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| **Topic/Skill**  | **Definition/Tips****Topic: Graphs and Graph Transformations**  | **Example** |
| 1. Coordinates | Written in **pairs**. The **first** term is the **x-coordinate** (movement **across**). The **second** term is the **y-coordinate** (movement **up or down**) | A: (4,7)B: (-6,-3) |
| 2. Linear Graph | **Straight line** graph.The **equation** of a linear graph can contain an **x-term**, a **y-term** and a **number**. | Example:Image result for linear graphOther examples:$x=y$ $y=4$ $x=-2$ $y=2x-7$ $y+x=10$ $2y-4x=12$  |
| 3. Quadratic Graph | A ‘**U-shaped**’ curve called a **parabola**.The equation is of the form$y=ax^{2}+bx+c$, where $a$, $b$ and $c$ are numbers, $a\ne 0$. If $a<0$**,** the parabola is **upside down**. | Image result for quadratic graph definition math |
| 4. Cubic Graph | The equation is of the form $y=ax^{3}+k$, where $k$ **is an number**.If $a>0$, the curve is **increasing**.If $a<0$, the curve is **decreasing**. | Image result for cubic function definition mathImage result for cubic function definition math |
| 5. Reciprocal Graph | The equation is of the form $y=\frac{A}{x}$, where $A$ **is a number** and $x\ne 0$.The graph has **asymptotes** on the **x-axis and y-axis**. | Image result for reciprocal graph |
| 6. Asymptote | A **straight line** that a graph **approaches** but **never touches**.**Subject: Maths** | Image result for asymptote definition maths |
| 7. Exponential Graph | The equation is of the form $y=a^{x}$**,** where $a $is a number called the **base**.If $a>1$ the graph **increases**.If $0<a<1$, the graph **decreases**.The graph has an **asymptote** which is the **x-axis**. | Image result for exponential function definition math |
| 8. $y=\sin(x)$ | Key Coordinates:$$\left(0,0\right), \left(90,1\right), \left(180,0\right), \left(270,-1\right), (360,0)$$$y$ is never more than 1 or less than -1.Pattern repeats every 360°. | Image result for sine graph gcse |
| 9. $y=\cos(x)$ | Key Coordinates:$$\left(0,1\right), \left(90,0\right), \left(180,-1\right), \left(270,0\right), (360,1)$$$y$ is never more than 1 or less than -1.Pattern repeats every 360°. | cosine graph |
| 10. $y=\tan(x)$ | Key Coordinates:$$\left(0,0\right), \left(45,1\right), \left(135,-1\right), \left(180,0\right), $$$$\left(225,1\right), \left(315,-1\right), (360,0)$$**Asymptotes** at $x=90$ and $x=270$Pattern repeats every 360°. | tan graph |
| 11. $f\left(x\right)+a$ | **Vertical translation** up a units. $\left(\begin{matrix}0\\a\end{matrix}\right)$ | Image result for graph transformations vertical translation |
| 12. $f(x+a)$ | **Horizontal translation** left a units. $\left(\begin{matrix}-a\\0\end{matrix}\right)$ | Image result for graph transformations vertical translation |
| 13. $-f(x)$ | **Reflection** over the **x-axis**. | Image result for graph transformations reflections |
| 14. $f(-x)$ | **Reflection** over the **y-axis**. | Image result for graph transformations reflections |
| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Proportion**  |
| 1. Direct Proportion | If two quantities are in direct proportion, **as one increases**, the **other increases** by the **same percentage**.If $y$ is directly proportional to $x$, this can be written as $y ∝ x$An equation of the form $y=kx $represents direct proportion, where $k$ **is the constant of proportionality**. |  |
| 2. Inverse Proportion | If two quantities are inversely proportional, **as one increases**, the **other decreases** by the **same percentage**.If $y$ is inversely proportional to $x$, this can be written as $y ∝\frac{1}{x}$An equation of the form $y=\frac{k}{x}$ represents inverse proportion. |  |
| 3. Using proportionality formulae | **Direct**: **y = kx** or **y**$ ∝ $**x****Inverse**: **y =** $\frac{k}{x}$ or **y** $∝$$\frac{1}{x}$1. **Solve to find k** using the pair of values in the question.2. **Rewrite the equation** using the k you have just found.3. **Substitute the other given value** from the question in to the equation to **find the missing value**. | p is directly proportional to q.When p = 12, q = 4. Find p when q = 20.1. p = kq12 = k x 4so k = 32. p = 3q3. p = 3 x 20 = 60, so p = 60 |
| 4. Direct Proportion with powers | Graphs showing **direct proportion** can be written in the form $y=kx^{n}$Direct proportion graphs will always start at the origin. |  |
| 5. Inverse Proportion with powers | Graphs showing **inverse proportion** can be written in the form $y=\frac{k}{x^{n}}$Inverse proportion graphs will never start at the origin. |  |
| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Area Under Graph and Gradient of Curve**  |
| 1. Area Under a Curve | To find the area under a curve, **split it up into simpler shapes** – such as rectangles, triangles and trapeziums – that approximate the area. |  |
| 2. Tangent to a Curve | A straight **line** that **touches** a curve at **exactly one point**. | Image result for tangent to a curve |
| 3. Gradient of a Curve | The **gradient of a curve** at a point is the same as the **gradient of the tangent** at that point.1. Draw a tangent carefully at the point.2. Make a right-angled triangle.3. Use the measurements on the axes to calculate the rise and run (change in y and change in x)4. Calculate the gradient. | $$Gradient=\frac{Change in y}{Change in x}$$$$=\frac{16}{2}=8$$ |
| 4. Rate of Change | The rate of change at a particular instant in time is represented by the **gradient of the tangent to the curve** at that point. | Image result for positive negative rate of change |
| 5. Distance-Time Graphs | You can find the **speed** from the **gradient** of the line (Distance ÷ Time)The steeper the line, the quicker the speed.A **horizontal** line means the object is not moving (**stationary**). |  |
| 6. Velocity-Time Graphs | You can find the **acceleration** from the **gradient** of the line (Change in Velocity ÷ Time)The steeper the line, the quicker the acceleration.A **horizontal line** represents no acceleration, meaning a **constant velocity**.The **area** under the graph is the **distance.** |  |

**Knowledge Organiser**