Calculation in Division

Tools to support

- Number lines
- Bead strings
- Arrays
- Arrow cards
- Objects/ counters
- Straws
- Hundred/ multiplication squares
- Dienes/multilink

Key Vocabulary

Share equally, lots of, groups of, sets of, divide, product, factors, multiples, inverse, chunks of, regrouping, exchanging

What is… shared by…?

How many groups of … in …?

Context

- Money
- Measures
- Decimals
- Percentages

Teaching points

- As with every operation teaching each step alongside apparatus is essential.
- When moving to number lines, big number lines are useful for this so children can make and solve the problem. These can still be used as you move into vertical chunking and formal methods. Dienes can be used to model the formal methods.
- Once the children are confident with vertical chunking and the formal methods it will be important to spend time teaching children to consider the most appropriate method for the calculation they have been given. In some cases this could even be a mental method.

Using the method above would not be the best method to choose for this calculation unless the child happened to be fluent in their 36 times table. A more accurate method in this case would more likely be chunking.

- Or in the case of 359 ÷ 36 children can use what they know to calculate what they don't know. 'I know that 36 x 10 is 360. 359 is 1 less. Therefore I know that I will get 9 groups of 36 with a remainder of 35.' They do not need a written calculation in this case.
- Estimate and check- Children need to routinely use these skills when calculating to ensure they consider the reasonableness of their answers. Checking could either be using the inverse operation or using an alternative method they are more confident with.
- The numbers used in calculations need to be appropriate for the learner e.g. initially we would give numbers that involve dividing using times tables children are more confident with to allow them to succeed.
- When dividing with a remainder it is useful to ask the children what the highest remainder they could end up with is to ensure that children don't end with a remainder that is greater than the divisor.
- When moving to division including decimals, teachers will need to decide whether it is appropriate to teach children to multiply the decimal out or whether their understanding of place value is secure enough to allow them to complete this without removing the decimal.

Errors/Misconceptions

Not recognising that division is the inverse of multiplication. Therefore, not using the multiplication facts they know to work out division facts.

- Thinking division is only about sharing and not also about repeated subtraction.
- Thinking division always makes things smaller (e.g. 355 ÷ 5 =7 but there are still 35. Nothing has been taken they have just been rearranged).

End of year expectations

EOY3: TU ÷ U
EOY4: HTU ÷ U (and remainders)
EOY5: ThHTU ÷ U (and remainders)
EOY6: ThHTU ÷ TU including decimals to 2DP

Apparatus will be needed with each of these methods up to and including long division when first introducing them.

Using Arrays

Sharing equally between.

e.g. 28 ÷ 4

1 xxxxxxx
2 xxxxxxx
3 xxxxxxx
4 xxxxxxx

or 28 ÷ 7

1 2 3 4 5 6 7
x x x x x x x
x x x x x x x
x x x x x x x
x x x x x x x

Grouping

I have 28 sweets. I want to put them into bags of 7. How many can I fill?

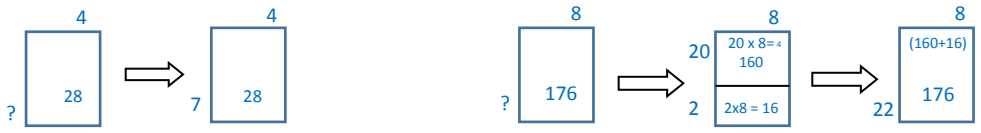
1 xxxxxxx 1 bag (7 sweets)
2 xxxxxxx 2 bags (14 sweets)
3 xxxxxxx 3 bags (21 sweets)
4 xxxxxxx 4 bags (28 sweets)

Sharing

I have 28 sweets. I want to share them between 7 friends. How many do they get each?

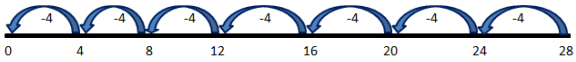
1 2 3 4 5 6 7
1 x x x x x x x 1 each (7 shared out)
2 x x x x x x x 2 each (14 shared out)
3 x x x x x x x 3 each (21 shared out)
4 x x x x x x x 4 each (All 28 shared out)

Once confident children can begin to use an empty grid to represent their array. This will help them to move onto the grid method in multiplication and can be used in division as preparation for chunking.



Number lines

Using a number line for repeated subtraction.

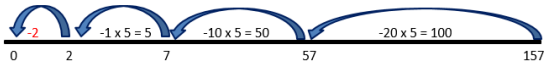


With remainders e.g. 21 ÷ 5 = 4 r 1

Number lines for repeated subtraction that uses chunking. Children are encouraged to divide numbers into known facts and then add the answers.

e.g. 126 ÷ 6 = 21

e.g. 157 ÷ 5 = 31 r 2



Chunking

Recorded vertically. This will be taught alongside chunking using a number line. With practise, children will begin looking for the biggest multiples of the divisor to take away larger 'chunks'

```
  021
6)126
- 60 (10 x 6)
  66
- 60 (10 x 6)
   6
-  6 (1 x 6)
   0
```

```
  021
6)126
- 120 (20 x 6)
   6
-  6 (1 x 6)
   0
```

Progressing to dividing by TU

```
  028 r10
15)430
- 300 (20 x 15)
  130
- 120 (8 x 15)
   10
```

Long Division

```
  028 r12
15)432
- 0
  43
- 30
  132
- 120
   12
```

Or

```
  028 r 12
15)432
  43
- 30
  132
- 120
   12
```

```
   232
13)3016
- 0
  30
- 26
  41
- 39
   26
- 26
    0
```

```
   232
13)3016
  30
- 26
  41
- 39
   26
- 26
    0
```

Suggested modelling of long division

- How many groups of 15 hundred can we make with the 4 hundreds? We can't make any groups of 15 hundreds. Record a 0 above the hundreds. We will have to regroup the hundreds into the tens column. We now have 43 tens.
- How many groups of 15 tens can we make with 43 tens? We can make 2 groups. Record a 2 above the tens. Do we have any tens left? Yes we have 13 tens left. We will have to regroup the tens into the unit's column. We have 132 units.
- How many groups of 15 units can we make with 132 units? We can make 8 groups of 15. Record an 8 above the units. Are there any units left? Yes, there are 12. These will be our remainder.

Short Division (Bus Stop)

```
  045
8)3 3 6 4 0
```

```
  086 r 2
5)4 4 3 3 2
```

or

```
  086.4
5)4 4 3 3 2 .2 0
```

```
  044 r 3
15)6 6 6 3
```

or

```
  044.2
15)6 6 6 3 .3 0
```

Calculation in Division