Calculation Policy: Y2

Mathematical Manipulatives | Key Representations

Progression in **Procedures**



Avonwood Primary School

The best in everyone[™]

Part of United Learning

Key vocabulary

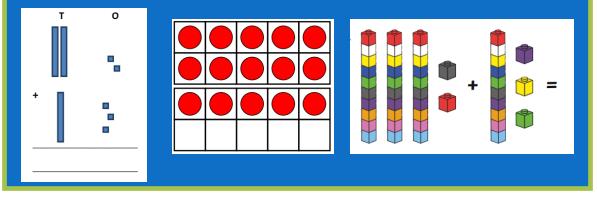
- Place value: ones, tens, hundreds, column
- Addition: sum, addend, add
- Subtraction: difference, subtrahend, subtract, partition
- Multiplication: product, multiplicand, multiplier, multiply, multiple, repeated addition
- Division: quotient, dividend, divisor, divide, repeated subtraction
- Fractions: denominator, numerator, equal part, whole, equivalent, ascending, descending, unit fraction, non-unit fraction, tenth
- Manipulatives: place value counters, Dienes, 10 frame
- Representations: represent, representation, numberline, array, row/column, Part-Part-Whole diagram, bar model

YEAR 2: Addition



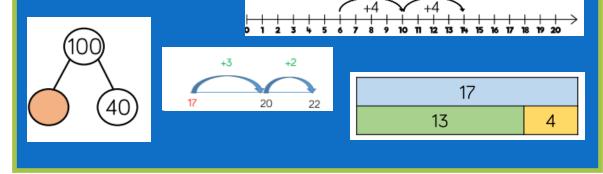
Manipulatives

The recommended manipulatives (physical resources) for adding two 2- digit numbers crossing 10 are **Counters, cubes, dienes and 10 frames.**



Representations

The key representations used are **Populated and blank number lines, bar models and part-part-whole diagrams** (which encourage children to apply their knowledge of place value).



Factual knowledge

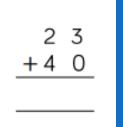
The key factual knowledge includes recall of addition/subtraction facts to 20, doubling/halving facts to 20.

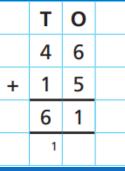
| A | Addition Tables | | | | | | | Zero i | n Additio | 'n | Doubles, Add With Ten Doubles Plus One (10 as an Addend | | | | | | | |
|-------------------------|-------------------------|-------------------------|----------------------------|---------------------------|----------------------------|--|----|--------|----------------------|--------|--|--------|------------------------|--------|--------|--------|--------|---------|
| crises 1+1=2 | 1mms 2+1=3 | threes 3+1=4 | fours 4+1=5 | frees 5+1=6 | stors 6+1=7 | | | | ing On I Property | | | | iake a Te idding 7, | | | | | |
| 1+2+3 1+3=4 | 2+2=4 2+3=5 | 3+2+5 3+3+6 3+4-7 | 4+2=6 4+3=7 | 5+2=7 5+3=8 5+4=9 | 6+2=8 6+3=9 6+4=10 | | + | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1+4=5 1+5=6 1+6=7 | 2+4=6 2+5=7 2+6=8 | 3+4=7 3+5=8 3+6=9 | 4+4=8 4+5=9 4+6=10 | 5+4=9 5+5=10 5+6=11 | 6+5=10 6+5=11 6+6=12 | | 0 | 0 + 0 | 0 + 1 | 0 + 2 | 0 + 3 | 0 + 4 | 0 + 5 | 0 + 6 | 0 + 7 | 0 + 8 | 0 + 9 | 0 + 10 |
| 1+7=8 | 2+7=9 2+8=10 | 3+7=10 | 4+6+10 4+7=11 4+8=12 | 5+7=12 5+8=13 | 6+7=13 6+8=16 | | 1 | 1+0 | 1 + 1 | 1 + 2 | 1 + 3 | 1 + 4 | 1 + 5 | 1 + 6 | 1 + 7 | 1 + 8 | 1 + 9 | 1 + 10 |
| 1+9=10 | 2+9=11 2+10=12 | 3+9=12 3+10=13 | 4+9=13 4+10=14 | 5+9=14 5+10=15 | 6+9=15 6+10+16 | | 2 | 2 + 0 | 2 + 1 | 2 + 2 | 2 + 3 | 2 + 4 | 2 + 5 | 2 + 6 | 2 + 7 | 2 + 8 | 2 + 9 | 2 + 10 |
| 1+11=12 1+12=13 | 2+11=13 2+12=14 | 3+11=14 3+12=15 | 4+11=15 4+12=16 | 5+11=16 5+12=17 | 6+11=17 6+12=18 | | 3 | 3 + 0 | 3 + 1 | 3 + 2 | 3 + 3 | 3 + 4 | 3 + 5 | 3 + 6 | 3 + 7 | 3 + 8 | 3 + 9 | 3 + 10 |
| SEVERS | eights | nines | terns | elevens | twelves | | 4 | 4 + 0 | 4 + 1 | 4 + 2 | 4+3 | 4 + 4 | 4 + 5 | 4+6 | 4 + 7 | 4 + 8 | 4 + 9 | 4 + 10 |
| 7+1=8 7+2=9 | 8+1=9 8+2+10 | 9+1=10 9+2+11 | 10+1=11 10+2=12 | 11+1=12 11+2+13 | 12+1+13 12+2+14 | | 5 | 5 + 0 | 5 + 1 | 5 + 2 | 5 + 3 | 5+4 | 5 + 5 | 5+6 | 5 + 7 | 5 + 8 | 5 + 9 | 5 + 10 |
| 7+3=10 7+4=11 | 8+3=11 8+4=12 | 9+3=12 9+4=13 | 10+3+13 10+4±14 | 11+3+14 11+4±15 | 12+3=15 12+4=16 | | 6 | 6 + 0 | 6 + 1 | 6 + 2 | 6 + 3 | 6 + 4 | 6 + 5 | 6+6 | 6 + 7 | 6 + 8 | 6 + 9 | 6 + 10 |
| 7+5=12 7+6=13 | 8+5=13 8+6=14 | 9+5=14 9+6=15 | 10+5=15 10+6=16 | 11+5=16 11+6=17 | 12+5=17 12+6=18 | | 7 | 7 + 0 | 7 + 1 | 7 + 2 | 7 + 3 | 7 + 4 | 7 + 5 | 7 + 6 | 7 + 7 | 7 + 8 | 7 + 9 | 7 + 10 |
| 7+7=14 7+8=15 | 8+7=15 8+8=16 | 9+7=16 9+8=17 | 10+7=17 10+8=18 | 11+7=18 11+8=19 | 12+7=19 12+8=20 | | 8 | 8 + 0 | 8 + 1 | 8 + 2 | 8 + 3 | 8 + 4 | 8 + 5 | 8+6 | 8 + 7 | 8 + 8 | 8 + 9 | 8 + 10 |
| 7+9=16 7+10=17 | 8+9=17 8+10=18 | 9+9=18 9+10=19 | 10+9=19 10+10=20 | 11+9=20 11+10=21 | 12+9=21 12+10=22 | | 9 | 9 + 0 | 9 + 1 | 9 + 2 | 9 + 3 | 9 + 4 | 9 + 5 | 9+6 | 9 + 7 | 9 + 8 | 9 + 9 | 9 + 10 |
| 7+11=18 7+12=19 | 8+11=19 8+12=20 | 9+11=20 9+12=21 | 10+11=21 10+12=22 | 11+11=22 11+12=23 | 12+11=23 12+12=24 | | 10 | 10 + 0 | 10 + 1 | 10 + 2 | 10 + 3 | 10 + 4 | 10 + 5 | 10 + 6 | 10 + 7 | 10 + 8 | 10 + 9 | 10 + 10 |

Procedural knowledge

The key methods is **formal column addition.** It is suggested that the children write the calculation alongside the concrete resources to ensure they can see the link between the two.

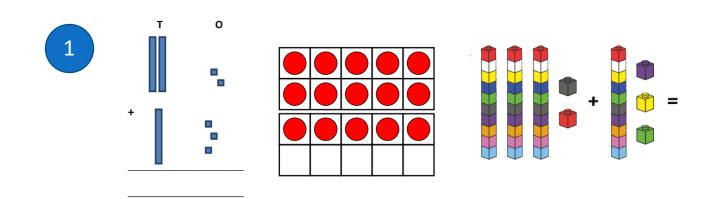






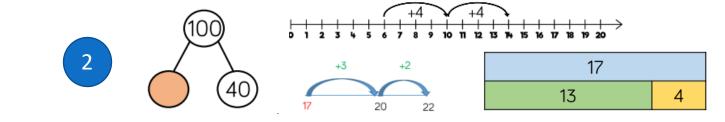
Addition in Year 2

 The recommended manipulatives (physical resources) for adding two 2- digit numbers are Counters, cubes, dienes and 10 frames.

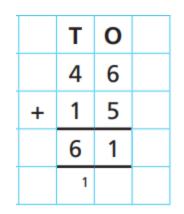


 The key representations used are: Populated and blank number lines, bar models and partpart-whole diagrams (which encourage children to apply their knowledge of place value) and place value grids.

3. The key method (procedural knowledge) is **formal column addition** for adding two 2- digit numbers crossing 10. It is suggested that the children write the calculation alongside the concrete resources to ensure they can see the link between the two.



3

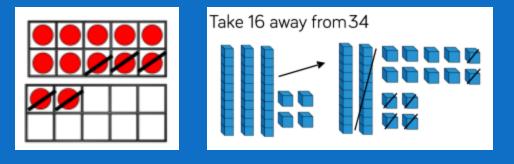


YEAR 2: Subtraction



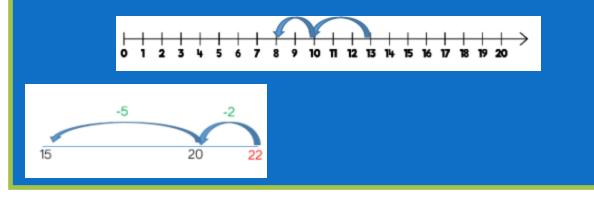
Manipulatives

The recommended manipulatives (physical resources) for subtracting two 2- digit numbers crossing 10 are **Dienes and 10 frames.**



Representations

The key representations used are **Populated and blank number lines and bar models** (which encourage children to apply their knowledge of place value).



Factual knowledge

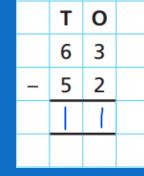
The key factual knowledge includes recall of addition/subtraction facts to 20, doubling/halving facts to 20.

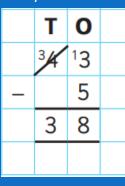
| Subtraction Tables | 10-1 | 11-2 | 12 – 3 | 13 – 4 | 14 – 5 | 15 – 6 | 16 - 7 | 17 – 8 | 18 - 9 |
|--|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| Softracting 0 Softracting 1 Softracting 2 Softracting 3 Softracting 3 0.0.0 3.1.8.0 2.2.4.0 3.3.8.0 6.4.4.9 3.5.5.0 1.0.0.1 2.2.1.1 3.2.8.0 6.4.4.9 5.5.5.0 2.0.0.2 3.1.8.0 5.3.8.2 6.4.4.9 5.5.5.0 2.0.0.2 3.1.8.0 4.3.9.3 5.4.4.2 7.5.5.2 | 9-1 | 10 – 2 | 11 – 3 | 12 – 4 | 13 – 5 | 14 - 6 | 15 – 7 | 16 - 8 | 17 – 9 |
| 3:0=3 4:1=3 5:2=3 6:3=3 7:4=2 8:5=3 4:0=4 5:1=4 6:2=4 7:2=4 8:4=4 9:5=4 5:0=5 6:1=5 7:2=5 8:3=5 9:4=5 10:5=5 6:0=6 7:1=6 8:2=6 9:3=6 10:4=6 13:5=6 | 8-1 | 9 – 2 | 10 - 3 | 11 – 4 | 12 – 5 | 13 – 6 | 14 – 7 | 15 – 8 | 16 — 9 |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | 7 – 1 | 8 – 2 | 9 — 3 | 10-4 | 11 – 5 | 12 – 6 | 13 – 7 | 14 - 8 | 15 — 9 |
| $\begin{array}{c c c c c c c c c c c c c c c c c c c $ | 6 – 1 | 7 – 2 | 8 – 3 | 9 – 4 | 10 - 5 | 11 – 6 | 12 – 7 | 13 - 8 | 14 – 9 |
| Solitizating 6 Solitizating 7 Solititetttt Solitizating 7 Solitizat | 5 – 1 | 6 – 2 | 7 – 3 | 8-4 | 9 – 5 | 10 - 6 | 11 – 7 | 12 – 8 | 13 – 9 |
| B:6+2 9:7+2 10:8+2 11:9+2 12:10+2 13:11+2 9:6+3 10:7+3 11:4+3 12:9+3 13:10+3 14:11+3 10:6+4 11:7+4 12:4+4 13:9+4 14:10+4 15:11+4 | 4-1 | 5 – 2 | 6 – 3 | 7 – 4 | 8 – 5 | 9 — 6 | 10 - 7 | 11 - 8 | 12 – 9 |
| $\begin{array}{ c c c c c c c c c c c c c c c c c c c$ | 3-1 | 4 – 2 | 5 — 3 | 6-4 | 7 – 5 | 8-6 | 9 – 7 | 10 - 8 | 11 – 9 |
| $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | 2 – 1 | 3 – 2 | 4 – 3 | 5 – 4 | 6 — 5 | 7 – 6 | 8-7 | 9 – 8 | 10 - 9 |

Procedural knowledge

The key methods is **formal column subtraction.** It is suggested that the children write the calculation alongside the concrete resources to ensure they can see the link

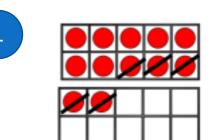
between the two.



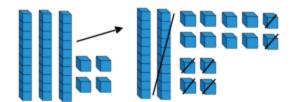


Subtraction in Year 2

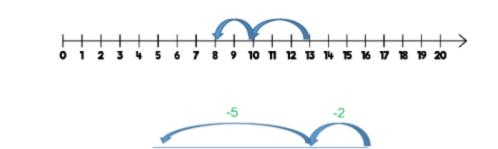
- The recommended manipulatives (physical 1. resources) for subtracting two 2 digit numbers crossing 10 are Dienes and 10 frames.



Take 16 away from 34



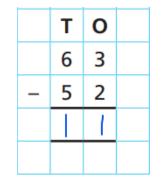


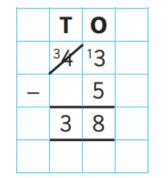


The key representations used are: **populated** 2. and blank number lines and bar models (which encourage children to apply their knowledge of place value) and place value grids.

The key method (procedural knowledge) is 3. formal column subtraction for two 2- digit numbers crossing 10. It is suggested that the children write the calculation alongside the concrete resources to ensure they can see the link between the two.





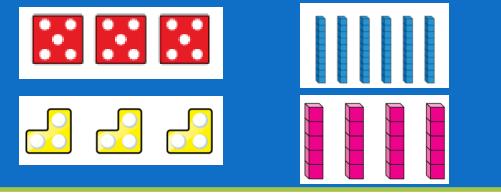


YEAR 2: Multiplication



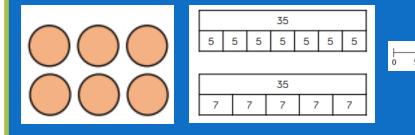
Manipulatives

The recommended manipulatives (physical resources) for calculating statements within the multiplication tables 2, 5 and 10 are **numicon, denies, cubes and dice.**



Representations

The key representations used are **arrays and bar models and partially completed number lines.**





Factual knowledge

The key factual knowledge includes recall of 2, 5 and 10 multiplication tables.

| 2 | tin | ies | tab | le | 5 | tin | ies | tab | le | 10 | tir | nes | ta | ble |
|----|-----|-----|-----|----|----|-----|-----|-----|----|----|-----|-----|----|-----|
| 0 | х | 2 | = | 0 | 0 | х | 5 | = | 0 | 0 | х | 10 | - | 0 |
| 1 | х | 2 | = | 2 | 1 | х | 5 | = | 5 | 1 | х | 10 | = | 10 |
| 2 | х | 2 | = | 4 | 2 | х | 5 | - | 10 | 2 | х | 10 | = | 20 |
| 3 | х | 2 | = | 6 | 3 | х | 5 | = | 15 | 3 | х | 10 | = | 30 |
| 4 | х | 2 | = | 8 | 4 | х | 5 | = | 20 | 4 | х | 10 | = | 40 |
| 5 | х | 2 | = | 10 | 5 | х | 5 | = | 25 | 5 | х | 10 | = | 50 |
| 6 | х | 2 | = | 12 | 6 | х | 5 | = | 30 | 6 | х | 10 | - | 60 |
| 7 | х | 2 | = | 14 | 7 | х | 5 | = | 35 | 7 | х | 10 | = | 70 |
| 8 | х | 2 | = | 16 | 8 | х | 5 | = | 40 | 8 | х | 10 | = | 80 |
| 9 | х | 2 | = | 18 | 9 | х | 5 | = | 45 | 9 | х | 10 | = | 90 |
| 10 | х | 2 | = | 20 | 10 | х | 5 | = | 50 | 10 | х | 10 | = | 100 |
| 11 | х | 2 | = | 22 | 11 | х | 5 | = | 55 | 11 | х | 10 | = | 110 |
| 12 | x | 2 | = | 24 | 12 | х | 5 | = | 60 | 12 | х | 10 | = | 120 |

Procedural knowledge

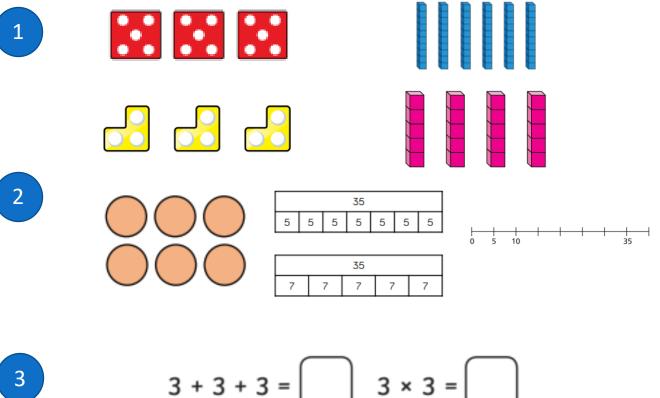
The key methods is **repeated addition.** It is suggested that the children write the calculation alongside the concrete resources to ensure they can see the link between the two.

Key vocabulary: product, multiplicand, multiplier, multiply, multiple, repeated addition

Multiplication in Year 2

- The recommended manipulatives (physical 1. resources) The key representations for calculating statements within the multiplication tables 2, 5 and 10 are: numicon, denies, cubes and dice.
- The key representations used are: arrays and 2. bar models
- The key methods (procedural knowledge) is 3. repeated addition. It is suggested that the children write the calculation alongside the concrete resources to ensure they can see the link between the two.



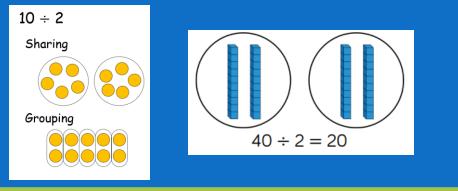


YEAR 2: Division



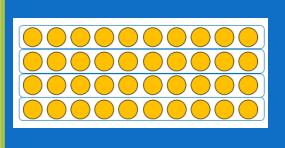
Manipulatives

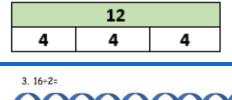
The recommended manipulatives (physical resources) for division are **place value counters and Dienes.**



Representations

The key representations used are arrays, bar models and number lines.





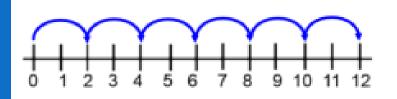
Factual knowledge

The key factual knowledge includes recall of 2, 5 and 10 multiplication tables.

| 2 | tin | ies | tab | le | 5 | tin | ies | tab | le | 10 | tù | nes | ta | ble |
|-----|-----|-----|-----|----|-----|-----|-----|-----|----|----|----|-----|----|-----|
| 0 | х | 2 | = | 0 | 0 | х | 5 | = | 0 | 0 | х | 10 | - | 0 |
| 1 | х | 2 | = | 2 | 1 | х | 5 | = | 5 | 1 | х | 10 | = | 10 |
| 2 | х | 2 | - | 4 | 2 | х | 5 | - | 10 | 2 | х | 10 | = | 20 |
| 3 | х | 2 | = | 6 | 3 | х | 5 | = | 15 | 3 | х | 10 | = | 30 |
| - 4 | х | 2 | = | 8 | - 4 | х | 5 | = | 20 | 4 | х | 10 | = | 40 |
| 5 | х | 2 | = | 10 | 5 | х | 5 | = | 25 | 5 | х | 10 | = | 50 |
| 6 | х | 2 | = | 12 | 6 | х | 5 | = | 30 | 6 | х | 10 | - | 60 |
| 7 | х | 2 | = | 14 | 7 | х | 5 | = | 35 | 7 | х | 10 | = | 70 |
| 8 | х | 2 | = | 16 | 8 | х | 5 | = | 40 | 8 | х | 10 | = | 80 |
| 9 | х | 2 | = | 18 | 9 | х | 5 | = | 45 | 9 | х | 10 | = | 90 |
| 10 | х | 2 | = | 20 | 10 | х | 5 | = | 50 | 10 | х | 10 | = | 100 |
| 11 | х | 2 | = | 22 | 11 | х | 5 | = | 55 | 11 | х | 10 | = | 110 |
| 12 | х | 2 | = | 24 | 12 | х | 5 | = | 60 | 12 | х | 10 | = | 120 |

Procedural knowledge

The key method is repeated subtraction on a number line.



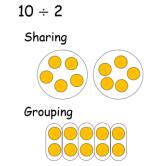
Key vocabulary: quotient, divisor, dividend, divide, repeated subtraction

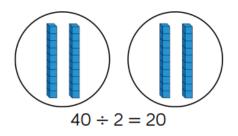
Division in Year 2

1. The recommended manipulatives (physical resources) for division are **place value counters and dienes.**

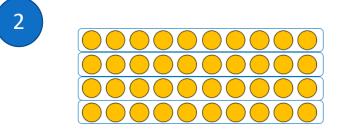


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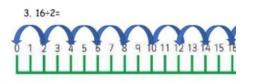


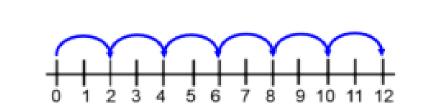


- 2. The key representations used are: arrays, bar models and number lines.
- 3. The key method (procedural knowledge) for dividing is **repeated subtraction** on a number line.



| 12 | | | | | | | | | | |
|----|---|---|--|--|--|--|--|--|--|--|
| 4 | 4 | 4 | | | | | | | | |



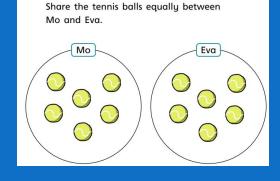


YEAR 2: Fractions



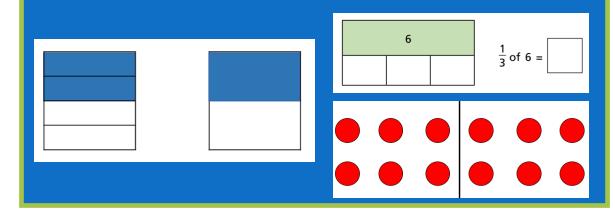
Manipulatives

The recommended manipulatives (physical resources) for fractions are **counters or** real-life objects.



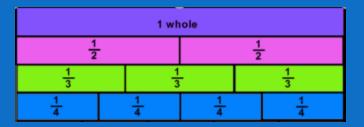
Representations

The key representations are **shapes**, **bar models and arrays**.



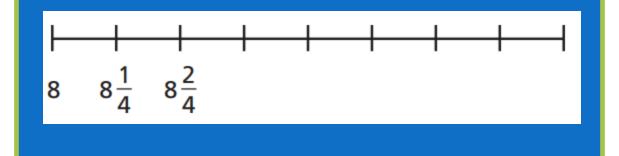
Factual knowledge

The key factual knowledge includes the recall and recognition of equivalent fractions of half and two quarters.



Procedural knowledge

The key procedure is counting up/down in fractions on a number line.



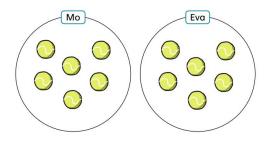
Key vocabulary: denominator, numerator, equal part, whole, equivalent, ascending, descending, unit fraction, non-unit fraction, tenth

Fractions in Year 2

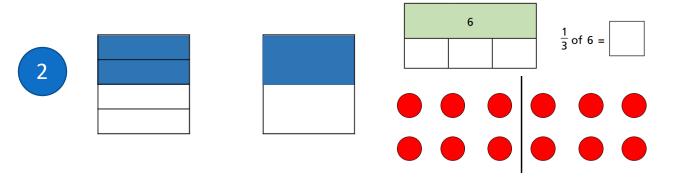


1. The recommended manipulatives (physical resources) for fractions are **counters or real-life objects.**

Share the tennis balls equally between Mo and Eva.



2. The key representations are **shapes, bar models** and arrays.



3. The key procedure is counting up/down in fractions on **a number line**.

