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| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Algebraic Fractions**  |
| 1. Algebraic Fraction | A fraction whose **numerator** and **denominator** are **algebraic expressions**. | $$\frac{6x}{3x-1}$$ |
| 2. Adding/ Subtracting Algebraic Fractions | For $\frac{a}{b}\pm \frac{c}{d}$ , the **common denominator** is $bd$$$\frac{a}{b}\pm \frac{c}{d}=\frac{ad}{bd}\pm \frac{bc}{bd}=\frac{ad\pm bc}{bd}$$ | $$\frac{1}{x}+\frac{x}{2y}$$$$=\frac{1\left(2y\right)}{2xy}+\frac{x\left(x\right)}{2xy}$$$$=\frac{2y+x^{2}}{2xy}$$ |
| 3. Multiplying Algebraic Fractions | **Multiply** the **numerators together** and the **denominators together**.$$\frac{a}{b}×\frac{c}{d}=\frac{ac}{bd}$$ | $$\frac{x}{3}×\frac{x+2}{x-2}$$$$=\frac{x\left(x+2\right)}{3\left(x-2\right)}$$$$=\frac{x^{2}+2x}{3x-6}$$ |
| 4. Dividing Algebraic Fractions | **Multiply** the first fraction by the **reciprocal of the second fraction**.$$\frac{a}{b}÷\frac{c}{d}=\frac{a}{b}×\frac{d}{c}=\frac{ad}{bc}$$ | $$\frac{x}{3}÷\frac{2x}{7}$$$$=\frac{x}{3}×\frac{7}{2x}$$$$=\frac{7x}{6x}=\frac{7}{6}$$ |
| 5. Simplifying Algebraic Fractions | **Factorise** the numerator and denominator and **cancel common factors**. | $$\frac{x^{2}+x-6}{2x-4}=\frac{(x+3)(x-2)}{2(x-2)}=\frac{x+3}{2}$$ |

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| **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:$$4(n^{2}+2n-3)$$ |

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| **Topic/Skill**  | **Definition/Tips****Topic: Functions**  | **Example** |
| 1. Function Machine | Takes an **input** value, performs some **operations** and produces an **output** value. | Image result for function machine |
| 2. Function | A **relationship** between two sets of values. | $f\left(x\right)=3x^{2}-5$ ‘For any input value, square the term, then multiply by 3, then subtract 5’. |
| 3. Function notation | $f(x)$ $x $is the **input** value$f(x)$ is the **output** value. | $$f\left(x\right)=3x+11$$Suppose the input value is $x=5$The output value is $f\left(5\right)=3×5+11=26$ |
| 4. Inverse function | $f^{-1}(x)$ A function that performs the **opposite process** of the original function.1. Write the function as $y=f(x)$2. Rearrange to make $x$ the subject.3. Replace the $y $**with** $x$ and the $x $**with** $f^{-1}\left(x\right)$ | $f\left(x\right)=(1-2x)^{5}$. Find the inverse.$y=(1-2x)^{5}$ $\sqrt[5]{y}=1-2x$ $1-\sqrt[5]{y}=2x$  $\frac{1-\sqrt[5]{y}}{2}=x$$$f^{-1}\left(x\right)=\frac{1-\sqrt[5]{x}}{2}$$ |
| 5. Composite function | A **combination** of two or more **functions** to create a new function.$fg(x)$ is the composite function that **substitutes** the function $g\left(x\right)$ **into** the function $f\left(x\right).$$fg(x)$ means ‘**do g first, then f**’$gf(x)$ means ‘**do f first, then g**’ | $f\left(x\right)=5x-3$, $g\left(x\right)=\frac{1}{2}x+1$What is $fg\left(4\right)$?$$g\left(4\right)=\frac{1}{2}×4+1=3$$$$f\left(3\right)=5×3-3=12=fg\left(4\right)$$What is $fg(x)$?$$fg\left(x\right)=5\left(\frac{1}{2}x+1\right)-3=\frac{5}{2}x+2$$ |
| Rearranging Formulae | **Use inverse operations** on both sides of the formula (balancing method) until you find the expression for the letter. | Make x the subject of $y=\frac{2x-1}{z}$Multiply both sides by z$$yz=2x-1$$Add 1 to both sides$$yz+1=2x$$Divide by 2 on both sides$$\frac{yz+1}{2}=x$$We now have x as the subject. |
| 11. Surd | The **irrational number** that is a **root of a positive integer,** whose value cannot be determined exactly.Surds have **infinite non-recurring decimals**. | $\sqrt{2}$ is a surd because it is a root which cannot be determined exactly.$\sqrt{2}=1.41421356…$ which never repeats. |
| 12. Rules of Surds | $$\sqrt{ab}=\sqrt{a}×\sqrt{b}$$$$\sqrt{\frac{a}{b}}=\frac{\sqrt{a}}{\sqrt{b}}$$$$a\sqrt{c}\pm b\sqrt{c}=\left(a\pm b\right)\sqrt{c}$$$$\sqrt{a}×\sqrt{a}=a$$ | $$\sqrt{48}=\sqrt{16}×\sqrt{3}=4\sqrt{3}$$$$\sqrt{\frac{25}{36}}=\frac{\sqrt{25}}{\sqrt{36}}=\frac{5}{6}$$$$2\sqrt{5}+7\sqrt{5}=9\sqrt{5}$$$$\sqrt{7}×\sqrt{7}=7$$ |

**Knowledge Organiser**