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| **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 $y=3$ |
| 7. Solving Linear and Quadratic Simultaneous Equations | Method 1: If both equations are in the same form (eg. Both $y=$…):1. Set the equations **equal to each other**.2. **Rearrange** to make the equation **equal to zero**.3. **Solve** the quadratic equation.4. **Substitute** the values back in to one of the equations.Method 2: If the equations are not in the same form:1.  **Rearrange** the linear equation into the form $y=...$ or $x=...$2. **Substitute** in to the quadratic equation.3. **Rearrange** to make the equation **equal to zero**.4. **Solve** the quadratic equation.5. **Substitute** the values back in to one of the equations.You should get **two pairs of solutions** (two values for $x$, two values for $y$.)Graphically, you should have **two points of intersection**. | Example 1Solve $y=x^{2}-2x-5$ and $y=x-1$$$x^{2}-2x-5=x-1$$$$x^{2}-3x-4=0$$$$\left(x-4\right)\left(x+1\right)=0$$$x=4$ and $x=-1$$y=4-1=3$ and $y=-1-1=-2$ Answers: (4,3) and (-1,-2)Example 2Solve $x^{2}+y^{2}=5$ and $x+y=3$$$x=3-y$$$$\left(3-y\right)^{2}+y^{2}=5$$$$9-6y+y^{2}+y^{2}=5$$$$2y^{2}-6y+4=0$$$$y^{2}-3y+2=0$$$$\left(y-1\right)\left(y-2\right)=0$$$y=1$ and $y=2$$x=3-1=2$ and $x=3-2=1$Answers: (2,1) and (1,2) |

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