Week 1 – Indices

Core Concepts

1. **Index (Exponent/Power)**
   A small number written above and to the right of a base number showing how many times to multiply the base by itself (e.g. $2^3 = 2 \times 2 \times 2 = 8$).
2. **Base**
   The number being raised to a power (e.g. in 3^4, the base is 3).
3. **Square Number**
   A number multiplied by itself (e.g. $5^2 = 25$).
4. **Cube Number**
   A number multiplied by itself twice (e.g. $2^3 = 8$).
5. **Index Notation**
   A way of writing repeated multiplication using powers (e.g. $2 \times 2 \times 2 \times 2 = 2^4$).

Index Laws

6. **Product Rule**
   When multiplying powers with the same base, add the indices:
   $a^m \times a^n = a^{m+n}$
7. **Quotient Rule**
   When dividing powers with the same base, subtract the indices:
   $a^m \div a^n = a^{m-n}$
8. **Power of a Power Rule**
   Multiply the indices when raising a power to another power:
   $(a^m)^n = a^{mn}$
9. **Zero Index**
   Any non-zero number raised to the power of 0 equals 1:
   $a^0 = 1$
10. **Negative Index**
    A negative index means reciprocal:
    $a^{-n} = \frac{1}{a^n}$
11. **Fractional Index**
    Represents roots:
    $a^{1/n} = \sqrt[n]{a}$, and
    $a^{m/n} = \sqrt[n]{a^m}$

Week 2 – Expanding brackets and factorising

- **Expression**
  A combination of numbers, variables, and operators (such as +, –, ×) without an equals sign.
- **Term**
  A single part of an expression, made up of numbers and/or variables multiplied together.
- **Like Terms**
  Terms that have the same variable(s) raised to the same power, and can be combined.
- **Expand (Expanding Brackets)**
  Multiplying out brackets to write an expression without brackets.
- **Factorise**
  The reverse of expanding: writing an expression as a product of its factors (usually involving brackets).
- **Common Factor**
  A number or expression that divides exactly into each term of the expression.
- **Distributive Law**
  A rule stating that *a(b+c)=ab+aca(b + c) = ab + ac*a(b+c)=ab+ac; used when expanding brackets.
- **Linear Expression**
  An expression in which the highest power of the variable is 1 (e.g., *2x+32x + 3*2x+3).
- **Quadratic Expression**
  An expression where the highest power of the variable is 2 (e.g., *x2+5x+6x^2 + 5x + 6*x2+5x+6).
- **Difference of Two Squares**
  A special quadratic pattern: *a2−b2=(a−b)(a+b)a^2 - b^2 = (a - b)(a + b)*a2−b2=(a−b)(a+b).
- **Factor Pair**
  Two numbers that multiply to give a certain product, often used in factorising quadratics.

Week 3 – Expanding triple brackets and algebraic fractions

1. **Algebraic Fraction**
   A fraction where the numerator, denominator, or both contain algebraic expressions
2. **Numerator**
   The top part of a fraction; in algebraic fractions, it can be an algebraic expression.
3. **Denominator**
   The bottom part of a fraction; must not be zero and can be an algebraic expression.
4. **Simplify**
   To rewrite a fraction in its simplest form by cancelling common factors in the numerator and denominator.
5. **Cancel**
   The process of dividing both the numerator and denominator by a common factor to simplify a fraction.
6. **Lowest Common Denominator (LCD)**
   The smallest expression that is a common multiple of two or more denominators; used when adding or subtracting algebraic fractions.
7. **Multiply Fractions**
   Multiply the numerators together and the denominators together
8. **Divide Factorising**
   Writing an expression as a product of its factors, used to simplify or cancel parts of algebraic fractions.
9. **Equivalent Fractions**
   Fractions that have different forms but represent the same value or expression

Week 4 – Factorise quadratic equations, completing the square and using the quadratic formula

1. **Quadratic Equation**
   An equation of the form $ax^2 + bx + c = 0$, where $a \neq 0$.
2. **Factorise**
   Writing the quadratic expression as a product of two binomial expressions (e.g., $x^2 + 5x + 6 = (x + 2)(x + 3)$) to solve it.
3. **Roots (Solutions)**
   The values of x that satisfy the quadratic equation (make the equation equal to zero).
4. **Completing the Square**
   Rewriting a quadratic expression in the form $(x + p)^2 + q$ to solve or analyse it.

Week 5 and 6– Rearranging formulae

1. **Equation**
   A statement showing that two expressions are equal, often involving variables and numbers.
2. **Subject of the Formula**
   The variable that is isolated on one side of the equation (e.g., making x the subject in $y = 3x + 2$).
3. **Rearrange**
   Changing the structure of an equation to make a different variable the subject, using algebraic operations.
4. **Inverse Operation**
   An operation that reverses the effect of another (e.g., subtraction is the inverse of addition).
5. **Isolate the Variable**
   The process of getting the desired variable alone on one side of the equation.
6. **Transposition**
   Moving terms from one side of the equation to the other, changing the operation accordingly.
7. **Bracket Expansion**
   Multiplying out brackets (e.g., $a(b + c) = ab + ac$) before rearranging if needed.
8. **Formula**
   A mathematical rule or relationship, often involving multiple variables, that can be rearranged to solve for any one of them.

Week 7 and 8 – Linear and quadratic inequalities

1. **Inequality**
   A mathematical statement showing that two expressions are not equal, using symbols such as $<$, $>$, $\leq$, or $\geq$.
2. **Linear Inequality**
   An inequality involving a variable to the power of 1 (e.g., $2x + 3 < 7$).
3. **Quadratic Inequality**
   An inequality where the variable is squared (e.g., $x^2 - 4x < 5$).
4. **Solution Set**
   All the values of the variable that make the inequality true.
5. **Number Line**
   A visual tool used to represent the solution set of an inequality, showing open or closed circles and shaded regions.
6. **Inequality Symbols**
   The signs used to compare expressions:
   - $<$: less than
   - $>$: greater than
   - $\leq$: less than or equal to
   - $\geq$: greater than or equal to
7. **Flip the Sign**
   When multiplying or dividing both sides of an inequality by a **negative number**, the inequality sign must be reversed.
8. **Factorise and Solve**
   A method used to solve quadratic inequalities: rearrange into standard form, factorise, find the roots, and use a sign diagram or number line to find the solution set.

Week 9, 10 and 11 – Solving quadratic simultaneous equations

1. **Simultaneous Equations**
   A set of equations with two or more variables that are solved together to find a common solution.
2. **Quadratic Equation**
   An equation that includes a squared term (e.g., $x^2 + 3x - 4 = 0$).
3. **Linear Equation**
   An equation where the variable is to the power of 1 (e.g., $y = 2x + 1$).
4. **Substitution Method**
   A method for solving simultaneous equations where one equation is rearranged to express a variable, then substituted into the other.
5. **Elimination Method**
   A technique typically used for linear simultaneous equations, but less common with quadratics; involves adding or subtracting equations to eliminate a variable.
6. **Solve the Quadratic**
   After substitution, the resulting equation is quadratic and can be solved by factorising, completing the square, or using the quadratic formula.
7. **Solution Pair**
   The values of x and y that satisfy both equations (often two pairs for quadratic systems).

Week 12, 13 and 14 – Revision, Probability and Tree diagrams

1. **Probability**
   A measure of how likely an event is to happen, expressed as a number between 0 (impossible) and 1 (certain).
2. **Outcome**
   A possible result of a probability experiment (e.g., rolling a 4 on a die).
3. **Sample Space**
   The set of all possible outcomes of an experiment.
4. **Event**
   One or more outcomes that we are interested in (e.g., getting an even number on a die).
5. **Tree Diagram**
   A visual representation used to map out all possible outcomes of one or more events, showing branches for each possible choice.
6. **Independent Events**
   Events where the outcome of one does not affect the outcome of the other (e.g., flipping a coin twice).
7. **Conditional Probability**
   The probability of an event occurring given that another event has already happened, often seen when outcomes are not replaced.