📘 Year 9 Maths – Expressions

🔑 Key Vocabulary

- **Term**: A single number or variable, or numbers and variables multiplied together
- **Expression**: A combination of terms using operations (+, −, ×, ÷)
- **Simplify**: Reduce an expression by collecting like terms
- **Coefficient**: The number in front of a variable (e.g. 3 in 3x)
- **Expand**: Multiply out brackets
- **Factorise**: Put an expression into brackets
- **Identity**: An equation that is true for all values of the variable (≡)
- **Like terms**: Terms with the same variables and powers

🧠 Key Knowledge

- **Simplify expressions** by collecting like terms
- **Expand** single and double brackets
- **Factorise** expressions including common factors and quadratics
- Recognise and use **algebraic identities**
- Manipulate and simplify expressions involving powers (indices)
- Understand and apply **notation and structure** when writing expressions

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🧪 Lesson Sequence

1. Simplifying expressions
2. Expanding single brackets
3. Expanding double brackets
4. Factorising simple expressions

5. Factorising quadratics
6. Recognising and using identities
7. Manipulating expressions with indices

⚠ Possible Misconceptions

- Treating unlike terms as like terms when simplifying
- Forgetting to multiply every term in brackets when expanding
- Incorrectly factorising or missing common factors
- Mixing up identities and equations
- Confusing powers with multiplication

❓ 3 Key Questions

1. How do you know which terms are like terms in an expression?
2. What is the difference between expanding and factorising?
3. How can you use identities to simplify or transform expressions?

Sparx codes

Expressions	M813	Algebraic notation
	M830	Algebraic terminology
	M795	Simplifying expressions containing a single variable
	M531	Simplifying expressions containing multiple variables
	M949	Simplifying expressions containing non-linear terms

📘 Year 9 Maths – Substitution

🔑 Key Vocabulary

- Substitute: To replace a variable with a given number
- Expression: A combination of numbers, variables, and operations
- Formula: A rule or relationship written using symbols
- Variable: A letter used to represent a number
- Evaluate: Find the value of an expression or formula
- Order of operations: The correct sequence to solve expressions (BIDMAS)

🧠 Key Knowledge

- Substitute numbers into expressions correctly by replacing variables
- Follow the order of operations when evaluating expressions
- Use substitution in algebraic formulae (e.g. $A = lw$, $P = 2l + 2w$)
- Apply substitution to real-life formulae, e.g. speed = distance ÷ time
- Pay attention to negative values and squared terms when substituting

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🧪 Lesson Sequence

1. Substituting into expressions with one operation
2. Substituting into expressions with multiple operations
3. Substituting into algebraic formulae
4. Substituting into real-life formulae

⚠️ Possible Misconceptions

- Not applying the correct order of operations

- Forgetting to square or cube values when variables have powers
- Incorrect substitution of negative numbers (especially with brackets)
- Treating formulas as equations to solve, instead of evaluating them

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❓ 3 Key Questions

1. What steps do you follow when substituting values into a formula?
2. Why is it important to use brackets in substitution?
3. How does substitution apply to real-world problems?

Sparx codes

Substitution	M417	Substituting into expressions with one operation
	M327	Substituting into expressions with multiple operations
	M208	Substituting into algebraic formulae
	M979	Substituting into real-life formulae

📘 Year 9 Maths – Expanding, Factorising and Rearranging Formulae

🔑 Key Vocabulary

- Expand: Remove brackets by multiplying
- Simplify: Combine like terms in an expression
- Factorise: Write an expression as a product using brackets
- Subject of a formula: The variable that is isolated on one side of the equation
- Rearrange: Change the structure of a formula to make a different variable the subject
- Inverse operations: Opposite operations used to isolate a variable

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🧠 Key Knowledge

- Use distributive law to expand expressions like a(b+c)a(b + c)a(b+c)
- Simplify fully after expanding by collecting like terms
- Factorise by finding the highest common factor (HCF) and using a bracket
- Understand how to change the subject of a formula using inverse operations
- Rearrange formulae involving one or more steps, including use of brackets and fractions

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🧪 Lesson Sequence

1. Expanding single brackets and simplifying expressions
2. Factorising expressions into one bracket
3. Changing the subject of a formula (one step)
4. Changing the subject of a formula (two or more steps)

⚠️ Possible Misconceptions

- Forgetting to multiply all terms when expanding

- Failing to take out the full common factor when factorising
- Rearranging formulae incorrectly by not applying inverse operations in the correct order
- Confusing terms like simplify, expand, and factorise

❓ 3 Key Questions

1. What is the difference between expanding and factorising?
2. How do you decide which operation to undo first when rearranging a formula?
3. Why is it important to simplify expressions fully after expanding?

Sparx Codes

Expanding	M237	Expanding single brackets
	M792	Expanding single brackets and simplifying expressions
Factorising	M100	Factorising into one bracket
Rearranging formulae	M242	Changing the subjects of formulae with one step
	M983	Changing the subjects of formulae with two or more steps

📘 Year 9 Maths – Solving Linear Equations

🔑 Key Vocabulary

- Equation: A mathematical statement showing two expressions are equal
- Solve: Find the value of the unknown that makes the equation true
- Linear equation: An equation where the highest power of the variable is 1
- Inverse operation: The opposite operation used to isolate the variable
- Brackets: Used to group terms — must be expanded before solving
- Unknown: The variable (usually xxx) you are trying to find
- Simultaneous equations: Two equations solved together to find shared values

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🧠 Key Knowledge

- Solve one-step and two-step equations using inverse operations
- Rearrange and solve linear equations (e.g. ax+b=cax + b = c, ax+b=c and x+ab=c\frac{x + a}{b} = cbx+a=c)
- Handle more complex equations with brackets and unknowns on both sides
- Solve equations involving fractions or the unknown in the denominator
- Construct equations from word problems or contexts
- Solve simultaneous equations using the elimination method

🧪 Lesson Sequence

1. Solving equations with one step
2. Solving two-step equations (e.g. ax+b=c, ax + b = c, ax+b=c)
3. Solving equations with the unknown in the denominator
4. Solving equations involving brackets
5. Solving equations with the unknown on both sides

6. Mixed problems: solving multi-step equations
7. Constructing and solving equations from word problems
8. Solving simultaneous equations using elimination

⚠ Possible Misconceptions

- Not using inverse operations correctly or in the right order
- Failing to balance both sides of the equation
- Forgetting to expand brackets before solving
- Incorrectly handling negative signs or fractions
- Assuming simultaneous equations are the same as regular equations

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❓ 3 Key Questions

1. What steps do you take to isolate the unknown in an equation?
2. How do you solve an equation when the unknown appears on both sides?
3. How does solving simultaneous equations differ from solving one equation?

Sparx codes

Solving equations	M707	Solving equations with one step
	M634	Solving equations of the form ax+b=c ax+b=c
	M647	Solving equations of the form xa+b=c ax+b=c
	M855	Mixed problems: solving equations
	M401	Solving equations of the form x+ab=c bx+a=c
	M902	Solving linear equations involving brackets
	M387	Solving equations with the unknown in the denominator
	M509	Mixed problems: solving equations with two or more steps
	M554	Solving equations with the unknown on both sides
	M957	Constructing and solving equations
	M852	Solving simultaneous equations using elimination

📘 Year 9 Maths – Linear Inequalities

🔑 Key Vocabulary

- Inequality: A statement showing one quantity is greater or less than another
- Greater than (>) / Less than (<): Symbols showing relative size
- Greater than or equal to (≥) / Less than or equal to (≤): Include equality
- Solution set: All values that satisfy the inequality
- Number line: A diagram used to represent solutions visually
- Unknown: The variable you are solving for

🧠 Key Knowledge

- Understand and interpret inequality symbols
- Represent inequalities on number lines using open and closed circles
- Solve simple inequalities using inverse operations
- Rearrange and solve inequalities with variables on both sides
- Be aware that multiplying or dividing by a negative reverses the inequality sign
- Solutions to inequalities are not just one value, but a range

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🧪 Lesson Sequence

1. Reading and drawing inequalities on number lines
2. Solving single inequalities
3. Solving inequalities with the unknown on both sides

⚠️ Possible Misconceptions

- Confusing inequality symbols (e.g. mixing up < and >)

- Not reversing the inequality when multiplying or dividing by a negative
- Forgetting to plot open vs closed circles correctly on number lines
- Treating inequality solutions as a single number instead of a range

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❓ 3 Key Questions

1. What does the solution to an inequality look like on a number line?
2. When do you need to reverse the inequality sign while solving?
3. How is solving an inequality different from solving an equation?

Sparx codes

Linear inequalities	M384	Reading and drawing inequalities on number lines
	M118	Solving single inequalities
	M732	Solving inequalities with the unknown on both sides

📘 Year 9 Maths – Fractions, Decimals and Percentages

🔑 Key Vocabulary

- Fraction: A part of a whole, written as ab\frac{a}{b}ba
- Decimal: A number with a decimal point representing tenths, hundredths, etc.
- Percentage: A number out of 100, represented with the % symbol
- Equivalent: Different forms that represent the same value
- Convert: Change between different representations of the same value
- Order: Arrange numbers from smallest to largest (or vice versa)

🧠 Key Knowledge

- Convert between fractions and decimals using division
- Convert between fractions, decimals and percentages fluently
- Recognise common equivalences, e.g. 12=0.5=50%\frac{1}{2} = 0.5 = 50\%21=0.5=50%
- Order mixed sets of fractions, decimals, and percentages by converting to the same form
- Calculate percentages of other numbers, e.g. 20% of 80 = 16
- Use a calculator where appropriate to aid conversion or calculation

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🧪 Lesson Sequence

1. Converting between fractions and decimals
2. Converting between fractions, decimals and percentages
3. Ordering fractions, decimals and percentages
4. Writing numbers as percentages of other numbers
5. Finding fractions of amounts without a calculator
6. Finding fractions of amounts with a calculator

⚠️ Possible Misconceptions

- Thinking 0.1 is larger than 0.9 due to appearance
- Mixing up percentage and decimal conversion (e.g. 0.6 = 6%)
- Forgetting to convert all numbers to the same format before ordering
- Misinterpreting percentages over 100% or less than 1%

❓ 3 Key Questions

1. How do you convert a fraction like 38\frac{3}{8}83 into a percentage?
2. What's the easiest way to compare values given in different forms?
3. Why is it important to recognise equivalent values in different formats?

Sparx codes

Converting fractions, decimals and percentages	M958	Converting between fractions and decimals
	M264	Converting between fractions, decimals and percentages
Ordering fractions, decimals and percentages	M553	Ordering fractions, decimals and percentages
	M235	Writing numbers as percentages of other numbers

📘 Year 9 Maths – Fraction Calculations

🔑 Key Vocabulary

- Numerator: The top number in a fraction
- Denominator: The bottom number in a fraction
- Improper fraction: A fraction where the numerator is larger than the denominator
- Mixed number: A whole number and a fraction combined
- Equivalent fractions: Fractions that have the same value
- Simplify: Reduce a fraction to its simplest form

🧠 Key Knowledge

- Add and subtract fractions by finding a common denominator
- Convert between mixed numbers and improper fractions to simplify calculations
- Order fractions and mixed numbers by converting to the same form
- Multiply fractions by multiplying numerators and denominators
- Multiply and divide mixed numbers by converting to improper fractions first
- Divide fractions using the “keep-change-flip” method
- Tackle problem-solving questions by applying all the above skills in context

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🧪 Lesson Sequence

1. Adding and subtracting fractions
2. Converting between mixed numbers and improper fractions
3. Adding and subtracting mixed numbers
4. Ordering fractions and mixed numbers

5. Multiplying fractions
6. Multiplying with mixed numbers
7. Dividing fractions
8. Dividing with mixed numbers
9. Problem solving: Fractions and mixed numbers

⚠ Possible Misconceptions

- Adding numerators and denominators directly without a common denominator
- Forgetting to convert mixed numbers before multiplying or dividing
- Not simplifying answers after calculations
- Confusing the process for division (e.g. forgetting to flip the second fraction)

❓ 3 Key Questions

1. When do you need a common denominator in fraction calculations?
2. What's the easiest way to multiply or divide with mixed numbers?
3. How can you check if your final answer is in its simplest form?

Sparx Codes

Fraction calculations	X481	Adding and subtracting fractions
	X721	Converting between mixed numbers and improper fractions
	X201	Adding and subtracting mixed numbers
	X717	Ordering fractions and mixed numbers
	X497	Multiplying fractions
	X422	Multiplying with mixed numbers
	X784	Dividing fractions
	X286	Dividing with mixed numbers
	X319	Problem solving: Fractions and mixed numbers

📘 Year 9 Maths – Percentage of an Amount and Percentage Change

🔑 Key Vocabulary

- Percentage: A proportion out of 100
- Amount: The quantity you're finding a percentage of
- Percentage increase: When a quantity grows by a percentage
- Percentage decrease: When a quantity is reduced by a percentage
- Original value: The starting value before any percentage change
- Multiplier: A decimal used to calculate percentage changes

🧠 Key Knowledge

- Find percentages of amounts using mental methods, written methods or a calculator
- Use multipliers to increase or decrease values by percentages (e.g. 1.2 = +20%)
- Calculate percentage change using the formula:

$$\text{Percentage Change} = \frac{\text{Change}}{\text{Original}} \times 100$$

- Work backwards to find the original value given a final amount and percentage
- Know when to use a calculator efficiently and how to check for reasonableness

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🧪 Lesson Sequence

1. Finding percentages of amounts without a calculator
2. Finding percentages of amounts with a calculator
3. Percentage change without a calculator
4. Percentage change with a calculator
5. Finding the percentage an amount has been changed by
6. Finding original values in percentage calculations

⚠️ Possible Misconceptions

- Confusing percentage increase with percentage of an amount
- Using the wrong base number when calculating change
- Forgetting to subtract when calculating percentage decrease
- Misusing or misinterpreting the multiplier method
- Incorrectly rearranging when working backwards to find the original value

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❓ 3 Key Questions

1. How do you know when to use a calculator in percentage problems?
2. What is a multiplier, and how does it simplify percentage calculations?
3. How can you find the original amount before a percentage change?

Sparx codes

Percentage of an amount	M437	Finding percentages of amounts without a calculator
	M905	Finding percentages of amounts with a calculator
Percentage change	M476	Percentage change without a calculator
	M533	Percentage change with a calculator
	X382	Finding the percentage an amount has been changed by
	X749	Finding original values in percentage calculations

📘 Year 9 Maths – Reverse Percentages and Compound Interest

🔑 Key Vocabulary

- Reverse percentage: A method for finding the original value before a percentage change
- Original value: The value before an increase or decrease
- Final value: The value after the percentage change
- Multiplier: A decimal used to represent a percentage increase or decrease
- Compound interest: Interest calculated on both the original amount and any accumulated interest
- Growth/Decay: Increase or decrease over time, often used in compound scenarios

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🧠 Key Knowledge

- Reverse percentages involve working backwards using the formula:

$$\text{Original Value} = \frac{\text{Final Value}}{\text{Multiplier}}$$

- A multiplier greater than 1 represents an increase, less than 1 a decrease
- Compound interest grows exponentially using the formula:

$$\text{Final Amount} = \text{Initial} \times (1 + \frac{r}{100})^n$$

where r is the rate and n is the number of time periods

- Recognise and interpret compound percentage growth and decay over time
- Understand the difference between simple and compound interest

🧪 Lesson Sequence

1. Finding original values in percentage calculations (reverse percentages)
2. Compound interest calculations

⚠️ Possible Misconceptions

- Confusing percentage of a value with original value
- Using subtraction instead of division when working backwards
- Forgetting to convert percentage rates into decimal multipliers
- Applying simple interest methods to compound problems
- Using incorrect powers when calculating compound growth

❓ 3 Key Questions

1. How do you work backwards to find an original value using percentages?
2. What's the difference between simple and compound interest?
3. Why does compound interest grow faster over time than simple interest?

Sparx codes

Reverse percentages	M528	Finding original values in percentage calculations
Compound interest	X432	Compound interest calculations

📘 Year 9 Maths – Probability

🔑 Key Vocabulary

- Probability: A measure of how likely something is to happen
- Mutually exclusive: Events that cannot happen at the same time
- Sample space: A list or diagram showing all possible outcomes
- Expected frequency: The predicted number of times an outcome occurs
- Theoretical probability: Based on known possible outcomes
- Experimental probability: Based on actual results from trials

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🧠 Key Knowledge

- Probability values range from 0 (impossible) to 1 (certain)
- Probabilities can be written as fractions, decimals or percentages
- For mutually exclusive events,

$$P(A \text{ or } B) = P(A) + P(B)$$

- The sum of probabilities of all outcomes in a sample space = 1
- Use sample space diagrams to list all combinations of outcomes
- To calculate expected results, multiply probability by the number of trials

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🧪 Lesson Sequence

1. Writing probabilities as fractions
2. Writing probabilities as fractions, decimals and percentages
3. Probabilities of mutually exclusive events
4. Expected results from repeated experiments
5. Sample space diagrams

⚠ Possible Misconceptions

- Thinking probabilities can be greater than 1
- Forgetting that all probabilities in a complete scenario must add to 1
- Confusing mutually exclusive with independent events
- Using incorrect denominators when listing outcomes
- Mixing up theoretical and experimental probability

❓ 3 Key Questions

1. How do you convert between different forms of probability (fraction, decimal, %)?
2. What's the difference between mutually exclusive and non-exclusive events?
3. How can you predict how often something is likely to occur in repeated trials?

Sparx codes

Writing probabilities	X702	Writing probabilities as fractions
	X970	Writing probabilities as fractions, decimals and percentages
Calculating probabulities	X686	Probabilities of mutually exclusive events
	X277	Expected results from repeated experiments
	X289	Sample space diagrams

📘 Year 9 Maths – Tree Diagrams

🔑 Key Vocabulary

- Tree diagram: A branching diagram used to show all possible outcomes of a series of events
- Independent events: Events where the outcome of one does not affect the other
- Dependent events: Events where the outcome of one does affect the other
- Probability: The likelihood of an event occurring, expressed as a fraction, decimal, or percentage
- Branch: Each possible outcome at a stage in a tree diagram
- Outcome: A single possible result of an event

🧠 Key Knowledge

- Tree diagrams show all possible outcomes of one or more events
- For independent events, probabilities stay the same on each branch
- For dependent events, probabilities change based on previous outcomes
- Multiply probabilities along branches to find the probability of a combined event
- Add probabilities of different branches to find the total probability of an event
- Probabilities on each level must always add up to 1

🧪 Lesson Sequence

1. Tree diagrams for independent events
2. Tree diagrams for dependent events

⚠ Possible Misconceptions

- Forgetting to multiply along the branches
- Adding probabilities instead of multiplying for combined events
- Not updating probabilities for dependent events (e.g. when items aren't replaced)
- Assuming all events are independent by default
- Missing possible outcome paths in the diagram

❓ 3 Key Questions

1. How can tree diagrams help us find the probability of combined events?
2. What's the difference between independent and dependent events in tree diagrams?
3. Why must probabilities on each level of a tree diagram add up to 1?

Sparx codes

Tree diagrams	X999	Tree diagrams for independent events
	X554	Tree diagrams for dependent events

📘 Year 9 Maths – Factors, Multiples, Primes

🔑 Key Vocabulary

- Factor: A number that divides another exactly
- Multiple: The result of multiplying a number by an integer
- Prime number: A number greater than 1 with exactly two factors (1 and itself)
- Lowest Common Multiple (LCM): The smallest multiple common to two or more numbers
- Highest Common Factor (HCF): The largest number that divides exactly into two or more numbers
- Prime factor: A factor that is also a prime number
- Prime factor decomposition: Breaking a number down into its prime factors

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🧠 Key Knowledge

- Use divisibility tests to identify factors of a number quickly
- A prime number has no factors other than 1 and itself
- LCM helps with problems involving repeating patterns or timings
- HCF is useful in simplifying ratios or sharing quantities
- Use prime factor trees to find HCF and LCM efficiently:
    - HCF = Product of common prime factors
    - LCM = Product of all prime factors (taking the highest powers)

🧪 Lesson Sequence

1. Finding factors and using divisibility tests
2. Finding the lowest common multiple (LCM)
3. Finding the highest common factor (HCF)
4. Primes and finding prime numbers

5. Prime factor decomposition
6. Finding the HCF and LCM using prime factor decomposition

⚠ Possible Misconceptions

- Confusing factors and multiples
- Thinking 1 is a prime number (it is not)
- Using incorrect prime factors when decomposing numbers
- Mixing up methods for LCM and HCF
- Forgetting to use all primes when calculating LCM

❓ 3 Key Questions

1. What is the difference between a factor and a multiple?
2. How can you find the LCM and HCF using prime factor decomposition?
3. Why are prime numbers and prime factors important in maths?

Sparx codes

Divisibility test	X317	Finding factors and using divisibility tests
LCM	X530	Finding the lowest common multiple (LCM)
HCF	X863	Finding the highest common factor (HCF)
Primes	X773	Finding prime numbers
	X871	Prime factor decomposition
	X941	Finding the HCF and LCM using prime factor decomposition

📘 Year 9 Maths – Index Laws

🔑 Key Vocabulary

- Index (Exponent): Shows how many times a number is multiplied by itself
- Base: The number being raised to a power
- Power: The combination of a base and its index
- Product rule: Add powers when multiplying like bases
- Quotient rule: Subtract powers when dividing like bases
- Negative index: Represents the reciprocal of the base
- Fractional index: Represents roots

$$\text{(e.g. } a^{1/2} = \sqrt{a}\text{)}$$

🧠 Key Knowledge

- **Product rule:** $a^m \times a^n = a^{m+n}$
- **Quotient rule:** $\frac{a^m}{a^n} = a^{m-n}$
- **Power of a power:** $(a^m)^n = a^{mn}$
- **Zero index:** $a^0 = 1$ (for $a \neq 0$)
- **Negative indices:** $a^{-n} = \frac{1}{a^n}$
- **Fractional indices:**
  - $a^{1/n} = \sqrt[n]{a}$
  - $a^{m/n} = \sqrt[n]{a^m}$

🧪 Lesson Sequence

1. Index rules with positive indices
2. Simplifying expressions using index laws
3. Indices of the form $a^{1/n}$ and $a^{m/n}$
4. Indices of the form a^{-n} (negative indices)
5. Mixed problems applying all index laws

⚠️ Possible Misconceptions

- Adding powers when multiplying numbers with different bases
- Believing $a^0 = 0$ instead of 1
- Misunderstanding that a negative index does not mean a negative number
- Confusing fractional indices with multiplication/division
- Forgetting to apply index laws consistently in algebraic expressions

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❓ 3 Key Questions

1. What do negative and fractional indices mean?
2. How do you simplify algebraic expressions using index laws?
3. Why does $a^0 = 1$, and how does this help with simplifying expressions?

Sparx codes

Index laws	X156	Index rules with positive indices
	X927	Simplifying expressions using index laws
	X783	Indices of the form a/b
	X647	Indices of the form 1/a
	X770	Index rules with negative indices

📘 Year 9 Maths – Sequences

🔑 Key Vocabulary

- **Term: A number in a sequence**
- **Arithmetic sequence: A sequence where the same amount is added each time**
- **Term-to-term rule: Describes how to get from one term to the next**
- **Position-to-term rule: A formula that gives the value of a term based on its position**
- **Linear sequence: A sequence with a constant difference**
- **Special sequences: Includes square numbers, cube numbers, triangular numbers, etc.**

🧠 Key Knowledge

- Term-to-term rule uses the previous term to find the next (e.g. “add 3”)
- Position-to-term rule is written as a formula like Tn = 3n+2
- In an arithmetic sequence, the difference between terms is constant
- You can substitute the term number into the position-to-term rule to find any term
- Special sequences follow specific patterns (e.g. square numbers: 1, 4, 9, 16...)

🧪 Lesson Sequence

1. Special sequences
2. Position-to-term rules for sequences of patterns
3. Position-to-term rules for arithmetic sequences
4. Term-to-term rules
5. Substituting into position-to-term rules

⚠️

Possible Misconceptions

- Confusing term number with term value
- Mixing up term-to-term and position-to-term rules
- Thinking all sequences are linear
- Substituting incorrectly into the position-to-term formula
- Assuming the first term is always 1 (it could start at any number)

❓ 3 Key Questions

1. What is the difference between a term-to-term and position-to-term rule?
2. How do you find a specific term in an arithmetic sequence?
3. What makes a sequence linear, and how can you identify it?

Sparx codes

Sequences	X137	Special sequences
	X337	Position-to-term rules for sequences of patterns
	X989	Position-to-term rules for arithmetic sequences
	X636	Term-to-term rules
	X617	Substituting into position-to-term rules

📘 Year 9 Maths – Coordinates and Graphs

🔑 Key Vocabulary

- Coordinates: A pair of numbers (x, y) that show a position on a grid
- Origin: The point (0, 0) on a coordinate grid
- Midpoint: The point exactly halfway between two coordinates
- Gradient: The steepness of a line
- Y-intercept: The point where a graph crosses the y-axis
- Linear graph: A graph that forms a straight line
- Equation of a line: Usually written as y=mx+cy = mx + cy=mx+c, where mmm is the gradient and ccc is the y-intercept

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🧠 Key Knowledge

- Coordinates are written as (x, y) and plotted in the correct quadrant
- Midpoint of two points (x1,y1) and (x2,y2) is

$$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

- Straight line graphs follow the form y=mx+c
- The gradient mmm is the change in y ÷ change in x
- The y-intercept ccc is the value of y when x = 0
- You can interpret real-life graphs by identifying what the axes and slopes represent

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🧪 Lesson Sequence

1. Reading and plotting coordinates
2. Solving shape problems involving coordinates
3. Calculating midpoints
4. Interpreting equations of straight line graphs
5. Finding equations of straight line graphs
6. Plotting straight line graphs

⚠️ Possible Misconceptions

- Reversing x and y when plotting coordinates
- Assuming all graphs are straight lines
- Confusing the gradient with the y-intercept
- Forgetting negative values in coordinates or midpoints
- Believing the line must go through the origin if it's linear

❓ 3 Key Questions

1. How do you find the equation of a straight line from a graph?
2. What does the gradient tell you about the line?
3. How do you calculate and use the midpoint between two coordinates?

Sparx codes

Coordinates	X723	Reading and plotting coordinates
	X884	Solving shape problems involving coordinates
	X356	Calculating midpoints
Plotting graphs and finding equations	X549	Interpreting equations of straight line graphs
	X366	Finding equations of straight line graphs
	X918	Plotting straight line graphs

📘 Year 9 Maths – Transformations

🔑 Key Vocabulary

- Transformation: A change in the position or size of a shape
- Translation: Moving a shape without rotating or flipping it
- Vector: Describes the direction and distance of a translation
- Reflection: A mirror image of a shape across a line of reflection
- Rotation: Turning a shape around a fixed point
- Centre of rotation: The point a shape is rotated around
- Enlargement: Changing the size of a shape using a scale factor
- Scale factor: Tells you how much larger or smaller the shape becomes
- Centre of enlargement: The point from which the shape is enlarged

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🧠 Key Knowledge

- Translation is described using vectors
- Reflection is across a mirror line, e.g. the x-axis or a diagonal line
- Rotation requires a centre, an angle (90°, 180°, etc.), and a direction (clockwise/anticlockwise)
- Enlargement uses a scale factor and a centre; scale factor > 1 makes it bigger, between 0 and 1 makes it smaller
- You can combine transformations in sequence, and the order matters
- The shape remains congruent after translations, reflections and rotations

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🧪 Lesson Sequence

1. Translation
2. Reflection
3. Rotation
4. Enlargement
5. Combining transformations

⚠️ Possible Misconceptions

- Confusing translation with rotation
- Forgetting to use a vector when describing a translation
- Reflecting across the wrong line (e.g. x instead of y-axis)
- Rotating in the wrong direction or around the wrong point
- Thinking enlargement always means getting bigger

❓ 3 Key Questions

1. How can you describe a translation using a vector?
2. What information do you need to complete a rotation?
3. How do you enlarge a shape using a centre and scale factor?

Sparx codes

Transformations	X306	Translation
	X823	Reflection
	X266	Rotation
	X696	Enlargement
	X572	Combining transformations

📘 Year 9 Maths – Area and Perimeter

🔑 Key Vocabulary

- Perimeter: The total distance around the edge of a shape
- Area: The amount of space inside a shape
- Base: The bottom edge of a shape (often used in area calculations)
- Height: The vertical measurement from base to top
- Parallelogram: A four-sided shape with opposite sides parallel and equal
- Trapezium: A four-sided shape with one pair of parallel sides
- Radius: The distance from the centre of a circle to the edge
- Diameter: A straight line through the centre of a circle
- Circumference: The perimeter of a circle
- Compound shape: A shape made up of two or more standard shapes

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🧠 Key Knowledge

- **Area of triangle** = $\frac{1}{2} \times \text{base} \times \text{height}$
- **Area of parallelogram** = base × height
- **Area of trapezium** = $\frac{1}{2} \times (a + b) \times h$, where a and b are the parallel sides
- **Circumference of circle** = πd or $2\pi r$
- **Area of circle** = πr^2
- To find the **area of compound shapes**, split them into simpler parts
- Always check and convert **units** correctly in problems involving different measures

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🧪 Lesson Sequence

1. Finding the area of triangles
2. Finding the area of parallelograms
3. Finding the area of trapeziums
4. Finding the area of compound shapes
5. Area and perimeter of simple shapes
6. Identifying parts of circles
7. Finding the circumference of circles
8. Finding the area of circles
9. Problem solving: Unit conversions

⚠️ Possible Misconceptions

- Confusing area with perimeter
- Using slant height instead of vertical height in triangles/parallelograms
- Forgetting to square units when calculating area
- Mixing up radius and diameter
- Leaving answers in terms of π\piπ when asked to give a decimal

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❓ 3 Key Questions

1. How do you calculate the area of a compound shape?
2. What is the difference between diameter and radius?
3. How do you convert between cm^2, m^2 and mm^2?

Sparx codes

Area and perimeter	X158	Finding the area of triangles
	X748	Finding the area of parallelograms
	X325	Finding the area of compound shapes
	X555	Mixed problems: Finding the area and perimeter of simple shapes
	X608	Finding the area of trapeziums
	X501	Identifying parts of circles
	X668	Finding the circumference of circles
	X478	Finding the area of circles
	X385	Problem solving: Converting units of length, area and volume

📘 Year 9 Maths – Volume of Prisms

🔑 Key Vocabulary

- **Volume**: The amount of space a 3D shape occupies
- **Prism**: A solid shape with the same cross-section throughout its length
- **Cuboid**: A rectangular box-shaped prism
- **Cylinder**: A prism with circular cross-section
- **Cross-section**: The shape you get when you cut straight through a 3D object
- **Height** (or length): The distance the cross-section is extended
- **Units of volume**: Typically measured in cm^3, m^3, mm^3

🧠 Key Knowledge

- **Volume of a cuboid** = length × width × height
- **Volume of any prism** = area of cross-section × length
- **Volume of a cylinder** = πr2×h\pi r^2 \times hπr2×h, where rrr is radius and hhh is height
- Be careful to use consistent units (e.g., convert mm to cm before calculating)
- 1 cm^3 = 1000 mm^3, and 1 m^3 = 1,000,000 cm^3

🧪 Lesson Sequence

1. Finding the volume of cubes and cuboids
2. Converting units of volume
3. Finding the volume of prisms
4. Finding the volume of cylinders

⚠ Possible Misconceptions

- Confusing **area** and **volume**
- Forgetting to multiply the cross-section by the length
- Using incorrect radius or height in the cylinder formula
- Mixing units (e.g. cm and mm) without converting
- Assuming all 3D shapes are prisms

❓ 3 Key Questions

1. How do you calculate the volume of any prism?
2. What does the cross-section of a prism mean?
3. How do you convert between different units of volume?

Sparx codes

Volume of prisms	X165	Finding the volume of cubes and cuboids
	X559	Converting units of volume
	X819	Finding the volume of prisms
	X160	Finding the volume of cylinders

📘 Year 9 Maths – Similar Shapes

🔑 Key Vocabulary

- Similar shapes: Shapes that have the same angles and proportional sides
- Scale factor: The number used to multiply each side length of a shape to get the corresponding side in a similar shape
- Enlargement: Making a shape larger or smaller using a scale factor
- Proportion: A statement showing two ratios are equal
- Corresponding sides: Sides in the same relative position in different shapes

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🧠 Key Knowledge

- Similar shapes have the same shape but different sizes
- All corresponding angles are equal
- All corresponding sides are in the same ratio
- To find an unknown side:
  Side of new shape=Side of original shape×scale factor\text{Side of new shape} = \text{Side of original shape} \times \text{scale factor}Side of new shape=Side of original shape×scale factor
- If a shape is enlarged by a scale factor k, then:
  - Lengths multiply by k
  - Areas multiply by k^2
  - Volumes multiply by k^3

🧪 Lesson Sequence

1. Understanding similarity
2. Using scale factors to find missing lengths
3. Applying similarity to solve problems

4. Exploring area and volume in similar shapes

⚠ Possible Misconceptions

- Confusing similar with congruent (congruent shapes are identical in size and shape)
- Not matching the correct corresponding sides
- Using the wrong scale factor (e.g. dividing instead of multiplying)
- Mixing scale factors for length with those for area or volume

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❓ 3 Key Questions

1. What makes two shapes similar?
2. How can you find the missing side in a similar shape?
3. What happens to area and volume under enlargement?

Sparx code

Similar shapes	X456	Finding unknown sides in similar shapes

📘 Year 9 Maths – Rounding and Averages

🔑 Key Vocabulary

- Significant figures: The digits that carry meaning contributing to a number's precision
- Rounding: Reducing the digits in a number while keeping its value similar
- Mean: The total of a set of numbers divided by how many numbers there are
- Frequency table: A table that shows how often each value occurs
- Grouped data: Data that is put into intervals
- Midpoint: The middle value of a group interval, used to estimate averages

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🧠 Key Knowledge

- To round to significant figures:
    - Start counting digits from the first non-zero number
- Mean = Total of all values ÷ Number of values
- For frequency tables:
    - Multiply each value by its frequency
    - Add them all together and divide by the total frequency
- For grouped data:
    - Use the midpoint of each group
    - Estimate the mean using:
        - Use the **midpoint** of each group
        - Estimate the mean using:

$$\text{Estimated Mean} = \frac{\sum(\text{midpoint} \times \text{frequency})}{\sum \text{frequency}}$$

🧪 Lesson Sequence

1. Rounding whole numbers using significant figures
2. Rounding decimals using significant figures
3. Calculating the mean of simple data sets
4. Using frequency tables to find the mean
5. Estimating the mean from grouped data

⚠️ Possible Misconceptions

- Starting significant figures from a zero
- Forgetting to divide by total frequency
- Using group boundaries instead of midpoints in grouped data
- Confusing mode, median, and mean

❓ 3 Key Questions

1. How do you round a number to 2 significant figures?
2. What is the formula for calculating the mean?
3. How do you estimate the mean from grouped data?

Sparx codes

Rounding	X553	Rounding integers using significant figures
	X207	Rounding decimals using significant figures
Averages	X729	Calculating the mean
	X687	Finding averages from frequency tables
	X771	Finding averages from grouped data

📘 Year 9 Maths – Standard Form

🔑 Key Vocabulary

- Standard form: A way of writing very large or very small numbers
- Index/Exponent: The power to which a number is raised
- Coefficient: The number in front of the power of 10 in standard form
- Positive index: Used for large numbers
- Negative index: Used for small numbers

🧠 Key Knowledge

- Standard form is written as:
  a×10na \times 10^na×10n, where 1≤a<101 \leq a < 101≤a<10 and nnn is an integer
- Positive powers: move the decimal point to the right
  - Example: 3.2×104=32,0003.2 \times 10^4 = 32,0003.2×104=32,000
- Negative powers: move the decimal point to the left
  - Example: 4.5×10−3=0.00454.5 \times 10^{-3} = 0.00454.5×10−3=0.0045
- To add or subtract, convert numbers to the same power of 10 first
- To multiply, multiply the coefficients and add the powers
- To divide, divide the coefficients and subtract the powers
- Calculators can be used to convert between standard and ordinary form

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🧪 Lesson Sequence

1. Writing large numbers in standard form
2. Writing small numbers in standard form
3. Using standard form with positive and negative indices
4. Adding and subtracting standard form numbers
5. Multiplying and dividing in standard form
6. Using a calculator with standard form

⚠️ Possible Misconceptions

- Using a number outside the range 1≤a<101 \leq a < 101≤a<10
- Reversing the rules for positive/negative powers
- Forgetting to align powers when adding or subtracting
- Incorrectly using the calculator's standard form (SCI) button

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❓ 3 Key Questions

1. What does the index in standard form tell you?
2. How do you add or subtract numbers in standard form?
3. What is $(2\times10^3)\div(4\times10^2)$ in standard form?

Sparx codes

Standard form	X964	Standard form with a calculator
	X159	Standard form with negative indices
	X369	Standard form with positive indices
	X413	Adding and subtracting numbers in standard form
	X124	Multiplying and dividing in standard form

📘 Year 9 Maths – Cumulative Frequency Graphs

🔑 Key Vocabulary

- Cumulative frequency: A running total of frequencies
- Upper class boundary: The highest value in a class interval
- Cumulative frequency graph: A graph showing how the cumulative frequency builds up
- Estimate: An approximation of a value based on the graph
- Interquartile range (IQR): The difference between the upper and lower quartiles

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🧠 Key Knowledge

- To create a cumulative frequency table, add up frequencies progressively
- Plot cumulative frequency against the upper class boundaries
- Join points with a smooth curve (not straight lines)
- Use the graph to estimate:
    - Median (50% of total frequency)
    - Lower quartile (LQ) (25%)
    - Upper quartile (UQ) (75%)
    - Interquartile range = UQ − LQ

🧪 Lesson Sequence

1. Creating a cumulative frequency table
2. Plotting cumulative frequency graphs
3. Estimating median, LQ, UQ
4. Finding interquartile range
5. Comparing data sets using graphs

⚠ Possible Misconceptions

- Plotting against class midpoints instead of upper boundaries
- Drawing straight lines instead of a smooth curve
- Misreading the vertical axis (cumulative frequency)
- Confusing frequency with cumulative frequency

❓ 3 Key Questions

1. What is cumulative frequency and how is it calculated?
2. How do you find the median from a cumulative frequency graph?
3. What does the interquartile range represent in a data set?

Sparx codes

Interpreting cumulative frequency graphs	X881	Drawing cumulative frequency graphs
	X465	Interpreting cumulative frequency graphs

📘 Year 9 Maths – Right-Angled Triangles

🔑 Key Vocabulary

- Right-angled triangle: A triangle with one 90° angle
- Hypotenuse: The side opposite the right angle (longest side)
- Pythagoras' Theorem: a2+b2=c2a^2 + b^2 = c^2a2+b2=c2
- Trigonometry: The study of relationships between side lengths and angles
- Sine, Cosine, Tangent: Trigonometric ratios used to find sides or angles
- Opposite / Adjacent: Relative to the given angle in the triangle

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🧠 Key Knowledge

- **Pythagoras' Theorem** applies in right-angled triangles to find missing sides:
  $\text{Hypotenuse}^2 = \text{Opposite}^2 + \text{Adjacent}^2$
- **Trigonometric Ratios** (SOH CAH TOA):
  - **Sine**: $\sin(\theta) = \frac{\text{opposite}}{\text{hypotenuse}}$
  - **Cosine**: $\cos(\theta) = \frac{\text{adjacent}}{\text{hypotenuse}}$
  - **Tangent**: $\tan(\theta) = \frac{\text{opposite}}{\text{adjacent}}$
- Use **inverse trig** to find angles:
  $\theta = \sin^{-1}, \cos^{-1}, \tan^{-1}$

🧪 Lesson Sequence

1. Identifying hypotenuse, opposite and adjacent
2. Applying Pythagoras' Theorem to find missing sides
3. Understanding and using sine, cosine and tangent
4. Finding missing sides using trigonometry
5. Finding missing angles using trigonometry
6. Solving multi-step right-angled triangle problems

⚠️ Possible Misconceptions

- Misidentifying the hypotenuse
- Using the wrong trig ratio
- Forgetting to square root in Pythagoras' theorem
- Mixing up opposite and adjacent sides
- Calculator in the wrong mode (degrees vs radians)

❓ 3 Key Questions

1. When should I use Pythagoras' Theorem vs trigonometry?
2. How can I decide which trig ratio to use?
3. What steps do I follow to find an angle in a right-angled triangle?

Sparx codes

Pythagoras' theorem	M677	Using Pythagoras' theorem in 2D
	M480	Applying Pythagoras' theorem in 2D
Trigonometry	M380	Understanding sin, cos and tan
	M212	Finding unknown sides in right-angled triangles
	M646	Finding unknown angles in right-angled triangles

📘 Year 9 Maths – Quadratics

🔑 Key Vocabulary

- Expression: A combination of terms without an equals sign
- Bracket: Used to group parts of an algebraic expression
- Expanding: Multiplying out brackets
- Factorising: Writing an expression as a product of its factors
- Quadratic: An expression where the highest power of x is 2
- Difference of Two Squares: A special case: $a^2 - b^2 = (a-b)(a+b)$

🧠 Key Knowledge

- **Expanding Brackets**:
  - Single: $a(x + b) = ax + ab$
  - Double: $(x + a)(x + b) = x^2 + (a + b)x + ab$
- **Factorising**:
  - Take out common factors
  - Quadratics of the form $x^2 + bx + c = (x + m)(x + n)$
  - Difference of squares: $x^2 - y^2 = (x - y)(x + y)$
- **Solving by Factorising**: Set each bracket to 0

🧪 Lesson Sequence

1. Expanding single brackets
2. Expanding and simplifying single brackets
3. Expanding double brackets
4. Factorising into one bracket
5. Factorising quadratics into two brackets
6. Solving quadratics by factorising
7. Factorising the difference of two squares

⚠️ Possible Misconceptions

- Forgetting to multiply each term when expanding
- Incorrect signs when factorising
- Confusing expanding with solving
- Not checking answers by expanding back out
- Applying the difference of two squares incorrectly (e.g., $x^2 + y^2$) ≠ special case)

❓ 3 Key Questions

1. How can I expand and simplify expressions correctly?
2. What method do I use to factorise a quadratic expression?
3. How does factorising help me solve equations?

Sparx codes

Expanding	M237	Expanding single brackets
	M792	Expanding single brackets and simplifying expressions
	M960	Expanding double brackets
Factorising	M100	Factorising into one bracket
	M908	Factorising into two brackets
Solving equations	X620	Factorising to solve quadratic equations of the form x2+bx+c=0
	X560	Factorising the difference of two squares

📘 Year 9 Maths – Constructions

🔑 Key Vocabulary

- Construct: To draw shapes, angles or lines accurately using a compass and ruler
- Bisector: A line that cuts an angle or a line segment exactly in half
- Perpendicular: At a right angle (90°) to another line
- Compass: A drawing tool used to create arcs and circles
- Precision: Accuracy in measurement and drawing

🧠 Key Knowledge

- Constructing Triangles: Use given lengths and angles to draw accurate triangles
- Angle Bisector: Divides an angle into two equal parts using arcs from the angle's arms
- Perpendicular Bisector: A line that crosses a segment at 90° and passes through its midpoint
- Perpendicular from a Point: Use arcs to drop or raise a perpendicular from or to a point on a line

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🧪 Lesson Sequence

1. Using compasses and rulers accurately
2. Constructing triangles from given SSS, SAS, ASA
3. Constructing angle bisectors
4. Constructing perpendicular bisectors
5. Constructing perpendicular lines from points

⚠ Possible Misconceptions

- Drawing freehand instead of using compass and straightedge
- Misplacing arcs when constructing bisectors
- Confusing angle bisector with perpendicular bisector
- Not labelling points clearly
- Thinking construction is estimation rather than precision

❓ 3 Key Questions

1. What tools do I need to construct shapes accurately?
2. How do I construct an accurate triangle from given measurements?
3. What is the difference between an angle bisector and a perpendicular bisector?

Sparx codes

Constructions	M565	Constructing triangles
	M232	Constructing bisectors of angles
	M239	Constructing perpendicular bisectors and lines