5 Probability & Statistics 1 – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

Write each word three times.

English	**Write it 3 times** (English)		
mean			
median			
mode			
range			
standard deviation			
permutation			
combination			

Recall

At IGCSE you summarised data and found simple probabilities. Bring this with you:

- the **mean** , **median** and **mode** of a set of numbers;
- listing outcomes to find a probability.

Statistics 1 adds a measure of **spread**, and a way to **count** arrangements.

New ideas

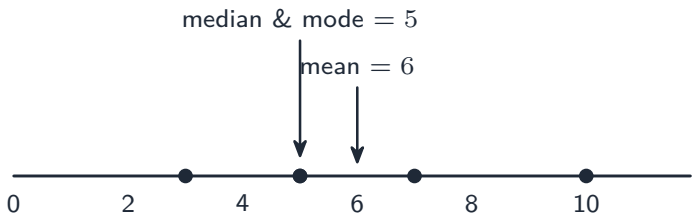
1 Averages and spread

A "middle" value (a measure of central tendency):

- the **mean** $\bar{x} = \dfrac{\sum x}{n}$; the **median** (the middle value in order); the **mode** (the most common value).

A measure of spread says how spread out the data is:

- the **range** = highest − lowest;
- the **standard deviation** $\sigma = \sqrt{\dfrac{\sum x^2}{n} - \bar{x}^2}$.



Worked example. For 10 values with $\sum x = 50$ and $\sum x^2 = 300$: $\bar{x} = \frac{50}{10} = 5$ and $\sigma = \sqrt{\frac{300}{10} - 5^2} = \sqrt{5} = 2.24$.

Micro-check. Find the **mean** of $4, 6, 8, 10, 12$. [1]

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2 Permutations and combinations

- a **permutation** is an arrangement where **order matters** (AB is different from BA);
- a **combination** is a selection where **order does not matter** ($\{A, B\}$ is the same as $\{B, A\}$).

The counts are ${}^nP_r = \dfrac{n!}{(n-r)!}$ and ${}^nC_r = \dfrac{n!}{r!\,(n-r)!}$.

permutation (order matters)

AB BA

combination (order does not)

$\{A, B\}$

Micro-check. When choosing a team where order does **not** matter, do you use a permutation or a combination? [1]

Watch out: $\sigma = \sqrt{\dfrac{\sum x^2}{n} - \bar{x}^2}$ – square the mean *before* subtracting. Permutation (order *matters*) uses ${}^nP_r$; combination (order does *not*) uses ${}^nC_r$, which is always smaller.

Practice

5.1 Find the **mean**, **median** and **mode** of $3, 5, 5, 7, 10$. [3]

5.2 Find the **range** of $12, 4, 9, 20, 7$. [1]

5.3 For 8 values, $\sum x = 40$ and $\sum x^2 = 218$. Find the mean and the standard deviation. [3]

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5.4 State whether **order matters** for (a) a permutation, (b) a combination. [2]

5.5 Find ${}^5C_2 = \dfrac{5!}{2!\,3!}$. [2]

5.6 Challenge. A committee of 3 is chosen from 7 people. How many different committees are possible? [2]