SPRING 2017

HUNTER COLLEGE

STAT 213 Section 05

Introduction to Applied Statistics

FINAL EXAM

Last Name: ________________________________

First Name: ________________________________

Graduation Year: __________________________

May 24, 2017

1. Please do not tear paper. Please do not leave blank for any question. Show your work.
2. There are 10 questions, each question is 5 points. A perfect score is 50 points.
3. You have 120 minutes for this exam (3:00 pm - 5:00 pm).
4. Sign your name in the front of classroom before leaving.

Formulas

$\sum_{i=1}^{n} x_i = x_1 + x_2 + \cdots + x_n$

$\overline{x} = \frac{1}{n}\sum_{i=1}^{n} x_i$

$z = \frac{x-\mu}{\sigma}$

$x = \mu + \sigma z$

$s_x^2 = \frac{\sum_{i=1}^{n}(x_i-\overline{x})^2}{n-1}$

$s_x = \sqrt{\frac{\sum_{i=1}^{n}(x_i-\overline{x})^2}{n-1}}$

$\Pr(|X-\mu| \le k\sigma) \ge 1 - \frac{1}{k^2}$, for any distribution

$\Pr(|X-\mu| \le \sigma) \approx 0.68$, $\Pr(|X-\mu| \le 2\sigma) \approx 0.95$, $\Pr(|X-\mu| \le 3\sigma) \approx 0.997$, for normal distribution

$r = \frac{1}{n-1}\sum_{i=1}^{n}\left(\frac{x_i-\overline{x}}{s_x}\right)\left(\frac{y_i-\overline{y}}{s_y}\right)$

$r = \frac{\sum_{i=1}^{n}(x_i-\overline{x})(y_i-\overline{y})}{(n-1)s_x s_y}$

$\widehat{y} = a + bx$

$b = r\frac{s_y}{s_x}$

$b = \frac{\sum_{i=1}^{n}(x_i-\overline{x})(y_i-\overline{y})}{\sum_{i=1}^{n}(x_i-\overline{x})^2}$

$a = \overline{y} - b\overline{x}$

$SSTo = \sum_{i=1}^{n}(y_i-\overline{y})^2$, $SSTo = \sum_{i=1}^{n} y_i^2 - n\overline{y}^2$

$SSResid = \sum_{i=1}^{n}(y_i-\widehat{y}_i)^2$, $SSResid = \sum_{i=1}^{n} y_i^2 - a\sum_{i=1}^{n} y_i - b\sum_{i=1}^{n} x_i y_i$

$r^2 = 1 - \frac{SSResid}{SSTo}$

$s_e = \sqrt{\frac{SSResid}{n-2}}$

If events $E_1, \cdots, E_k$ are all mutually exclusive, then $\Pr(E1 \cup \cdots \cup E_k) = \Pr(E_1) + \cdots + \Pr(E_k)$

$\Pr(E \mid F) = \frac{\Pr(E \cap F)}{P(F)}$

The event E and F are independent if and only if $\Pr(E \cap F) = \Pr(E)\Pr(F)$

$\Pr(E \cup F) = \Pr(E) + \Pr(F) - \Pr(E \cap F)$

$\Pr(E \cap F) = \Pr(E|F)\Pr(F) = \Pr(F|E)\Pr(E)$

If events $B_1, \cdots, B_k$ are all mutually exclusive with $\Pr(B_1) + \cdots + \Pr(B_k) = 1$, then for any event E, $\Pr(E) = \Pr(E \mid B_1)\Pr(B_1) + \cdots + \Pr(E \mid B_k)\Pr(B_k)$

If events $B_1, \cdots, B_k$ are all mutually exclusive with $\Pr(B_1) + \cdots + \Pr(B_k) = 1$, then for any event E, $\Pr(B_i \mid E) = \frac{\Pr(E|B_i)\Pr(B_i)}{\Pr(E|B_1)\Pr(B_1)+\cdots+\Pr(E|B_k)\Pr(B_k)}$

For continuous random variable X, $\Pr(a < X \leq b) = \Pr(X \leq b) - \Pr(X \leq a)$

Mean value of a discrete random variable $\mu_X = \sum x \cdot p(x)$

Standard deviation of a discrete random variable $\sigma_X = \sqrt{\sum (x - \mu_X)^2 \cdot p(x)}$

$Y = a + bX$. Mean $\mu_Y = a + b\mu_X$. Standard deviation $\sigma_Y = |b|\sigma_X$

$Y = a_1 X_1 + \cdots + a_n X_n$. Mean $\mu_Y = a_1\mu_{X_1} + \cdots + a_n\mu_{X_n}$. Standard deviation (when X_i's are independent) $\sigma_Y = \sqrt{a_1^2\sigma_{X_1}^2 + \cdots + a_n^2\sigma_{X_n}^2}$

Binomial distribution $p(x) = \frac{n!}{x!(n-x)!}p^x(1-p)^{n-x}$, $\mu_X = np$, $\sigma_X = \sqrt{np(1-p)}$

Geometric distribution $p(x) = (1-p)^{x-1}p$, $\mu_X = 1/p$

Continuity correction (X is a discrete variable (integer values), Y is the corresponding Normal random variable): If $\Pr(X \leq m)$ use $\Pr(Y < m + 0.5)$; If $\Pr(X < m)$ use $\Pr(Y < m - 0.5)$

Sampling distribution of $\overline{X}$: $\mu_{\overline{X}} = \mu$, $\sigma_{\overline{X}} = \sigma/\sqrt{n}$

Sampling distribution of $\widehat{p}$: $\mu_{\widehat{p}} = p$, $\sigma_{\widehat{p}} = \sqrt{p(1-p)/n}$

Critical value $z_{\alpha/2}$ is defined as: $\Pr(Z > z_{\alpha/2}) = \alpha/2$, where Z is a normally distributed random variable with mean 0 and SD 1.

$(1-\alpha) \times 100\%$ confidence interval for p: $\widehat{p} \pm z_{\alpha/2}\sqrt{\frac{\widehat{p}(1-\widehat{p})}{n}}$

$n = p(1-p)\left(\frac{z_{\alpha/2}}{B}\right)^2$

$(1-\alpha) \times 100\%$ confidence interval for μ: $\overline{x} \pm z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$

$n = \left(\frac{z_{\alpha/2}\sigma}{B}\right)^2$

$(1-\alpha) \times 100\%$ confidence interval for μ: $\overline{x} \pm t_{\alpha/2,n-1}\frac{s}{\sqrt{n}}$

Finite population correction factor: $\sqrt{\frac{N-n}{N-1}}$

$z = \frac{\overline{x}-\mu}{\sigma/\sqrt{n}}$, where μ is the hypothesized value under H_0

$t = \frac{\overline{x}-\mu}{s/\sqrt{n}}$, $d.f. = n - 1$, where μ is the hypothesized value under H_0

Random Number Table

34234	27566	94454	20349	69224	69483	21821	38248	62410	16481	54270	14344	60679	95118
44916	95522	17144	05395	40643	08340	52134	20753	41452	52797	45320	67751	00459	28894
43588	46388	64547	10072	00054	56665	60274	22889	35043	72024	87641	67346	28230	19021
20090	16885	26498	97659	10735	24621	56406	07936	06463	37439	17953	23294	07272	55338
11140	70292	66278	31434	09408	48929	30366	12613	39316	59206	26094	25430	00863	01122
53461	69887	94050	48120	85909	45984	92318	26757	49997	27162	22226	10476	45725	39980
83773	52393	73092	84437	71657	66721	54971	90220	84475	28268	70330	17587	07148	56945
07552	29174	17424	52673	46928	90721	32783	80040	64827	57350	79781	12488	40923	82176

STUDENT'S t PERCENTAGE POINTS

one-tail	40.0%	33.3%	25.0%	20.0%	12.5%	10.0%	5.0%	2.5%	1.0%	0.5%	0.1%
two-tail	80.0%	66.7%	50.0%	40.0%	25.0%	20.0%	10.0%	5.0%	2.0%	1.0%	0.2%
cum. prob	60.0%	66.7%	75.0%	80.0%	87.5%	90.0%	95.0%	97.5%	99.0%	99.5%	99.9%
1	0.325	0.577	1.000	1.376	2.414	3.078	6.314	12.706	31.821	63.657	318.31
2	0.289	0.500	0.816	1.061	1.604	1.886	2.920	4.303	6.965	9.925	22.327
3	0.277	0.476	0.765	0.978	1.423	1.638	2.353	3.182	4.541	5.841	10.215
4	0.271	0.464	0.741	0.941	1.344	1.533	2.132	2.776	3.747	4.604	7.173
5	0.267	0.457	0.727	0.920	1.301	1.476	2.015	2.571	3.365	4.032	5.893
6	0.265	0.453	0.718	0.906	1.273	1.440	1.943	2.447	3.143	3.707	5.208
7	0.263	0.449	0.711	0.896	1.254	1.415	1.895	2.365	2.998	3.499	4.785
8	0.262	0.447	0.706	0.889	1.240	1.397	1.860	2.306	2.896	3.355	4.501
9	0.261	0.445	0.703	0.883	1.230	1.383	1.833	2.262	2.821	3.250	4.297
10	0.260	0.444	0.700	0.879	1.221	1.372	1.812	2.228	2.764	3.169	4.144
11	0.260	0.443	0.697	0.876	1.214	1.363	1.796	2.201	2.718	3.106	4.025
12	0.259	0.442	0.695	0.873	1.209	1.356	1.782	2.179	2.681	3.055	3.930
13	0.259	0.441	0.694	0.870	1.204	1.350	1.771	2.160	2.650	3.012	3.852
14	0.258	0.440	0.692	0.868	1.200	1.345	1.761	2.145	2.624	2.977	3.787
15	0.258	0.439	0.691	0.866	1.197	1.341	1.753	2.131	2.602	2.947	3.733
16	0.258	0.439	0.690	0.865	1.194	1.337	1.746	2.120	2.583	2.921	3.686
17	0.257	0.438	0.689	0.863	1.191	1.333	1.740	2.110	2.567	2.898	3.646
18	0.257	0.438	0.688	0.862	1.189	1.330	1.734	2.101	2.552	2.878	3.610
19	0.257	0.438	0.688	0.861	1.187	1.328	1.729	2.093	2.539	2.861	3.579
20	0.257	0.437	0.687	0.860	1.185	1.325	1.725	2.086	2.528	2.845	3.552
21	0.257	0.437	0.686	0.859	1.183	1.323	1.721	2.080	2.518	2.831	3.527
22	0.256	0.437	0.686	0.858	1.182	1.321	1.717	2.074	2.508	2.819	3.505
23	0.256	0.436	0.685	0.858	1.180	1.319	1.714	2.069	2.500	2.807	3.485
24	0.256	0.436	0.685	0.857	1.179	1.318	1.711	2.064	2.492	2.797	3.467
25	0.256	0.436	0.684	0.856	1.178	1.316	1.708	2.060	2.485	2.787	3.450
26	0.256	0.436	0.684	0.856	1.177	1.315	1.706	2.056	2.479	2.779	3.435
27	0.256	0.435	0.684	0.855	1.176	1.314	1.703	2.052	2.473	2.771	3.421
28	0.256	0.435	0.683	0.855	1.175	1.313	1.701	2.048	2.467	2.763	3.408
29	0.256	0.435	0.683	0.854	1.174	1.311	1.699	2.045	2.462	2.756	3.396
30	0.256	0.435	0.683	0.854	1.173	1.310	1.697	2.042	2.457	2.750	3.385
35	0.255	0.434	0.682	0.852	1.170	1.306	1.690	2.030	2.438	2.724	3.340
40	0.255	0.434	0.681	0.851	1.167	1.303	1.684	2.021	2.423	2.704	3.307
45	0.255	0.434	0.680	0.850	1.165	1.301	1.679	2.014	2.412	2.690	3.281
50	0.255	0.433	0.679	0.849	1.164	1.299	1.676	2.009	2.403	2.678	3.261
55	0.255	0.433	0.679	0.848	1.163	1.297	1.673	2.004	2.396	2.668	3.245
60	0.254	0.433	0.679	0.848	1.162	1.296	1.671	2.000	2.390	2.660	3.232
∞	0.253	0.431	0.674	0.842	1.150	1.282	1.645	1.960	2.326	2.576	3.090
conf. level	20.0%	33.3%	50.0%	60.0%	75.0%	80.0%	90.0%	95.0%	98.0%	99.0%	99.8%

NORMAL CUMULATIVE DISTRIBUTION FUNCTION

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7703	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.6	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.7	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.8	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

1. Plots for Quantitative Variables (Chapter 1,3,4)

   Cristiano Ronaldo dos Santos Aveiro, is a Portuguese professional soccer player.

   The stem-and-leaf display shows the numbers of league appearances by season by Cristiano Ronaldo from season 2002-03 to season 2016-17.

   Table 1: Number of Appearances (3|5 means 35)

stem	leaf
3	1
3	5
4	03
4	7789
5	03344
5	55

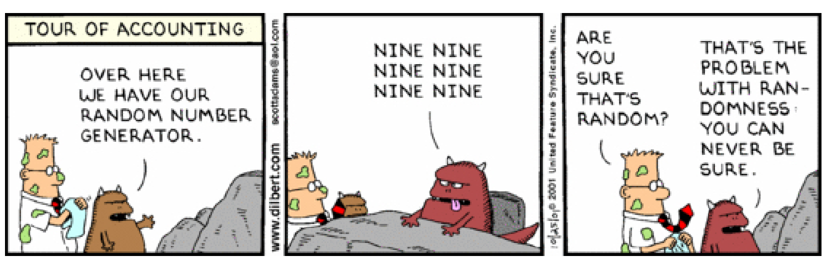
   Find out (a) the minimum, (b) the maximum, (c) the median, (d) the mean, and (e) the interquartile range. (f) Draw the boxplot, and (g) report whether outliers are observed. (h) Discuss the skewness of the distribution of the numbers of appearances (symmetric, positively or negatively skewed).

Figure 1: Cristiano Ronaldo

2. Sampling (Chapter 2)
   Please randomly draw four students from a group of eighteen by using Simple Random Sampling without Replacement (SRS):

   1 Alan
   2 Lucy
   3 Tom
   4 Azar
   5 Jayne
   6 Nadima
   7 Matthew
   8 Sushi
   9 Mohammed
   10 Rachel
   11 Ben
   12 Emma
   13 Grace
   14 Anna
   15 Sophie
   16 Karen
   17 Joshua
   18 James

   Briefly describe the sampling procedure you use.



3. Regression (Chapter 5)
A investigation of the properties of bricks used to line aluminum smelter pots was published in *The American Ceramic Society Bulletin* in February 2005. Six different commercial bricks were evaluated. The life span of a smelter pot depends on the porosity of the brick lining (the less porosity, the longer is the life); consequently, the researchers measured the apparent porosity of each brick specimen (percentage), as well as the mean pore diameter of each brick (micrometer). The data are given in the table below.

Brick	Apparent Porosity (%)	Mean Pore Diameter (μm)
1	18.8	12.0
2	18.3	9.7
3	16.3	7.3
4	6.9	5.3
5	17.1	10.9
6	20.4	16.8

Summary statistics for the two variables are shown in another table.

	Mean	SD
Apparent Porosity	16.30	4.82
Mean Pore Diameter	10.33	4.00

(1) Find the correlation between porosity and mean pore diameter.
(2) Find the least squares line relating porosity (y) to mean pore diameter (x).
(3) Predict the apparent percentage of porosity for a brick with a mean pore diameter of 10 micrometers.

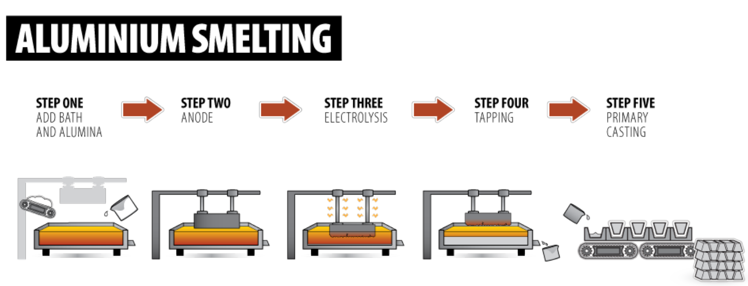


Figure 2: Aluminum Smelting

4. Bayes' Rule (Chapter 6)
Researchers want to evaluate an intelligent robotic controller that aims to capture the intent of a wheelchair user and aid in navigation. Consider the following scenario. From a certain location in a room, a wheelchair user will either (1) turn to the right and navigate through a door, (2) proceed straight to the other side of the room, or (3) turn slightly left and stop at a table. Denote these three events as D (for door), S (straight), and T (for table). Based on previous trips, $\Pr(D) = 0.5$, $\Pr(S) = 0.2$, and $\Pr(T) = 0.3$. The wheelchair is installed with a robot-controlled joystick. When the user intends to go through the door, he points the joystick straight 30% of the time; when the user intends to go straight, he points the joystick straight 40% of the time; and when the user intends to go to the table, she points the joystick straight 5% of the time. If the wheelchair user points to joystick straight, what is his most likely destination?

Figure 3: A wheelchair user in a room

5. Discrete Random Variables (Chapter 7)
Suppose an individual plays a gambling game where it is possible to lose \$1.00, break even, win \$3.00, or win \$5.00 each time she plays. The probability distribution for each outcome is provided by the following table:

Outcome	$-\$1.00$	\$0.00	\$3.00	\$5.00
Probability	0.30	0.40	0.20	0.10

(1) Verify that the discrete probability distribution above is well-defined.
(2) Find the mean and standard deviation of this discrete random variable.
(3) Suppose that the casino decides that the game does not have an impressive enough top prize with the lower payouts, and decides to change the outcomes, as shown below

Outcome	$-\$3.00$	$-\$1.00$	\$5.00	\$9.00
Probability	0.30	0.40	0.20	0.10

Find the relation between new outcome and previous outcomes. Based on the relation, find the mean and standard deviation of the new random variable.

6. Normal Distribution (Chapter 7)
   Under normal distribution, find the relation between IQR and SD.

   When making a boxplot, we use

$$\text{value} > \text{upper quartile} + 1.5 \times \text{IQR}$$

   or

$$\text{value} < \text{lower quartile} - 1.5 \times \text{IQR}$$

   to identify outliers. When assuming normal distribution, what is the proportion of data which are identified as outliers?

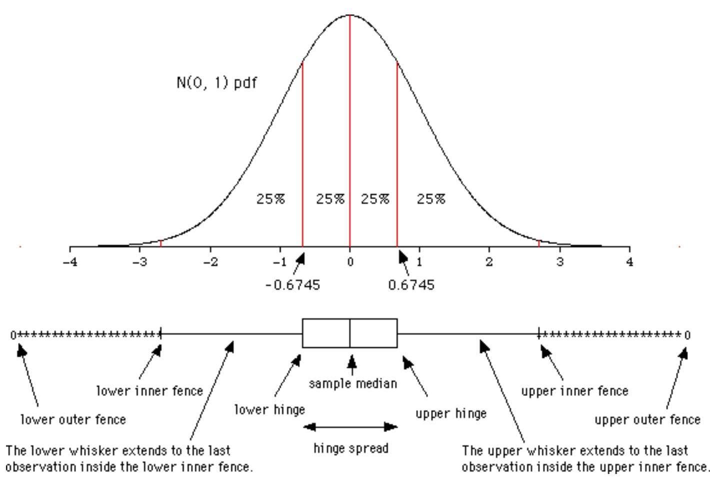


Figure 4: Boxplot and Normal Distribution

7. Normal Probability Plot (Chapter 7)
Scientists found two new types of insects in Rocky Mountain, with sample size 4 and 5. For insect A, the body lengths (centimeter) are

$$1.2,\ 1.6,\ 2.4,\ 2.9,$$

for insect B, the body lengths (centimeter) are

$$0.8,\ 1.0,\ 1.1,\ 1.4,\ 3.0.$$

(1) Make Normal Probability Plots for insect A and insect B. You may put two sets of data on one plot with different symbols (for example, $\circ$ and $\times$).
(2) Check the normality based on your plots.

How to make a Normal Probability Plot
1. Sort the data. $x_1 \leq x_2 \leq \cdots \leq x_n$
2. Calculate the corresponding quantile

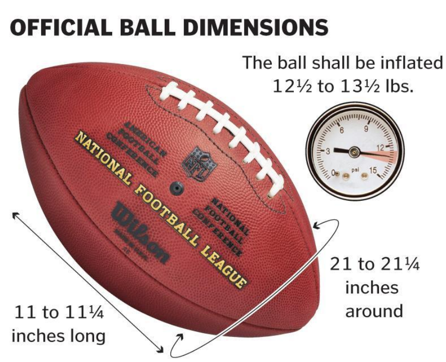
$$z_i = \Phi^{-1}\left(\frac{i - \frac{1}{2}}{n}\right)$$

3. Make a scatter plot for $\{z_i, x_i\}_{i=1}^n$.

8. Confidence Intervals (Chapter 8, 9)

   Consider the pharmaceutical company that desires an estimate of the mean increase in blood pressure of patients who take a new drug. The blood pressure increases (measured in points) for the $n = 6$ patients in the human testing phase are recorded, with the average blood pressure increases 2.283 points and sample standard deviation 0.950. (1) Use this information to construct a 95% confidence interval for μ, the mean increase in blood pressure associated with the new drug for all patients in the population. (2) What is the margin of error?

9. Sample Size Estimation (Chapter 9)
   Suppose the manufacturer of official NFL footballs uses a machine to inflate the new balls to a pressure of 13.5 pounds. When the machine is properly calibrated, the mean inflation pressure is 13.5 pounds, but uncontrollable factors cause the pressures of individual footballs to vary randomly by following a normal distribution with mean 13.5 pounds and SD 0.1 pounds. For quality control purposes, the manufacturer wishes to estimated the mean inflation pressure to within 0.025 pound of its true value (margin of error is 0.025 pound) with a 99% confidence interval. What sample size should be specified for the experiment?



10. Hypothesis Test (Chapter 10)

    Mirex is a chlorinated hydrocarbon that was commercialized as an insecticide and later banned because of its impact on the environment.

    Researchers tested 12 farm-raised salmon for organic contaminants. They found the mean concentration of the carcinogenic insecticide mirex to be 0.0913 parts per million, with sample standard deviation $s = 0.0195$ ppm. As a safety recommendation to recreational fishers, the Environmental Protection Agency's (EPA) recommended "screening value" for mirex is 0.08 ppm. Population distribution is assumed to be normal.

    Are farmed salmon contaminated beyond the level permitted by the EPA? Use the significance level $\alpha = 0.05$.

More Space

End of the Final Exam of Stat 213 Sec 05 (Instructor: Jiangtao Gou)