#### **Multiplication and Division** Vocabulary: Year 2 Part Altogether Represents Amount **Multiplication as Repeated Addition**

Group Equal Unequal Repeated Addition Multiplication Expression Equation Size



see each of the numbers (i.e. 10 pencils and 9 packets).

Year 2

Grouping problems: missing factors and division

#### Vocabulary:

Multiplication Division Factor 'divided by' Represents Skip Counting Multiplication facts Groups Amount Size

5



## Year 3

**Multiplication and Division Structures** 

#### Vocabulary:

| -              |                  |             |              |           |            |          |            |  |
|----------------|------------------|-------------|--------------|-----------|------------|----------|------------|--|
| Multiplication | Division         | o Commutati | ve G         | rouping ( | Quotitive) | Sharing  | Partitive) |  |
| 'Divided into' | 'Divided between |             | 'Divided by' |           | Equation   | Factor   | Product    |  |
|                |                  | 30          | ÷            | 5         | =          | 6        |            |  |
|                |                  | dividend    | ÷            | divisor   | =          | quotient |            |  |
|                |                  |             |              |           |            |          |            |  |



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.



| 1 | 4 |
|---|---|
| 7 | 7 |



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 = 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



Year 4

# Multiplying and Dividing by 10 and 100

#### Vocabulary:

MultiplyDivideUnitiseTen/Hundred timesBiggerSmallerOne-tenth thesizeOne-hundredth the sizeGattegno chartFactorProductMultipleGroups ofInverseInverseInverseInverse

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

# 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 88 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 x 1 = 8 8 x 1 ten – 8 tens 8 x 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





| Multiplication and Division                  | Vocabulary:  |
|--|--|
| Year 4                                       | Multiply Divide Commutative Groups of Times Equal to Factors<br>Product Quotient Dividend Divisor Represents Array |
| Manipulating the Multiplicative Relationship |  |
|  |  |



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 groups of 7

7 groups of 2

222222

(7)

(7)







## Year 4

# The Distributive Property of Multiplication

#### Vocabulary:

MultiplicationDistributive LawAdjacentMultiplesFactorsPartitioningEquationsExpressionsArraysPart-whole modelDifference



## Year 5

# Multiplying and Dividing by 10 and 100 (1)

#### Multin

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

8 ÷ 10 = 0.8 ÷ 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   |   | ÷ 10     |
| 0.01  | 0.02  | 0.03  | 0.04  | 0.05  | 0.06  | 0.07  | 0.08  | 0.09  |   | ÷ 10     |
|       |       |       |       |       |       |       |       |       |   | the size |

We can multiply and divide a number by 10.

0.08 x 10 = 0.8 x 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     | ٦ |           |
| 0.1   | 0.2   | 0.3   | 0.4   | 0.5   | 0.6   | 0.7   | 0.8   | 0.9   | 1 | × 1()     |
| 0.01  | 0.02  | 0.03  | 0.04  | 0.05  | 0.06  | 0.07  | 0.08  | 0.09  | J | 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.



one-tenth of the size



ten times the size

8 ÷ 100 = 0.08

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



Year 5

# Multiplying and Dividing by 10 and 100 (2)

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



Vocabulary:

## Year 5

# Multiplying and Dividing by 10 and 100 (3).

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 |
|----------------------|-------|-------|-------|-------|-------|
|                      | 100   | 200   | 300   | 400   | 500   |
| 0.27 × 10 = 2.7      | 10    | 20    | 30    | 40    | 50    |
| $2.7 \div 10 = 0.27$ | 1     | 2     | 3     | 4     | 5     |
|                      | 0.1   | 0.2   | 0.3   | 0.4   | 0.5   |
|                      |       |       |       |       |       |

 $4.4 \div 10 = 0.44$ 

one-tenth of the size

 $0.44 \times 10 = 4.4$ 

ten times the size

| 000  | 2,000 | 3,000 | 4,000 | 5,000 | 6,000 | 7,000 | 8,000 | 9,000 |
|------|-------|-------|-------|-------|-------|-------|-------|-------|
| 00   | 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  |

(0.01)

(0.01

0.01

(0.01)

0.27 is one-tenth the size of 2.7

2.7 divided by 10 is 0.27.

\_\_ 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 \_\_\_.

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.* 





| Multiplication and Division   | Vocabulary:  |                                      |                    |                  |                 |                |           |           |                |
|---|--|--------------------------------------|--------------------|------------------|-----------------|----------------|-----------|-----------|----------------|
| Year 5  | Factor Multiple C  | Composite Square Prime               | Cor                | nmon             | Facto           | Pr             | ime F     | actor     |                |
| Find Factors and Multiples  | Factor Bug Array   | Positive Integer Working Sy          | stemat             | ically           |                 |                |           |           |                |
|   | Factor x Factor = Proc   | luct                                 |                    | Divid            | end ÷           | Diviso         | or = Q    | uotie     | nt             |
|   | 6  | Make connections wit<br>connections  | h facto<br>with fa | rs and<br>actors | times<br>of fac | table<br>tors  | s. Ma     | ke<br>ble |                |
|   |  | Nine is a facto                      | r of all           | of thes          | se nur          | cm             | C5 (U)    | <i>.</i>  |                |
| Extend this to square numbers, and<br>prime numbers recognising the   | 1         2         3         4         5         6         7         8         9         10         11         12           0         10         11         12         12         14         16         18         20         22         24         24         27         30         33         36         36 | Three is a factor of nine v<br>of th | vhich n<br>nese nu | neans<br>Imbers  | it is al        | so a f         | actor     | of al     | ,              |
| number of factors.  | 4         0         4         8         12         16         20         24         28         32         36         40         44         48           5         0         5         10         15         20         25         30         35         40         44         48           6         0         5         10         15         20         25         30         35         40         45         50         55         60  | Is 9 a factor of 54?                 | 1                  | 2 3              | Δ               | 5 6            | 7         | 8         | 9 10           |
| 7 0<br>8 0  | 0         12         10         24         30         30         42         40         54         50         60         72           7         14         21         28         35         42         49         56         63         70         77         84           8         16         24         32         40         48         56         64         72         80         88         96   | 54 ÷ 9 = 6                           | 11                 | 12 13            | 14              | 15 1e          | ,<br>5 17 | 18        | 19 20          |
| 9 0<br>10 0   | 9         18         27         36         45         54         63         72         81         90         99         108           10         20         30         40         50         60         70         80         90         100         110         120   | 9 and 6 are factors of               | 21                 | 22 23            | 24              | 25 26          | 27        | 28        | 29 30          |
| Lise factor bugs to find  | 11         22         33         44         55         66         77         88         99         110         121         132           12         24         36         48         60         72         84         96         108         120         132         144   | 54.                                  | 31                 | 32 33            | 34              | 35 36          | 37        | 38        | 39 40          |
| common factors and nrime factors  |  |                                      | 41                 | 42 43<br>52 53   | 44              | 45 46<br>55 56 | 47        | 48<br>58  | 49 50<br>59 60 |
|   |  |                                      | 61                 | 62 63            | 64              | 65 66          | 67        | 68        | 69 70          |
| (1) $(1)$ $(1)$ $(20$ $(1)$ | 1 20   |                                      | 71                 | 72 73            | 74              | 75 76          | 77        | 78        | 79 80          |
| (12) $(20)$ $(12)$ $(12)$ $(12)$ $(12)$   | 20 10  |                                      | 81                 | 82 83            | 84              | 85 86          | 87        | 88        | 89 90          |
| (2) $(2)$ $(2)$ $(10)$ $(1)$ $(1)$  |  |                                      | 91                 | 92 93            | 94              | 95 96          | 97        | 98        | 99 100         |
| 3 4 4 5 3 4   | 4 5  |                                      |                    |                  |                 |                |           |           |                |



## Year 5

# **Multiply using a Formal Written Method (1)**

#### Vocabulary:

Ones Tens Hundreds Thousands Represents Partition Recombine Multiply Unitising Partial Product Aligned Calculation Expanded layout Compact layout Equation Regroup Algorithm

#### Factor x Factor = Product







Divide using a Formal Written Method (2)

Year 5

#### Vocabulary:

Partitive (sharing)Quotitive (grouping)OnesTensHundredsThousandsRepresentsDivideUnitisingDividendDivisorQuotientPartial QuotientAlignedCalculationEquationExchangeAlgorithm 'Sharees'DivisibleRemainderShortDivision $84 \div 4 = 21$  $\frac{2}{418} \frac{1}{8}$ 

| 84       | ÷ | 4       | = | 21       | 4) 8 4                       |
|----------|---|---------|---|----------|------------------------------|
| dividend | ÷ | divisor | = | quotient | quotient<br>divisor)dividend |



# Addition, Subtraction, Multiplication and Division

## Year 6

# Quantify additive and multiplicative relationships

#### Vocabulary:

AdditiveMultiplicativeRelationshipRepresentsComposeCombineTotalMore thanLess thanPlus +Minus -Equal to =AdditionSubtractionDivide ÷Multiply xOne-\_\_\_\_\_ofEquationExpressionBar ModelWholePartDifferenceMultiplierUnknownSequence

Addend + Addend = Sum Factor x Factor = Product (Multiplicand x Multiplier = Product)

Minuend – Subtrahend = Difference

Dividend ÷ Divisor = Quotient







| Addition, Subtraction, Multiplication and Division | Vocabulary:  |  |  |  |  |  |
|--|--|--|--|--|--|--|
| Year 6   | Additive Multiplicative Relationship Represents Compose Combine Total<br>More than Less than Plus + Minus - Equal to = Addition Subtraction Divide ÷ |  |  |  |  |  |
| Quantify additive and multiplicative relationships | 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

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

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

10

10

| Addition and Subtraction              |                    | Vocabulary:   |   |  |  |  |  |  |
|---------------------------------------|--------------------|---|---|--|--|--|--|--|
| Year 6<br>Derive Related Calculations |                    | Additive Multiplicative Relationship Represents Equation Unknown Re-<br>arrange Inverse Place Value Properties Commutative Associative<br>Distributive Compensation |   |  |  |  |  |  |
| Derive Related Calculations           |                    | Addend + Addend = Sum Factor x Factor = Product (Multiplicand x Multiplier = Product)   |   |  |  |  |  |  |
|                                       |                    | Minuend – Subtrahend = Difference   | Dividend ÷ Divisor = Quotient   |  |  |  |  |  |
|                                       |                    |   |   |  |  |  |  |  |
| 252 = 3 × 84                          | 252 = 3 × 84       | 252 = 3 × 84  | Manipulate an equation to solve another. Pupils could:  |  |  |  |  |  |
| 2,520 = 30 ×                          | = 3 × 85           | 252 = 3 × 60 + 3 ×  | <ul> <li>rearrange the terms;</li> <li>rewrite using inverse operations;</li> <li>apply place value;</li> <li>use the properties of division that correspond<br/>to the commutative, associative or<br/>distributive property of multiplication;</li> </ul> |  |  |  |  |  |
| 625 – 148 = 477                       | 625 – 148 = 477    | 625 – 148 = 477   | use the compensation property.  Additive examples   |  |  |  |  |  |
| 6,250 – 1,480 =                       | 625 – 70 – 🔤 = 477 | 625 – 248 =   | Multiplicative examples   |  |  |  |  |  |
| 14.8 + 7.6 = 22.4                     | 14.8 + 7.6 = 22.4  | 14.8 + 7.6 = 22.4   |   |  |  |  |  |  |
| 1,480 + = 2,240                       | - 7.6 = 14.8       | 12.8 + = 22.4   |   |  |  |  |  |  |
|                                       |                    |   |   |  |  |  |  |  |
| 4,800 ÷ 25 = 192                      | 4,800 ÷ 25 = 192   | 4,800 ÷ 25 = 192  |   |  |  |  |  |  |
| 25 × 192 =                            | 4,800 ÷ 250 =      | 4,800 ÷ 5 ÷ 5 =   |   |  |  |  |  |  |

# **Addition and Subtraction**

Year 6

# Solve Problems involving Ratio Relationship

#### Vocabulary:

Additive Multiplicative Relationship Represents Equation Unknown Scalefactor Ratio Ratio Table \_\_\_\_\_\_times the size one-\_\_\_\_\_the size of Vertical Horizontal

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

Dividend ÷ Divisor = Quotient



# **Addition and Subtraction**

Year 6

# Solve Problems with Two Unknowns

#### Vocabulary:

AdditiveMultiplicativeRelationshipRepresentsEquationTwo UnknownsScale-factorRatio\_\_\_\_\_\_times the sizeone-\_\_\_\_\_the size ofTotalBar ModelStructure



The two numbers are 9 and 16.

The two numbers are 16 and 4.