Gainford C E Primary School

PROGRESSION

IN

MENTAL

CALCULATION

MENTAL CALCULATION - EXPECTATIONS FOR EACH YEAR GROUP

	Rapid recall	Mental strategies	Mental calculation
FS	• Find one more or one less than a number from 1 to 10	• say and use number names in order in familiar contexts; • know that numbers identify how many objects are in a set; • count reliably up to 10 everyday objects; • estimate how many objects they can see and check by counting; • count aloud in ones, twos, fives or tens; • use language such as 'more' or 'less' to compare two numbers; • use ordinal numbers in different contexts; • recognise numerals 1 to 9.	
Y1	• Derive and recall all pairs of numbers with a total of 10 and addition facts for totals to at least 5; work out the corresponding subtraction facts • Count on or back in ones, twos, fives and tens and use this knowledge to derive the multiples of 2, 5 and 10 to the tenth multiple • Recall the doubles of all numbers to at least 10	• count on or back in ones; • reorder numbers in a calculation; • be.g.in to bridge through 10, and later 20, when adding a single-digit number; • count back to subtract: • find a small difference by counting up from the smaller to the larger number; • use known number facts and place value to add or subtract pairs of single-digit numbers; • use patterns of similar calculations.	• add or subtract a single-digit to or from a single-digit, without crossing 10, e.g. 4 + 5, 8 – 3; • add or subtract a single-digit to or from 10; • add or subtract a single-digit to or from a 'teens' number, without crossing 20 or 10, e.g. 13 + 5, 17 – 3; • doubles of all numbers to 5 + 5, e.g. 8 + 8, double 6.
Y2	• Derive and recall all addition and subtraction facts for each number to at least 10, all pairs with totals to 20 and all pairs of multiples of 10 with totals up to 100 • 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 multiples of 2, 5 and 10 • Use knowledge of number facts and operations to estimate and check answers to calculations	• count on or back in tens or ones; • reorder numbers in a calculation; • add three small numbers by putting the largest number first and/or find a pair totalling 10; • partition additions into tens and units then recombine; • bridge through 10 or 20; • use known number facts and place value to add or subtract pairs of numbers; • add 9 to single-digit numbers by adding 10 then subtracting 1 by rounding and compensating; • use patterns of similar calculations; • use the relationship between addition and subtraction; • use knowledge of number facts and place value to multiply or divide by 2, 5 or 10; • identify near doubles, using doubles already known; • use doubles and halves and halving as the inverse of doubling.	• add or subtract any single-digit to or from any two-digit number, without crossing the tens boundary, e.g. 62 + 4, 38 – 7; • add or subtract any single-digit to or from a multiple of 10, e.g. 60 + 5, 80 – 7; • add or subtract any 'teens' number to any two-digit number, without crossing the tens boundary, e.g. 23 + 14, 48 – 13; • find what must be added to any two-digit multiple of 10 to make 100, e.g. 70 + ? = 100; • add or subtract a multiple of 10 to or from any two-digit number, without crossing 100, e.g., 47 + 30, 82 – 50; • subtract any two-digit number from any two-digit number when the difference is less than 10, e.g. 78 – 71, or 52 – 48; • doubles of all numbers to at least 15, e.g. double 14; • double any multiple of 5 up to 50, e.g. double 35; • halve any multiple of 10 up to 100, e.g. halve 50.

	Rapid recall	Mental strategies	Mental calculation
Y3	• Derive and recall all addition and subtraction facts for each number to 20, sums and differences of multiples of 10 and number pairs that total 100 • Derive and recall multiplication facts for the 2, 3, 4, 5, 6 and 10 times-tables and the corresponding division facts; recognise multiples of 2, 5 or 10 up to 1000 • Use knowledge of number operations and corresponding inverses, including doubling and halving, to estimate and check calculations	• count on or back in tens or ones; • find a small difference by counting up from the smaller to the larger number; • reorder numbers in a calculation; • add three or four small numbers by putting the largest number first and/or by finding pairs totalling 9, 10 or 11; • partition into tens and units then recombine; • bridge through a multiple of 10, then adjust; • use knowledge of number facts and place value to add or subtract pairs of numbers; • add or subtract mentally a 'near multiple of 10' to or from a two-digit number, e.g. 9, 11, 19, 21, etc; • identify near doubles; • use patterns of similar calculations; • say or write a subtraction statement corresponding to a given addition statement; • to multiply a number by 10/100, shift its digits one/two places to the left; • use knowledge of number facts and place value to multiply or divide by 2, 5, 10, 100; • use doubling or halving; • say or write a division statement corresponding to a given multiplication statement.	• find what must be added to any multiple of 100 to make 1000, e.g. 300 + ? = 1000; • add or subtract any pair of two-digit numbers, without crossing a tens boundary or 100, e.g. 33 + 45, 87 – 2; • add or subtract any single-digit to any two-digit number, including crossing the tens boundary, e.g. 67 + 5, 82 – 7; • find what must be added to/subtracted from any two-digit number to make the next higher/lower multiple of 10, e.g. 64 + ? = 70, 56 – ? = 50; • find complements to 100, e.g. 36 + ? = 100; • subtract any three-digit number from any three-digit number when the difference is less than 10, e.g. 458 – 451, or 603 – 597; • find what must be added to/subtracted from any three-digit number to make the next higher/lower multiple of 10, e.g. 647 + ? = 650, 246 – ? = 240; • doubles: – double any number to at least 20, e.g. double 18, and corresponding halves, e.g. halve 36; – double 60, halve 120; – double 35, halve 70; – double 450, halve 900; • multiply single-digit numbers by 10 or 100, e.g. 6 x 100; • divide any multiple of 10 by 10, e.g. 60 ÷ 10, and any multiple of 100 by 100, e.g. 700 ÷ 100.

	Rapid recall	Mental strategies	Mental calculation
Y4	• Use knowledge of addition and subtraction facts and place value to derive sums and differences of pairs of multiples of 10, 100 or 1000 • 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 × 10, the corresponding division facts and multiples of numbers to 10 up to the tenth multiple • Use knowledge of rounding, number operations and inverses to estimate and check calculations	• count on or back in repeated steps of 1, 10 and 100; • count up through the next multiple of 10, 100 or 1000; • reorder numbers in a calculation; • add 3 or 4 small numbers, finding pairs totalling 10; • add three two-digit multiples of 10; • partition into tens and units, adding the tens first; • bridge through 100; • use knowledge of number facts and place value to add or subtract any pair of two-digit numbers; • add or subtract 9, 19, 29, 11, 21 or 31 by rounding and compensating; • add or subtract the nearest multiple of 10 then adjust; • identify near doubles; • continue to use the relationship between addition and subtraction; • double any two-digit number by doubling tens first; • use known number facts and place value to multiply or divide, including multiplying and dividing by 10 and then 100; • partition to carry out multiplication; • use doubling or halving; • use closely related facts to carry out multiplication and division; • use the relationship between multiplication and division.	• find what must be added to any two-digit number to make 100, e.g. 37 + ? = 100; • add or subtract any pair of two-digit numbers, e.g. 38 + 85, 92 – 47; • find out what must be added to/subtracted from any two- or three-digit number to make the next higher/lower multiple of 100, e.g. 374 + ? = 400, 826 – ? = 800; • subtract any four-digit number from any four-digit number when the difference is small, e.g. 3641 – 3628, 6002 – 5991; • doubles and halves: – double any whole number from 1 to 50, e.g. double 36, and find all the corresponding halves, e.g. 96 ÷ 2; – double any multiple of 10 to 500, e.g. 380 x 2, and find all the corresponding halves, e.g. 760 ÷ 2, 130 ÷ 2; – double any multiple of 5 to 100, e.g. 65 x 2; • multiply any two-digit number by 10, e.g. 26 x 10; • divide a multiple of 100 by 10, e.g. 600 ÷ 10; • multiply any two-digit multiple of 10 by 2, 3, 4 or 5, e.g. 60 x 4, 80 x 3.
Y5	• Use knowledge of place value and addition and subtraction of two-digit numbers to derive sums and differences and doubles and halves of decimals (e.g. 6.5 ±2.7, half of 5.6, double 0.34) • Recall quickly multiplication facts up to 10 × 10 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	• count up through the next multiple of 10, 100 or 1000; • re-order numbers in a calculation; • partition into hundreds, tens and units, adding the most significant digit first; • use known number facts and place value to add or subtract pairs of three-digit multiples of 10 and two-digit numbers with one decimal place; • add or subtract the nearest multiple of 10 or 100 then adjust; • identify near doubles; • add several numbers; • develop further the relationship between addition and subtraction; • use factors; • partition to carry out multiplication; • use doubling and halving; • use closely related facts to carry out multiplication and division; • use the relationship between multiplication and division; • use knowledge of number facts and place value to multiply or divide.	• add or subtract any pair of three-digit multiples of 10, e.g. 570 + 250, 620 – 380; • find what must be added to a decimal fraction with units and tenths to make the next higher whole number, e.g.. 4.3 + ? = 5; • add or subtract any pair of decimal fractions each with units and tenths, or each with tenths and hundredths, e.g. 5.7 + 2.5, 0.63 – 0.48; • subtract a four-digit number just less than a multiple of 1000 from a four-digit number just more than a multiple of 1000, e.g. 5001 – 1997; • multiply any two- or three-digit number by 10 or 100, e.g. 79 x 100, 363 x 100; • divide a multiple of 100 by 10 or 100, e.g. 4000 ÷ 10, 3600 ÷ 100; • multiply any two-digit multiple of 10 by a single-digit, e.g. 60 x 7, 90 x 6; • double any whole number from 1 to 100, multiples of 10 to 1000, and find corresponding halves; • find 50%, 25%, 10% of a small whole numbers or quantities, e.g. 25% of £8.

	Rapid recall	Mental strategies	Mental calculation
Y6	• Use knowledge of place value and multiplication facts to 10 × 10 to derive related multiplication and division facts involving decimals (e.g. 0.8 × 7, 4.8 ÷ 6) • Use knowledge of multiplication facts to derive quickly squares of numbers to 12 × 12 and the corresponding squares of multiples of 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	• consolidate all strategies from previous years; • use knowledge of number facts and place value to add or subtract pairs of three-digit multiples of 10 and two-digit numbers with one decimal place; • add or subtract the nearest multiple of 10, 100 or 1000, then adjust; • continue to use the relationship between addition and subtraction; • use factors; • partition to carry out multiplication; • use doubling and halving; • use closely related facts to carry out multiplication and division; • use the relationship between multiplication and division; • use knowledge of number facts and place value to multiply or divide.	• multiply any two-digit number by a single-digit, e.g. 34 x 6; • multiply any two-digit number by 50 or 25, e.g. 23 x 50, 47 x 25; • multiply or divide any whole number by 10 or 100, giving any remainder as a decimal, e.g. 47 ÷ 10 = 4.7, 1763 ÷ 100 = 17.63; • find squares of multiples of 10 to 100; • find any multiple of 10% of a whole number or quantity, e.g. 70% of £20, 50% of 5kg, 20% of 2 metres.

TEACHING ADDITION AND SUBTRACTION STRATEGIES

COUNTING FORWARDS AND BACKWARDS

Children first encounter counting by beginning at one and counting on in ones. Their sense of number is extended by beginning at different numbers and counting forwards and backwards in steps, not only of ones, but also of twos, tens, hundreds, etc. The image of a number line helps them to appreciate the idea of counting forwards and backwards. They will also learn that, when adding two numbers together, it is generally easier to count on from the larger number rather than the smaller. Eventually 'counting-on' will be replaced by more efficient methods.

Expectations

Year 1

4 + 8	count on in ones from 4 or count on in ones from 8
7 – 3	count back in ones from 7
13 + 4	count on from 13
15 – 3	count back in ones from 15
18 – 6	count back in twos

- Count in unison and individually passing a toy or rolling a ball. Clap hands to change direction – forward and back.
- Use number lines as images, marked and labelled, partially marked and labelled and empty.

Year 2

14 + 3	count on in ones from 14
27 – 4	count on or back in ones from any two-digit number
18 – 4	count back in twos from 18
30 + 3	count on in ones from 30

Year 3

40 + 30	count on in tens from 40
90 – 40	count back in tens from 90 or count on in tens from 40
35 – 15	count on in steps of 3, 4, or 5 to at least 50

Year 4

73 – 68	count on 2 to 70 then 3 to 73
86 – 30	count back in tens from 86 or count on in tens from 30
570 + 300	count on in hundreds from 300
960 – 500	count back in hundreds from 960
	or count on in hundreds from 500

Year 5

11/2 + 3/4	count on in quarters

Year 6

1.7 + 0.5	count on in tenths

REORDERING

Sometimes a calculation can be more easily worked out by changing the order of the numbers. The way in which children rearrange numbers in a particular calculation will depend on which number facts they have instantly available to them.

It is important for children to know when numbers can be reordered (e.g. 2 + 5 + 8 = 8 + 2 + 5 or 15 + 8 – 5 = 15 – 5 + 8 or 23 – 9 – 3 = 23 – 3 – 9) and when they can not (e.g. 8 – 5 ≠ 5 – 8).

The strategy of changing the order of numbers only really applies when the question is written down. It is difficult to reorder numbers if the question is presented orally.

Expectations

Year 1

2 + 7 = 7 + 2

5 + 13 = 13 + 5

3 + 4 + 7 = 3 + 7 + 4

Year 2

2 + 36 = 36 + 2

5 + 7 + 5 = 5 + 5 + 7

Year 3

23 + 54 = 54 + 23

12 – 7 – 2 = 12 – 2 – 7

13 + 21 + 13 = 13 + 13 + 21 (using double 13)

Year 4

6 + 13 + 4 + 3 = 6 + 4 + 13 + 3

17 + 9 – 7 = 17 – 7 + 9

28 + 75 = 75 + 28 (thinking of 28 as 25 + 3)

Year 5

3 + 8 + 7 + 6 + 2 = 3 + 7 + 8 + 2 + 6

25 + 36 + 75 = 25 + 75 + 36

58 + 47 – 38 = 58 – 38 + 47

200 + 567 = 567 + 200

1.7 + 2.8 + 0.3 = 1.7 + 0.3 + 2.8

Year 6

34 + 27 + 46 = 34 + 46 + 27

180 + 650 = 650 + 180 (thinking of 180 as 150 + 30)

4.6 + 3.8 + 2.4 = 4.6 + 2.4 + 3.8

8.7 + 5.6 – 6.7 = 8.7 – 6.7 + 5.6

4.8 + 2.5 – 1.8 = 4.8 – 1.8 + 2.5

- Play detectives to spot numbers which add together easily
- Play speed games, e.g. cards with sets of numbers, e.g. 3 numbers, 2 of which add to 10/20 (13 + 3 + 7)
- Use paring when adding long list of consecutive numbers, e.g. 1 + 2 + 3 + 4 + 5 + 6

- Give out sets of cards – chn must find pairs, e.g. bonds to 10/20/100 or decimals adding to 1.

PARTITIONING: USING MULTIPLES OF 10 AND 100

It is important for children to know that numbers can be partitioned into, for example, hundreds, tens and ones, so that 326 = 300 + 20 + 6. In this way, numbers are seen as wholes, rather than as a collection of single-digits in columns. This way of partitioning numbers can be a useful strategy for addition and subtraction. Both numbers involved can be partitioned in this way, although it is often helpful to keep the first number as it is and to partition just the second number.

Expectations

Year 2

30 + 47 = 30 + 40 + 7

78 – 40 = 70 – 40 + 8

25 + 14 = 20 + 5 + 10 + 4

= 20 + 10 + 5 + 4

- Use moon walk, jump and step to create 3-digit numbers.
- Create numbers with dice labelled 1, 1, 10, 10, 100, 100.
- Use place value arrow cards (ITP Place Value).
- Use PV arrow cards to make given numbers (fish game).
- Apply using counting on or back using number line.

Year 3

23 + 45 = 40 + 5 + 20 + 3

= 40 + 20 + 5 + 3

68 – 32 = 60 + 8 – 30 – 2

= 60 – 30 + 8 – 2

Year 4

55 + 37 = 55 + 30 + 7

= 85 + 7

365 – 40 = 300 + 60 + 5 – 40

= 300 + 60 – 40 + 5

Year 5

43 + 28 + 51 = 40 + 3 + 20 + 8 + 50 + 1

= 40 + 20 + 50 + 3 + 8 + 1

5.6 + 3.7 = 5.6 + 3 + 0.7

= 8.6 + 0.7

4.7 –3.5 = 4.7 – 3 – 0.5

Year 6

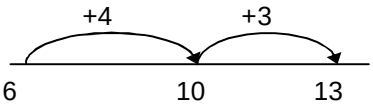
540 + 280 = 540 + 200 + 80

276 – 153 = 276 – 100 – 50 – 3

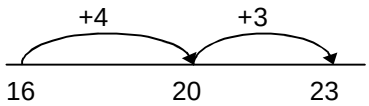
PARTITIONING: BRIDGING THROUGH MULTIPLES OF 10

It is important to know when a number is close to 10 or a multiple of 10: to recognise, for example, that 47 is 3 away from 50, or that 96 is 4 away from 100. When adding or subtracting mentally, it is often useful to make use of the fact that one of the numbers is close to 10 or a multiple of 10 by partitioning another number to provide the difference. The use of an empty number line where the multiples of 10 are seen as 'landmarks' is helpful and enables children to have an image of jumping forwards or backwards to these 'landmarks'. For example,

6 + 7 = 6 + 4 + 3



In the case of subtraction, bridging through the next 10 or multiple of 10 is a very useful method (often termed 'shopkeeper's subtraction'; it is the method used almost universally with money). So the change from £1 for a purchase of 37p is carried out thus: '37 and 3 is 40 and 10 is 50 and 50 is £1'. The use of actual coins, or the image of coins, helps to keep track of the subtraction. The empty number line can provide an image for this method when the subtraction does not involve money. The calculation 23 – 16 can be built up as an addition:



'16 and 4 is 20 and 3 is 23, so add 4 + 3 for the answer.'

A similar method can be applied to the addition and subtraction of decimals, but here, instead of building up to a multiple of 10, numbers are built up to a whole number or to a tenth.

So 2.8 + 1.6 can be turned into 2.8 + 0.2 + 1.4 = 3 + 1.4

Expectations

Year 2

6 + 7 = 6 + 4 + 3

23 – 9 = 23 – 3 – 6

15 + 7 = 15 + 5 + 2

Year 3

49 + 32 = 49 + 1 + 31

Year 4

57 + 14 = 57 + 3 + 11 or 57 + 13 + 1

Year 5

3.8 + 2.6 = 3.8 + 0.2 + 2.4

5.6 + 3.5 = 5.6 + 0.4 + 3.1

Year 6

296 + 134 = 296 + 4 + 130

584 – 176 = 584 – 184 + 8

0.8 + 0.35 = 0.8 + 0.2 + 0.15

- Find complements to 10, 20, 100.
- Use trios (See XL spreadsheets. 'Addition and Subtraction Trios' and 'Multiplication and Division Trios')
- Use in context of money.
- Record with empty number line.
- Give lists of numbers – ask chn to find pairs that make given number.

PARTITIONING: COMPENSATING

This strategy is useful for adding numbers that are close to a multiple of 10, for adding numbers that end in 1 or 2, or 8 or 9. The number to be added is rounded to a multiple of 10 plus a small number or a multiple of 10 minus a small number. For example, adding 9 is carried out by adding 10 and then subtracting 1, and subtracting 18 is carried out by subtracting 20 and adding 2. A similar strategy works for decimals, where numbers are close to whole numbers or a whole number of tenths. For example,
1.4 + 2.9 = 1.4 + 3 – 0.1 or 2.45 – 1.9 = 2.45 – 2 + 0.1

Expectations

Year 2

5 + 9 = 5 + 10 – 1
34 + 9 = 34 + 10 – 1
70 – 9 = 70 – 10 + 1

- Use class shop with realistic prices or catalogues for older chn.
- Record on number line.

Year 3

52 + 21 = 52 + 20 + 1
53 + 11 = 53 + 10 + 1
58 + 71 = 58 + 70 + 1
84 – 19 = 84 – 20 + 1

Year 4

38 + 69 = 38 + 70 – 1
53 + 29 = 53 + 30 – 1
64 – 19 = 64 – 20 + 1

Year 5

138 + 69 = 138 + 70 – 1
405 – 399 = 405 – 400 + 1
21/2 + 13/4 = 21/2 + 2 – 1/4

Year 6

5.7 + 3.9 = 5.7 + 4.0 – 0.1

PARTITIONING: USING NEAR DOUBLES

If children have instant recall of doubles, they can use this information when adding two numbers that are very close to each other. So, knowing that 6 + 6 = 12, they can be encouraged to use this to help them find 7 + 6, rather than use a 'counting on' strategy or 'building up to 10'.

Expectations

Year 1

5 + 6 is double 5 and add 1 or double 6 and subtract 1

Year 2

13 + 14 is double 14 and subtract 1 or double 13 and add 1

40 + 39 is double 40 and subtract 1

Year 3

18 + 16 is double 18 and subtract 2 or double 16 and add 2

36 + 35 is double 36 and subtract 1 or double 35 and add 1

60 + 70 is double 60 and add 10 or double 70 and subtract 10

Year 4

38 + 35 is double 35 and add 3

160 + 170 is double 150 and add 10 then add 20, or double 160 and add 10, or double 170 and subtract 10

380 + 380 is double 400 and subtract 20 twice

Year 5

1.5 + 1.6 is double 1.5 and add 0.1 or double 1.6 and subtract 0.1

Year 6

421 + 387 is double 400 add 21 and then subtract 13

- Display a doubles fact and ask chn what they can work out from it.
- Ask one child to start and how far can the class can get with doubling, then extend to double plus 1.
- Play 'Think of a number', e.g. I think of a number, I double it and add 3. My answer is 63, what is my number?

PARTITIONING: BRIDGING THROUGH NUMBERS OTHER THAN 10

Time is is non-metric, so children need to learn that bridging through 10 or 100 is not always appropriate. A digital clock displaying 9.59 will, in two minutes time, read 10.01 not 9.61. When working with minutes and hours, it is necessary to bridge through 60 and with hours and days through 24.

Expectations

Year 1

1 week = 7 days

What time will it be in one hour's time?

How long is it from 2 o'clock to 6 o'clock?

It is half past seven. What time was it 3 hours ago?

It is 7 o'clock in the morning. How many hours to mid-day?

- Refer to analogue and digital classroom clocks throughout the day – how many minutes to..?
- Explore methods of counting on/back, e.g. counting on/back in hours then minutes, or bridging through 'o'clock' times.
- Use timetables

Year 2

1 year = 12 months

1 week = 7 days

1 day = 24 hours

1 hour = 60 minutes

What time will it be 1 hour after 9 o'clock?

10.30 to 10.45

9.45 to 10.15

Year 3

40 minutes after 3.30

50 minutes before 1.00 pm

It is 10.40. How many minutes to 11.00?

It is 9.45. How many minutes to 10.00?

Year 4

It is 8.35. How many minutes to 9.15?

Year 5

It is 11.30. How many minutes to 15.40?

Year 6

It is 10.45. How many minutes to 13.20?

So to find the time 20 minutes after 8.50, for example, children might say 8.50 + 10 minutes takes us to 9.00, then add another 10 minutes.

TEACHING MULTIPLICATION AND DIVISION SKILLS AND STRATEGIES

KNOWING MULTIPLICATION AND DIVISION FACTS TO 10

Instant recall of multiplication and division facts is key in developing children's numeracy skills. The expectation (see below) is that most year 4 children know the multiplication facts up to 10 x 10 and the associated division facts. However, learning these facts and being fluent at recalling them quickly is a gradual process which takes place over time and which relies on regular opportunities for practice in a variety of situations.

The ability to work out and knowing by heart are linked and support each other, e.g. the child who can work out the answer to 6 x 8 by recalling 6 x 2 and then doubling this result twice will, through regular use of this strategy, become more familiar with the fact that 6 x 8 is 48. In the interest of speed and accuracy, it is important that these facts are known by heart, even if children are able to employ effective strategies for working them out.

Expectations

Year 1

Count in tens – 10, 20, 30 … to 50

Count in fives – 5, 10, 15, 20, … to 20 or more

Count in twos – 2, 4, 6, 8, … to 20

Year 2

Recall the 2, 10 and 5 times tables up to 10 x

Recall division facts for the 2, 10 and 5 times tables

Year 3

Count in threes, fours and sixes and recall the 3, 4 and 6 times tables up to 10 x

Recall the corresponding division facts

Year 4

Count in sevens, eights and nines and recall the 7, 8 and 9 times tables up to 10 x

Recall the corresponding division facts

Year 5

Recall quickly multiplication facts up to 10 × 10 and use them to multiply pairs of multiples of 10 and 100

Derive quickly corresponding division facts

Year 6

Use knowledge of place value and multiplication facts to 10 × 10 to derive related multiplication and division facts involving decimals (e.g. 0.8 × 7, 4.8 ÷ 6)

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

MULTIPLYING AND DIVIDING BY MULTIPLES OF 10

Being able to multiply by 10 and multiples of 10 depends on an understanding of place value and is fundamental to being able to multiply and divide larger numbers.

Expectations

Year 2

7 x 10

60 ÷ 10

Year 3

6 x 100

26 x 10

Year 4

4 x 60

3 x 80

351 x 10

79 x 100

976 x 10

700 ÷ 100

580 ÷ 10

Year 5

9357 x 100

4.37 x 10

1.06 x 1000

9900 ÷ 10

737 ÷ 100

2060 ÷ 1000

135.4 ÷ 100

Year 6

Consolidate work from previous years

- ITP 'Moving digits'.
- Place value charts (See XL spreadsheet. 'Place value charts and Partitioning tool'.)

MULTIPLYING AND DIVIDING BY SINGLE-DIGIT NUMBERS AND MULTIPLYING BY TWO-DIGIT NUMBERS

Once children are familiar with some multiplication facts, they can use these facts to work out others. One strategy that can be used is writing one of the numbers as the sum of two others about which more is known: 6 x 7 = 6 x (2 + 5) = 6 x 2 + 6 x 5. Another strategy is making use of factors, so 7 x 6 is seen as 7 x 3 x 2.

Expectations

Year 2

9 x 2

5 x 4

18 ÷ 2

16 ÷ 4

Year 3

7 x 3

4 x 8

35 ÷ 5

24 ÷ 3

23 x 2

46 ÷ 2

Year 4

13 x 9

32 x 3

64 ÷ 4

93 ÷ 3

Year 5

428 x 2

154 ÷ 2

47 x 5

3.1 x 7

Year 6

13 x 50

14 x 15

153 ÷ 51

8.6 x 6

2.9 x 9

45.9 ÷ 9

- Partitioning, e.g.
  - 24 x 6
    (20 x 6) + (4 x 6)
    120 + 24 = 144
  - 98 ÷ 7
    (70 ÷ 7) + (28 ÷ 7)
    10 + 4 = 14
- Factorising, e.g.
  - 24 x 6
    (12 x 2) x 6
    12 x (2 x 6)
    12 x 12 = 144
  - 98 ÷ 14
    98 ÷ (7 ÷ 2)
    (98 ÷ 2) ÷ 7
    49 ÷ 7 = 7

Note: Children will need to make jottings to attempt many of the above strategies.

DOUBLING AND HALVING

The ability to double numbers is a fundamental tool for multiplication. Historically, all multiplication was calculated by a process of doubling and adding. Most people find doubles the easiest multiplication facts to remember, and they can be used to simplify other calculations. Sometimes it can be helpful to halve one of the numbers in a product and double the other.

Expectations

Year 1

7 + 7 is double 7

Year 2

7 + 7 = 7 x 2

Half of 14 is 7

Half of 30 is 15

Year 3

18 + 18 is double 18

Half of 18 is 9

60 x 2 is double 60

Half of 120 is 60

Half of 900 is 450

Half of 36 is 18

Year 4

14 x 5 = 14 x 10 ÷ 2

12 x 20 = 12 x 2 x 10

60 x 4 = 60 x 2 x 2

Year 5

36 x 50 = 36 x 100 ÷ 2

Half of 960 = 480

Quarter of 64 = Half of half of 64

15 x 6 = 30 x 3

Year 6

34 x 4 = 34 x 2 x 2

26 x 8 = 26 x 2 x 2 x 2

20% of £15 = 10% of £15 x 2

36 x 25 = 36 x 100 ÷ 4 = (36 ÷ 4) x 100

1.6 ÷ 2 = 0.8

- Doubles and halves number chains
- Doubles and halves dominoes
- Doubles and halves loop game

FRACTIONS, DECIMALS AND PERCENTAGES

Children need an understanding of how fractions, decimals and percentages relate to each other, e.g. if they know that 1/2, 0.5 and 50% are all ways of representing the same part of a whole, then the calculations

½ x 40

40 x 0.5

50% of £40

can be seen as different versions of the same calculation. Sometimes it might be easier to work with fractions, sometimes with decimals and sometimes with percentages.

Expectations

- Find several fractions of one amount.
- Use number lines for fractions, decimals and percentages and compare fractions on each line.
- Use percentage webs.

Year 2

Find half of 8

Find half of 30

Year 3

Find one third of 18

Find one tenth of 20

Find one fifth of 15

Year 4

Find half of 9, giving the answer as 4½

Know that 0.7 is $^{7}/_{10}$ and that 0.5 is ½

Know that 6.25 is 6¼

Find ½ of 36, 150, £21.60

Year 5

Know that $^{27}/_{100}$ = 0.27, $^{75}/_{100}$ is ¾ or 0.75 and 3 hundredths is $^{3}/_{100}$ or 0.03

Find $^{1}/_{7}$ of 35, ½ of 920, ½ of £71.30

Know that 10% = 0.1 = $^{1}/_{10}$, 25% = 0.25 = ¼

Find 25% of £100, 70% of 100cm

Year 6

Know that 0.007 is $^{7}/_{1000}$, 0.27 is $^{27}/_{100}$

0.1 x 26

0.01 x 17

7 x 8.6

Know that 43% is 0.43 or $^{43}/_{100}$

Find 25% of £360, 17½ % of £5250