# Progression in calculation- Multiplication

| Year Group objectives | Models and images | Ways in which children could record |
|---|---|---|

## Year 1

*Counting and understanding number*

Count reliably at least 20 objects, recognising that when rearranged the number of objects stays the same; estimate a number of objects that can be checked by counting

Compare and order numbers, using the related vocabulary; use the equals (=) sign

Read and write numerals from 0 to 20 then beyond; use knowledge of place value to position these numbers on a number track and number line

Use the vocabulary of halves and quarters in context

*Knowing and using number facts*

Count on and back in ones, twos, fives and tens and use this knowledge to derive the multiplies of 2, 5 and 10 to the tenth multiple
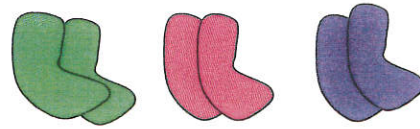
Recall the doubles of all numbers to at least 10

*Calculating*

Solve practical problems that involve combining groups of 2, 5 and 10, or sharing into equal groups

### Counting in 2s

3 pairs of socks, there are 6 socks altogether.

2 girls have 3 cookies each, that's 6 cookies altogether.

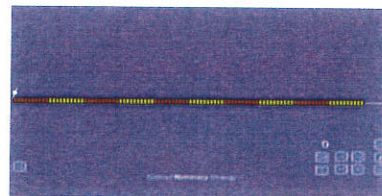3 bags of cookies, 2 in each bag, that's 6 cookies altogether.

Introduce vocabulary 'groups of...' for more able e.g. 4 groups of 2 to explain collections

### Counting in 10s.

10 20 30 40 50    50p altogether

Counting on and back ITP

Grouping ITP

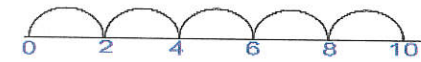---

2 girls have 3 cookies each, that's 6 cookies altogether.

$3 + 3 = 6$

3 bags of cookies, 2 in each bag, that's 6 cookies altogether.

$2 + 2 + 2 = 6$
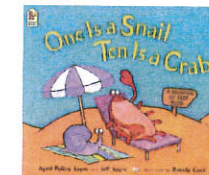
counting people and feet- 5 groups of 2
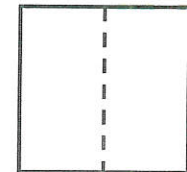
0  2  4  6  8  10

Use a number line marked in 2s – children draw the jumps. Children can draw own number line when ready
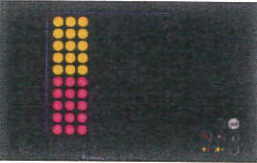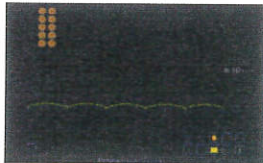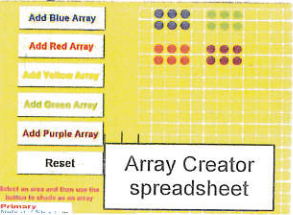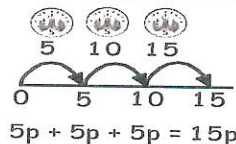
Use 'One is a Snail, Ten is a Crab' (counting by feet book) to support early 'counting in chunks'

### doubling and halving

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## Year 2

### Counting and understanding number

Read and write two-digit and three-digit numbers in figures and words; describe and extend number sequences and recognise odd and even numbers

Count up to 100 objects by grouping them and counting in tens, fives or twos; explain what each digit in a two-digit number represents, including numbers where 0 is a place holder; partition two-digit numbers in different ways, including into multiples of 10 and 1

Order two-digit numbers and position them on a number line; use the greater than (>) and less than (<) signs

Estimate a number of objects; round two-digit numbers to the nearest 10

Find one half and three quarters of shapes and sets of objects
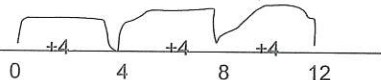
## Knowing and using number facts

Understand that halving is the inverse of doubling and derive and recall doubles of all numbers to 20, and the corresponding halves

Derive and recall multiplication facts for the 2,5 and 10 times tables and the related division facts, recognise multiplies of 2,5 and 10

Use knowledge of number facts and operations to estimate and check answers to calculations,

### Calculating

Represent repeated addition and arrays as multiplication and sharing and repeated subtraction (grouping) as division, use practical and informal methods and related vocabulary to support multiplication and division, including calculations with remainders.

Use the symbols = - x and ÷ to record and interpret number sentences involving all four operations; calculate The value of an unknown in a number sentence e.g.□ ÷ 2 = 6

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**Models and images**

What number sentences could we write about these arrays?

3 lots of 2,
3 groups of 2,
2 + 2 + 2 = 6
3 x 2 = 6
2 multiplied by 3

2 lots of 3
2 groups of 3
3 + 3 = 6
2 x 3 = 6
3 multiplied by 2

Multiplication array ITP

Multiplication facts ITP

Array Creator spreadsheet

Grouping ITP

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**Ways in which children could record**

5
10
15

0    5    10    15

5p + 5p + 5p = 15p

5p x 3 = 15p

Children can record by drawing and/or repeated addition on a number line

+4    +4    +4

0    4    8    12

Explore, explain and build arrays

4 groups of3  or 3 groups of 4

4x3          3x4

# Progression in calculation- Multiplication

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## Year 3

### Counting and understanding number

Read, write and order whole numbers to at least 1000 and position them on a number line; count on from and back to zero in single-digit steps or multiples of 10

Partition three-digit numbers into multiples of 100, 10 and 1 in different ways

Round two-digit or three-digit numbers to the nearest 10 or 100 and give estimates for their sums and differences

Read and write proper fractions (e.g. $\frac{3}{4}$) interpreting the denominator as the parts of a whole and the numerator as the number of parts: identify and estimate fractions of shapes, use diagrams to compare fractions and establish equivalence.

### Knowing and using number facts

Derive and recall multiplication facts for the 2,3,4,5,6 and 10 times tables and the corresponding division facts; recognise multiplies of 2,5 or 10 up to 1000

### Calculating

**Multiply** one digit and two digit numbers (e.g. 13 x 3, 50 ÷ 4) round remainders up or down depending on the context

Understand that division is the inverse of multiplication and vice versa; use this to derive and record related multiplication and division number sentences

Find unit fractions of numbers and quantities e.g. 1/2 1/3 1/4 and 1/6 of 12 litres

Grouping ITP (showing remainders)

Use books, 'One Hundred Hungry Ants' and 'A Remainder Of One'

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Use arrays to model deriving new facts from known facts eg:

$1 \times 4 = 4$

$2 \times 4 = 8$

$4 \times 4 = 16$

Could model on a number line

so $6 \times 4 = 24$
(3 lots of 2 x 4, or 2 lots of 3 x 4)

Apples cost 25p each. How much do 3 apples cost?

25p + 25p + 25p = 75p

0    25p    50p    75p

Array Creator spreadsheet

Multi array ITP to show 13 x 5

Number Dials ITP

See 'Steps to success' DVD

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**Apples cost 25p each. How much do 3 apples cost?**

+25    +25    +25

0    25p    50p    75p

0    4    8    12    16    20    24

*or*

2x4    2x4    2x4

2 lots/grp of 4    2 lots/grp of 4    2 lots/grp of 4

0    8    16    24

*or*

3x4    3x4

3 lots/grp of 4    3 lots/grp of 4

0    12    24

**13 x 5**- How would you partition this?

10x5    50

3x5    15

0    50    65

10 groups of 5 and 3 groups of 5 or 10x5 and 3x5

| x | 10 | 3 | |
|---|---|---|---|
| 5 | 50 | 15 | = 65 |

# Progression in calculation- Multiplication

| Year Group objectives | Models and images | Ways in which children could record |
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**Year 4**    Counting and understanding number

Recognise and continue number sequences formed by counting on or back in steps of constant size

Use decimal notation for tenths and hundredths and partition decimals; relate the notation to money and measurement; position one-place and two-place decimals on a number line

Recognise the equivalence between decimal and fraction forms of one half, quarters, tenths and hundredths

Use diagrams to identify equivalent fractions e.g. $\frac{3}{4}$ and 6/8 interpret mixed numbers and position them on a number line e.g. $3\frac{1}{2}$

Use the vocabulary of ratio and proportion to describe the relationship between two quantities e.g. There are two red beads to every 3 blue beads or 2 in every 5 beads are red. Estimate a proportion – about one quarter of the apples in the box are green

*Knowing and using number facts*

Identify the doubles of two-digit numbers; use these to calculate doubles of multiples of 10 and 100 and derive the corresponding halves

Derive and recall multiplication facts up to 10 x 10, the corresponding division facts and multiples of numbers up to 10 up to the tenth multiple

Use knowledge of rounding, number operations and inverses to estimate and check calculations

Identify pairs of fractions that total one

*Calculating*

Multiply and divide numbers to 1000 by 10 and then 100 (whole number answers) understanding the effect, relate to scaling up or down

Develop and use written methods to record, support and explain multiplication and division of two digit numbers by a one digit number including division and remainders (e.g. 15x9, 98÷6 )
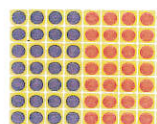
Find fractions of numbers, quantities or shapes e.g. 1/3 of plums

Use a calculator to carry out one and two step calculations involving all four operations recognising negative numbers in the display, correct mistaken entries and interpret the display correctly in the context of money
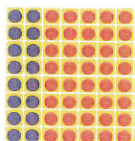
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Use arrays to model deriving new facts from known facts eg:
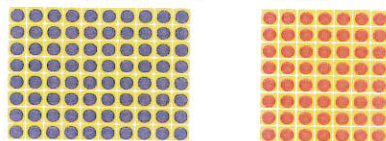$8 \times 7 = $ double $4 \times 7 = $  $28 + 28 = 56$
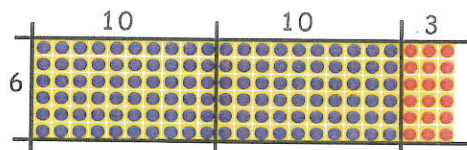
$8 \times 7 = 2 \times 8 + 5 \times 8 = 16 + 40 = 56$

$17 \times 8 = $    $10 \times 8$    $+$    $7 \times 8$    $= 80 + 56 = 136$

Use known number facts:
$6 \times 23 = 6 \times 20 + 6 \times 3$

|    | 10 | 10 | 3 |
|----|----|----|----|
| 6  |    |    |    |

$60$  $+$  $60$  $+18$  $= 138$

ITPs to support models and images
Place Value
Grouping
Multiplication Board
Multiplication Table
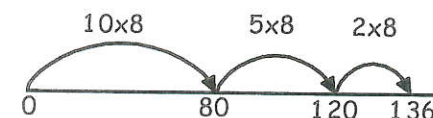Decimal Number Line
(see Yr3 and Y5)

Multiplication Grid ITP

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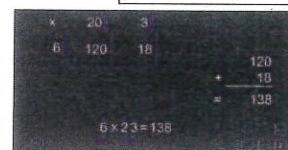
Associative law

$8 \times 7 = 28 + 28 = 56$

8x7

Distributive law

$8 \times 7 = (2 \times 8) + (5 \times 8)$
$= 16 + 40 = 56$

17 × 8

$10 \times 8$    $5 \times 8$    $2 \times 8$

| 0 | 80 | 120 | 136 |

6 × 23 = 138

| × | 20 | 3 |
|---|----|----|
| 6 | 120 | 18 | = 138

Deriving facts from known facts

$6 \times 8 = 48$
$6 \times 80 = 480$
$6 \times 800 = 4800$

## Year Group objective

### Year 5

#### Counting and understanding number

Count from any given number in whole-number and decimal steps, extending beyond zero when counting backwards; relate the numbers to their position on a number line

Explain what each digit represents in whole numbers and decimals with up to two places, and partition, round and order these numbers

Express a smaller number as a fraction of a larger one ( recognise 5 out of 8 is 5/8 ) find equivalent fractions 7/10 = 14/20 and relate fractions to their decimal representations

Understand percentages as the number of parts in every hundred and express tenths and hundredths as percentages

Use sequences to scale numbers up or down, solve problems involving proportions of quantities e.g. decrease quantities in a recipe designed to feed 6 people

#### Knowing and using number facts

Recall quickly multiplication facts up to 10 x10 and use them to multiply pairs of multiples of 10 and 100; derive quickly corresponding division facts

Identify pairs of factors of two digit whole numbers and find common multiples (e.g. for 6 and 9)

Use knowledge of rounding, place value, number facts and inverse operations to estimate and check calculations

#### Calculating

Use understanding of place value to multiply and divide whole numbers and decimals by 10,100 or 1000
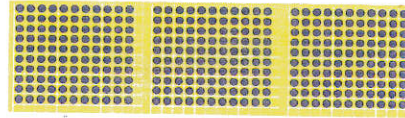
Refine and use efficient written methods to multiply and divide htu x u tu x tu u.t x u and htu ÷ u

Find fractions using division e.g. 1/100 of 5kg and percentages of numbers and quantities 10% 5 of £80

Use a calculator to solve problems involving decimals and fractions and interpret the display in the context of measures

## Models and images

$10 \times 30 = 10 \times 10 + 10 \times 10 + 10 \times 10 = 300$
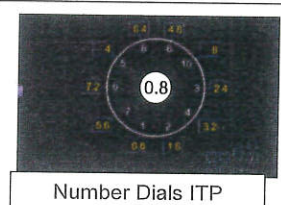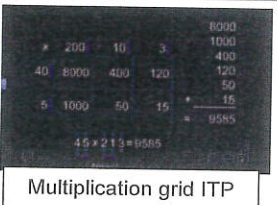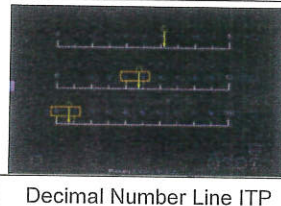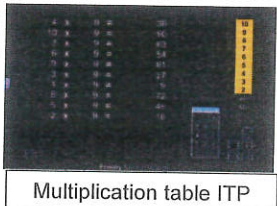


**Real life modelling**

10 boxes 10 x 12 = 120
20 boxes 20 x 12 = 240
 4 boxes  4 x 12 =  48

24 boxes = 240 + 48 = 288

> There are 12 pencils in a box. A school buys 24 boxes. How many pencils does the school buy?


Multiplication array ITP


Multiplication board ITP


Multiplication table ITP


Decimal Number Line ITP


Multiplication grid ITP


Number Dials ITP
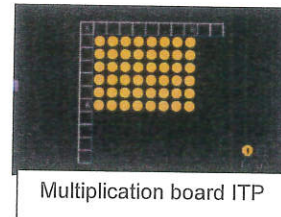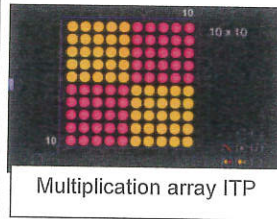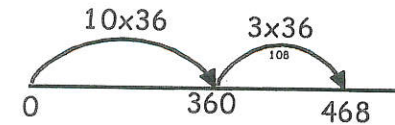
+ Array Creator spreadsheet (see Yr 3)

## Ways in which children could record

**36 x 13 = 468**

| x | 30 | 6 |
|---|----|---|
| 10 | 300 | 60 |
| 3 | 90 | 18 |

= 360 + 108 = 468

10x36   3x36
          108

0        360        468

**4 x 213**

| x | 200 | 10 | 3 |
|---|-----|----|---|
| 4 | 800 | 40 | 12 |

= 852

**£3.25 x 6 = £19.50**

| x | £3 | 20p | 5p |
|---|----|-----|-----|
| 6 | £18 | £1.20 | 30p |

=£19.50

Or

£3x6     20px6     5px6
     £18      £19.20      £19.50
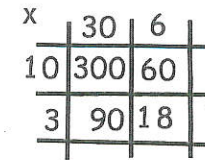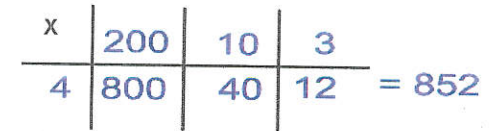
£3x6     25px6
              £1.50
     £18        £19.50
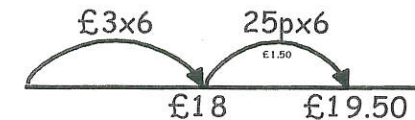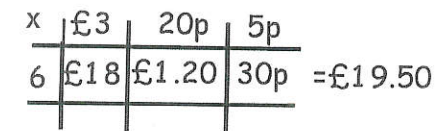
> You could use a calculator and interpret the display

# Progression in calculation- Multiplication

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## Year 6

### Counting and understanding number

Express a larger whole number as a fraction of a smaller one e.g. recognise that 8 slices of a 5 slice pizza represents 8/5 or 1 3/5 pizza. Simplify fractions by cancelling common factors; order a set of fractions by converting them to fractions with a common denominator

Express one quantity as a percentage of another e.g. express £400 as a percentage of £1000; find equivalent percentages, decimals and fractions

Solve simple problems involving direct proportion by scaling quantities up or down

### Knowing and using number facts

Use knowledge of place value and multiplication facts to 10 x 10 to drive related multiplication and division facts involving decimals e.g. 0.8 x 7 4.8 ÷ 6

Use knowledge of multiplication facts to derive quickly squares of numbers to 12 x 12 and the corresponding squares of multiples to 10

Recognise that prime numbers have only two factors and identify prime numbers less than 100, find the prime factors of two digit numbers

Use approximations, inverse operations and tests of divisibility to estimate and check results
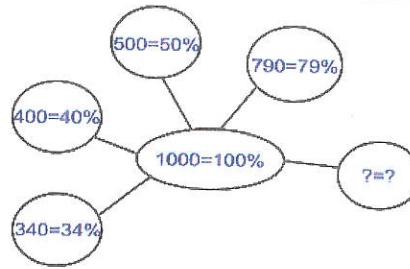
### Calculating

Calculate mentally with integers and decimals TU x U, TU ÷ U, U.t x U, U.t ÷ U

Use efficient methods to multiply and divide integers and decimals by a one digit integer and to multiply two digit and three digit integers by a two digit integer
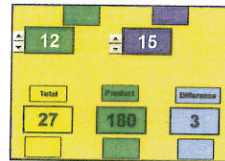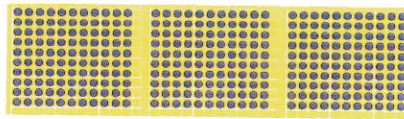
Relate fractions to multiplication and division e.g. 6 ÷ 2 = ½ of 6 = 6 x ½ express a quotient as a fraction or decimal e.g. 67 ÷ 5 = 13.4 or 13 and 2/5. Find fractions and percentages of whole number quantities e.g 5/8 of 96 65% of £260

Use a calculator to solve problems involving multi step calculations

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500=50%  790=79%  400=40%  1000=100%  ?=?  340=34%

$10 \times 30 = 10 \times 10 + 10 \times 10 + 10 \times 10 = 300$

| 12 | | 15 |
|---|---|---|
| Total | Product | Difference |
| 27 | 180 | 3 |

Sum, Product, Difference, Quotient spreadsheet

Number Dials ITP
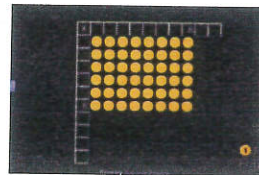
Multiplication board ITP

Multiplication grid ITP

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A kite costs £23.85. How much do 3 kites cost?
£23.85 x 3 = £71.55
( Yr7 –mentally)

| x | £20 | £3 | .80 | .05 |
|---|---|---|---|---|
| 3 | £60 | £9 | £2.40 | £0.15 |

= £69 + £2.55 = £71.55

3x£23  3x85p  £2.55
0  £69  £71.55
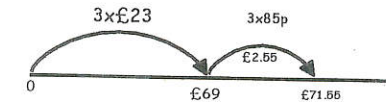
$0.7 \times 14 = 9.8$
14X7 and adjust by ÷ 10

| x | 10 | 4 |
|---|---|---|
| 0.7 | 7 | 2.8 |

= 9.8

10x0.7  2x0.7  2.8
0  7  9.8
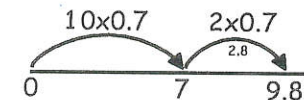
Column multiplication for more able – into Yr 7

```
  14
X  7
-----
  98
   2
```