



IRBY PRIMARY SCHOOL PROGRESSION THROUGH CALCULATIONS

POLICY GUIDANCE

When teaching early mathematics, the emphasis should be on children working mentally and with concrete apparatus. Once written methods are introduced, mental skills must be kept sharp by continuing to develop and apply them with appropriate examples. This will also build mental fluency.

Children should work through the school's progression in order that they know and understand a compact standard method for each numerical operation by the end of Year 6.

In many classes children will be at different stages in their move towards an efficient method. This process should not be rushed: children should be moved when they are ready. Judgements will need to be made as whether pupils possess sufficient skills to progress. Different prerequisite skills are needed for each operation.

- Do children know addition and subtraction facts to 20?
- Do they understand place value and can they partition numbers into hundreds, tens and units/ones?
- Do they use and apply the communicative and associate laws of addition and subtraction?
- Can they add at least three 1 digit numbers mentally?
- Can they add and subtract any pair of 2 digit numbers mentally?
- Can they explain their mental strategies orally and record them using informal jottings?

Corresponding criteria to indicate readiness to learn written methods for multiplication and division are:

- Do the children know the 2,3,4,5 and 10 times tables and corresponding division facts?
- Do they know the result of multiplying by 0 or 1?
 - Do they understand place value?
 - Do they understand 0 as a place holder?
 - Can they multiply 2 to 4 digits mentally by 10 and 100?
- Can they use their knowledge of all multiplication tables to estimate?
- Can they find products using multiples of 10?
- Can they use communicative and associate laws of multiplication?
- Can they halve and double two digit numbers mentally?
- Can they use multiplication facts to derive division facts mentally or other unknown multiplication facts?

- Can they explain their mental strategies orally and record them using informal jottings?

PROGRESSION THROUGH CALCULATIONS FOR ADDITION

MENTAL CALCULATIONS

(ongoing)

These are a selection of mental calculation strategies:

Mental recall of number bonds

$$6 + 4 = 10 \qquad \square + 3 = 10$$

$$25 + 75 = 100 \qquad 19 + \square = 20$$

Use near doubles

$$6+7 = \text{double } 6 + 1 = 13$$

Addition using partitioning and recombining

$$34 + 45 = (30 + 40) + (4 + 5) = 79$$

Counting on or back in repeated steps of 1, 10, 100, 1000

$$86 + 57 = 143 \text{ (by counting on in tens and then in ones)}$$

$$460 - 300 + 1600 \text{ (by starting at the largest number and counting on in hundreds then tens)}$$

Add the nearest multiple of 10, 100 and 1000 and adjust

$$24 + 19 = 24 + 20 - 1 = 43$$

$$458 + 71 = 458 + 70 + 1 = 529$$

Use the relationship between addition and subtraction

$$36 + 19 = 55 \qquad 19 + 36 = 55$$

$$55 - 19 = 36 \qquad 55 - 36 = 19$$

PROGRESSION THROUGH CALCULATIONS FOR SUBTRACTION

MENTAL CALCULATIONS

(ongoing)

These are a selection of mental calculation strategies:

Mental recall of addition and subtraction facts

$$10 - 6 = 4 \qquad 17 - \square = 11$$

$$20 - 17 = 3 \qquad 10 - \square = 2$$

Find a small difference by counting up

$$82 - 79 = 3$$

Counting on or back in repeated steps of 1, 10, 100, 1000

$$458 - 71 = 458 - 70 - 1 = 387$$

Use the relationship between addition and subtraction

$$36 + 19 = 55 \qquad 19 + 36 = 55$$

$$55 - 19 = 36 \qquad 55 - 36 = 19$$

Round and adjust

$$86 - 19 = 24 - 20 + 1 = 5$$

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

PROGRESSION THROUGH CALCULATIONS FOR MULTIPLICATIONS

MENTAL CALCULATIONS

(ongoing)

These are a selection of mental calculation strategies:

Doubling and halving

Applying the knowledge of doubles and halves to known facts. E.g. 8×4 is double 4×4 4×4 is double and double again.

Using multiplication facts

Tables should be taught regularly from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.

Year 1 Counting in 2s, 5s and 10s from zero.

Year 2 Recall times table facts for:

2 times table

5 times table

10 times table

Count in threes from zero.

Year 3 Recall multiplication facts for:

2 times table

3 times table

4 times table

5 times table

8 times table

Count in steps of 4, 8, 50 and 100 from zero.

Year 4 Derive and recall all multiplication facts up to 12×12 focus on 6, 7, 9, 11 times table, 11 and 12.

Years 5 and 6 Derive and recall quickly all multiplication facts up to 12×12

Using and applying multiplication facts

Children should be able to utilise their tables knowledge to derive other facts. E.g. If I know $3 \times 7 = 21$, what else do I know?

$30 \times 7 = 210$, $300 \times 7 = 2100$, $3000 \times 7 = 21000$, $0.3 \times 7 = 2.1$ etc.

Use closely related facts already known

$$13 \times 11 = (13 \times 10) + (13 \times 1)$$

$$= 130 + 13$$

$$= 143$$

Multiplying by 10 or 100

Knowing that the effect of multiplying by 10 is a shift in the digits one place to the left.

Knowing that the effect of multiplying by 100 is a shift in the digits two places to the left.

Partitioning

$$23 \times 4 = (20 \times 4) + (3 \times 4)$$

$$= 80 + 12$$

$$= 92$$

Use of factors

$$8 \times 12 = 8 \times 4 \times 3$$

MANY MENTAL CALCULATION STRATEGIES WILL CONTINUE TO BE USED. They are not replaced by written methods.

PROGRESSION THROUGH CALCULATIONS FOR DIVISION

MENTAL CALCULATIONS

(On going)

These are a selection of mental calculation strategies:

Doubling and halving

Knowing that halving is dividing by 2 and the inverse of doubling.

Deriving and recalling division facts

Tables should be taught regularly from Y2 onwards, either as part of the mental oral starter or other times as appropriate within the day.

Year 2 Recall division facts for:

2 times table

5 times table

10 times table

Year 3 Recall for division facts for the above plus:

3 times tables

4 times tables

8 times tables

Year 4 Derive and recall all division facts for all tables up to 12×12 , focus on 6, 7, 8, 9, 11 and 12.

Years 5 and 6 Derive and recall quickly all division facts for all tables up to 12×12

Using and applying division facts

Children should be able to utilise their tables knowledge to derive other facts. E.g. If I know $3 \times 7 = 21$, what else do I know?

$21 \div 7 = 3$, $21 \div 3 = 7$, $210 \div 7 = 30$, $210 \div 3 = 70$ 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

$378 \div 21$ (3×7) $378 \div 3 = 126$ $378 \div 21 = 18$

$126 \div 7 = 18$

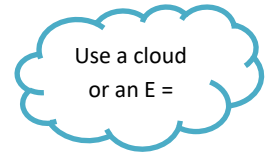
Use related facts

Given that $1.4 \times 1.1 = 1.54$

What is $1.54 \div 1.4$, or $1.54 \div 1.1$?

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

By the end of year 6, children will have a range of calculation methods, mental and written including standard algorithms. Selection will depend upon the numbers involved.



Children should be encouraged to estimate their answers before calculating.

Children should be encouraged to check their answers after calculation using an appropriate strategy such as inverse.

Children should be encouraged to consider if a mental calculation would be appropriate before using written methods.

Irby Primary School has opted to adopt the above policy guidance and agrees to operate under its terms

Signed Chair of Curriculum Committee

Date

Signed Headteacher

Date