SPRING 2014 : <u>STAT - 1</u> , Section 10.

HANDOUT - CHAPTERS 5, 6 & 7 - DISTRIBUTIONS

- We study DISCRETE RANDOM VARIABLES, BINOMIAL DISTRIBUTION $B(n, p)$,in Chapter 5 and the NORMAL DISTRIBUTION $N(\mu, \sigma)$ in Chapter 6.

- Definitions of random variable (rv) (Definition 5.1, p.212), Discrete rv (Definition 5.2, p.213) Discrete probability distribution (definition 5.3, p.213), Key facts 5.1 and 5.2, and worked examples 5.1 to 5.5 are important from section 5.1

  TRY exercises 5.1, 5.3, 5.7, 5.9, 5.11, 5.15 and 5.17.

  Learn about the mean μ of a discrete rv (Definition 5.4, p.220), Example 5.7, variance σ^2, standard deviation (s.d) σ (Definition 5.5, p.222) and Example 5.8 from section 5.2.

  TRY exercises 5.21, 5.23, 5.25, 5.27 and 5.30.

- In section 5.3 we study $k!$ (k factorial), Binomial coefficients $\begin{pmatrix} n \\ x \end{pmatrix}$, Bernoulli trials, Key fact 5.4 (p. 229), $X \sim B(n, p)$ (Formula 5.1, p.230)and Procedure 5.1 (p.231).

- Go over Example 5.12, use of the Binomial Probability Tables (Table XII in Appendix A) and their use, the shape of a $B(n, p)$ distribution, the mean and s.d. of $X \sim B(n, p)$ (Formula 5.2, p.234) and Key fact 5.5.

  TRY exercises 5.39, 5.41, 5.43, 5.45, 5.49, 5.51, 5.55, 5.57, 5.61, 5.63 and 5.67.

- Chapter 6 deals with the Normal Distribution. In section 6.1 we learn about $N(\mu, \sigma)$, $X \sim N(\mu, \sigma)$ (Definition 6.1), Z $= \frac{(X-\mu)}{\sigma} \sim N(0, 1)$ (the standard normal distribution, Definition 6.2) and Key fact 6.4 (p.258). In section 6.2 we study basic properties of the $z-$ curve (key fact 6.5, p.263). We use that to find areas relating to the $z-$curve using

Table II (see Appendix or the inside jacket of the text). Go over carefully all the worked out examples to find areas, $z-$scores, z_α and

TRY exercises 6.45, 6.47, 6.49, 6.51, 6.53, 6.55, 6.57, 6.59, 6.61, 6.63, 6.64, 6.65, 6.67, 6.69, 6.71, 6.73, 6.75, 6.77 and 6.79.

- In section 6.3, Procedure 6.1 (p.269) shows how to find the areas under the $x-$curve. Go over example 6.9, key fact 6.6 and procedure 6.2 (p.272) of finding $x-$value(s) corresponding the $z-$score(s).

  TRY exercises 6.83, 6.85, 6.87, 6.89, 6.91, 6.93, 6.95, 6.99, 6.101, 6.103.

- Although we discuss it briefly, note that for large values of n and $0 < p < 1$, we can approximate $B(n, p)$ probabilities by using an appropriate $N(\mu, \sigma)$ probabilities as in section 6.5.

- The biographies of the Bernoulli brothers (p.252) and of the child prodigy Gauss (p.295) are required readings.

- The sample mean $\overline{x}$ is viewed as a rv in Chapter 7 (understand why this view is reasonable). The distribution of the sample mean $\overline{x}$ has as its mean $\mu_{\overline{x}}$ and as its s.d. $\sigma_{\overline{x}}$. Formula 7.1 (p.304) shows that $\mu_{\overline{x}} = \mu$ and Formula 7.2 (p.305) shows that $\sigma_{\overline{x}} = \frac{\sigma}{\sqrt{n}}$. Go over example 7.6 (p.306) to solidify these notions and read on p.306 about the sample size and the STANDARD ERROR (SE) of the sample mean in particular and of a statistic in general.

  TRY exercises 7.28, 7.29, 7.31, 7.33, 7.35, 7.39, 7.47, 7.49.

- In section 7.3, we study key fact 7.2 which states that if a population has $N(\mu, \sigma)$ distribution then the sample mean $\overline{x}$ from that population has $N(\mu, \frac{\sigma}{\sqrt{n}})$ distribution. The Central Limit Theorem (CLT) is stated as key fact 7.3 (p.311). Key fact 7.4 (p.313) synthesizes these ideas and forms the basis for many statistical inference techniques to be studied in chapters 8 to 13.

  TRY exercises 7.63, 7.65, 7.69, 7.73, 7.76.

  Learn about the Newton of France (p.320).

- Learn quickly and thoroughly ALL the material covered by this handout so that you are well prepared to embark on the journey to master basic inference techniques.