61 Notation

Notation isn't just about using arbitrary symbols to represent quantities. Consistent use of notation can help reveal the structure and relationships present in a collection of ideas, such as statistical inference, and can help clarify the roles of various quantities in data analysis. To emphasize the structure in the notation we include a brief overview here of the different types of notation and where they have been used.

61.1 Greek Letters

Greek letters are frequently used in mathematics for a range of purposes. You will have seen the Greek letter 'p', π, used for the area of the unit circle. The most important role of Greek letters for us has been to signify a *population parameter*. Table 61.1 shows the ones we have used in this role, listed alphabetically.

Table 61.1: Greek symbols

Letter		Role	Section
α	alpha	loess smoothing parameter	6.3
β	beta	population intercept (β_0) & slope (β_1)	35
θ	theta	arbitrary population parameter	40
λ	lambda	Poisson mean	18
μ	mu	population mean	16
π	pi	used in Normal distribution	20
ρ	rho	population correlation	39
σ	sigma	population standard deviation	17
χ	chi	χ^2 distribution	47

Other Greek letters are similar to English, as shown in Table 61.2. One benefit of knowing these letters in statistics is that you can now read quite a bit of Greek because a lot of English words have Greek origins. Once you can pronounce the word you can possibly recognize it. Try reading the words given in Table 61.3.

Table 61.2: Familiar Greek letters

Greek	Name	English
κ	kappa	k
ε	epsilon	e
ι	iota	i
ο	omicron	o
τ	tau	t

Table 61.3: Greek words

αμβροσια	ασθμα	κρισισ	χαοσ
παθοσ	βασισ	ιβισ	θεσισ
κοσμοσ	χοροσ		

61.2 Capital Letters

We have generally used capital letters to denote random variables with lowercase letters used for particular outcomes of these. For example, $\bar{x}$ denotes a particular number, the mean from a sample, whereas $\bar{X}$ denotes a random process of taking a random sample and returning the mean.

We have had two main uses for random variables. Firstly we have thought of them as models for sampling from populations. The random variable X might be the height of a randomly chosen female, for instance. The second use has been to discuss the sampling distribution of statistics. In Section 2.4 we used the sample mean $\bar{x}$ to summarize the location of an observed distribution, while in Section 22 we used the random variable $\bar{X}$ to think about how $\bar{x}$ would change from sample to sample.

61.3 Other Symbols

Table 61.4 shows a list of some of the other symbols used in this book, together with the first section that discusses their use and meaning.

Table 61.4: Other symbols

Symbol	Role	Section
n	sample size	2.4
$\bar{x}$	sample mean	2.4
s	sample standard deviation	2.8
M	sample median	2.3
Q_j	jth quartile	2.5
$P(\cdot)$	probability	16
p	population proportion	10
$\hat{p}$	sample proportion	10
N	population size	16
$E(\cdot)$	expected value	16
$\text{var}(\cdot)$	variance	17
$\text{sd}(\cdot)$	standard deviation	17
$\text{se}(\cdot)$	standard error	25
e	base of natural logarithms	20
z	z score	20
z^*	critical z score	33
t	t statistic	29
t^*	critical t statistic	30.1
df	degrees of freedom	29
OR	odds ratio	34.1
F	F statistic	41.2
S	signed-rank statistic	50.3
W	Wilcoxon statistic	50.4
H	Kruskal-Wallis statistic	50.5
r_S	Spearmann correlation	50.7