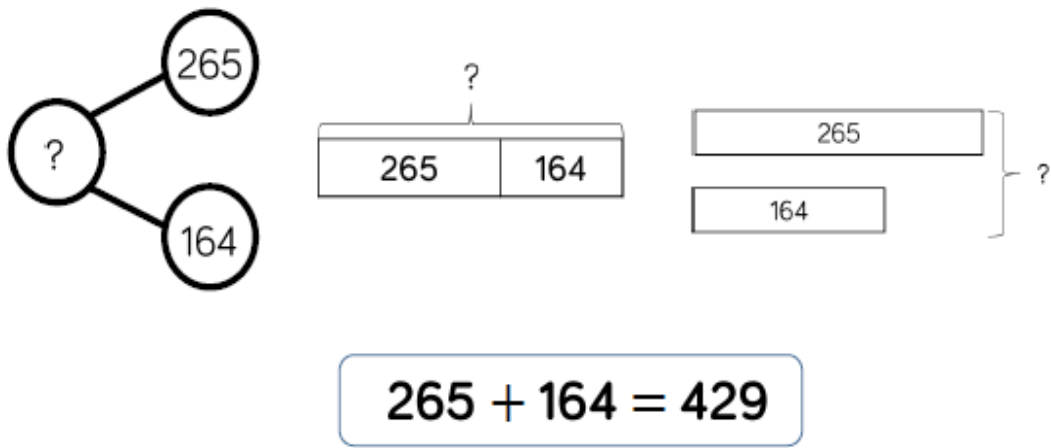
Year 2/3: Add 1 digit and 2 digit numbers to 100



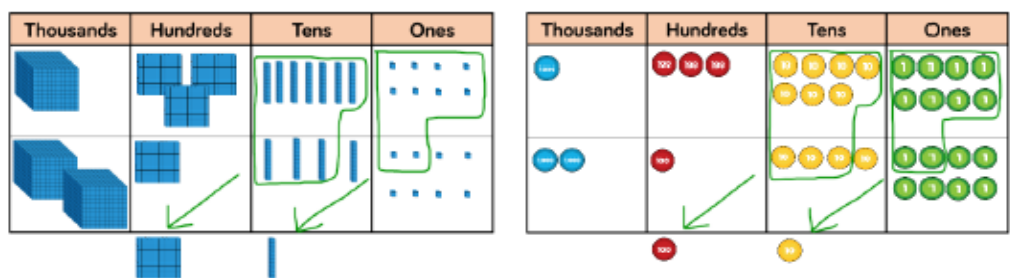
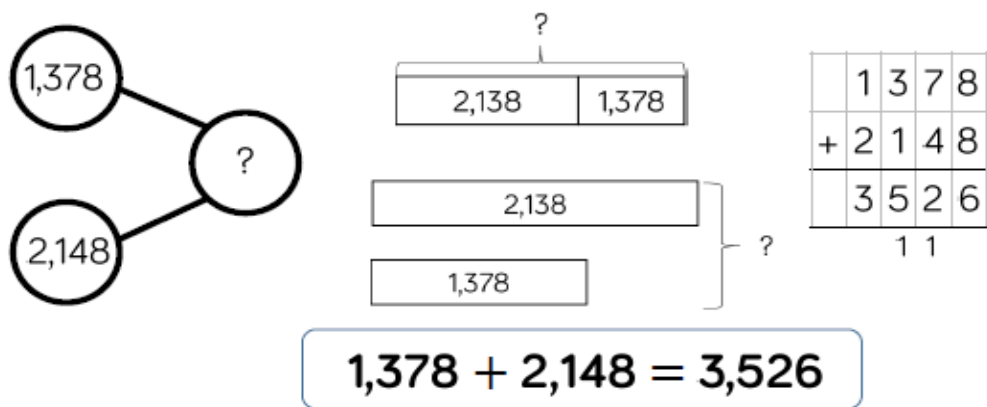
Year 2/3: Add two 2 digit numbers to 100



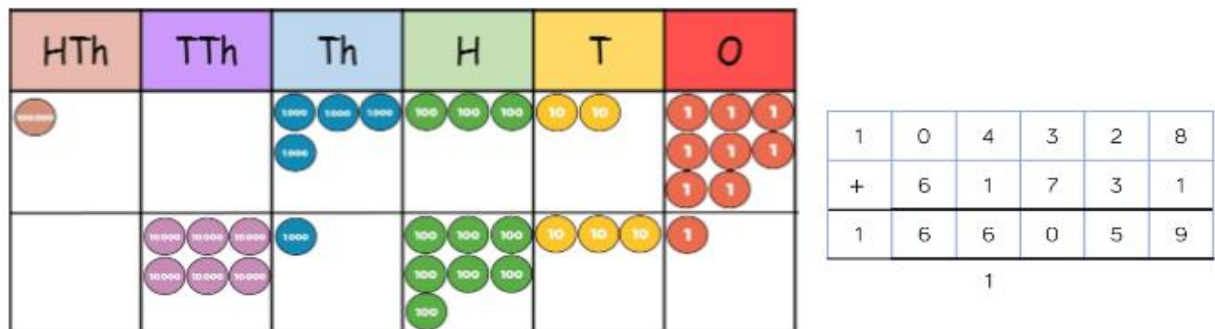
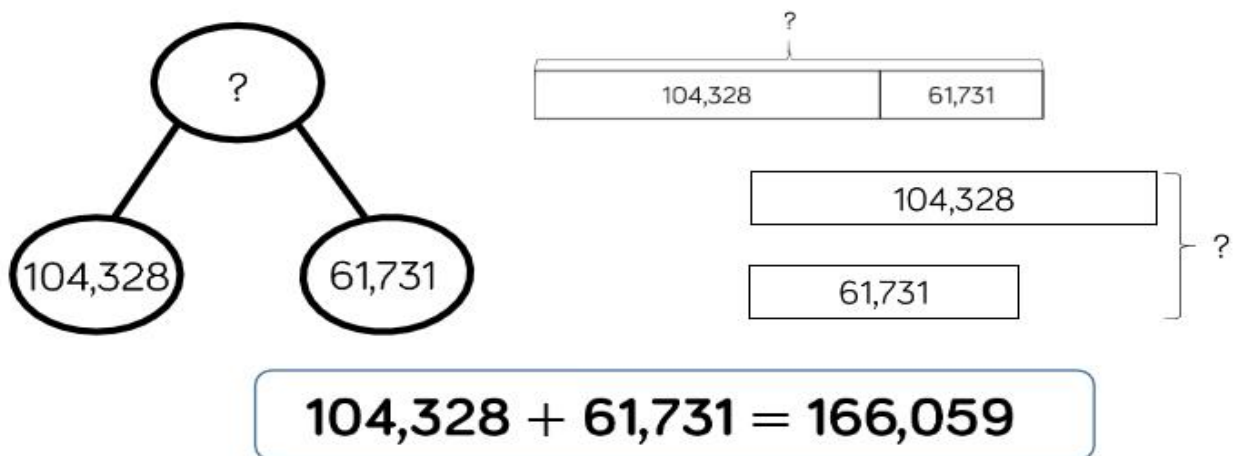
Year 3: Add with up to 3-digits



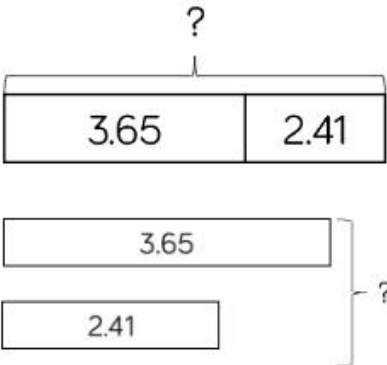
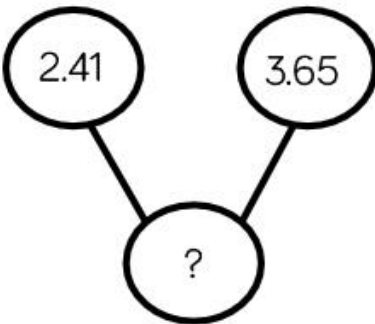
Year 4: Add with up to 4-digits



Year 5/6: Add whole numbers with more than 4 digits

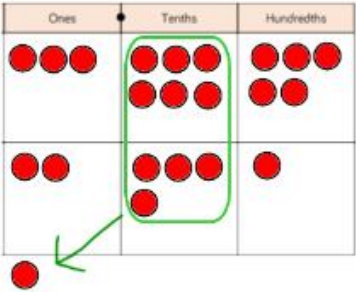
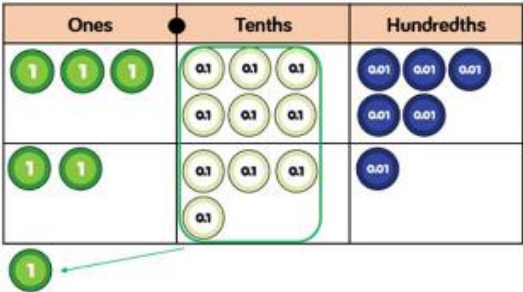


Year 5/6: Add numbers with up to 3 decimal places



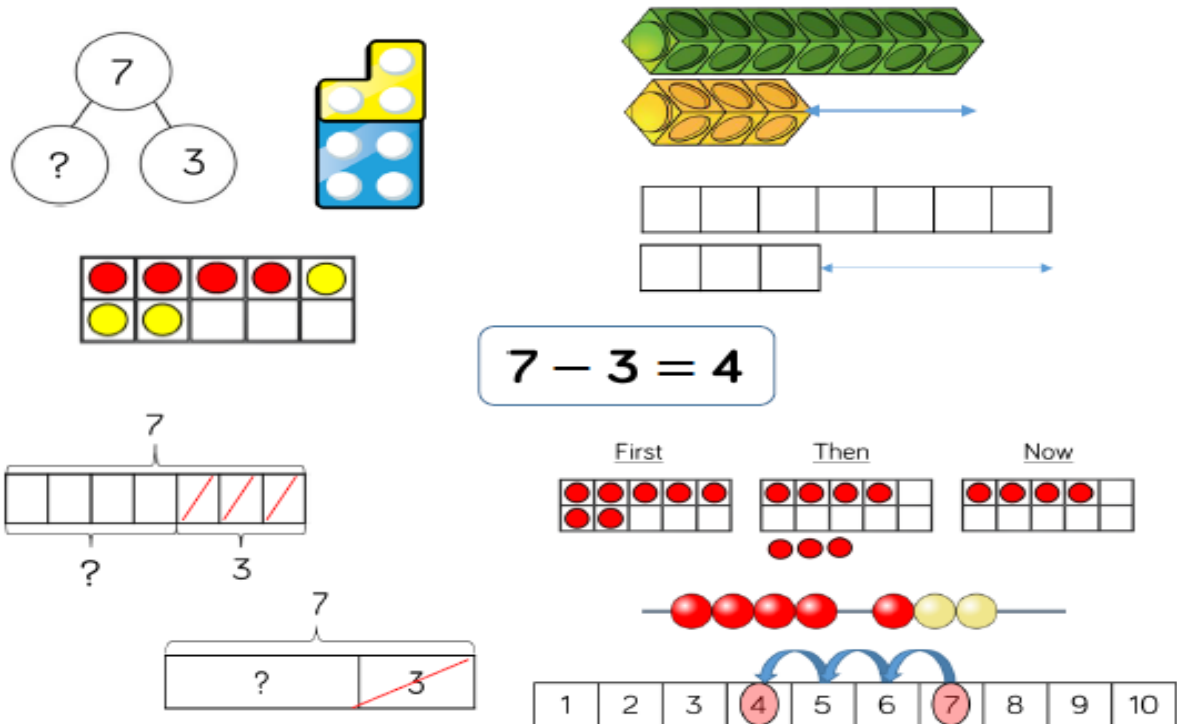
$$\begin{array}{r} 3.65 \\ + 2.41 \\ \hline 6.06 \\ 1 \end{array}$$

$3.65 + 2.41 = 6.06$

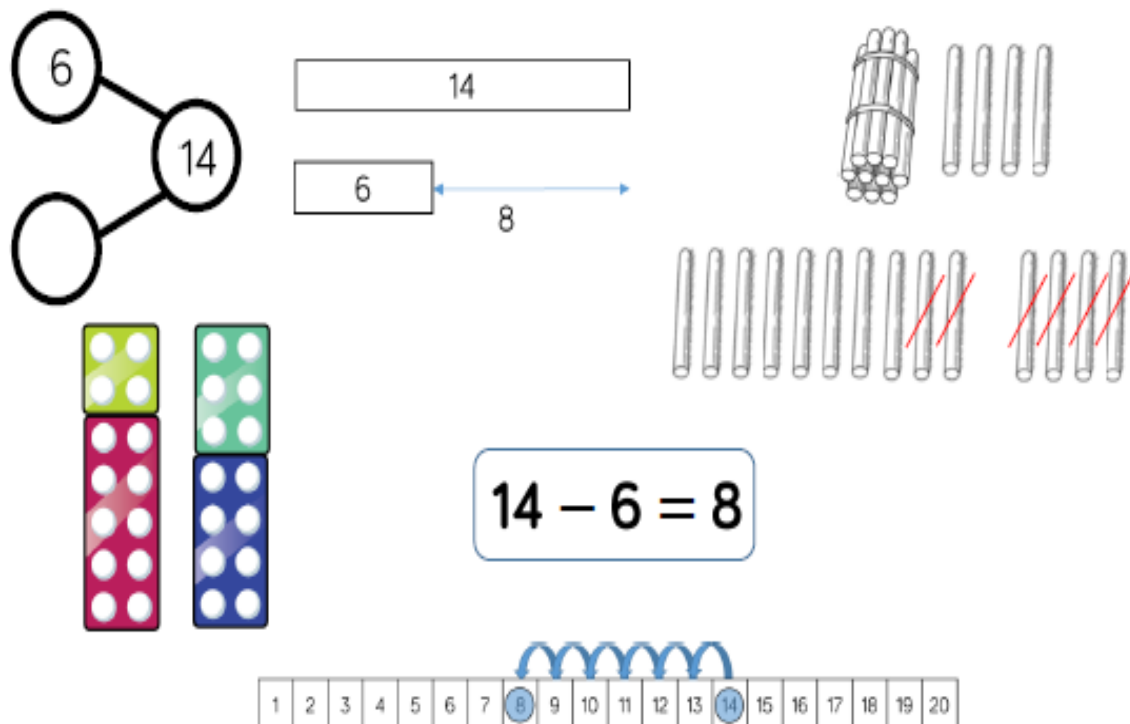


Subtraction

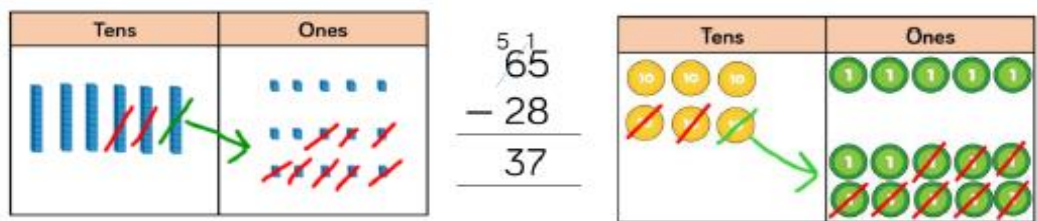
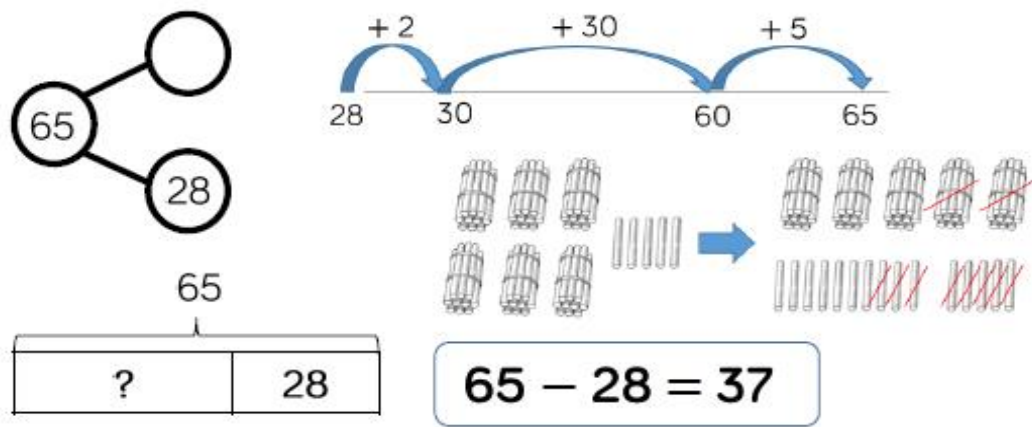
Year 1: Subtract 1 digit numbers within 10



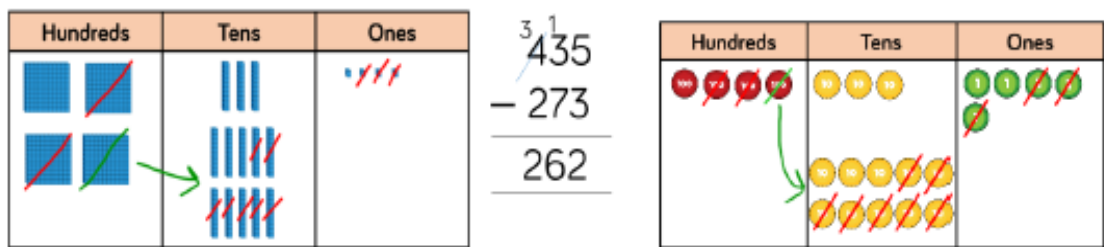
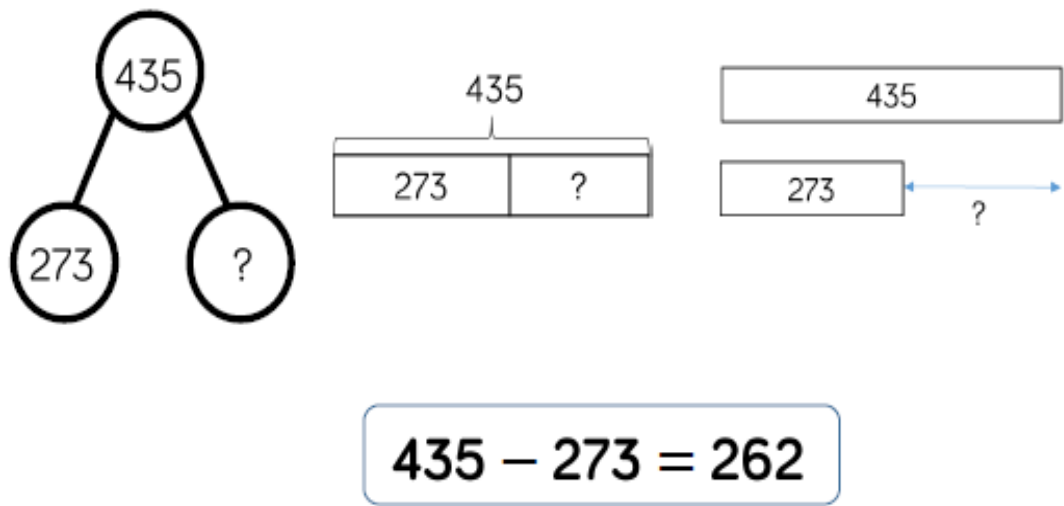
Year 1/2: Subtract 1/2 digit numbers to 20



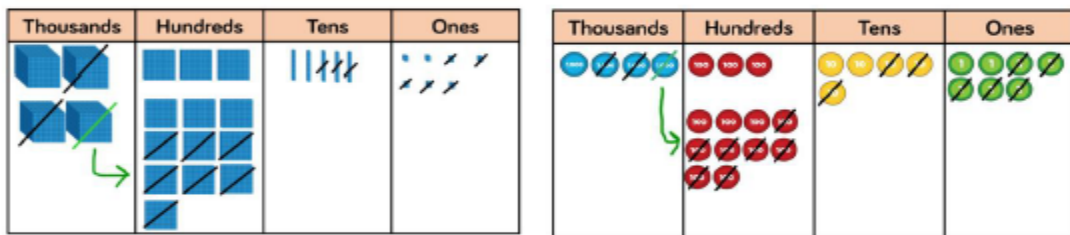
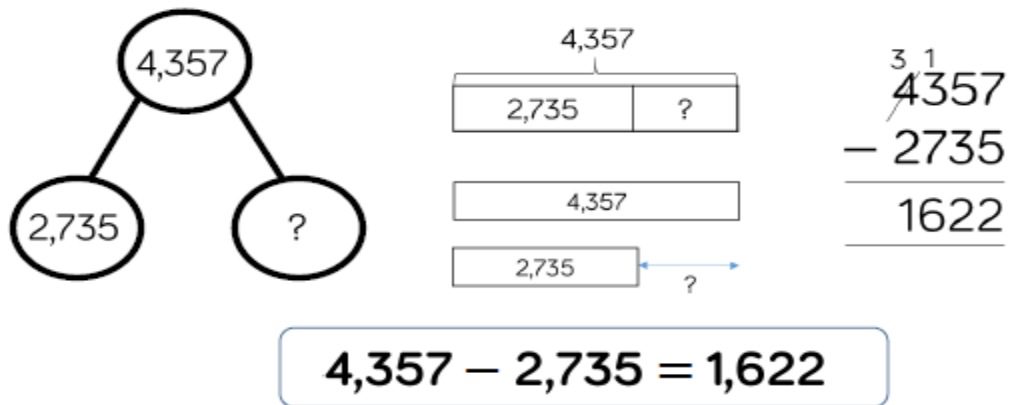
Year 2: Subtract 1/2 digit numbers to 100



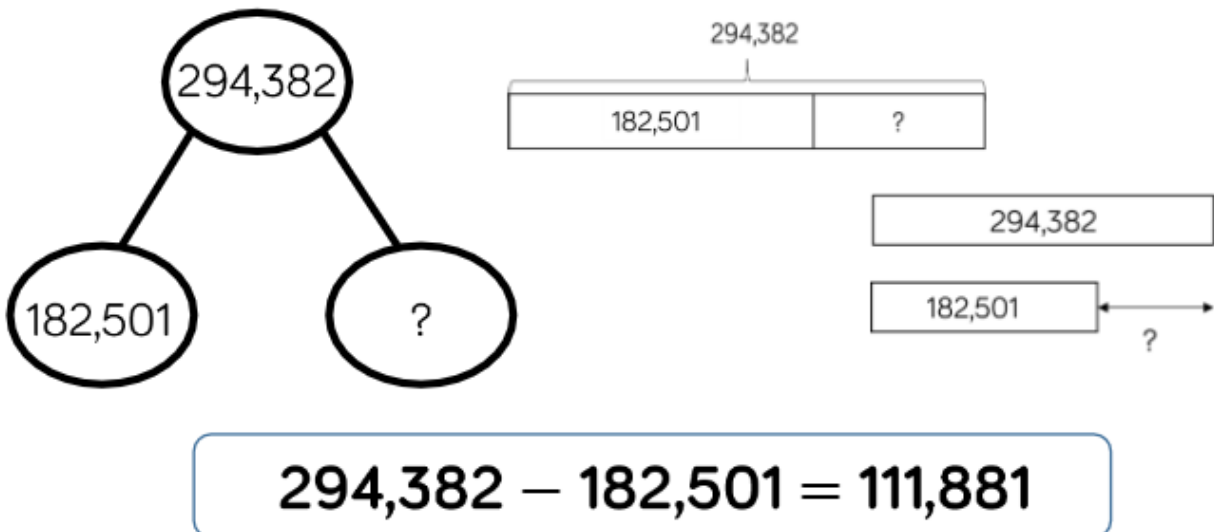
Year 3: Subtract numbers with up to 3 digits



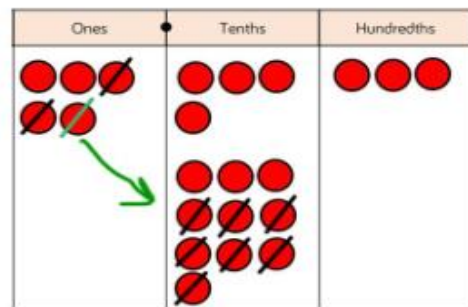
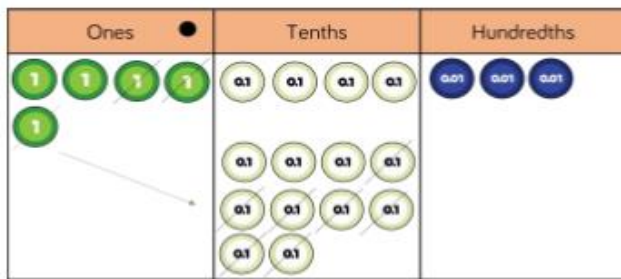
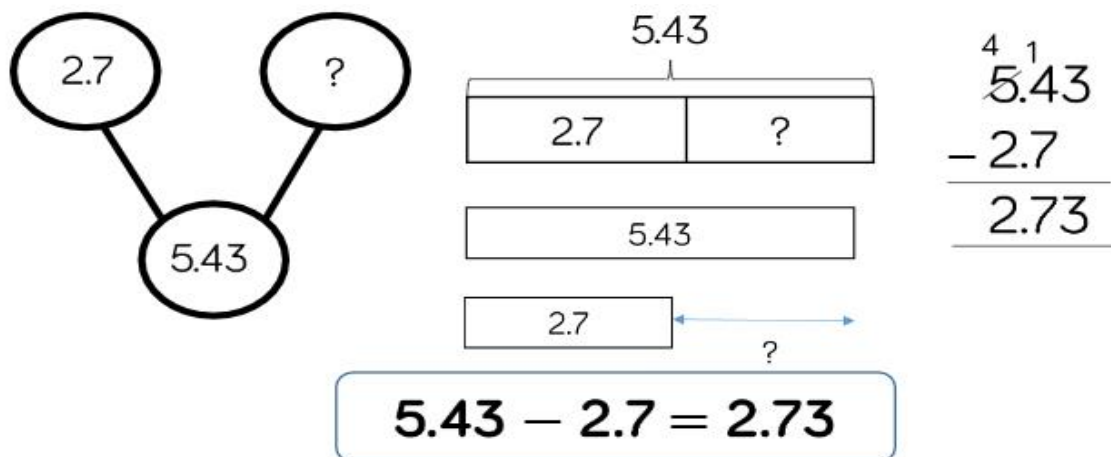
Year 4: Subtract numbers with up to 4 digits



Year 5/6: Subtract with more than 4 digits



Year 5/6: Subtract with up to 3 decimal places



Glossary

Addend - A number to be added to another.

Aggregation - combining two or more quantities or measures to find a total.

Augmentation - increasing a quantity or measure by another quantity.

Commutative - numbers can be added in any order.

Complement - in addition, a number and its complement make a total e.g. 300 is the complement to 700 to make 1,000

Difference - the numerical difference between two numbers is found by comparing the quantity in each group.

Exchange - Change a number or expression for another of an equal value.

Minuend - A quantity or number from which another is subtracted.

Partitioning - Splitting a number into its component parts.

Reduction - Subtraction as take away.

Subitise - Instantly recognise the number of objects in a small group without needing to count.

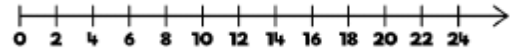
Subtrahend - A number to be subtracted from another.

Sum - The result of an addition.

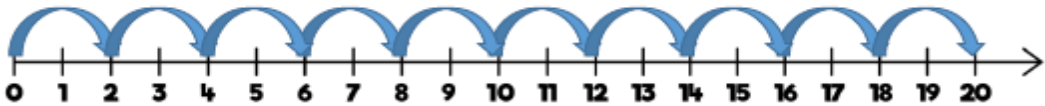
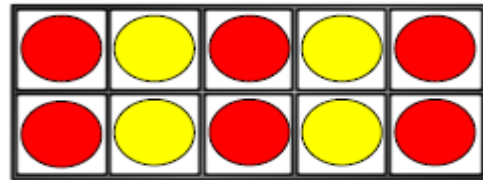
Total - The aggregate or the sum found by addition.

Times Tables

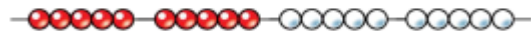
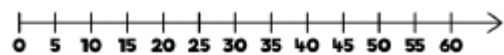
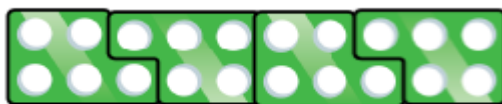
Year 2 Skill: 2 Times Table



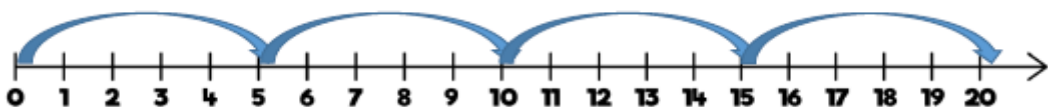
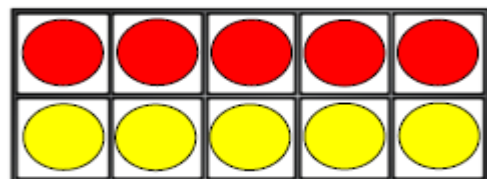
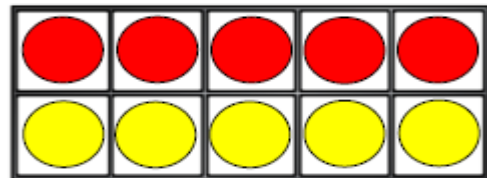
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50



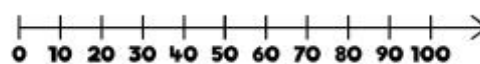
Year 2 Skill: 5 Times Table



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

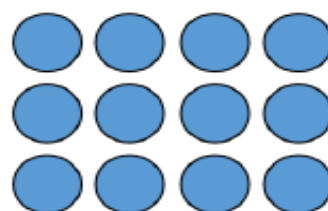


Year 2 Skill: 10 Times Table

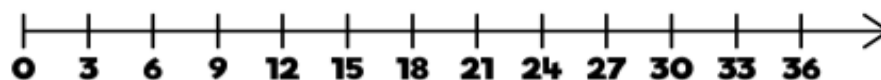
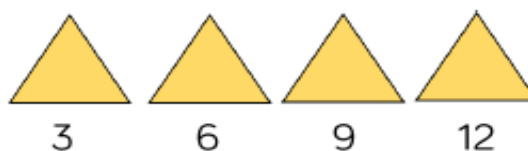


1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Year 3 Skill: 3 Times Tables



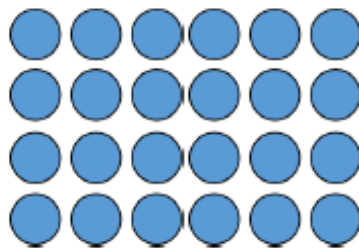
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50



Year 3 Skill: 4 Times Tables



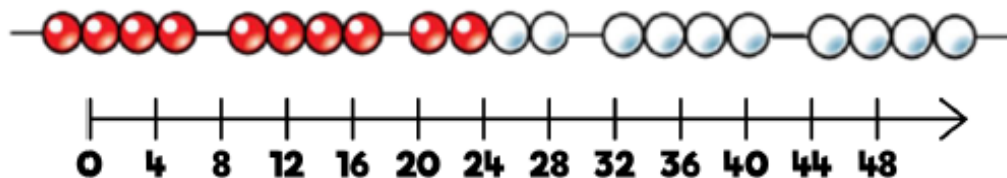
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11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50



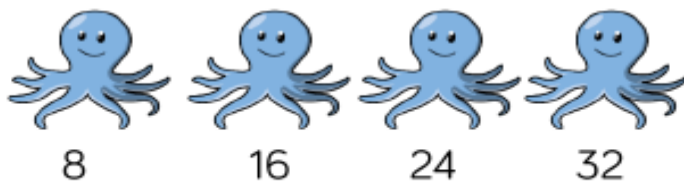
4	8	12	16	20
24	28	32	36	40
44	48	52	56	60



4 8 12 16

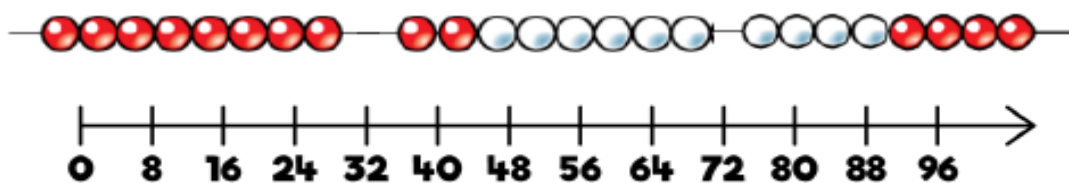


Year 3 Skill: 8 Times Tables

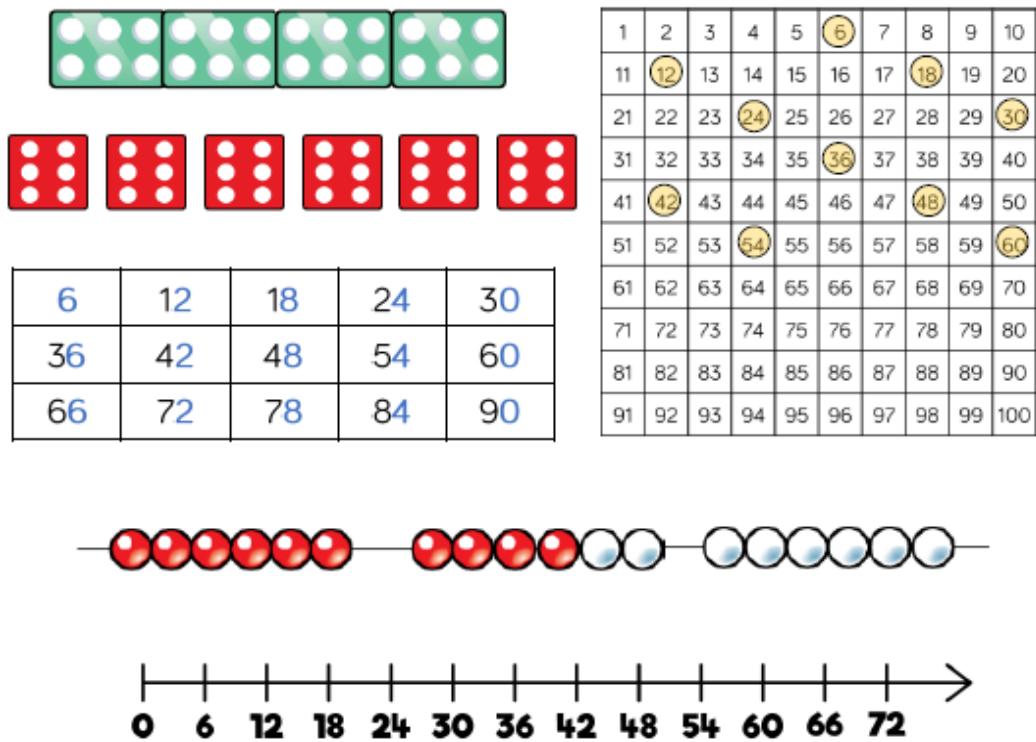


8	16	24	32	40
48	56	64	72	80

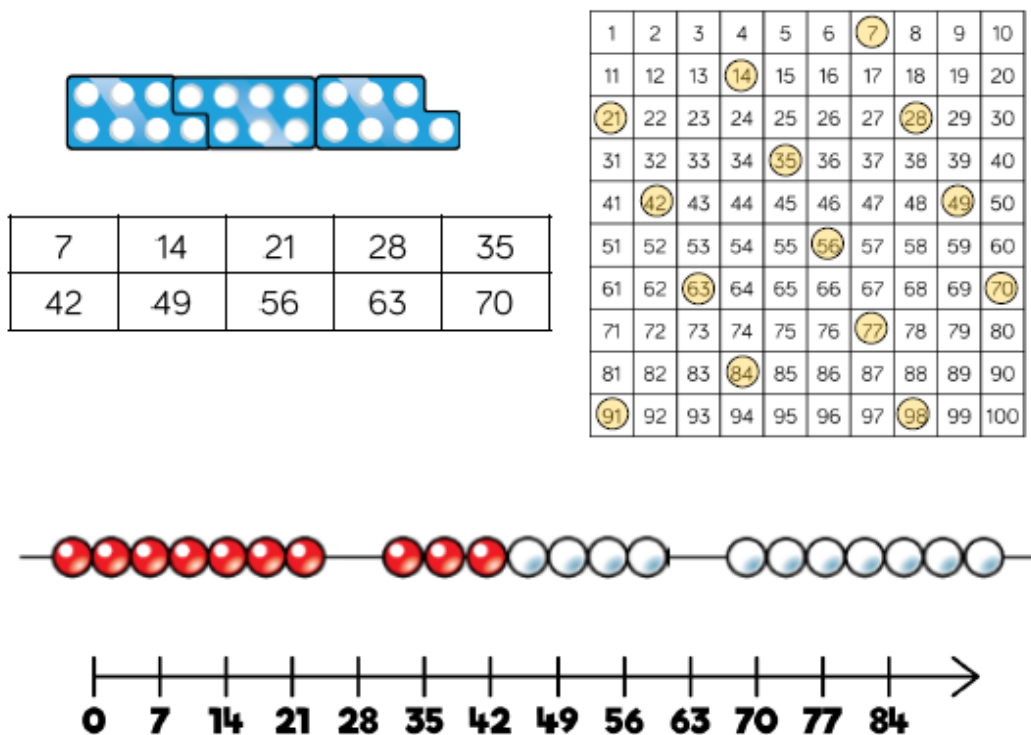
1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100



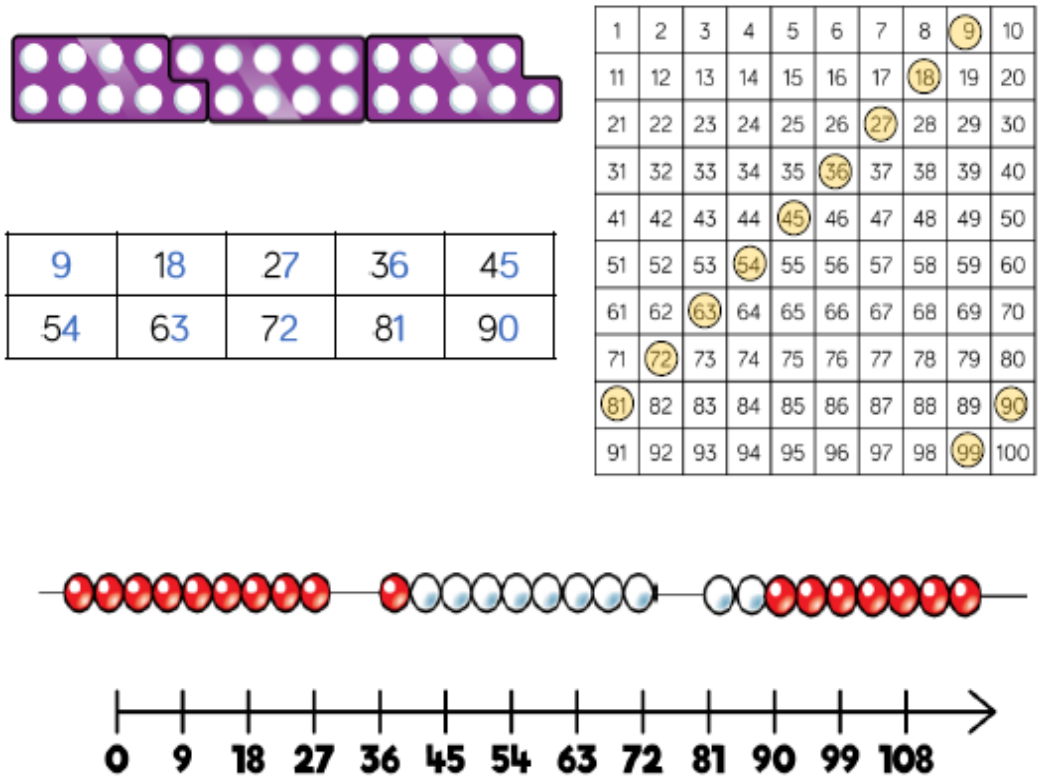
Year 4 Skill: 6 Times Table



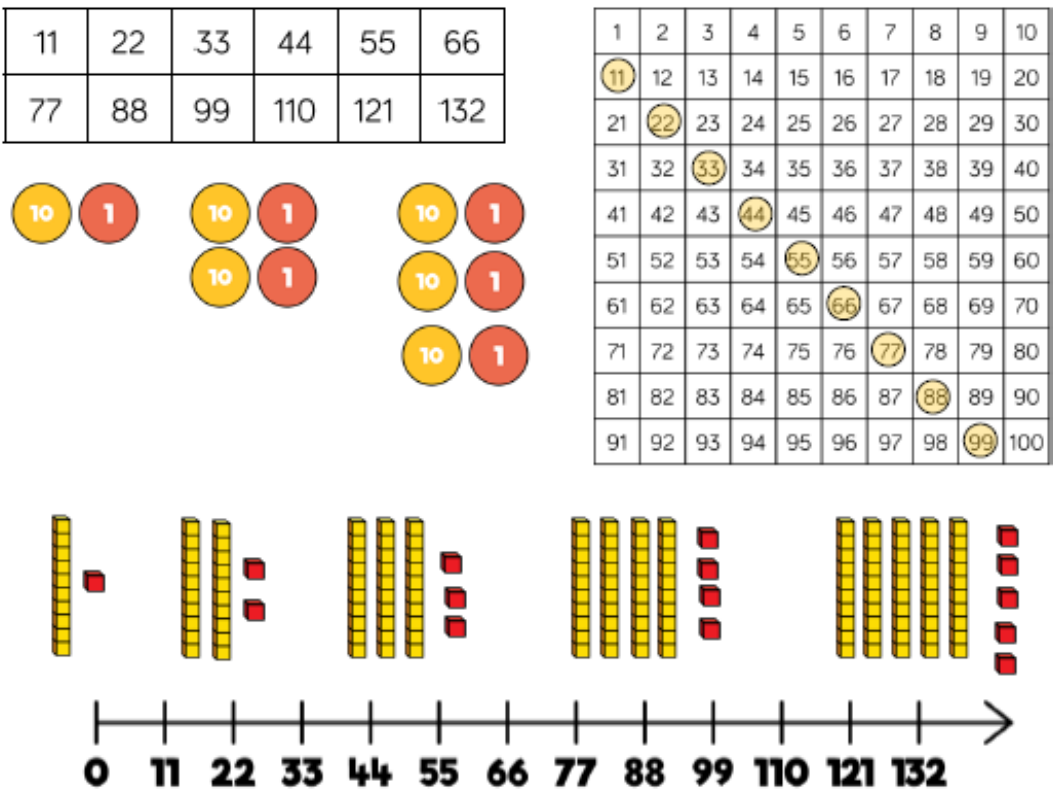
Year 4 Skill: 7 Times Table



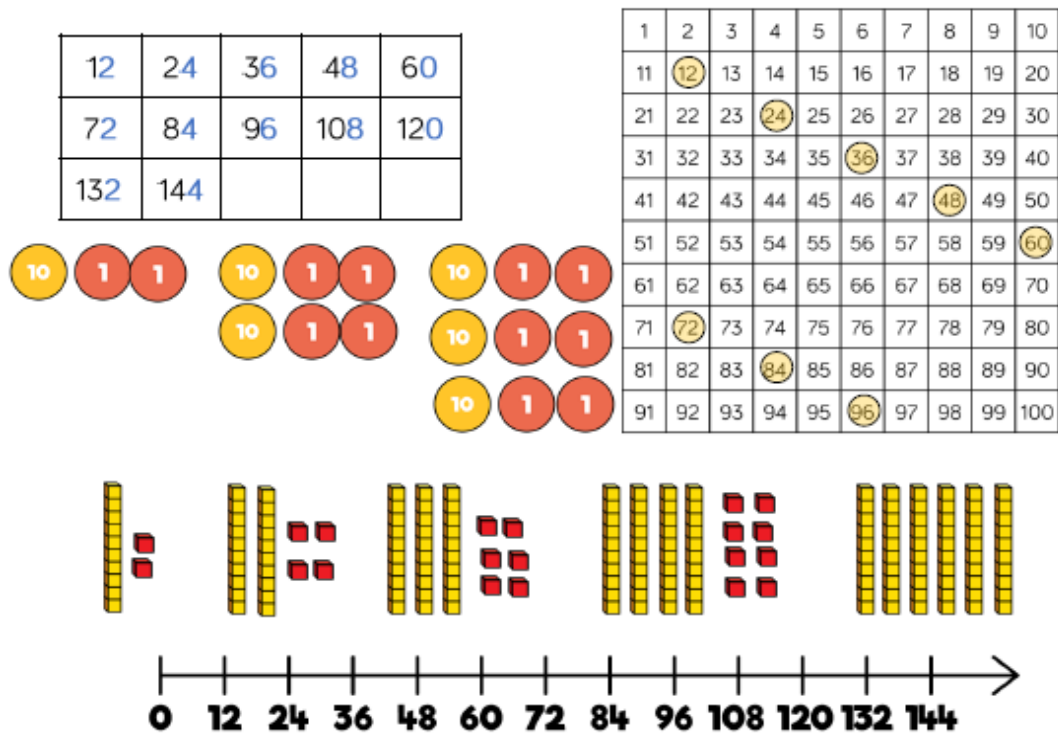
Year 4 Skill: 9 Times Table



Year 4 Skill: 11 Times Table



Year 4 Skill: 12 Times Table

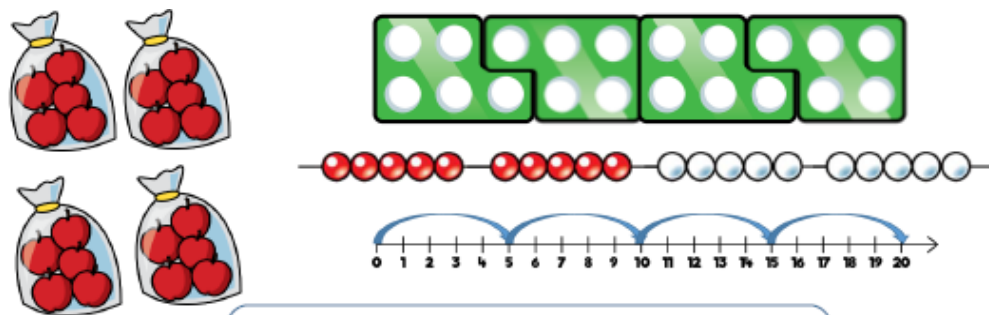


Year 5: consolidate all knowledge of times tables facts and relevant division facts and recall at speed

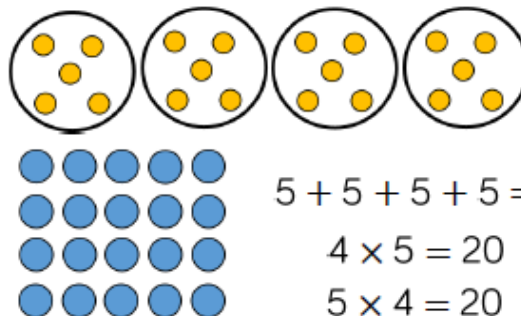
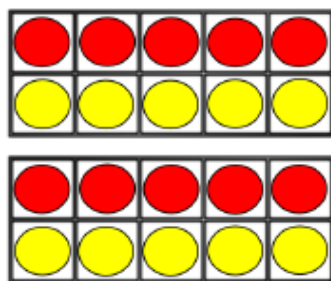
Year 6: use knowledge of times tables facts with multiples of 10, 100 and 1000

Multiplication

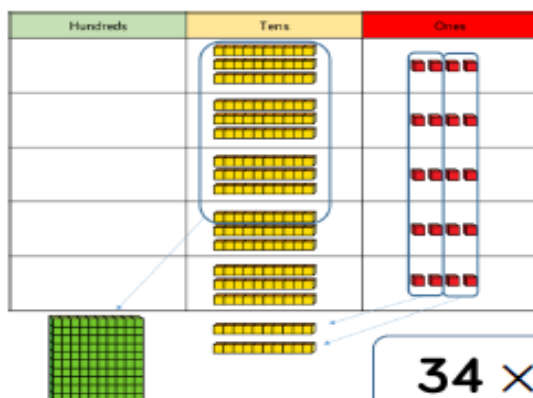
Year 1/2: Solve one step problems using multiplication



One bag holds 5 apples.
How many apples do 4 bags hold?



Year 3/4: Multiply 2-digit by 1-digit numbers



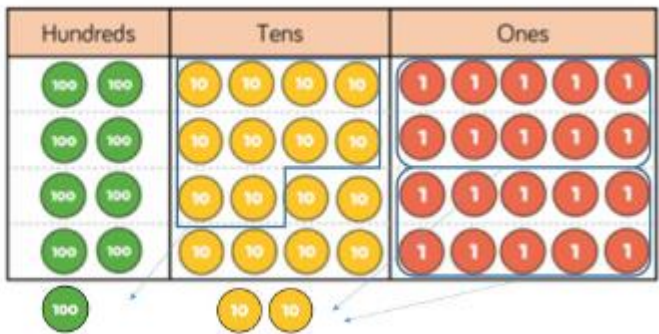
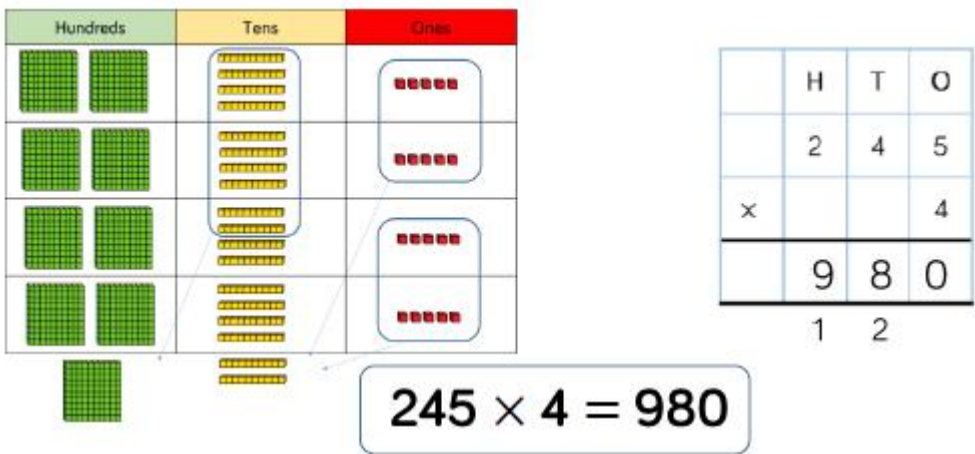
	H	T	O	
		3	4	
$\times$			5	
		2	0	(5×4)
$+$	1	5	0	(5×30)
	1	7	0	

$$34 \times 5 = 170$$

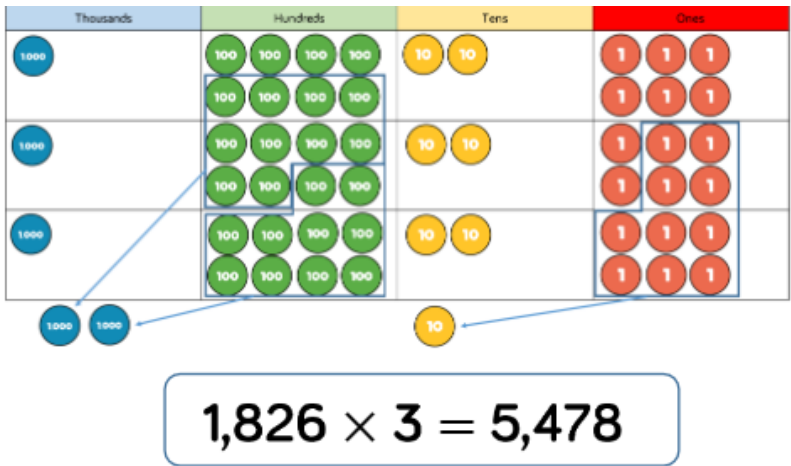
	H	T	O	
		3	4	
$\times$			5	
	1	7	0	
	1	2		



Year 4: Multiply 3-digit by 1-digit numbers



Year 5: Multiply 4 digit by 1 digit using formal methods



Year 5: Multiply 2 digits by 2 digits

×	20	2
30	600	60
1	20	2

22 × 31 = 682

	H	T	O
		2	2
×		3	1
		2	2
	6	6	0
	6	8	2

Year 5: Multiply 5 digits by 2 digits

×	200	30	4
30	6,000	900	120
2	400	60	8

234 × 32 = 7,488

	Th	H	T	O
		2	3	4
×			3	2
		4	6	8
¹ 7	¹ 0	2	0	
7	4	8	8	

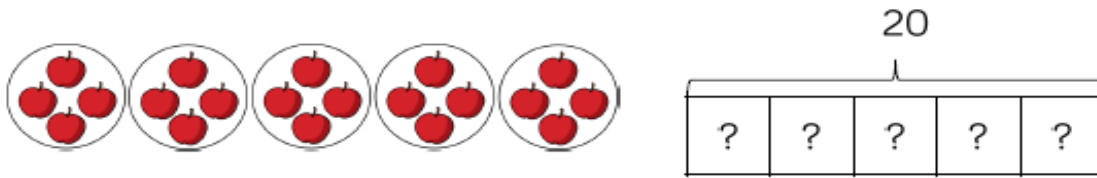
Year 5/6: Multiply 4 digits by 2 digits

	TTh	Th	H	T	O
		2	7	3	9
×				2	8
² 2	⁵ 1	³ 9	⁷ 1	2	
¹ 5	4	¹ 7	8	0	
7	6	6	9	2	

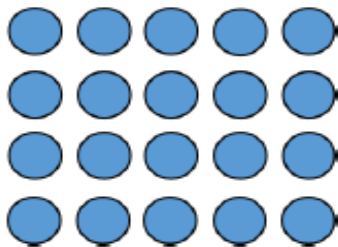
2,739 × 28 = 76,692

Division

Year 1/2: Use one step problems using multiplication (sharing)

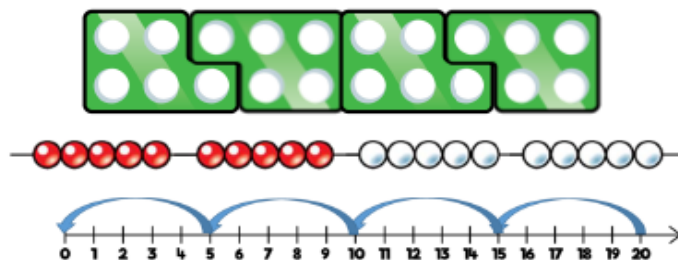
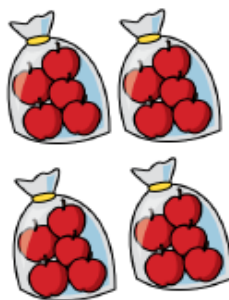


There are 20 apples altogether.
They are shared equally between 5 bags.
How many apples are in each bag?

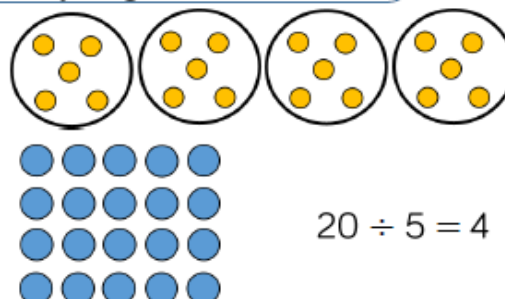
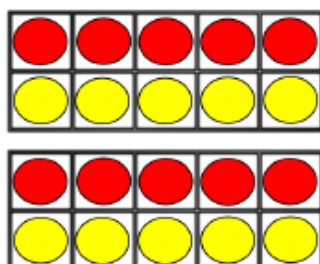


$$20 \div 5 = 4$$

Year 1/2: Solve 1 step problems using division (grouping)



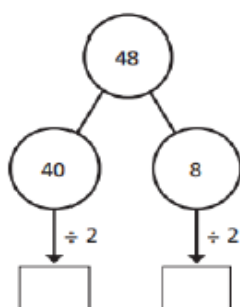
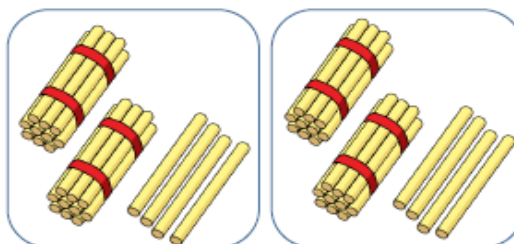
There are 20 apples altogether.
They are put in bags of 5.
How many bags are there?



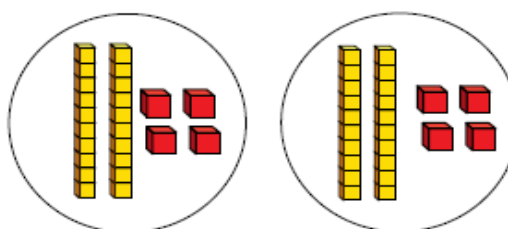
$$20 \div 5 = 4$$

Year 2: Divide two digits by one digit (sharing with no exchange)

Tens	Ones
	
	



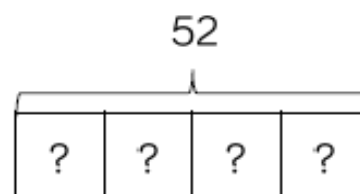
$$48 \div 2 = 24$$



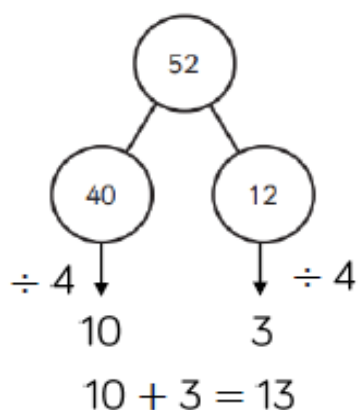
Year 3 – Divide 2-digits by 1-digit (no exchange sharing) – as Year 2

Year 3 – Divide 2-digits by 1-digit (sharing with exchange)

Tens	Ones
	
	
	
	

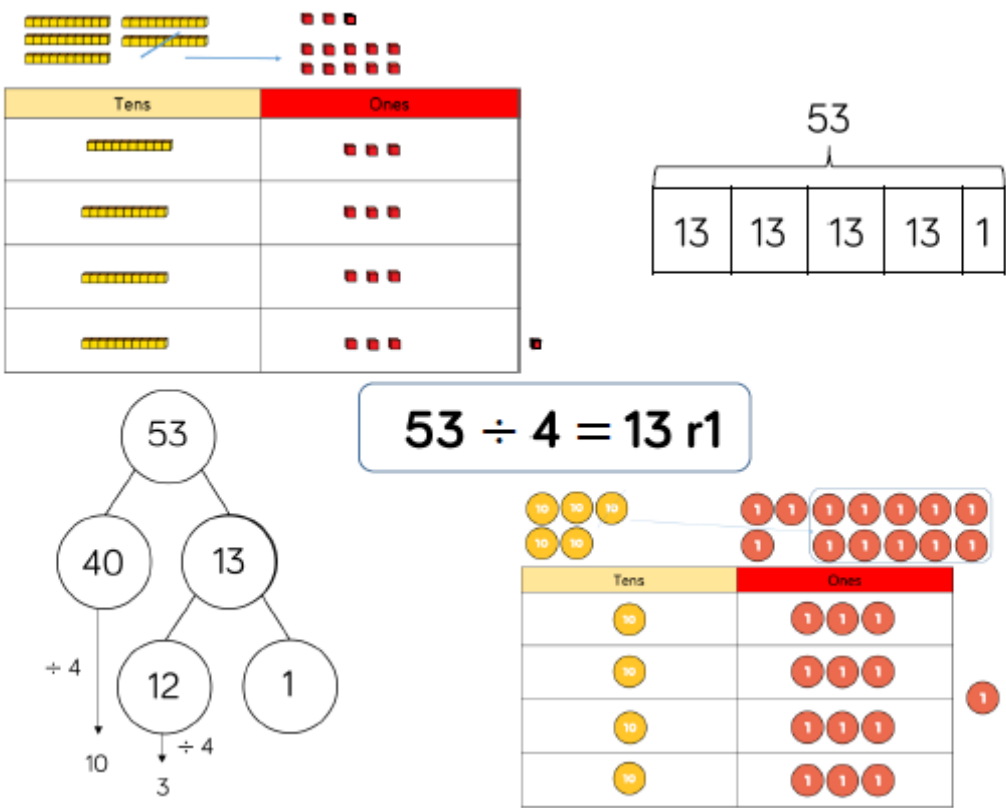


$$52 \div 4 = 13$$

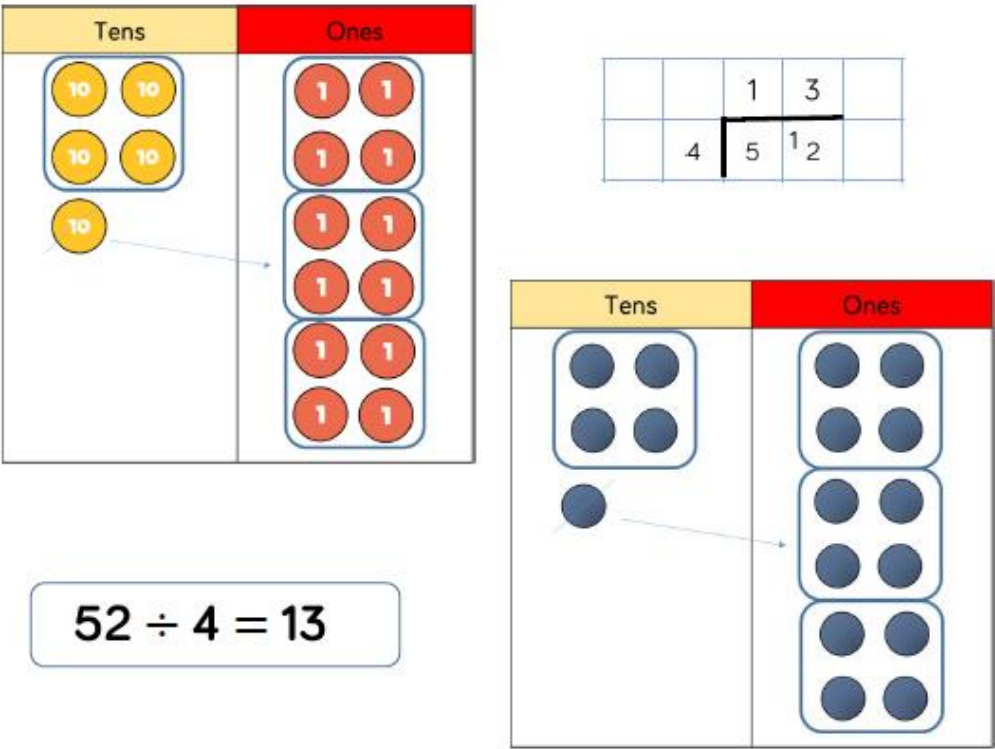


Tens	Ones
	
	
	
	
	

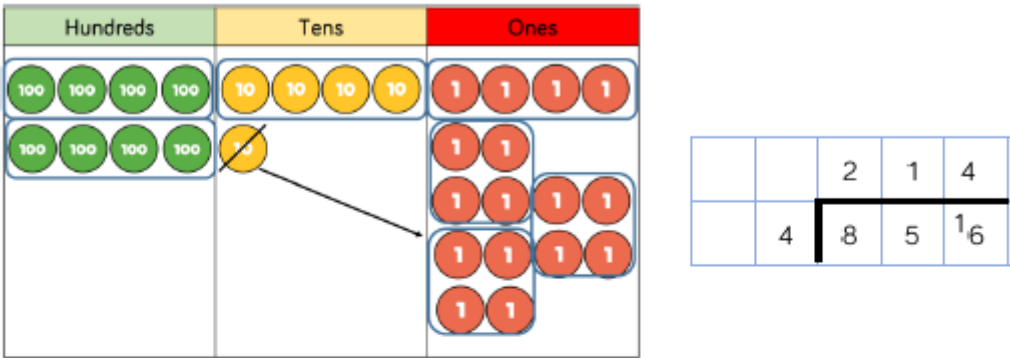
Year 3/4: Divide 2-digits by 1-digit (sharing with remainders)



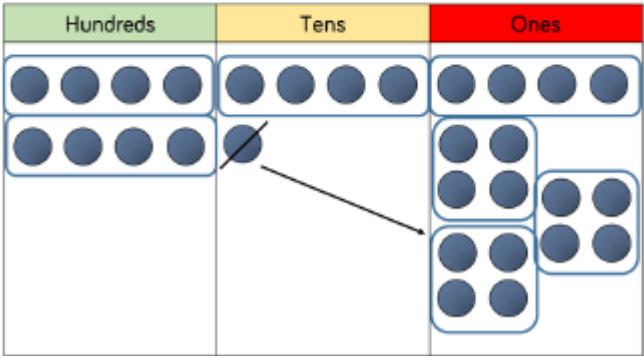
Year 4/5: Divide 2-digits by 1-digit (grouping)



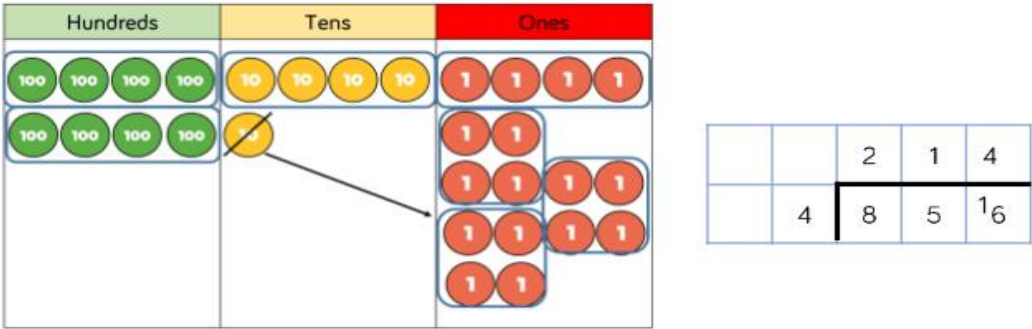
Year 4/5: Divide 3-digits by 1-digit (grouping)



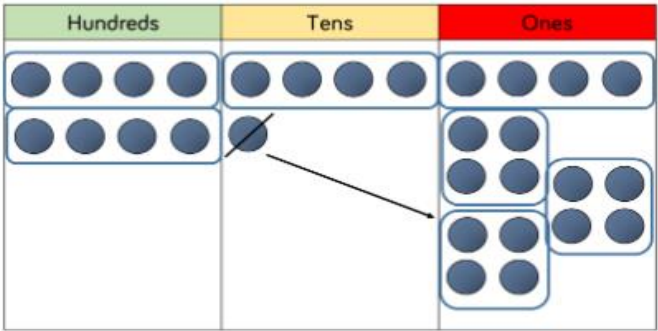
856 ÷ 4 = 214



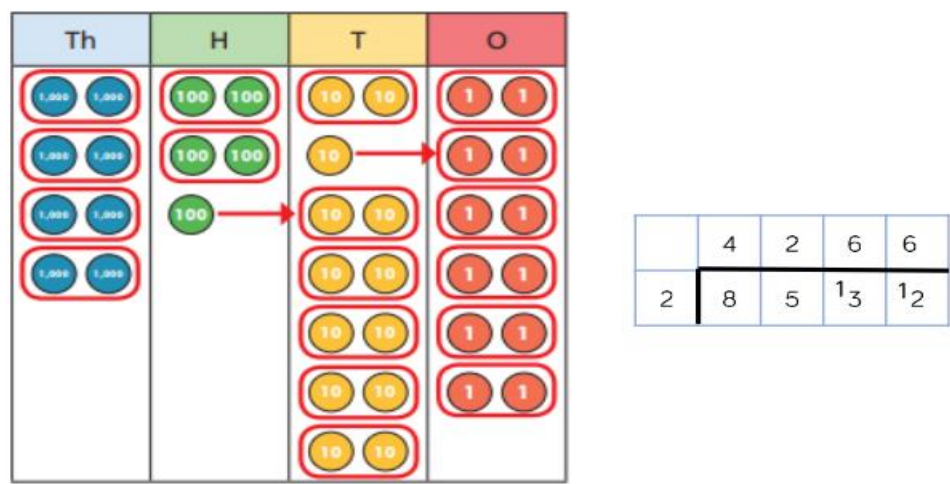
Year 5: Divide 3 digits by 1 digit regrouping



856 ÷ 4 = 214

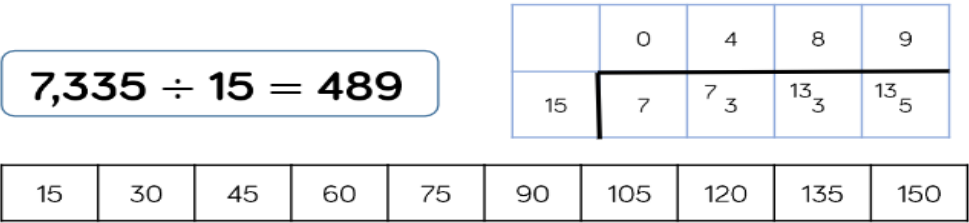
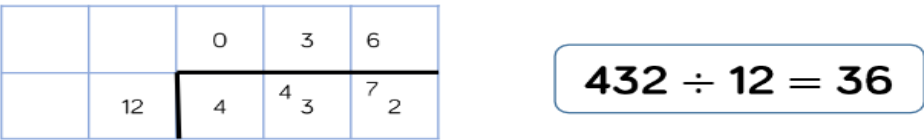


Year 5: Divide 4 digits by 1 digit regrouping



8,532 ÷ 2 = 4,266

Year 6: Divide 4 digits by 2 digits



Year 6: Divide multiple digits by 2 digits

÷

x

-

↓

Success criteria

1. List multiples of the divisor (are you going to do repeated addition or partition and add?)
2. Divide
3. Multiply
4. Subtract
5. Bring it down...
6. ...and bring it on back!

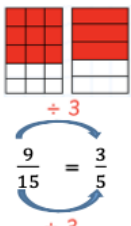
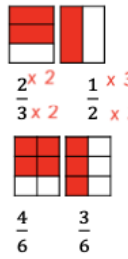
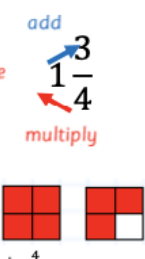
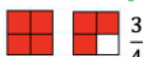
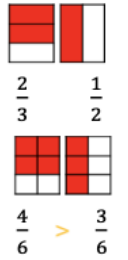
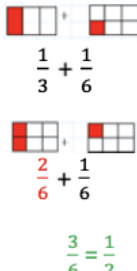
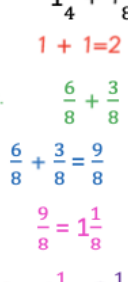
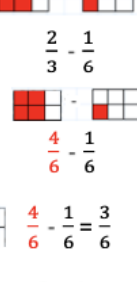
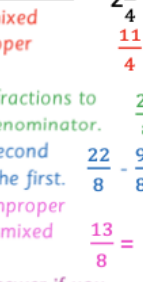
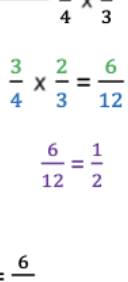
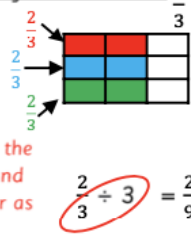
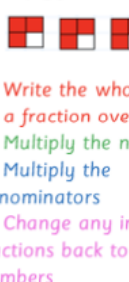
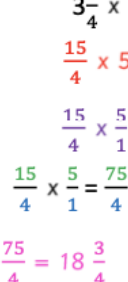
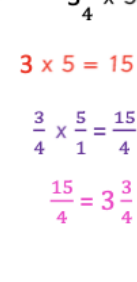
1) $\begin{array}{r} 13 \\ 70 + 3 = 15 \\ 20 + 6 = 26 \\ 30 + 9 = 39 \\ 40 + 12 = 52 \\ 50 + 15 = 65 \\ 60 + 18 = 78 \\ 70 + 21 = 91 \\ 80 + 24 = 104 \\ 90 + 27 = 117 \end{array}$	2) $\begin{array}{r} 14 \\ 10 + 4 = 14 \\ 20 + 8 = 28 \\ 30 + 12 = 42 \\ 40 + 16 = 56 \\ 50 + 20 = 70 \\ 60 + 24 = 84 \\ 70 + 28 = 98 \\ 80 + 32 = 112 \\ 90 + 36 = 126 \end{array}$
3) $\begin{array}{r} 21 \\ 20 + 1 = 21 \\ 40 + 2 = 42 \\ 60 + 3 = 63 \\ 80 + 4 = 84 \\ 100 + 5 = 105 \\ 120 + 6 = 126 \\ 140 + 7 = 147 \\ 160 + 8 = 168 \\ 180 + 9 = 189 \end{array}$	4) $\begin{array}{r} 22 \\ 20 + 2 = 22 \\ 40 + 4 = 44 \\ 60 + 6 = 66 \\ 80 + 8 = 88 \\ 100 + 10 = 110 \\ 120 + 12 = 132 \\ 140 + 14 = 154 \\ 160 + 16 = 176 \\ 180 + 18 = 198 \end{array}$

$$\begin{array}{r}
 543 \\
 1 - 24 \quad 24 \overline{) 13032} \\
 2 - 48 \quad - 120 \downarrow \\
 3 - 72 \quad \underline{103} \downarrow \\
 4 - 96 \quad - 96 \downarrow \\
 5 - 120 \quad \underline{72} \downarrow \\
 6 - 144 \quad - 72 \downarrow \\
 7 - 168 \quad \underline{00} \\
 8 - 192 \\
 9 - 216
 \end{array}$$

$$\begin{array}{r}
 28 \cdot 8 \\
 15 \overline{) 4320} \\
 \underline{30} \downarrow \\
 132 \\
 \underline{120} \downarrow \\
 120 \\
 \underline{120} \\
 0
 \end{array}$$

Answer: 28·8

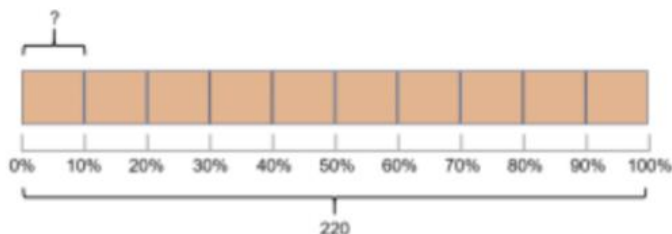
Calculating with Fractions

<u>Use common factors to simplify fractions.</u> 1) Find a number that both the numerator and the denominator can be divided by (in this case, 3) 2) Divide both the numerator and denominator by that number.  $\frac{9}{15} = \frac{3}{5}$	<u>Use multiples to express fractions in the same denominator</u> 1) Find a number that is a common multiple of both denominators (in this case, 6) 2) Multiply both fractions by the relevant multiple to reach the new denominator  $\frac{2}{3} \times \frac{2}{2} = \frac{4}{6}$ $\frac{1}{2} \times \frac{3}{3} = \frac{3}{6}$	<u>Convert mixed numbers to improper fractions</u> 1) Multiply the denominator by the whole number. 2) Add the numerator 3) Write the answer as a numerator over the existing denominator add multiply  $1\frac{3}{4} = \frac{7}{4}$ 1 whole $\frac{4}{4}$
<u>Convert improper fractions to mixed numbers</u> 1) See how many times the denominator will go into the numerator (once, with a remainder of 3) 2) Write the answer (1) as the whole number 3) Write the remainder (3) as the numerator over the existing denominator.  $1\frac{3}{4}$	<u>Compare fractions</u> 1) Decide on a common multiple of the two denominators to become the new denominator 2) Convert both fractions to have the same denominator. 3) Decide which symbol to use— which fraction is larger?  $\frac{4}{6} > \frac{3}{6}$	<u>Add proper fractions</u> 1) Convert both fractions to have the same denominator 2) Add the numerators, but not the denominators. 3) Simplify the answer if you can  $\frac{1}{3} + \frac{1}{6} = \frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$
<u>Add mixed numbers (method 1)</u> 1) Change any mixed numbers to improper fractions. 2) Convert both fractions to have the same denominator 3) Add the numerators together. 4) Change any improper fractions back to mixed numbers 5) Simplify the answer if you can.  $1\frac{3}{4} + 1\frac{3}{8} = \frac{7}{4} + \frac{11}{8} = \frac{14}{8} + \frac{11}{8} = \frac{25}{8} = 3\frac{1}{8}$	<u>Add mixed numbers (method 2)</u> 1) Add the two whole numbers together. 2) Convert both fractions to have the same denominator. 3) Add the numerators together. 4) Change any improper fractions back to mixed numbers 5) Add together your two answers. 6) Simplify the answer if you can.  $1 + 1 = 2$ $\frac{6}{8} + \frac{3}{8} = \frac{9}{8} = 1\frac{1}{8}$ $2 + 1\frac{1}{8} = 3\frac{1}{8}$	<u>Subtract proper fractions</u> 1) Convert both fractions to have the same denominator 2) Subtract the numerators, but not the denominators. 3) Simplify the answer if you can  $\frac{2}{3} - \frac{1}{6} = \frac{4}{6} - \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$
<u>Subtract mixed numbers</u> 1) Change any mixed numbers to improper fractions. 2) Convert both fractions to have the same denominator. 3) Subtract the second numerator from the first. 4) Change any improper fractions back to mixed numbers. 5) Simplify the answer if you can.  $2\frac{3}{4} - 1\frac{1}{8} = \frac{11}{4} - \frac{9}{8} = \frac{22}{8} - \frac{9}{8} = \frac{13}{8} = 1\frac{5}{8}$	<u>Multiply pairs of proper fractions</u> 1) Multiply the numerators 2) Multiply the denominators 3) Simplify the answer if you can.  $\frac{3}{4} \times \frac{2}{3} = \frac{6}{12} = \frac{1}{2}$	<u>Divide fractions by whole numbers</u> 1) Multiply the denominator by the whole number and write the answer as the new denominator. 2) Simplify the answer if you can.  $\frac{2}{3} \div 3 = \frac{2}{9}$
<u>Multiply fractions by whole numbers</u> 1) Write the whole number as a fraction over 1. 2) Multiply the numerators 3) Multiply the denominators 4) Change any improper fractions back to mixed numbers 5) Simplify the answer if you can  $\frac{3}{4} \times 5 = \frac{15}{4} = 3\frac{3}{4}$	<u>Multiply mixed numbers by whole numbers (method 1)</u> 1) Change any mixed numbers to improper fractions 2) Write the whole number as a fraction over 1. 3) Multiply the numerators 4) Multiply the denominators 5) Change any improper fractions back to mixed numbers. 6) Simplify the answer if you can.  $3\frac{3}{4} \times 5 = \frac{15}{4} \times \frac{5}{1} = \frac{75}{4} = 18\frac{3}{4}$	<u>Multiply mixed numbers by whole numbers (method 2)</u> 1) Multiply the two whole numbers together. 2) Multiply the fraction by the whole number. 3) Change any improper fractions back to mixed numbers. 4) Add your two answers together. 5) Simplify the answer if you can.  $3 \times 5 = 15$ $\frac{3}{4} \times \frac{5}{1} = \frac{15}{4} = 3\frac{3}{4}$ $15 + 3\frac{3}{4} = 18\frac{3}{4}$

Finding Percentages

To find 50%, 25%, 10% and 1% convert to fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{10}$ and $\frac{1}{100}$ and use the rule 'divide by the denominator'. Use a bar model to support this:

Mo uses a bar model to find 30% of 220



$10\% \text{ of } 220 = 22$, so $30\% \text{ of } 220 = 3 \times 22 = 66$

Then extend to finding percentages of any amount:

Step 1 - First find 1%

$1\% = \frac{1}{100}$ so you divide by 100 (to divide by 100 move the digits two places to the left).

Step 2 - When you have found 1%, multiply the answer you got by the percentage. You will need to use long multiplication of decimals.

e.g. Find 38% of £520 (which is the same as $\frac{38}{100} \times £520$)

Step 1) Find 1% by dividing by 100 e.g. $520/100 = £5.20$

Step 2) Then multiply the answer by 38 e.g. $£5.20 \times 38 = £197.60$

$38\% \text{ of } £520 = £197.60$

Glossary

Array – An ordered collection of counters, cubes or other item in rows and columns.

Commutative – Numbers can be multiplied in any order.

Dividend – In division, the number that is divided.

Divisor – In division, the number by which another is divided.

Exchange – Change a number or expression for another of an equal value.

Factor – A number that multiplies with another to make a product.

Multiplicand – In multiplication, a number to be multiplied by another.

Partitioning – Splitting a number into its component parts.

Product – The result of multiplying one number by another.

Quotient – The result of a division

Remainder – The amount left over after a division when the divisor is not a factor of the dividend.

Scaling – Enlarging or reducing a number by a given amount, called the scale factor