PROGRESSION THROUGH CALCULATIONS FOR DIVISION

MENTAL CALCULATIONS
(ongoing)
These are a selection of mental calculation strategies:

Doubling and halving

Knowing that halving is dividing by 2

Deriving and recalling division facts

Tables should be <u>taught</u> regularly from Y1 onwards, either as part of the mental oral starter or other times as appropriate within the day.
Progression will be:

Year 1

- 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

Year 2

- 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, 3, 5 and 10 times-tables and the related division facts; recognise multiples of 2, 3, 5 and 10
- Use knowledge of number facts and operations to estimate and check answers to calculations

Year 3

- Derive and recall multiplication facts for the 2, 3, 4, 5, 8, 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

Year 4

- Derive and recall multiplication facts up to 12 × 12, the corresponding division facts and multiples of numbers to 12 up to the tenth multiple

Year 5

- Recall quickly multiplication facts up to 12 × 12 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)

Year 6

- Use knowledge of place value and multiplication facts to 12 × 12 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

Using and applying division facts

Children should be able to utilise their tables knowledge to derive other facts.
e.g. If I know 3 x 7 = 21, what else do I know?
30 x 7 = 210, 300 x 7 = 2100, 3000 x 7 = 21 000, 0.3 x 7 = 2.1 etc

Dividing by 10 or 100

Knowing that the effect of dividing by 10 is a shift in the digits one place to the right.
Knowing that the effect of dividing by 100 is a shift in the digits two places to the right.

Use of factors

378 ÷ 21 378 ÷ 3 = 126 378 ÷ 21 = 18
126 ÷ 7 = 18

Use related facts

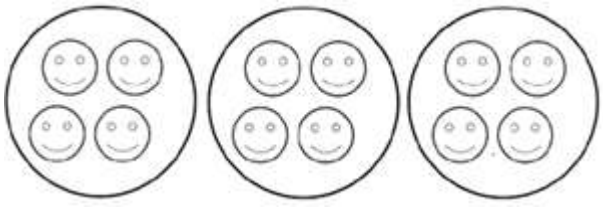
Given that 1.4 x 1.1 = 1.54
What is 1.54 ÷ 1.4, or 1.54 ÷ 1.1?

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. THEY ARE NOT REPLACED BY WRITTEN METHODS.

Stage 1

Cromwell Academy – Calculation Policy Division

Children will understand equal groups and share items out in play and problem solving. They will count in 2s and 10s and later in 5s.

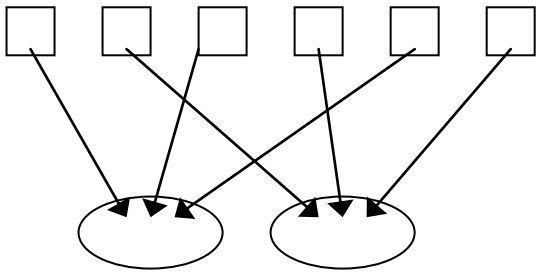


Stage 2

Children will develop their understanding of division and use jottings to support calculation

✓ Sharing equally

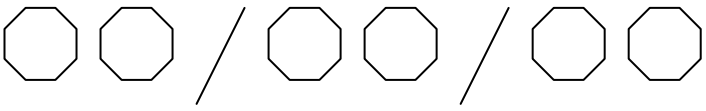
6 sweets shared between 2 people, how many do they each get?



It is really important that the children have lots of practical experience of sharing and grouping.

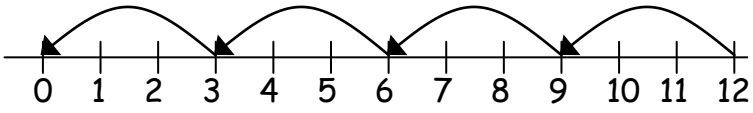
✓ Grouping or repeated subtraction

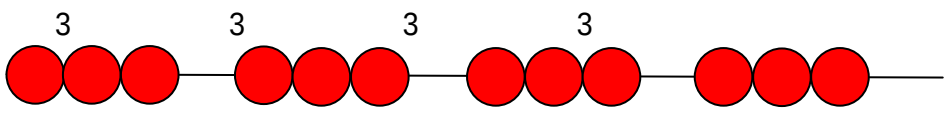
There are 6 sweets, how many people can have 2 sweets each?



✓ Repeated addition and subtraction using a number line or bead bar

12 ÷ 3 = 4





The bead bar will help children with interpreting division calculations such as 12 ÷ 3 as *'how many 3s make 12?'*

- ✓ Using symbols to stand for unknown numbers to complete equations using inverse operations

□ ÷ 2 = 4 20 ÷ △ = 4 □ ÷ 10 = 8

Stage 3

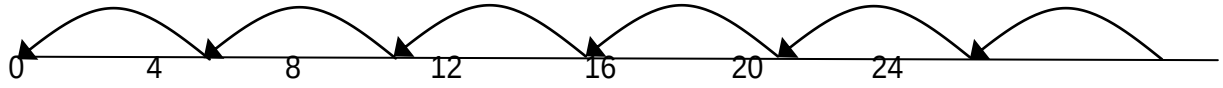
Ensure that the emphasis in stage 3 is on grouping rather than sharing.

Children will continue to use:

- ✓ Repeated addition or subtraction using a number line

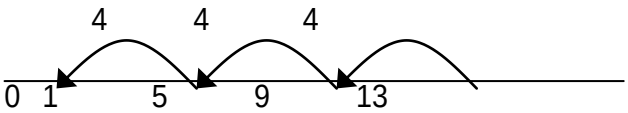
Children will use an empty number line to support their calculation.

24 ÷ 4 = 6 A context for the calculation is important. Eg I have 24 sweet



Children should also move onto calculations involving remainders.

13 ÷ 4 = 3 r 1



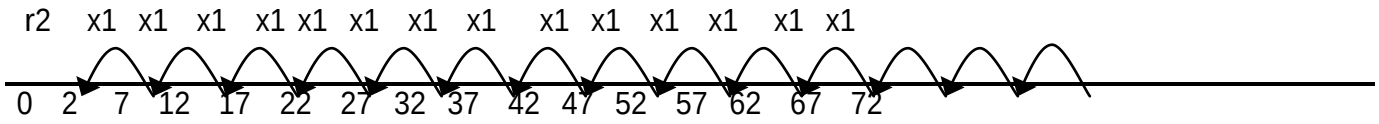
- ✓ Using symbols to stand for unknown numbers to complete equations using inverse operations

We need to show this as adding up on a number line too

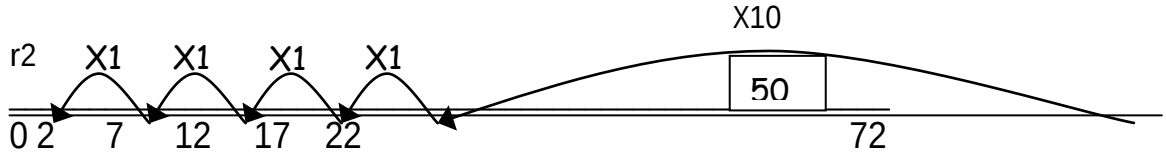
Stage 4

Children will develop their use of repeated addition and subtraction to be able to add and subtract multiples of the divisor. Initially, these should be multiples of 10s, 5s, 2s and 1s – numbers with which the children are more familiar.

72 ÷ 5 (The model below shows subtracting groups; children should have experience of both – and then select which jotting they prefer)

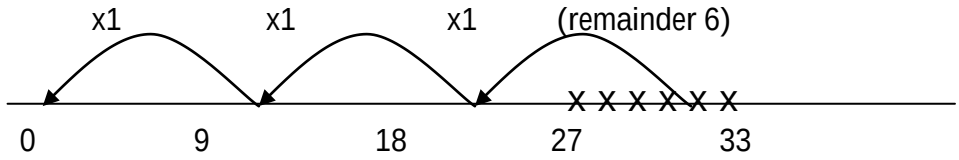


Moving onto:



Most chn will find it easier to add on groups on the number line.

33 ÷ 9 =

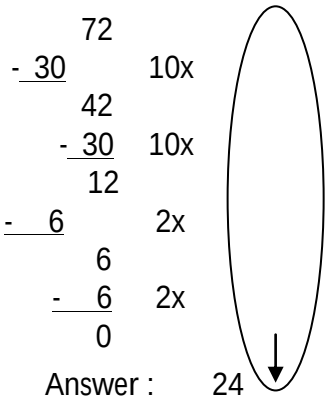


so 33 ÷ 9 = 3 r 6

Then onto the vertical method:

Short division TU ÷ U

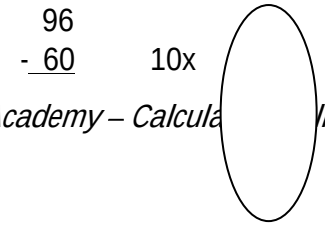
72 ÷ 3 = 24



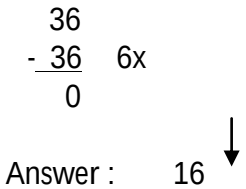
Difficulties children experience with division can be due to the calculations being abstract numbers to work with. Giving the children contextual division problems will provide them a context to hang on to. For example in this situation, if we had introduced the calculation as 'I have 72 chocolate bars that I need to make up into bags of 3 for the Christmas fair, how many whole bags can I make up?' Then we can talk to the children in terms of chocolate bars and bags instead of abstract numbers.

(WE SHOULD ALSO MODEL CHUNKING ADDING UP)
Leading to subtraction of other multiples.

96 ÷ 6 = 16



For many pupils the addition of an 'I know' box can be beneficial, e.g.
6 x 10 = 60
6 x 5 = 30 etc



Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. For example 62 ÷ 8 is 7 remainder 6, but whether the answer should be rounded up to 8 or rounded down to 7 depends on the context.

e.g. I have 62p. Sweets are 8p each. How many can I buy?
Answer: 7 (the remaining 6p is not enough to buy another sweet)

Apples are packed into boxes of 8. There are 62 apples. How many boxes are needed?
Answer: 8 (the remaining 6 apples still need to be placed into a box)

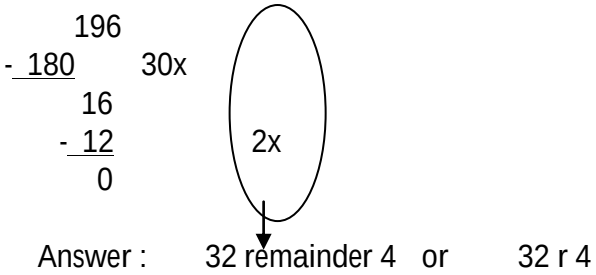
Stage 5

Children will continue to use written methods.

Children can start to subtract larger multiples of the divisor, e.g. 30x

HTU ÷ U

196 ÷ 6 = 32 r 4



Any remainders should be shown as integers, i.e. 14 remainder 2 or 14 r 2.

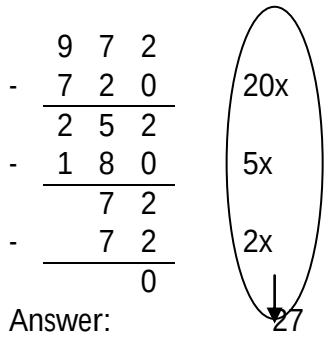
Children need to be able to decide what to do after division and round up or down accordingly. They should make sensible decisions about rounding up or down after division. For example 240 ÷ 52 is 4 remainder 32, but whether the answer should be rounded up to 5 or rounded down to 4 *depends on the context.*

Stage 6

Children will continue to use written methods and will subtract larger multiples of the divisor, e.g. 30x

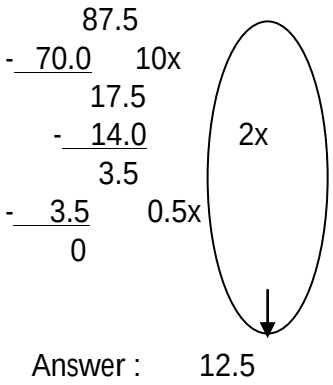
HTU ÷ TU

972 ÷ 36 = 27



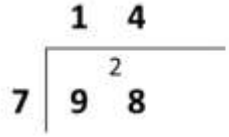
Extend to decimals with up to two decimal places. Children should know that decimal points line up under each other.

87.5 ÷ 7 = 12.5



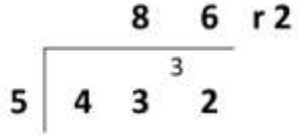
Stage 7 (updated for new curriculum)

98 ÷ 7 becomes



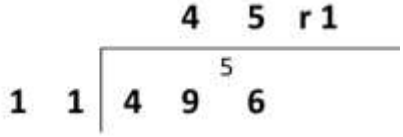
Answer: 14

432 ÷ 5 becomes



Answer: 86 remainder 2

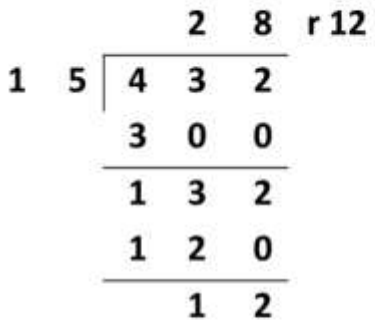
496 ÷ 11 becomes



Answer: $45\frac{1}{11}$

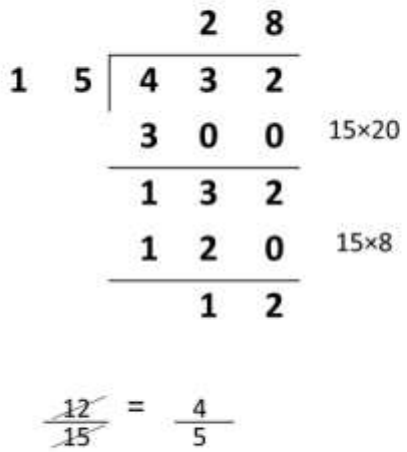
Stage 8 (updated for new curriculum)

432 ÷ 15 becomes



Answer: 28 remainder 12

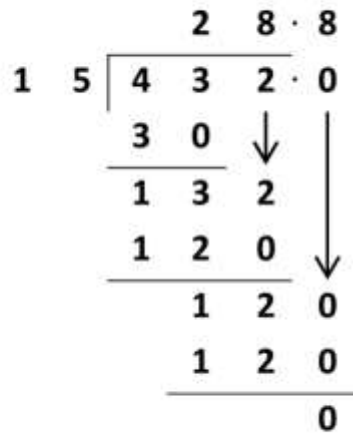
432 ÷ 15 becomes



$\frac{\cancel{12}}{\cancel{15}} = \frac{4}{5}$

Answer: $28\frac{4}{5}$

432 ÷ 15 becomes



Answer: 28·8

By the end of year 6, children will have a range of calculation methods, mental and written, but some children may still be dividing using a number line to access their end of year expectation, for example they may calculate 87.5 ÷ 7 on a number line. Selection will depend upon the numbers involved.

Children should not be made to go onto the next stage if:

1) they are not ready.
2) they are not confident.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.
Children should be encouraged to approximate their answers before calculating.
Children should be encouraged to check their answers after calculation using an appropriate strategy.