# Progression in Maths

St Andrew's CE Primary

ADDITION

- Use objects of same size and type
- Use objects of different sizes and types (how many altogether)
- Use cubes etc
- Use Base 10 to make both numbers, count up tens and units, swap 10 ones for a ten when bridging ten.

A number line is a method of recording a mental process – this helps the children make the link between the concrete and the abstract method of working.
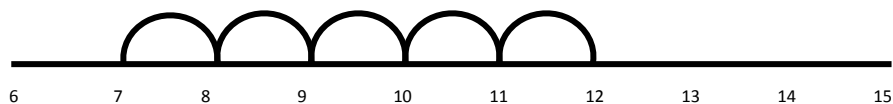
- Numbered number line counting up in ones not crossing tens.

  3 + 4 = 7
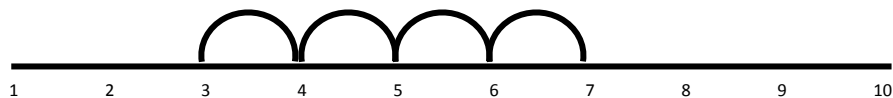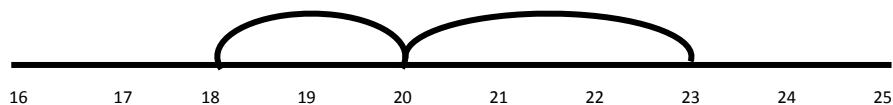

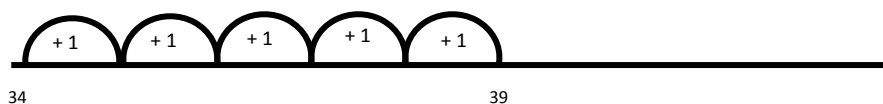- Numbered number line counting up in ones crossing tens

  7 + 5 = 12

- Numbered number line adding to multiple of ten and adding the rest.

  18 + 5 = 18 +2 +3 = 23

- Blank number line counting up in ones.

  34 + 5 = 39

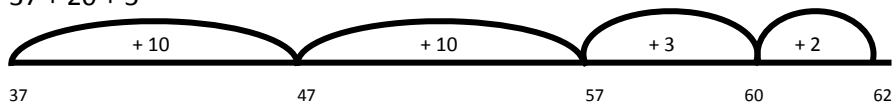- Blank number line adding to the multiple of ten and adding the rest.

  18 + 5 = 23

- Blank number line to add multiples of ten first in jumps of one at a time or chunk of them, then to the multiple of ten and then the rest.
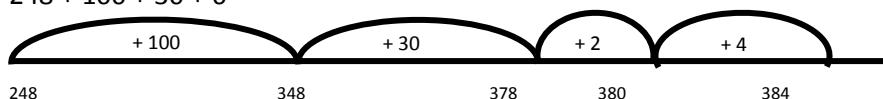
  37 + 25 =

  37 + 20 + 5

- Blank number line to add multiples of hundred first, then multiples of ten to the multiple of ten and then the rest.

  248 + 136 =

  248 + 100 + 30 + 6 =

ST ANDREW'S PROGRESSION IN MATHS

- Adding using partitioning (horizontal)   46 + 27

  $$40 + 20 = 60$$
  $$6 + \ 7 \ = \underline{13}$$
  $$\underline{73}$$

- Adding using partitioning (vertical)   83 + 56 = **139**   (2 digits then 3 digits)

  $$3 + \ 6 = \ \ 9$$
  $$80 + 50 = \underline{130}$$
  $$\underline{139}$$

- Adding using partitioning (expanded column method)

  ```
     47
  + 76
     13
   110
   123
  ```

- Adding using column addition NO carrying – 2 digit + 2 digit numbers then 3 digit

  ```
     32           143
  + 57          +235
     89           378
  ```

- Adding using column addition & carrying – 2 digit + 2 digit numbers

  ```
     47          The tens or hundreds that you
  + 76          carry goes UNDER the answer line
   123          in the correct column.
   1 1
  ```

  – 2 digit + 3 digit numbers

  – 3 digit + 3 digit numbers

  – using up to 5 digit numbers

  – decimals as money

  – U.0 + U.t numbers

  – decimal numbers to 1dp

  – decimal numbers to 2dp

 USE A NUMBER LINE FOR WORKING OUT DURATIONS IN TIME.

  MAKE SURE THE CHILDREN WRITE 1 DIGIT IN 1 SQUARE AT ALL TIMES READY FOR UNDERSTANDING PLACE VALUE WHEN WORKING ON COLUMN ADDITION.
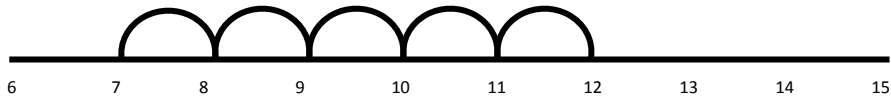
SUBTRACTION

- Use objects of same size and type
- Use objects of different sizes and types (how many altogether)
- Use cubes

- Use Base 10, swap a ten for 10 ones when crossing a ten number.

A number line is a method of recording a mental process – this helps the children make the link between the concrete and the abstract method of working.
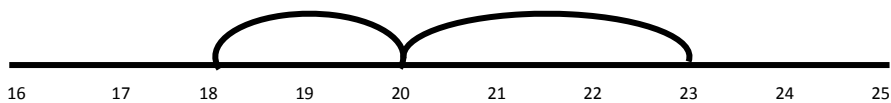
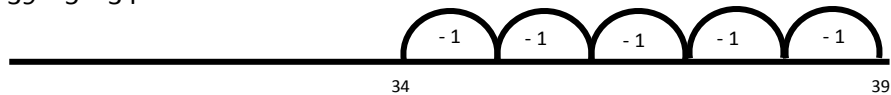- Numbered number line counting back in ones not crossing tens.

  7 - 3 = 4

  1　2　3　4　5　6　7　8　9　10
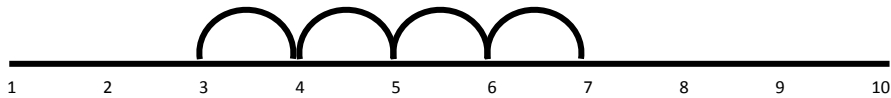
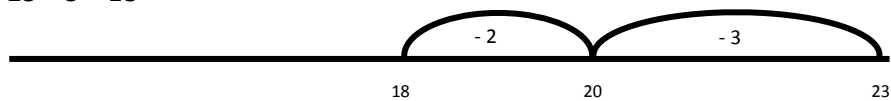- Numbered number line counting back in ones crossing tens.

  12 – 5 = 7

  6　7　8　9　10　11　12　13　14　15

- Numbered number line subtracting to multiple of ten and subtracting the rest.

  23 – 5 = 23 – 3 – 2 = 18

  16　17　18　19　20　21　22　23　24　25

- Blank number line counting back in ones.

  39 – 5 = 34

  - 1　- 1　- 1　- 1　- 1

  34　　　　　　　　　　39

- Blank number line subtracting to the multiple of ten and subtracting the rest.

  23 – 5 = 18

  - 2　　　　- 3

  18　　　20　　　　23

- Blank number line to subtract multiples of ten first in jumps of one at a time or chunk of them, then to the multiple of ten and then the rest.

  62 – 25 = 37

  62 – 20 – 5

  - 3　　- 2　　　- 10　　　　- 10

  37　　　40　　42　　　　52　　　　　62
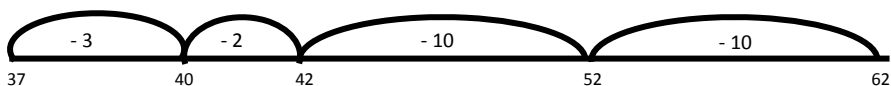
- Blank number line to subtract multiples of hundred first, then multiples of ten to the multiple of ten and then the rest.

  248 – 136 = 148

  248 – 100 – 30 – 6 =

  - 2　　　- 4　　　- 30　　　- 100

  148　　150　　　154　　　184　　　　284
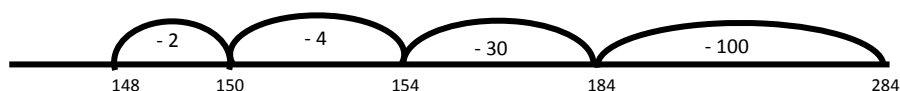
- Subtracting using partitioning (horizontal) $83 - 56 =$ (2 digits then 3 digits)

  $83 - 50 - 6$
  $83 - 50 = 33 - 6 = 27$

- Subtracting using partitioning (vertical) $^7\cancel{8}^13 - 56 =$ (2 digits then 3 digits)
  (borrowing a ten) UNITS FIRST $13 - 6 = 7$
  $70 - 50 = \underline{2\ 0}$
  $\underline{2\ 7}$

- Subtracting using column subtraction not crossing tens

$$
\begin{array}{r} 57 \\ -\ 34 \\ \hline 23 \end{array} \qquad \begin{array}{r} 386 \\ -\ 234 \\ \hline 152 \end{array}
$$

- Subtracting using column subtraction & borrowing – 2 digit - 2 digit numbers

$$
\begin{array}{r} ^6\cancel{7}^12 \\ -\ 4\ 3 \\ \hline 2\ 9 \end{array}
$$

  – 3 digit - 3 digit numbers
  – using up to 5 digit numbers
  – decimals as money and measures
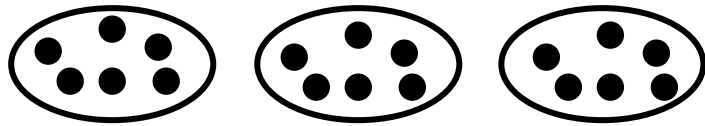 – decimal numbers to 1dp
  – decimal numbers to 2dp

  USE A NUMBER LINE FOR WORKING OUT TIME DIFFERENCES.

MULTIPLICATION

- Practical 'lots of' using objects
- 'Lots of' using marks on paper $\quad$ 3 x 6 =

- Repeated addition (horizontal) – using objects to support e.g. cubes

$$6 \text{ x } 4 =$$

4 $\quad$ 8 $\quad$ 12 $\quad$ 16 $\quad$ 20 $\quad$ 24

4 $\;+\;$ 4 $\;+\;$ 4 $\;+\;$ 4 $\;+\;$ 4 $\;+\;$ 4 $\;=\;$ 24

- Repeated addition using a number line

7 x 3 =
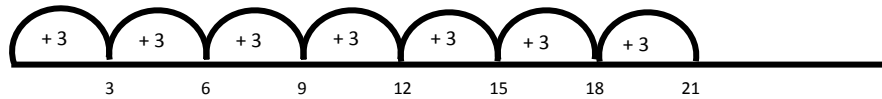
- Arrays
  Arrays can be read in two ways because multiplication is commutative.
  For the purposes of linking with division, set out the array in columns with x meaning 'lots of':

1 X 3 =	2 X 3 =	5 x 3 =
O	O O	O O O O O
O	O O	O O O O O
O	O O	O O O O O

- Grid for teen numbers x units (to draw the grid, use the smallest number to work out how many lines across and the bigger number to work out how many lines down).
  14 x 3 =

x	**10**	**4**
3	30	4

30
+ 4
34

- Grid method 2 digit x 1 digit
  38 x 4 =

x	**30**	**8**
4	120	32

120
+ 32
152

- Grid method 3 digit x 1 digit
  149 x 5 =

x	**100**	**40**	**9**
5	500	200	45

500
200
+ 45
745

ST ANDREW'S PROGRESSION IN MATHS

- Grid method 2 digit x 2 digit
  16 x 32 =

x	**30**	**2**
10	300	20
6	180	12

= 320
+
= <u>192</u>
  492

- Grid method 3 digit x 2 digit (as above)
- Grid method 3 digit x 3 digit (as above)

- Grid method decimals – 1dp
  6 x 2.3

x	**2**	**0.3**
6	12	1.8

  12
+ <u>1.8</u>
 <u>13.8</u>

- Grid method decimals – 2dp
  3 x 4.27

x	**4**	**0.2**	**0.07**
3	12	0.6	0.21

  12
  0.6
+ <u>0.21</u>
 <u>12.81</u>

TIMES TABLES:

To know them off by heart, with quick recall of times tables, both in and out of order.

Year 1 – 2x and 10x

Year 2 – 5x, 3x & recap 2x & 10x

Year 3 – 4x, 6x, 8x and recap 2x, 3x, 5x and 10x

Year 4 – 7x & 9x – recap 2x, 3x, 4x, 5x, 6x, 8x and 10x

Year 5 – recap and use facts – including teen numbers by mentally partitioning and multiplying by 10 then the units.

Year 6 – recap and use facts including multiplying by multiples of 10 mentally.

DIVISION

Useful Definitions:

Sharing = when the unit in the answer is the same as in the question e.g. There are 18 pencils. 3 children get the same amount each. How many pencils do they each get? *6 **pencils**.*

Grouping = when the unit in the answer is different as in the question e.g. There are 16 eggs. Egg boxes hold 6 eggs in each. How many boxes are needed to hold all the eggs? *3 **boxes**.*

- Practical sharing
  18 ÷ 3 = 6
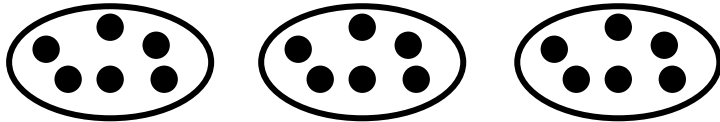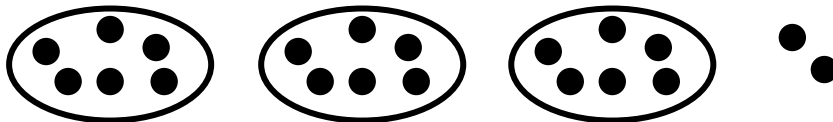
- Practical grouping e.g.
  12 ÷ 4 = 3

- Practical sharing with remainders
  20 ÷ 3 = 6 r2

- Practical grouping with remainders
  13 ÷ 4 = 3 r1

- Repeated subtraction (horizontal) using objects to support e.g. cubes

$$24 ÷ 4 = 6$$

$$24 \; 20 \; 16 \; 12 \; 8 \; 4 \; 0$$
$$\scriptstyle -4 \;\; -4 \;\; -4 \;\; -4 \;\; -4 \;\; -4$$

- Array (without remainder)
  For the purposes of linking with multiplication, set out the array in rows to show how many it is 'shared by' or 'grouped into':

6 ÷ 2 = 3   12 ÷ 4 = 3   15 ÷ 3 =5

Draw an oval around the first column to find the answer.

- Array (with remainder)

$7 \div 2 = 3$ r1 $15 \div 4 = 3$ r3 $17 \div 3 = 5$ r2

```
 O  O            O  O O O          O  O O
 O  O            O  O O O          O  O O
 O  O            O  O O O          O  O O
 O               O  O O            O  O O
                                   O  O O
                                   O  O O
                                      O  O
```

This is the same as division without remainders – to find the remainder, draw a line under the last FULL row of the array. Draw an oval round the first column, up to the line, to find the answer. Whatever is underneath the line is the remainder.

- Chunking – using subtraction – without remainders

$84 \div 7 = 12$

$- 70$ (<u>10</u> x 7)

  14

$- 14$ (<u>2</u> x 7)

   0

Chunking involves subtracting 'chunks' of the divisor (the number that you are dividing by) until you cannot take away any more.

Put the multiplication fact you used to find the 'chunk' in brackets next to the answer – UNDERLINE how many lots of the divisor you have used.

To find the ANSWER, total up how many lots of the divisor you have used ALTOGETHER.

- Chunking – using subtraction – with remainders

$73 \div 4 = 18$ r1

$- 40$ (<u>10</u> x 4)

  33

$- 32$ (<u>8</u> x 4)

   1

** Encourage children to use the 'cheat's corner' with x table facts in the working out space in their book:

1 x 4 = 4
2 x 4 = 8
3 x 4 = 12
5 x 4 = 20
10 x 4 = 40
20 x 4 = 80

Also encourage children to use doubling to find other related facts e.g. 4x by doubling 2x, 6x by doubling 3x etc. For larger amounts, ch could derive 15 by using 5x + 10x. Encourage playing with numbers in this way during mental skills sessions.

Years 1-6: Find the related facts (inverse) when working on multiplication activities. Children should have a quick mental recall of the facts by Year 6, using the multiplication facts that they know.

- Know the word and symbol for half 1/2
- Identify halves of objects e.g. apple, slice of bread, cake
- Find halves of objects e.g. apple, slice of bread, cake
- Identify halves of shapes
- Find halves of shapes

- Know the word and symbol for quarter 1/4
- Identify quarters of objects e.g. apple, slice of bread, cake
- Find quarters of objects e.g. apple, slice of bread, cake
- Identify quarters of shapes
- Find quarters of shapes

- Identify halves of amounts
- Find halves of amounts

- Identify quarters of amounts
- Find quarters of amounts

- Know the word and symbol for three quarters 3/4
- Three quarters of objects e.g. apple, slice of bread, cake

- Read and write single fractions 1/2, 1/3, 1/4, 1/5, 1/10
- Identify single fractions in shapes: 1/2, 1/3, 1/4, 1/5, 1/10
- Find single fractions in shapes: 1/2, 1/3, 1/4, 1/5, 1/10

- Read and write all previous fractions , now also including 1/7, 1/9, 1/12

- Find single fractions of amounts using an array (as in division) e.g. 1/2, 1/3, 1/4, 1/5, 1/10

- Find fractions of amounts with a numerator greater than 1 e.g. 2/3, 3/4, 2/5, 7/10 etc **using an array**
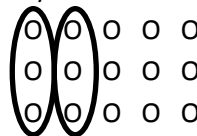 Using an array to find fractions:
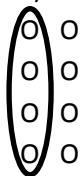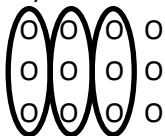
 1/2 of 8 = 4   3/4 of 12 = 3   2/5 of 15 = 6

  By dividing by the denominator (the bottom number) of the fraction, the children can see how the amount is 'split up'. By using the numerator (the top number) to tell you how many columns to circle, the children can then see the value of the fraction of the whole amount. They can also see the value of 'what is left'.

- Find fractions of amounts by dividing by the denominator and multiplying by the numerator:
 3/5 of 30 = 18
  1/5 = 30 ÷ 5 = 6
  3/5 = 6 x 3 = 18

ST ANDREW'S PROGRESSION IN MATHS

AREA

- Find the area of a rectangle (oblong or square) by counting squares.
- Find the area of an irregular shape by counting whole squares.
- Find the area of an irregular shape by counting squares, including half squares (on the diagonal).
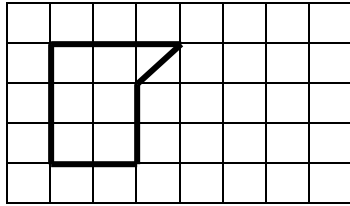

- Find the area of a rectangle by using the length and breadth of the shape (LxB= area)
- Work out the area of a compound shape by breaking it down into rectangles.
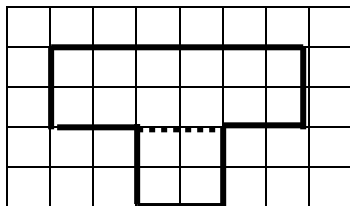
PERIMETER

- Count the squares around the edge of the rectangle.
- Count the squares around the edge of the irregular shape.
- Find the length of 2 of the sides of the rectangle – one long, one short if it's an oblong – and double each measurement and then find the total.
- Measure each side of the irregular shape.

SHAPE

- 2D shapes have sides and corners.

- Rectangle is the 'family' name for both oblongs ▭ and squares ☐. They have 2 pairs of equal parallel sides and 4 right angles.

- Any 4 sided shape is known as a quadrilateral.

- 3D shapes have faces, edges and vertices.

- There are flat and curved faces – a cylinder has 3 faces, 2 flat and 1 curved.