



11+ Arithmetic Methods Revision Problems Revision

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1. What Are Arithmetic Methods?

Arithmetic is the foundation of mathematics. It involves working with numbers using four main operations:

- **Addition (+)** — combining quantities.
- **Subtraction (-)** — finding a difference or taking away.
- **Multiplication (×)** — finding the total of equal groups.
- **Division (÷)** — sharing or grouping quantities.

For 11+ examinations, you may need to calculate mentally, use written methods, solve calculations involving large numbers, work with decimals, or decide which operation to use in a word problem.

The aim is not simply to get an answer. It is to choose a suitable method, carry out the calculation accurately, and check that your answer makes sense.

The four operations at a glance

Operation	Example	Answer
Addition	$347 + 285$	632
Subtraction	$703 - 268$	435
Multiplication	24×16	384
Division	$24 \div 16$	78

Remember

Different methods can lead to the same answer. A good mathematician chooses a method that is both **accurate and efficient**.

2. Addition Methods

Addition combines two or more numbers to find a total.

There are two useful approaches: written column addition and mental strategies.

Method A — Column addition

Column addition is particularly useful when adding larger numbers.

Example

Calculate:

$$3,478 + 2,685$$

Write the numbers in columns, aligning the ones, tens, hundreds and thousands.

$$\begin{array}{r} 3,478 \\ + 2,685 \\ \hline 6,163 \end{array}$$

Work from right to left.

1. Ones: $8 + 5 = 13$. Write 3 and carry 1.
2. Tens: $7 + 8 + 1 = 16$. Write 6 and carry 1.
3. Hundreds: $4 + 6 + 1 = 11$. Write 1 and carry 1.

4. Thousands: $3 + 2 + 1 = 6$.

Answer: 6,163

3. SUBTRACTION METHODS

Subtraction finds the difference between quantities or tells you what remains after an amount is taken away.

Method A — Column subtraction

Example

Calculate:

$$5,002 - 2,768$$

The numbers must be aligned by place value.

$$\begin{array}{r} 5,002 \\ - 2,768 \\ \hline \end{array}$$

Some columns contain zeros, so you need to exchange values from higher place-value columns.

Think of 5,002 as:

- 5 thousands
- 0 hundreds
- 0 tens
- 2 ones

After exchanging, the subtraction can be completed from right to left.

The result is:

Answer: 2,234

Method B — Counting up

Sometimes it is easier to count up from the smaller number to the larger number.

Calculate:

502 – 387

Count from 387 to 502.

$387 \rightarrow 400 = 13$

$400 \rightarrow 500 = 100$

$500 \rightarrow 502 = 2$

Add the jumps:

$13 + 100 + 2 = 115$

Answer: 115

When is counting up useful?

Counting up can be particularly efficient when two numbers are close together.

For example, calculating the difference between £498 and £500 is easier by counting up than by using a lengthy written method.

Important

Subtraction is not commutative. Changing the order changes the answer.

$502 - 387$ is not the same as $387 - 502$.

4. MULTIPLICATION METHODS

Multiplication is a quick way to calculate equal groups.

For example:

6×4 means 6 groups of 4, or 4 groups of 6.

Both give an answer of 24.

Method A — Partitioning

Example

Calculate:

$$34 \times 6$$

Split 34 into 30 and 4.

$$30 \times 6 = 180$$

$$4 \times 6 = 24$$

Add the results:

$$180 + 24 = 204$$

Answer: 204

Method B — Written multiplication

Example

Calculate:

$$247 \times 23$$

Split 23 into 20 and 3.

$$247 \times 3 = 741$$

$$247 \times 20 = 4,940$$

Add the two results:

$$4,940 + 741 = 5,681$$

Answer: 5,681

This is the same principle used in the standard written multiplication method.

Useful multiplication facts

Knowing these facts helps you calculate more quickly:

- Multiplying by 10 moves each digit one place to the left in place-value terms.
- Multiplying by 100 moves each digit two places to the left in place-value terms.
- Multiplying by 5 can be done by multiplying by 10 and halving.
- Multiplying by 9 can be done by multiplying by 10 and subtracting one group.

For example:

$$36 \times 5$$

$$36 \times 10 = 360$$

$$360 \div 2 = 180$$

Answer: 180

5. Plan The Calculations Division Methods

Division involves sharing equally or finding how many times one number fits into another.

Method A — Short division

Example

Calculate:

$$864 \div 4$$

Work from left to right.

1. $8 \div 4 = 2$.
2. $6 \div 4 = 1$ remainder 2.
3. Combine the remainder 2 tens with the 4 ones to make 24 ones.
4. $24 \div 4 = 6$.

Answer: 216

Method B — Using multiplication facts

Division is closely connected to multiplication.

For example:

$$168 \div 12$$

Ask:

$$12 \times \text{what} = 168?$$

$$12 \times 10 = 120$$

$$168 - 120 = 48$$

$$12 \times 4 = 48$$

$$10 + 4 = 14$$

Therefore:

$$168 \div 12 = 14$$

Division with remainders

For example:

$$29 \div 4$$

$$4 \times 7 = 28$$

$$29 - 28 = 1$$

So the answer is:

7 remainder 1

A remainder must be smaller than the divisor.

Important

Always check division by multiplying your quotient by the divisor and adding any remainder.

For example:

$$7 \times 4 + 1 = 29 \checkmark$$

6. Order Of Operations

When a calculation contains several operations, you must follow the correct order.

Use **BIDMAS** as a reminder:

- **B** — Brackets
- **I** — Indices, such as squares and cubes
- **D** — Division
- **M** — Multiplication
- **A** — Addition
- **S** — Subtraction

Division and multiplication have equal priority, so work from left to right when they appear together. Addition and subtraction also have equal priority, so work from left to right.

Example

Calculate:

$$8 + 4 \times 3$$

Do the multiplication first:

$$4 \times 3 = 12$$

Then add:

$$8 + 12 = 20$$

Answer: 20

Do not calculate $8 + 4$ first.

Example with brackets

Calculate:

$$(8 + 4) \times 3$$

Brackets first:

$$8 + 4 = 12$$

Then multiply:

$$12 \times 3 = 36$$

Answer: 36

Remember

Brackets can change the answer completely. Always check whether a calculation contains brackets before beginning.

7. Mental Arithmetic And Number Strategies

Mental arithmetic means calculating without relying on a full written method.

The following strategies can make calculations quicker and easier.

Strategy A — Make a multiple of 10

Calculate:

$$48 + 27$$

Move 2 from 27 to 48:

$$48 + 2 = 50$$

25 remains.

$$50 + 25 = 75$$

Answer: 75

Strategy B — Double and halve

When multiplying, you can double one number and halve the other without changing the product.

Calculate:

$$16 \times 25$$

Halve 16 to get 8 and double 25 to get 50.

$$8 \times 50 = 400$$

Answer: 400

Strategy C — Multiply by 9

Calculate:

$$47 \times 9$$

$$47 \times 10 = 470$$

$$470 - 47 = 423$$

Answer: 423

Strategy D — Use compatible numbers

Compatible numbers are numbers that are easy to work with together.

Calculate:

$$398 + 205$$

398 is close to 400.

$$400 + 205 = 605$$

Subtract the extra 2:

$$605 - 2 = 603$$

Answer: 603

The main principle

Look for a way to make the calculation easier without changing its value.

8. Decimals And Money

Arithmetic methods also apply to decimal numbers and money.

The most important rule is to **align decimal points** when adding or subtracting decimals.

Addition example

Calculate:

$$\pounds 12.75 + \pounds 8.60$$

$$\begin{array}{r} \pounds 12.75 \\ + \pounds 8.60 \\ \hline \end{array}$$

$$\pounds 21.35$$

Answer: $\pounds 21.35$

Subtraction example

Calculate:

$$\pounds 20.00 - \pounds 7.85$$

$$\begin{array}{r} \pounds 20.00 \\ - \pounds 7.85 \\ \hline \end{array}$$

$$\pounds 12.15$$

Answer: £12.15

Multiplying decimals

Calculate:

$$2.4 \times 3$$

$$2.4 + 2.4 + 2.4 = 7.2$$

Therefore:

$$2.4 \times 3 = 7.2$$

Common mistake

When adding money, do not align the last digits without considering the decimal point.

The pounds must be aligned with pounds and the pence with pence.

9. ESTIMATION AND CHECKING

Estimation helps you decide whether an answer is sensible.

You do not always need an exact answer to spot a mistake.

Example

Calculate:

$$198 \times 6$$

Estimate first:

$$200 \times 6 = 1,200$$

Now calculate exactly:

$$198 \times 6 = 1,188$$

The exact answer is close to the estimate, so it is reasonable.

Useful checking methods

Addition: Subtract one addend from the total to see whether you recover the other addend.

Subtraction: Add the difference to the smaller number to see whether you recover the larger number.

Multiplication: Divide the product by one factor.

Division: Multiply the quotient by the divisor and include any remainder.

Example

Money problems often combine multiplication, addition, subtraction and percentages.

Example

If:

$$72 \times 8 = 576$$

Check:

$$576 \div 8 = 72 \checkmark$$

Remember

Estimation is not a replacement for an exact answer when the question requires one. It is a way to check that your calculation is sensible.

10. Fully Worked Examples

These examples demonstrate five different arithmetic situations that can arise in 11+ mathematics.

Study the working carefully and notice why each method is appropriate.

Example 1 — Addition And Subtraction

Question

A school library has 2,785 books. It receives another 468 books, then removes 239 damaged books.

How many books does the library have now?

Step 1: Add the new books.

$$2,785 + 468 = 3,253$$

Step 2: Subtract the damaged books.

$$3,253 - 239 = 3,014$$

Answer: 3,014 books

Why this method works

The new books must be added before the damaged books are removed.

Key lesson

When a question describes a quantity changing more than once, follow the events in the order they happen.

Example 2 — Multiplication And Division

Question

A school orders 24 boxes of pencils. Each box contains 36 pencils.

The pencils are shared equally between 18 classrooms.

How many pencils does each classroom receive?

Step 1: Calculate the total number of pencils.

$$24 \times 36$$

Split 24 into 20 and 4.

$$20 \times 36 = 720$$

$$4 \times 36 = 144$$

$$720 + 144 = 864$$

There are 864 pencils altogether.

Step 2: Share the pencils equally.

$$864 \div 18 = 48$$

Check:

$$18 \times 48 = 864 \checkmark$$

Answer: 48 pencils per classroom

Key lesson

When a problem involves equal groups followed by equal sharing, calculate the total before dividing.

Example 3 — Order Of Operations

Question

Calculate:

$$72 - 6 \times (5 + 3) \div 4$$

Step 1: Complete the brackets.

$$5 + 3 = 8$$

The calculation becomes:

$$72 - 6 \times 8 \div 4$$

Step 2: Complete multiplication and division from left to right.

$$6 \times 8 = 48$$

$$48 \div 4 = 12$$

The calculation becomes:

$$72 - 12$$

Step 3: Subtract.

$$72 - 12 = 60$$

Answer: 60

Key lesson

Follow the order of operations carefully. Do not automatically calculate from left to right across the entire expression.

Example 4 — Decimals And Money

Question

A customer buys 3 notebooks costing £2.45 each and 2 pens costing £1.80 each.

They pay with a £15 note.

How much change do they receive?

Step 1: Calculate the cost of the notebooks.

$$3 \times £2.45 = £7.35$$

Step 2: Calculate the cost of the pens.

$$2 \times £1.80 = £3.60$$

Step 3: Calculate the total cost.

$$£7.35 + £3.60 = £10.95$$

Step 4: Calculate the change.

$$£15.00 - £10.95 = £4.05$$

Answer: £4.05

Key lesson

Calculate each group separately, add the costs together, and only then calculate the change.

Example 5 — Mental Strategies And Estimation

Question

A shop sells 25 identical tickets for £16 each.

Calculate the total cost using an efficient method.

Step 1: Recognise that 25 is a quarter of 100.

Instead of using a long multiplication, calculate:

$$16 \times 100 = 1,600$$

Step 2: Divide by 4.

$$1,600 \div 4 = 400$$

Therefore:

$$25 \times 16 = 400$$

Answer: £400

Check

$$25 \times 4 = 100$$

So four groups of 25 tickets cost:

$$4 \times £400 = £1,600$$

This agrees with the cost of 100 tickets at £16 each.

Key lesson

Look for useful number relationships. An efficient method can reduce the number of steps while keeping the calculation accurate.

11. Common 11+ Arithmetic Mistakes

MISTAKE 1 — Misaligning columns

When using written methods, ones must align with ones, tens with tens, and so on.

Better approach: Write each number neatly in place-value columns.

MISTAKE 2 — Forgetting to exchange

In addition and subtraction, carrying or exchanging may be necessary.

Better approach: Complete each column carefully and check the next column before moving on.

MISTAKE 3 — Incorrect order of operations

Multiplication and division take priority over addition and subtraction, unless brackets change the order.

Better approach: Apply BIDMAS, remembering that multiplication and division have equal priority, as do addition and subtraction.

MISTAKE 4 — Making decimal-point errors

Decimal points must be aligned when adding or subtracting decimal numbers.

Better approach: Write any missing zeroes where helpful, such as £15.00.

MISTAKE 5 — Ignoring remainders

Division does not always give a whole number.

Better approach: State the remainder when appropriate, or express the answer as a fraction or decimal if the question requires it.

MISTAKE 6 — Not checking

A small arithmetic error can change the final answer.

Better approach: Use the inverse operation or estimate the result.

12. Five Practice Questions

Now apply the methods independently.

Show your working and choose the most suitable method for each calculation.

Question 1 — Addition And Subtraction

A warehouse has 4,675 boxes. It receives another 1,890 boxes and then sends out 2,745 boxes.

How many boxes remain in the warehouse?

Answer: _____ boxes

Question 2 — Multiplication And Division

A theatre has 28 rows of seats, with 36 seats in each row.

If 168 seats are empty, how many people are seated in the theatre?

Answer: _____ people

Question 3 — Order Of Operations

Calculate:

$$96 \div 8 + 7 \times 6 - 5$$

Answer: _____

Question 4 — Decimals And Money

A customer buys 4 items costing £3.75 each and 3 items costing £2.40 each.

They pay with £30.

How much change do they receive?

Answer: £_____

Question 5 — Efficient Calculation

A school buys 25 packs of exercise books. Each pack costs £18.

The school then receives a £50 discount on the total cost.

What is the final amount paid?

Answer: £_____

Answers And Full Working

Question 1 — Addition And Subtraction

Starting number of boxes:

4,675

Add the delivery:

$$4,675 + 1,890 = 6,565$$

Subtract the boxes sent out:

$$6,565 - 2,745 = 3,820$$

Answer: 3,820 boxes

Question 2 — Multiplication And Division

First find the total number of seats.

$$28 \times 36$$

$$28 \times 30 = 840$$

$$28 \times 6 = 168$$

$$840 + 168 = 1,008$$

Total seats = 1,008.

Subtract the empty seats:

$$1,008 - 168 = 840$$

Answer: 840 people

Question 3 — Order Of Operations

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Calculate:

$$96 \div 8 + 7 \times 6 - 5$$

Complete division first:

$$96 \div 8 = 12$$

Complete multiplication:

$$7 \times 6 = 42$$

The expression becomes:

$$12 + 42 - 5$$

Work from left to right:

$$12 + 42 = 54$$

$$54 - 5 = 49$$

Answer: 49

Question 4 — Decimals And Money

Cost of the first four items:

$$4 \times \text{£}3.75 = \text{£}15.00$$

Cost of the next three items:

$$3 \times \text{£}2.40 = \text{£}7.20$$

Total cost:

$$\text{£}15.00 + \text{£}7.20 = \text{£}22.20$$

Change:

$$\text{£}30.00 - \text{£}22.20 = \text{£}7.80$$

Answer: £7.80

Question 5 — Efficient Calculation

There are 25 packs costing £18 each.

Calculate the total before the discount:

$$25 \times £18$$

Since 25 is one-quarter of 100:

$$100 \times £18 = £1,800$$

$$£1,800 \div 4 = £450$$

Subtract the discount:

$$£450 - £50 = £400$$

Answer: £400

13. Final Revision Checklist

Before finishing, make sure you can:

- ☐ Add large numbers using column addition.
- ☐ Subtract large numbers using column subtraction.
- ☐ Use mental strategies to simplify calculations.
- ☐ Multiply using partitioning or written methods.
- ☐ Divide using short division or multiplication facts.
- ☐ Handle division with remainders.
- ☐ Apply BIDMAS correctly.
- ☐ Add and subtract decimals accurately.
- ☐ Calculate totals and change in money problems.
- ☐ Estimate and check answers using inverse operations.

THE GOLDEN RULES

ADDITION

Align the place values and carry when necessary.

SUBTRACTION

Align the place values and exchange when necessary.

MULTIPLICATION

Use partitioning, written methods or number facts.

DIVISION

Think about multiplication facts and check any remainder.

ORDER OF OPERATIONS

Follow BIDMAS, including left-to-right rules for operations of equal priority.

ALWAYS

Choose a suitable method, calculate carefully and check your answer.

ACUMEN TEACH

Building strong foundations for 11+ mathematics.

Arithmetic becomes easier when you understand why a method works, rather than simply memorising steps.

Revisit the worked examples, practise the questions independently, and use estimation to check your answers.

Explore more 11+ resources at: www.acumen-teach.co.uk