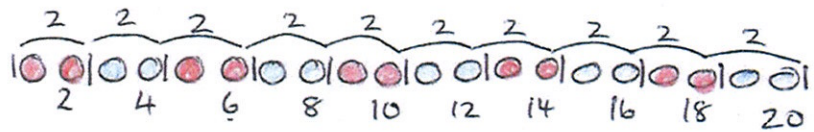
Hamilton Overview of Calculation Methods and Strategies – Multiplication and Division DRAFT

Mental Multiplication

Year 1

Counting in steps ('Clever' counting)

Count in 2s and 10s

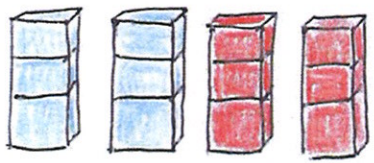


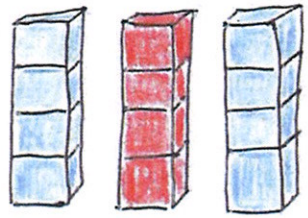
Doubling and halving

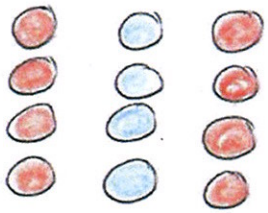
Find doubles to double 6 using fingers

Grouping

Begin to use visual and concrete arrays and 'sets of' objects to find the answers to '3 lots of 4' or '2 lots of 5', etc.



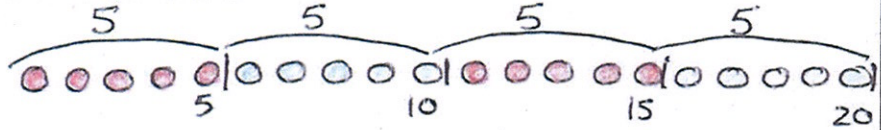




Year 2

Counting in steps ('Clever' counting)

Count in 2s, 5s and 10s



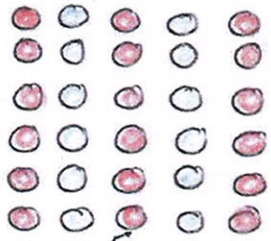
Begin to count in 3s

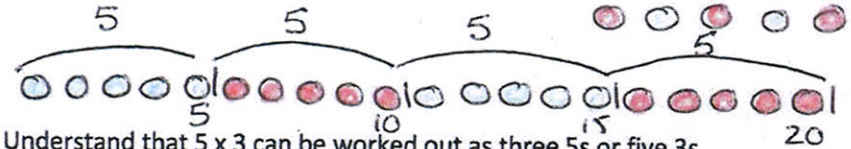
Doubling and halving

Begin to know doubles of multiples of 5 to 100, *e.g. double 35 is 70*

Grouping

Use arrays to find answers to multiplication and relate to 'clever' counting, *e.g. 3 x 4 as three lots of four things and 6 x 5 as six steps in the 5s count as well as six lots of five*



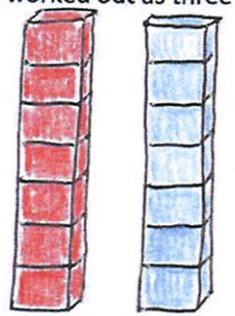


Understand that 5 x 3 can be worked out as three 5s or five 3s

Using number facts

Know doubles to double 20

Double 7 = 14



Start learning 2x, 5x, 10x tables, relating these to 'Clever counting' in 2s, 5s, and 10s, *e.g. 5 x 10 = 50, and 10, 20, 30, 40, 50 is five steps in the tens count*

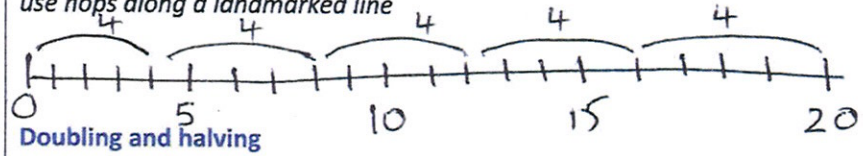
Hamilton Overview of Calculation Methods and Strategies – Multiplication and Division DRAFT

Mental Multiplication

Year 3

Counting in steps ('Clever' counting)

Count in 2s, 3s, 4s, 5s, 8s and 10s, *e.g. colour the multiples on a 1-100 grid or use hops along a landmarked line*

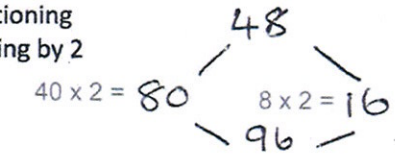


Doubling and halving

Find doubles to double 50 using partitioning

Use doubling as a strategy in multiplying by 2

E.g. 18 x 2 is double 18 (36)



Grouping

Recognise that multiplication is commutative, *e.g. 4 x 8 ≡ 8 x 4*

Multiply multiples of 10 by single digit numbers, e.g. 30 x 8 = 240

Multiply friendly 2-digit numbers by single digit numbers, *e.g. 13 x 4*

Using number facts

Know doubles to 20 and doubles of multiples of 5 to 100, *e.g. double 45 is 90*

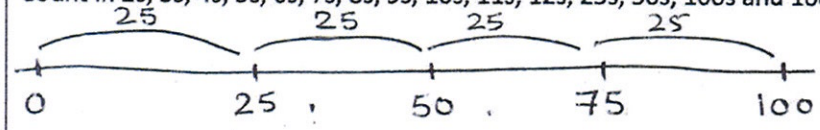
Know doubles of multiples of 5 to 100, *e.g. double 85 is 170*

Know 2x, 3x, 4x, 5x, 8x, 10x tables facts

Year 4

Counting in steps – sequences

Count in 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s, 10s, 11s, 12s, 25s, 50s, 100s and 1000s

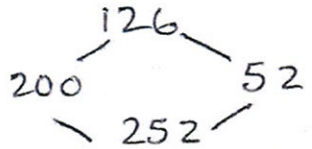


Doubling and halving

Find doubles to double 100 and beyond using partitioning

Begin to double amounts of money.

E.g. £3.50 doubled is £7



Use doubling as a strategy in multiplying by 2, 4 and 8, *e.g. 34 x 4 = double 34 (68) doubled again (136)*

Grouping

Use partitioning to multiply 2-digit numbers by single-digit numbers

Multiply multiples of 100 by single digit numbers using tables facts, *e.g. 400 x 8 = 3200*

Multiply using near multiples by rounding, *e.g. 24 x 19 as (24 x 20) – 24*

Using number facts - Know times tables up to 12 x 12

Written Multiplication

Year 3

Build on partitioning to develop grid multiplication

x	20	3
4	80	12

= 92

Year 4

Use grid multiplication to multiply 3-digit by 1-digit numbers

x	200	50	3
6	1200	300	18

= 1518

Use a vertical written algorithm (ladder) to multiply 3-digit numbers by 1-digit numbers

```
 253
X  6
1200
 300
  18
1518
```

Use grid multiplication to multiply 2-digit numbers by 2-digit numbers

x	40	6
10	400	60
8	320	48
	720	108

= 828

Hamilton Overview of Calculation Methods and Strategies – Multiplication and Division DRAFT

Mental Multiplication

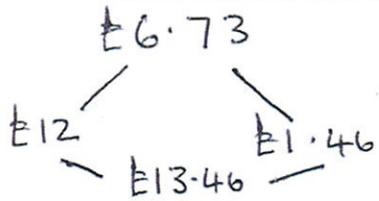
Year 5

Doubling and halving

Double amounts of money using partitioning, *e.g. £6.73 doubled is double £6 (£12) plus double 73p (£1.46)*

Use doubling and halving as a strategy in multiplying by 2, 4, 8, 5 and 20.

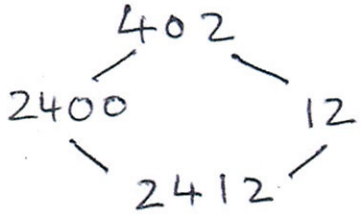
E.g. 58 x 5 = ½ of 58 (29) X 10 (290)



Grouping

Multiply decimals by 10, 100, 1000, *e.g. 3.4 x 100 = 340*

Use partitioning to multiply friendly 2-digit and 3-digit numbers by single-digit numbers. *E.g. 402 x 6 as 400 x 6 (2400) and 2 x 6 (12)*



Use partitioning to multiply decimal numbers by single-digit numbers, *e.g. 4.5 x 3 as (4 x 3) + (4 x 0.5)*

Multiply using near multiples by rounding, *e.g. 32 x 29 as (32 x 30) – 32*

Using number facts

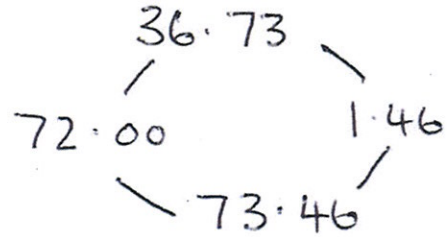
Use times tables facts up to 12 x 12 to multiply multiples of the multiplier, *e.g. 4 x 6 = 24 so 40 x 6 = 240 and 400 x 6 = 2400*

Know square numbers and cube numbers

Year 6

Doubling and halving

Double decimal numbers with up to 2-places using partitioning, *e.g. 36.73 doubled is double 36 (72) plus double 0.73 (1.46)*



Use doubling and halving as strategies in mental multiplication

Grouping

Use partitioning as a strategy in mental multiplication, as appropriate, *e.g. 3060 x 4 as (3000 x 4) + (60 x 4) or 8.4 x 8 as 8 x 8 (64) and 0.4 x 8 (3.2)*

Use factors in mental multiplication, *e.g. 421 x 6 as 421 x 3 (1263) doubled (2526) or 3.42 x 5 as half of (3.42 x 10)*

Multiply decimal numbers using near multiples by rounding, *e.g. 4.3 x 19 as 4.3 x 20 (86 – 4.3)*

Using number facts

Use times tables facts up to 12 x 12 in mental multiplication of large numbers or numbers with up to two decimal places, *e.g. 6 x 4 = 24 and 0.06 x 4 = 0.24*

Written Multiplication

Short multiplication of 2-digit, 3-digit and 4-digit numbers by 1-digit numbers

```
  387
x   6
 2322
```

Long multiplication of 2-digit, 3-digit and 4-digit numbers by teen numbers

Grid multiplication of numbers with up to 2 decimal places by single digit numbers

```
  387
x  14
 3870
 1548
 5418
```

Multiplying fractions by single digit numbers *E.g. ¾ x 6 = $^{18}/_{4}$ which is 4 $^{2}/_{4}$ = 4½*

NB Grid multiplication provides a default method for ALL children

Short multiplication of 2-digit, 3-digit and 4-digit numbers by 1-digit numbers

```
  3875
x    6
 23250
```

Long multiplication of 2-digit, 3-digit and 4-digit numbers by 2-digit numbers

Short multiplication of decimal numbers using x100 and ÷100, e.g. 13.72 x 6 as 1372 x 6 ÷ 100

Short multiplication of money, £13.72 x 6

Grid multiplication of numbers with up to 2 decimal places by single digit numbers

Multiplying proper and improper fractions, e.g. ¾ x $^{2}/_{3}$

NB Grid multiplication provides a default method for ALL children

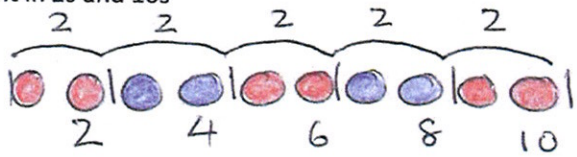
Hamilton Overview of Calculation Methods and Strategies – Multiplication and Division DRAFT

Mental Division

Year 1

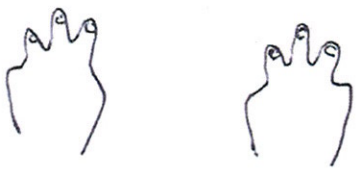
Counting in steps ('Clever' counting)

Count in 2s and 10s



Doubling and halving

Find half of even numbers up to 12 including realising that it is hard to halve an odd number

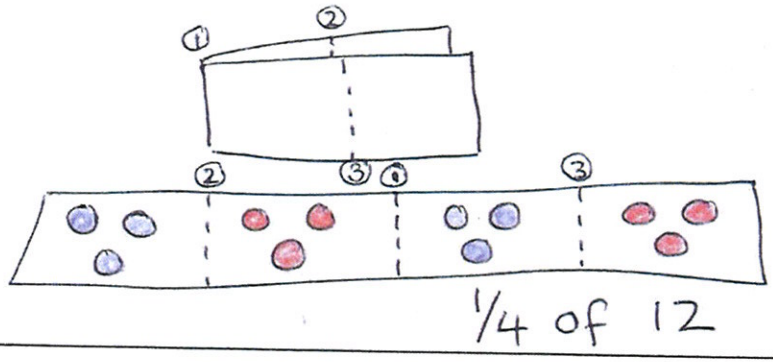


Grouping

Begin to use visual and concrete arrays and 'sets of' objects to find the answers to *'how many towers of 3 can I make with 12 cubes?'*

Sharing

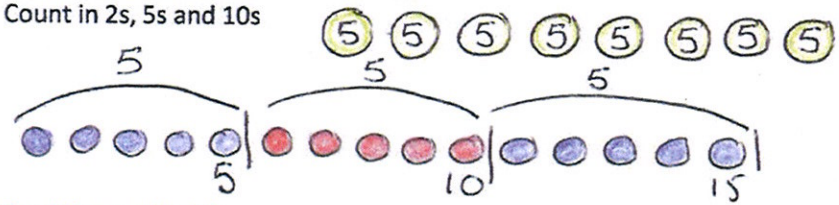
Begin to find half of a quantity using sharing, *e.g. half of 16 cubes by giving one each repeatedly to two children*



Year 2

Counting in steps ('Clever' counting)

Count in 2s, 5s and 10s



Doubling and halving

Find half of numbers up to 40, including realising that half of an odd number gives a remainder of 1 or an answer containing a ½

Begin to know half of multiples of 10 to 100, *e.g. half of 70 is 35*

Grouping

Relate division to multiplication by using arrays or towers of cubes to find answers to division, *e.g. how many towers of five cubes can I make from 20 cubes as ☐ x 5 = 20 and also as 20 ÷ 5 = ?*

Relate to division to 'clever' counting and hence to multiplication, *e.g. how many 5s do I count to get to 20?*

Sharing

Begin to find half or a quarter of a quantity using sharing, *e.g. ¼ of 16 cubes by sorting the cubes into four piles*

Find ¼, ½, ¾ of small quantities

Using number facts

Know halves of even numbers to 24

Know 2x, 5x and 10x division facts

Begin to know 3x division facts

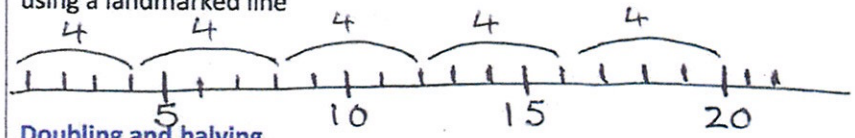
Hamilton Overview of Calculation Methods and Strategies – Multiplication and Division DRAFT

Mental Division

Year 3

Counting in steps ('Clever' counting)

Count in 2s, 3s, 4s, 5s, 8s and 10s by colouring numbers on the 1-100 grid or using a landmarked line

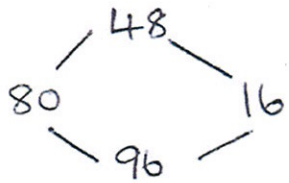


Doubling and halving

Find half of even numbers to 100 using partitioning.

Use halving as a strategy in dividing by 2.

E.g. 36 ÷ 2 is half of 36



Grouping

Recognise that division is not commutative, *e.g. 16 ÷ 8 does not equal 8 ÷ 16*

Relate division to multiplications 'with holes in', *e.g. □ x 5 = 30 is the same calculation as 30 ÷ 5 = ? thus we can count in 5s to find the answer*

Divide multiples of 10 by single digit numbers, *e.g. 240 ÷ 8 = 30*

Using number facts

Know halves of even numbers to 40

Know halves of multiples of 10 to 200, *e.g. half of 170 is 85*

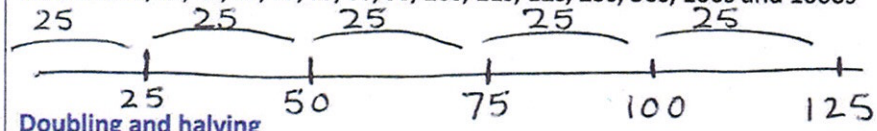
Know 2x, 3x, 4x, 5x, 8x, 10x division facts

Use division facts to find unit and simple non-unit fractions of amounts within the times tables, *e.g. ¾ of 48 is 3 x (48 ÷ 4)*

Year 4

Counting in steps – sequences

Count in 2s, 3s, 4s, 5s, 6s, 7s, 8s, 9s, 10s, 11s, 12s, 25s, 50s, 100s and 1000s



Doubling and halving

Find halves of even numbers to 200 and beyond using partitioning.

Begin to half amounts of money.

E.g. £9 halved is £4.50

Use halving as a strategy in dividing by 2, 4 and 8, *e.g. 164 ÷ 4 is half of 164 (82) halved again (41)*

45 ÷ 3 = □

□ x 3 = 45

10 x 3 = 30

15

5 x 3 = 15

Grouping

Use multiples of 10 times the divisor to divide by number ≤9 above the tables facts, *e.g. 45 ÷ 3*

Divide multiples of 100 by single digit numbers using division facts, *e.g. 3200 ÷ 8 = 400*

Using number facts

Know times tables up to 12 x 12 and all related division facts

Use division facts to find unit and non-unit fractions of amounts within the times tables, *e.g. $^{7}/_{8}$ of 56 is 7 x (56 ÷ 8)*

Written Division

Written version of a mental method

□ x 3 = 86

20 x 3 = 60

26

8 x 3 = 24

2

84 ÷ 3 = 28 r2

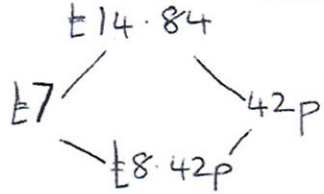
Hamilton Overview of Calculation Methods and Strategies – Multiplication and Division DRAFT

Mental Division

Year 5

Doubling and halving

Halve amounts of money using partitioning, *e.g. half of £14.84 as half of £14 and half of 84p*



Use doubling and halving as a strategy in dividing by 2, 4, 8, 5 and 20, *e.g. 115 ÷ 5 as double 115 (230) ÷ 10*

Grouping

Divide numbers by 10, 100, 1000 to obtain decimal answers with up to three places, *e.g. 340 ÷ 100 = 3.4.*

Use the 10th, 20th, 30th... multiple of the divisor to divide friendly 2-digit and 3-digit numbers by single-digit numbers, *e.g. 186 ÷ 6 as 30 x 6 (180) and 1 x 6 (6)*

Find unit & non-unit fractions of large amounts, *e.g. $^3/_5$ of 265 is 3 x (265 ÷ 5)*

Using number facts

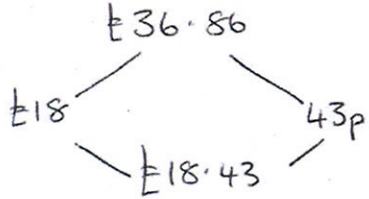
Use division facts from the times tables up to 12 x 12 to divide multiples of powers of ten of the divisor, *e.g. 3600 ÷ 9 using 36 ÷ 9*

Know square numbers and cube numbers

Year 6

Doubling and halving

Halve decimal numbers with up to 2-places using partitioning, *e.g. half of 36.86 is half of 36 (18) plus half of 0.86 (0.43)*



Use doubling and halving as strategies in mental division, *e.g. 216 ÷ 4 is half of 216 (108) and half of 108 (54)*

Grouping

Use 10th, 20th, 30th, ... or 100th, 200th, 300th.... multiples of the divisor to divide large numbers, *e.g. 378 ÷ 9 as 40 x 9 = 360 and 2 x 9 = 18 so the answer is 42*

Use tests for divisibility, *e.g. 135 divides by 3 as 1 + 3 + 5 = 9 and 9 is in the 3x table*

Using number facts

Use division facts from the times tables up to 12 x 12 to divide decimal numbers by single-digit numbers, *e.g. 1.17 ÷ 3 is $^1/_{100}$ of 117 ÷ 3 (0.39)*

Written Division

Written version of a mental strategy for 3-digit ÷ 1 digit numbers

□ x 6 = 326
50 x 6 = 300
26
4 x 6 = 24
2
54 r2

326 ÷ 6 = 54 r2

Short division of 3-digit and 4-digit numbers by single-digit numbers

$$6\overline{)7^{1}5^{3}8^{2}4} = 1264$$

Short division of 3-digit and 4-digit numbers by single-digit numbers

$$6\overline{)7^{1}5^{3}8^{2}4} = 1264$$

Long division of 3-digit and 4-digit numbers by two-digit numbers

200 + 50 + 1	15
15 | 3765	30
3000	45
765	60
750	75
15	90

Divide fractions by whole numbers, *e.g. ¼ ÷ 3 = $^1/_{12}$*