|  |  |  |
| --- | --- | --- |
| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Summarising Data**  |
| 1. Types of Data | **Qualitative** Data – **non-numerical** data**Quantitative** Data – **numerical** data**Continuous** Data – data that can take **any numerical value** within a given range.**Discrete** Data – data that can take **only specific values** within a given range. | Qualitative Data – eye colour, gender etc.Continuous Data – weight, voltage etc.Discrete Data – number of children, shoe size etc. |
| 2. Grouped Data | Data that has been **bundled in to categories**.Seen in grouped frequency tables, histograms, cumulative frequency etc. |  |
| 3. Primary /Secondary Data | **Primary** Data – **collected yourself** for a specific purpose.**Secondary** Data – **collected by someone else** for another purpose. | Primary Data – data collected by a student for their own research project.Secondary Data – Census data used to analyse link between education and earnings. |
| 4. Mean | **Add** up the values and **divide** by how many values there are. | The mean of 3, 4, 7, 6, 0, 4, 6 is $$\frac{3+4+7+6+0+4+6}{7}=5$$ |
| 5. Mean from a Table | 1. Find the midpoints (if necessary)2. Multiply Frequency by values or midpoints3. Add up these values4. Divide this total by the Total FrequencyIf **grouped** data is used, the answer will be an **estimate**. |  |
| 6. Median Value | The **middle** value. Put the data in order and find the middle one.If there are **two middle values**, find the number half way between them by **adding them together and dividing by 2**. | Find the median of: 4, 5, 2, 3, 6, 7, 6Ordered: 2, 3, 4, **5**, 6, 6, 7Median = 5 |
| 7. Median from a Table | Use the formula $\frac{(n+1)}{2}$ to find the position of the median.$n$ is the total frequency. | If the total frequency is 15, the median will be the $\left(\frac{15+1}{2}\right)=8th $position |
| 8. Mode /Modal Value | **Most** frequent/common.Can have more than one mode (called bi-modal or multi-modal) or no mode (if all values appear once) | Find the mode: 4, 5, 2, 3, 6, 4, 7, 8, 4Mode = 4 |
| 9. Range | **Highest value subtract the Smallest value**Range is a ‘measure of spread’. The smaller the range the more consistent the data. | Find the range: 3, 31, 26, 102, 37, 97.Range = 102-3 = 99 |
| 10. Outlier | A value that ‘**lies outside**’ most of the other values in a set of data.An outlier is **much smaller or much larger** than the other values in a set of data. | Image result for outlier maths |
| 11. Lower Quartile | **Divides** the **bottom half** of the data into **two halves**.**LQ =** $Q\_{1}=\frac{(n+1)}{4}th $**value** | Find the lower quartile of: 2, **3**, 4, 5, 6, 6, 7$Q\_{1}=\frac{(7+1)}{4}=2nd $value 🡪 3 |
| 12. Lower Quartile | **Divides** the **top half** of the data into **two halves**.**UQ =** $Q\_{3}=\frac{3(n+1)}{4}th $**value** | Find the upper quartile of: 2, 3, 4, 5, 6, **6**, 7$Q\_{3}=\frac{3(7+1)}{4}=6th $value 🡪 6 |
| 13. Interquartile Range | The **difference** between the **upper quartile and lower quartile.**$$IQR=Q\_{3}-Q\_{1}$$The **smaller** the **interquartile range**, the **more** **consistent** the data. | Find the IQR of: 2, 3, 4, 5, 6, 6, 7$$IQR=Q\_{3}-Q\_{1}=6-3=3$$ |

|  |  |  |
| --- | --- | --- |
| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Representing Data**  |
| 1. Frequency Table | A record of **how often each value** in a set of data **occurs**. | Image result for math definition frequency table |
| 2. Bar Chart | Represents data as vertical blocks.$x-axis$ shows the **type** of data$y-axis$ shows the **frequency** for each type of dataEach bar should be the **same width**There should be **gaps** between each barRemember to **label** each axis. | Image result for gcse bar charts |
| 3. Types of Bar Chart | **Compound/Composite** Bar Charts show data stacked on top of each other.**Comparative/Dual** Bar Charts show data side by side. | Image result for compound bar chartsImage result for comparative bar charts |
| 4. Pie Chart | Used for showing **how data breaks down** **into** its constituent **parts**.When drawing a pie chart, **divide 360° by the total frequency**. This will tell you how many degrees to use for the frequency of each category.Remember to **label** the category that each sector in the pie chart represents. | Image result for pie chart gcseIf there are 40 people in a survey, then each person will be worth 360÷40=9° of the pie chart. |
| 5. Pictogram | Uses **pictures** or symbols to **show the value** of the data.A pictogram must have a **key**. |  |
| 6. Line Graph | A graph that uses **points connected by straight lines** to show how data changes in values.This can be used for **time series data**, which is a series of data points spaced over uniform time intervals in **time order**. | Line Graph |
| 7. Two Way Tables | A table that **organises data** around **two categories.**Fill out the information step by step using the information given.Make sure all the totals add up for all columns and rows. |  |
| 8. Box Plots | The minimum, lower quartile, median, upper quartile and maximum are shown on a box plot.A box plot can be drawn independently or from a cumulative frequency diagram. | Students sit a maths test. The highest score is 19, the lowest score is 8, the median is 14, the lower quartile is 10 and the upper quartile is 17. Draw a box plot to represent this information. |
| 9. Comparing Box Plots | Write two sentences.1. Compare the **averages** using the **medians** for two sets of data.2. Compare the **spread** of the data using the **range or IQR** for two sets of data.The smaller the range/IQR, the more consistent the data.You must compare box plots **in the context of the problem**. | ‘On average, students in class A were more successful on the test than class B because their median score was higher.’‘Students in class B were more consistent than class A in their test scores as their IQR was smaller.’ |

|  |  |  |
| --- | --- | --- |
| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Systematic Listing**  |
| 1. Combination | A collection of things, where the **order does not matter**. | How many combinations of two ingredients can you make with apple, banana and cherry?Apple, BananaApple, CherryBanana, Cherry3 combinations |
| 2. Permutation | A collection of things, where the **order does matter**. | You want to visit the homes of three friends, Alex (A), Betty (B) and Chandra (C) but haven’t decided the order. What choices do you have?ABCACBBACBCACABCBA |
| 3. Permutations with Repetition | When something has $n$ different types, there are $n$ **choices each time**.Choosing $r$ of something that has $n$ different types, the permutations are:$$n×n×…\left(r times\right)=n^{r}$$ | How many permutations are there for a three-number combination lock?10 numbers to choose from $\{1, 2, ….10\}$ and we choose 3 of them 🡪$10×10×10=10^{3}=1000$ permutations. |
| 4. Permutations without Repetition | We have to **reduce the number of available choices each time**.One you have chosen something, you cannot choose it again. | How many ways can you order 4 numbered balls?$$4×3×2×1=24$$ |
| 5. Factorial | The factorial symbol ‘!’ means to multiply a series of descending integers to 1.Note: $0!=1$ | $$4!=4×3×2×1=24$$ |
| 6. Product Rule for Counting | If there are $x$ **ways of doing something** and $y$ **ways of doing something else**, then there are $xy$ **ways of performing both**. | To choose one of $\{A,B,C\}$ and one of $\{X,Y\}$ means to choose one of $\{AX, AY, BX, BY, CX, CY\}$The rule says that there are $3×2=6$ choices. |

|  |  |  |
| --- | --- | --- |
| **Topic/Skill**  | **Definition/Tips****Topic: Scatter Graphs**  | **Example** |
| 1. Correlation | Correlation between two sets of data means they are **connected** in some way. | There is correlation between temperature and the number of ice creams sold. |
| 2. Causality | When one variable **influences** another variable. | The more hours you work at a particular job (paid hourly), the higher your income from that job will be. |
| 3. Positive Correlation | As one value **increases** the other value **increases**. |  |
| 4. Negative Correlation | As one value **increases** the other value **decreases**. |  |
| 5. No Correlation | There is **no linear relationship** between the two. |  |
| 6. Strong Correlation | When two sets of data are **closely linked**. | Image result for strong weak correlation definition math |
| 7. Weak Correlation | When two sets of data have correlation, but are **not closely linked**. | Image result for strong weak correlation definition math |
| 8. Scatter Graph | A graph in which values of **two variables** are plotted along two axes to **compare** them and see if there is any **connection** between them. | Image result for scatter diagram |
| 9. Line of Best Fit | A **straight line** that **best represents the data** on a scatter graph. | Image result |
| 10. Outlier | A value that ‘lies outside’ most of the other values in a set of data.An outlier is **much smaller or much larger** than the other values in a set of data. | Image result for outlier maths |

|  |  |  |
| --- | --- | --- |
| **Topic/Skill**  | **Definition/Tips** | **Example****Topic: Real Life Graphs**  |
| 1. Real Life Graphs | Graphs that are supposed to model some real-life situation.The actual meaning of the values depends on the labels and units on each axis.The **gradient** might have a contextual meaning.The **y-intercept** might have a contextual meaning.The **area** under the graph might have a contextual meaning. | A graph showing the cost of hiring a ladder for various numbers of days.The gradient shows the cost per day. It costs £3/day to hire the ladder.The y-intercept shows the additional cost/deposit/fixed charge (something not linked to how long the ladder is hired for). The additional cost is £7. |
| 2. Conversion Graph | A line graph to **convert one unit to another**.Can be used to convert units (eg. miles and kilometres) or currencies ($ and £)Find the value you know on one axis, read up/across to the conversion line and read the equivalent value from the other axis. | Image result for conversion graph$$8 km=5 miles$$ |
| 3. Depth of Water in Containers | Graphs can be used to show how the depth of water changes as different shaped containers are filled with water at a constant rate. |  |

**Knowledge Organiser**