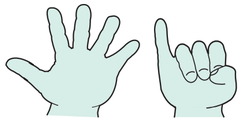
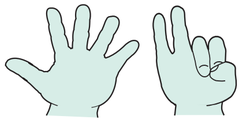
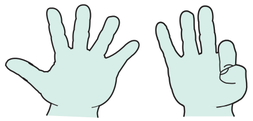
# Models and images for partitioning and recombining



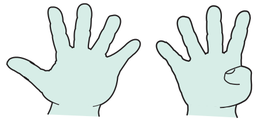
6 is 5 and 1 more
6 = 5 + 1



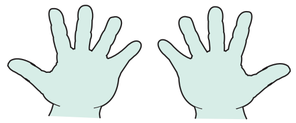
7 is 5 and 2 more
7 = 5 + 2



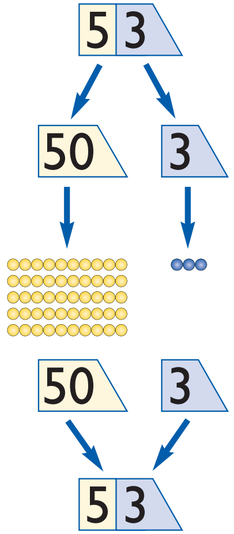
8 is 5 and 3 more
8 = 5 + 3

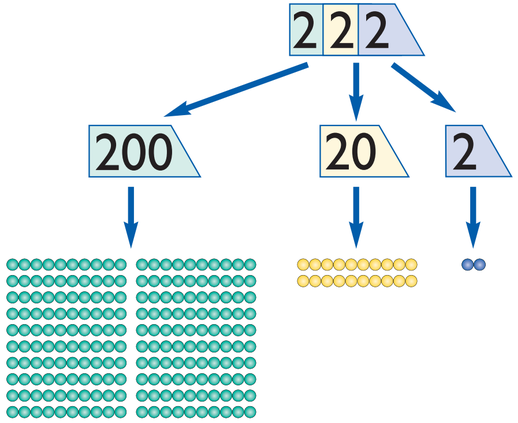


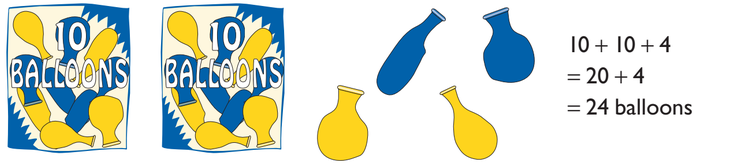
9 is 5 and 4 more
9 = 5 + 4



10 is 5 and 5 more
10 = 5 + 5

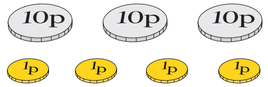



10 + 10 + 4
= 20 + 4
= 24 balloons

We need 35 balloons
35 = 30 + 5. We need 3 packs of 10 and 5 single balloons

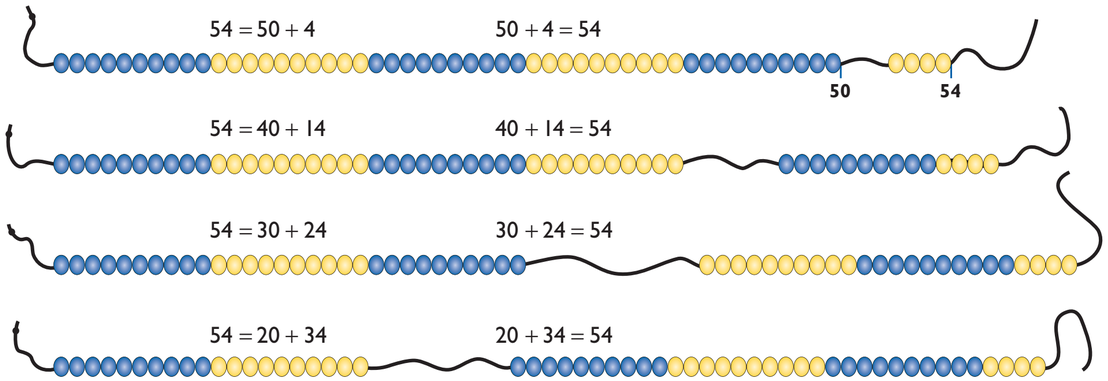




30p + 4p = 34p

41p could be made from 10p + 10p + 10p + 10p + 1p


or 20p + 20p + 1p


or lots of other ways with 20p, 10p and 1p coins.




# Progression

**Primary**
*National Strategy*
Ref: DfES 0508-2003 G(4)

## Reception

- Show some different ways of planting these 5 bulbs in these 2 bowls; putting 5 biscuits on 2 plates.
- I have 4 red buttons and 2 yellow buttons so that's 6 buttons altogether. Can you draw that for me?

## Year 1

### Autumn

- Show 12 beads. What number is this? Use place value cards to show me the same number. Now show me 17, 19, 11 etc.
- How can I count these shells most easily?

- 8 = □ + 7 1 + 7 = □
  8 = □ + 6 2 + 6 = □
  8 = □ + 5 etc. 3 + 5 = □ etc.
- How many hands do you need to show me 12? Can you draw it?

### Spring

- What number needs to go in the box? 14 = □ + 4
  12 = □ + 2 etc.
- Tell me how you would add 7 + 8 (5 and a bit 5 + 2 + 5 + 3).
- What number is the same as one ten and four units?
- What number goes in the box: 5 + □ = 6?
  What number if we want the answer to be 7, 15?

### Summer

- I'm thinking of the number 34. Hold up 30. Can you show me with your cards what is missing?
- I'm thinking of the number 48. Hold up 8. Can you show me with your cards what is missing?
- What numbers go in each box?
  54 = □ + 4, 3 + 20 = □
  42 = 40 + □, 60 + 7 = □
  42 – 2 = □, 63 – □ = 60
  19 – 10 = □, □ – 10 = 3
- Say which number is the same as: one ten and seven ones
  two tens (and no ones).

## Year 2

### Autumn

- Make 47p in 10p and 1p coins.
- What numbers go in the boxes?
  64 = □ + 4 50 + 2 = □
  64 = □ + 14 40 + 12 = □
  64 = □ + 24 etc. 30 + 22 = □
- How many ways can you make 75? e.g. 70 + 5.
- What is the value of the 5 in 53?
- What number is 10 more/less than 53?

### Spring

- How many different ways can you make 45?
- I have 6 10p coins and 5 1p coins. How much money do I have?
- Show me a calculation where you would use 5 and a bit as a strategy for adding 2 numbers.
- Show me 10, 50, 90. Why is there only one card if it is a two-digit number?
- Show me 69 on the bead string. How many tens, how many ones? How many tens and ones if we add on one?

### Summer

- What would you add
  to 3 to make 53?
  to 40 to make 53?
- What numbers go in the boxes?
  53 = 30 + □, 67 – 30 = □.
- Use your cards to show me 202. Why are there only two cards if it is a three-digit number?
- I have 68p, how much will I have if I am given two 10p coins, and three 1p coins? What if I spend four 10p coins?

## Year 3

### Autumn

- What number is on this card 428?
- Write in figures these words:
  one hundred and sixty seven;
  four hundred and nine;
  three hundred and fifty.
- Make me a three-digit number and tell me how you made it.
- What is the value of 3 in 23, 36, 310?
- Which number is bigger 401 or 410? Why?

### Spring

- Give 364p in £1, 10p and 1p coins.
- What number has four hundreds, five tens and six ones?
- Partition 502 and 430. What does the zero do?
- Explain your strategy for calculating 55 + 16, 35 – 24.
- Change one digit to make 476 into 976. Which digit did you change? What **was** the 4 worth? What is the 9 worth? By how much have we increased 476?

### Summer

- Make the biggest/smallest number you can with these digits: 2, 5, 3. Now read the number(s). What is the value of the 2 in each number?
- In one step make 478 into 978, 263 to 203 etc.
- What numbers go in the boxes?
  60 + 18 = □, 20 + 37 = □,
  10 + 19 = □.
- What numbers go in the boxes?
  43 – 20 = □, 54 – □ = 14,
  □ – 30 = 66.

## Year 4

- Work out mentally 24 + 58 and explain how you did it.
  (20 + 50 = 70, 4 + 8 = 12, 70 + 12 = 82 OR 24 + 50 + 8 = 74 + 8 = 82)
- Work out mentally 57 – 19 and explain how you did it.
  (57 – 17 – 2 = 40 – 2 = 38 OR 57 – 20 + 1 = 37 + 1 = 38)

# Partitioning and recombining

## Potential difficulties

Children may:

- record incorrectly numbers they hear, for example hearing thirty-one but reversing the digits and recording 13;
- interpret the two digits in a two-digit number as separate single-digit numbers, for example associate 47 with 4 and 7 not with 40 and 7, as they do not have a secure understanding of place value;
- be able to partition 47 into 40 and 7 but not into 30 and 17 or 20 and 27 etc, for later use when subtracting numbers that involve crossing boundaries or when using 'chunking' as a method of division;
- partition numbers into tens and units, but are less confident when partitioning in other ways, for example 17 into 5s and a bit to get 15 and 2 to help when doubling, or 16 into 15 + 1 and 8 into 5 + 3 when adding 16 and 8;
- recombine tens numbers with units, for example 30 and 2 to get 32, but are less assured recombining tens numbers with two-digit numbers, for example 40 and 38 and recording 438;
- associate combining with joining together rather than with addition, for example writing 40 combined with 2 as 402 rather than 40 + 2 = 42;
- recognise from saying a number how it can be partitioned, for example that seventy-three can be partitioned as 70 and 3, but are confused by the 'teens' as how they are said does not help with partitioning;
- rely on their interpretation of the value of the digits in a two-digit number and have no images to draw upon to help them 'see' the different ways numbers can be partitioned and recombined;
- misunderstand zero as a placeholder and say that 103 has no tens rather than 10 tens;
- be over-reliant on the language of number to help them recombine and record three-digit numbers, for example saying one hundred and six and recording 1006;
- not associate the components of a number with their magnitudes when they partition and recombine and make errors of scale, for example partition 35 and 47 into 30 and 5 and 40 and 7 when adding, but sum the wrong components 30 + 7 = 37 and 40 + 5 = 45 and recombine as 37 + 45 = 712;
- be over-reliant on partitioning when other calculation strategies are more efficient, for example working through 32 – 3 as 20 + 12 – 3 etc rather than counting back 3.

# Other useful models and images



# Examples of progression and application in Years 4 to 6

These examples are drawn from section 6 of the *Framework for teaching mathematics from Reception to Year 6*.

## Year 4

- Read and write whole numbers to at least 10 000 in figures and words, and know what each digit represents.

  What is the value of the digit 4 in the number 7451? And the 7?

  Write the number that is equivalent to: Seven thousands, four hundreds, five tens and six ones.

- Understand decimal notation and place value for tenths and hundredths, and use it in context.

  Convert £13.25 to pence or 125 cm to m.

- Partition into tens and units, adding the tens first.

  Work out mentally that 24 + 58 = 82, because it is 20 + 50 = 70 and 4 + 8 = 12, making 70 + 12 = 82.

- Develop and refine written methods for column addition and subtraction of two whole numbers less than 1000, and addition of more than two such numbers.

```
  625
+  48
 600
  60
  13
 673
```

- Develop and refine pencil methods for TU × U, TU ÷ U.

```
23 × 8    ×  |  20   3  |
          8  | 160  24  | 184
```

```
72 ÷ 5 = (50 + 22) ÷ 5
       = 10 + 4 remainder 2
       = 14 remainder 2
```

## Year 5

- Read and write whole numbers in figures and words, and know what each digit represents.

  What is the value of the digit 7 in the number 79 451? And the 9?

  What needs to be added to 47 823 to make 57 823?

- Use decimal notation for tenths and hundreds. Know what each digit represents in a number with up to two decimal places.

  What is the 4 worth in 7.45? And the 5?

  Use a calculator, in one step, change 7.82 to 7.86.

- Use known number facts and place value for mental addition and subtraction.

  Work mentally to calculate 5.7 + 2.5 and 0.57 + 0.25.

- Extend written methods to: column addition/subtraction of two integers less than 10 000; addition or subtraction of a pair of decimal fractions both with one or both with two decimal places.

```
  7587          £6.72
+  675        + £8.56
 7000           £14
 1100           £1.20
  150           £0.08
   12          £15.28
 8262
```

- Use informal pencil and paper methods to support, record and explain multiplications or divisions.

```
  346
×   8
2400
 320
  48
2768
```

```
196 ÷ 6 = (180 + 16) ÷ 6

6 | 196
  – 180 (6 × 30)
    16
    12 (6 × 2)
     4

Answer 32 r 4
```

## Year 6

- Use decimal notation for tenths and hundredths in calculations, and tenths, hundredths and thousandths when recording measurements. Know what each digit represents in a number with up to three decimal places.

  Convert 1.25 litres to millilitres

  Using a calculator, in one step, change 7 to 0.07.

- Extend written methods to column addition and subtraction of numbers involving decimals.

  124.9 + 7.25

  14.5 kg + 750 g

  401.2 + 26.85 + 0.71

- Extend written methods to multiplication of decimals, and division of HTU by TU.

```
4.92 × 3    4.00 × 3 = 12.00
            0.90 × 3 =  2.70
            0.02 × 3 =  0.06
                       14.76
```

```
972 ÷ 36 = (720 + 252) ÷ 36

36 | 972
   – 720 (36 × 20)
     252
     252 (36 × 7)
       0

Answer 27
```