Notation and Equations for Exam 1

X: The variable we measure in a scientific study

n: The size of the sample

N: The size of the population

M: The mean of the sample

μ: The mean of the population (Greek letter mu)

x: Any possible value of the measurement variable X

$f(x)$: The frequency of x, meaning the number of members of the population or sample for which $X = x$

P: Probability; P(*event*) means the probability that *event* will occur. When x is a value in a population, $P(x)$ is the fraction of the population for which $X = x$, or the probability that if we select a member of the population at random, the value of X for that member will be x.

σ: Standard deviation of the population (Greek lowercase letter sigma)

σ^2: Variance of the population

SS: Sum of squares

s: Standard deviation of the sample

s^2: Variance of the sample

$F(x)$: Cumulative distribution function

z: z-score

Formula name	Formula	Recipe	Step-by-step results
Cumulative frequency	$F(x) = \sum_{y \le x} f(y)$	Find frequency $f(y)$ for all values y	$f(y)$
		Sum over all y that are $\le x$	$\sum_{y \le x} f(y)$
		(y is the same kind of variable as x; we just need two symbols here)	
Sample mean	$M = \frac{\sum_{sample} X}{n}$	Sum scores in sample	$\sum_{sample} X$
		Divide by n	$\frac{\sum_{sample} X}{n}$
Mean of finite population	$\mu = \frac{\sum_{pop} X}{N}$	Sum scores in population	$\sum_{pop} X$
		Divide by N	$\frac{\sum_{pop} X}{N}$
$P(x)$ for finite population	$P(x) = \frac{f(x)}{N}$	Divide frequency by N	$\frac{f(x)}{N}$
Mean of a finite or infinite population	$\mu = \sum_{x} x \cdot P(x)$	Multiply every value by its probability	$x \cdot P(x)$
		Sum over all values	$\sum_{x} x \cdot P(x)$

Formula name	Formula	Recipe	Step-by-step results
Sum of squares	$SS = \sum_{pop} (X - \mu)^2$	Subtract mean from each score	$X - \mu$
		Square each of these differences	$(X - \mu)^2$
		Sum over all scores	$\sum_{pop} (X - \mu)^2$
Population variance	$\sigma^2 = \frac{\sum_{pop} (X - \mu)^2}{N}$	Compute the sum of squares as above	$\sum_{pop} (X - \mu)^2$
		Divide by N	$\frac{\sum_{pop} (X - \mu)^2}{N}$
Population standard deviation	$\sigma = \sqrt{\frac{\sum_{pop} (X - \mu)^2}{N}}$	Compute the variance as above	$\frac{\sum_{pop} (X - \mu)^2}{N}$
		Take the square root	$\sqrt{\frac{\sum_{pop} (X - \mu)^2}{N}}$
z-score	$z = \frac{X - \mu}{\sigma}$	Subtract the mean from the raw score	$X - \mu$
		Divide by the standard deviation	$\frac{X - \mu}{\sigma}$

Formula name	Formula	Recipe	Step-by-step results
Expected value (for any random variable R)	$E(R)=\sum_x x\cdot P(R=x)$	Multiply each possible value by its probability	$x\cdot P(R=x)$
		Sum over all values	$\sum_x x\cdot P(R=x)$
Sample variance	$s^2=\frac{\sum_{sample}(X-M)^2}{n-1}$	Subtract sample mean from each raw score	$X-M$
		Square each of these differences	$(X-M)^2$
		Sum over all members of the sample	$\sum_{sample}(X-M)^2$
		Divide by one less than the sample size	$\frac{\sum_{sample}(X-M)^2}{n-1}$
Sample standard deviation	$s=\sqrt{\frac{\sum_{sample}(X-M)^2}{n-1}}$	Compute sample variance as above	$\frac{\sum_{sample}(X-M)^2}{n-1}$
		Take square root	$\sqrt{\frac{\sum_{sample}(X-M)^2}{n-1}}$