|  |  |  |
| --- | --- | --- |
| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Algebra**  |
| 1. Expression | A mathematical statement written using **symbols**, **numbers** or **letters**, | 3x + 2 or 5y2 |
| 2. Equation | A statement showing that **two expressions are equal** | 2y – 17 = 15 |
| 3. Identity | An equation that is **true for all values** of the variablesAn identity uses the symbol: $≡$ | *2x ≡ x+x* |
| 4. Formula | Shows the **relationship** between **two or more variables** | Area of a rectangle = length x width or A= LxW |
| 5. Simplifying Expressions | **Collect ‘like terms’.** Be careful with negatives. $x^{2}$ and $x$ are not like terms. | $$2x+3y+4x-5y+3=6x-2y+3$$$$3x+4-x^{2}+2x-1=5x-x^{2}+3$$ |
| 6. $x $times $x$ | The answer is $x^{2}$ not $2x$. | Squaring is multiplying by itself, not by 2. |
| 7. $p×p×p$  | The answer is $p^{3}$ not $3p$ | If p=2, then $p^{3}$=2x2x2=8, not 2x3=6 |
| 8. $p+p+p$  | The answer is 3p not $p^{3}$ | If p=2, then 2+2+2=6, not $2^{3}=8$ |
| 9. Expand | To expand a bracket, **multiply** each term **in the bracket** by the expression **outside** the bracket. | $$3\left(m+7\right)=3x+21$$ |
| 10. Factorise | The **reverse** of **expanding**.Factorising is writing an expression as a product of terms by ‘**taking out’ a common factor**. | $6x-15=3(2x-5)$, where 3 is the common factor. |

|  |  |  |
| --- | --- | --- |
| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Solving Quadratics by Factorising**  |
| 1. Quadratic | A quadratic expression is of the form$$ax^{2}+bx+c$$where $a, b$ and $c$ are numbers, $a\ne 0$ | Examples of quadratic expressions:$$x^{2}$$$$8x^{2}-3x+7$$Examples of non-quadratic expressions:$$2x^{3}-5x^{2}$$$$9x-1$$ |
| 2. Factorising Quadratics | When a quadratic expression is in the form $x^{2}+bx+c$ find the two numbers that **add to give b** and **multiply to give c**. | $$x^{2}+7x+10=(x+5)(x+2)$$(because 5 and 2 add to give 7 and multiply to give 10)$$x^{2}+2x-8=(x+4)(x-2)$$(because +4 and -2 add to give +2 and multiply to give -8) |
| 3. Difference of Two Squares | An expression of the form $a^{2}-b^{2}$ can be factorised to give $(a+b)(a-b)$ | $$x^{2}-25=(x+5)(x-5)$$$$16x^{2}-81=(4x+9)(4x-9)$$ |
| 4. Solving Quadratics $(ax^{2}=b)$ | Isolate the $x^{2}$ term and square root both sides.Remember there will be a **positive and a negative solution**. | $$2x^{2}=98$$$$x^{2}=49$$$$x=\pm 7$$ |
| 5. Solving Quadratics $(ax^{2}+bx=0)$ | **Factorise** and then **solve = 0**. | $$x^{2}-3x=0$$$$x\left(x-3\right)=0$$$$x=0 or x=3$$ |
| 6. Solving Quadratics by Factorising $\left(a=1\right)$  | **Factorise** the quadratic in the usual way.**Solve = 0** Make sure the equation = 0 before factorising. | Solve $x^{2}+3x-10=0$Factorise: $\left(x+5\right)\left(x-2\right)=0$$$x=-5 or x=2$$ |

|  |  |  |
| --- | --- | --- |
| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Simultaneous Equations**  |
| 1. Simultaneous Equations | A set of **two or more equations**, each involving **two or more variables** (letters).The **solutions** to simultaneous equations **satisfy both**/all of the **equations**. | $$2x+y=7$$$$3x-y=8$$$$x=3$$$$y=1$$ |
| 2. Variable | A **symbol**, usually a **letter**, which **represents a number** which is usually unknown.  | In the equation $x+2=5$, $x$ is the variable. |
| 3. Coefficient | A **number** used to **multiply** a **variable**.It is the number that comes before/in front of a letter. | 6z6 is the coefficientz is the variable |
| 4. Solving Simultaneous Equations (by Elimination) | 1. **Balance** the **coefficients** of one of the variables.2. **Eliminate** this variable by adding or subtracting the equations (**Same Sign Subtract, Different Sign Add**)3. **Solve** the linear equation you get using the other variable.4. **Substitute** the value you found back into one of the previous equations.5. **Solve** the equation you get.6. **Check** that the two values you get satisfy both of the original equations. | $$5x+2y=9$$$$10x+3y=16$$Multiply the first equation by 2.$$10x+4y=18$$$$10x+3y=16$$Same Sign Subtract (+10x on both)$$y=2$$Substitute $y=2$ in to equation.$$5x+2×2=9$$$$5x+4=9$$$$5x=5$$$$x=1$$Solution: $x=1, y=2$ |
| 5. Solving Simultaneous Equations (by Substitution) | 1. **Rearrange** one of the equations into the form $y=...$ or $x=...$2. **Substitute** the right-hand side of the rearranged equation into the other equation.3. Expand and **solve** this equation.4. **Substitute** the value into the $y=...$ or $x=...$ equation.5.  **Check** that the two values you get satisfy both of the original equations. | $$y-2x=3$$$$3x+4y=1$$Rearrange: $y-2x=3\rightarrow y=2x+3$Substitute: $3x+4\left(2x+3\right)=1$Solve: $3x+8x+12=1$$$11x=-11$$$$x=-1$$Substitute: $y=2×-1+3$$$y=1$$Solution: $x=-1, y=1$ |
| 6. Solving Simultaneous Equations (Graphically) | **Draw the graphs** of the two equations.The **solutions** will be **where the lines meet**.The solution can be written as a **coordinate**. | $y=5-x$ and $y=2x-1.$They meet at the point with coordinates (2,3) so the answer is $x=2$ and $y=3$ |

|  |  |  |
| --- | --- | --- |
| **Topic/Skill**  | **Definition/Tips****Topic: Proofs**  | **Example** |
| 1. Expression | A mathematical statement written using **symbols**, **numbers** or **letters**, | 3x + 2 or 5y2 |
| 2. Equation | A statement showing that **two expressions are equal** | 2y – 17 = 15 |
| 3. Identity | An equation that is **true for all values** of the variablesAn identity uses the symbol: $≡$ | *2x ≡ x+x* |
| 4. Formula | Shows the **relationship** between **two or more variables** | Area of a rectangle = length x width or A= LxW |
| 5. Coefficient | A **number** used to **multiply** a **variable**.It is the number that comes before/in front of a letter. | 6z6 is the coefficientz is the variable |
| 6. Odds and Evens | An **even** number is a **multiple of 2**An **odd** number is an integer which is **not a multiple of 2**. | If n is an integer (whole number):An even number can be represented by **2n** or **2m** etc.An odd number can be represented by **2n-1** or **2n+1** or **2m+1** etc. |
| 7. Consecutive Integers | Whole numbers that follow each other in order. | If n is an integer:**n, n+1, n+2** etc. are consecutive integers. |
| 8. Square Terms | A term that is produced by multiply another term by itself. | If n is an integer:$n^{2}$, $m^{2}$ etc. are square integers |
| 9. Sum | The sum of two or more numbers is the value you get when you add them together. | The sum of 4 and 6 is 10 |
| 10. Product  | The product of two or more numbers is the value you get when you multiply them together. | The product of 4 and 6 is 24 |
| 11. Multiple | To show that an expression is a **multiple** of a number, you need to show that you can **factor out the number**. | $4n^{2}+8n-12$ is a multiple of 4 because it can be written as:$$4(n^{2}+2n-3)$$ |

**Knowledge Organiser**