p1 BIO 260, Spr 2016, Exam 1, Form A Name:_________________________

Please place your name legibly at the top and the first letter of your last name in the box.
Put your calculator's number on the blank below the box.
Written answers should be concise and final answers should be copied into blanks provided where designated.

MULTIPLE CHOICE (3 pts each) ***** The exam has 100 points total *****

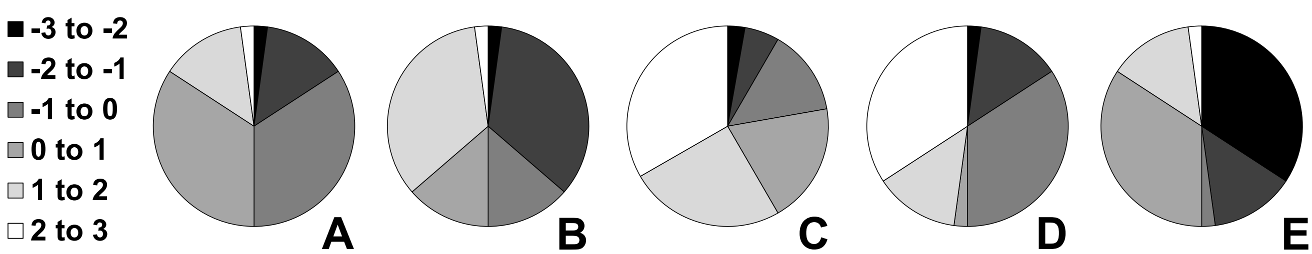
(1) The equation " p(┐ A|B) " would be read out loud as which of the following?
(A) "The probability of A occurring given that B has occurred."
(B) "The probability of A not occurring given that B has occurred."
(C) "The probability of A occurring given that B has not occurred."
(D) "The probability of A not occurring given that B has not occurred."
(E) "The probability of A and B occurring together."

(2) Consider a data set where most values are between 10 and 15, but there are few between 5 and 10. Which of the following is most likely to be correct?
(A) Range < 10, skew < 0.
(B) Range < 10, skew > 0.
(C) Range and skew are roughly equal.
(D) Range > 10, skew < 0.
(E) Range > 10, skew > 0.

(3) Consider a sample of data which has a symmetric distribution and entirely consists of positive values. We then make a second data set where each value is twice as big as in the first data set. What would happen to the range and standard deviation of the new data set compared to the first one?
(A) Range doubles, standard deviation doubles.
(B) Range doubles, standard deviation more than doubles.
(C) Range more than doubles, standard deviation doubles.
(D) Range more than doubles, standard deviation more than doubles.
(E) Range stays the same, standard deviation stays the same.

(4) Consider a symmetric data set of positive values. If two values are changed, one made larger and the other made smaller, which of the following is true?
(A) The mean decreases and the standard deviation decreases.
(B) The mean decreases and the standard deviation increases.
(C) The mean increases and the standard deviation decreases.
(D) The mean increases and the standard deviation increases.
(E) There is insufficient information to know what happens to the mean and standard deviation.

(5) Which of the pie charts below accurately represents the proportion of values in the designated ranges of Z values for a normal distribution?



(6) For a Poisson distribution with a mean value of 25, the coefficient of variation and the coefficient of dispersion are which two values respectively?
(A) 5%, 1 (B) 20%, 0 (C) 20%, 1 (D) 25%, 0 (E) 25%, 1

$$\sum_{x=1}^{\infty} \frac{2^x e^{-2}}{x!}$$

(7) Which of the following is closest to the value of the summation to the right?
(A) 0.8 (B) 0.85 (C) 0.9 (D) 0.95 (E) 0.99

(8) The proportion of observations in a data set that are less than the median is closest to which of the following?
(A) 50% (B) 65% (C) 75% (D) 95% (E) 99%

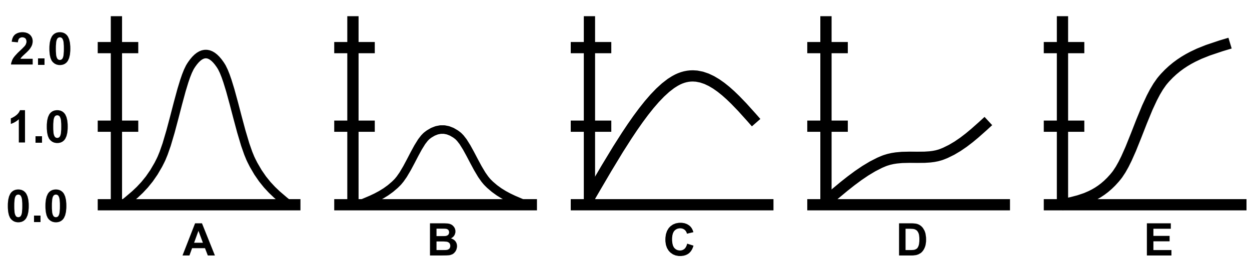
(9) Which of the following can we say about an asymmetric data set?
(A) The skew is nonzero and the excess kurtosis is positive.
(B) The skew is nonzero and the excess kurtosis is negative.
(C) The skew is zero and the excess kurtosis is negative.
(D) The skew is zero and the access kurtosis is positive.
(E) We cannot be sure of any of the statements above.

(10) For a set of numbers larger than 100 that exhibit a symmetric distribution, which of the following is not always true?
(A) The mean is equal to the median.
(B) The mean is equal to the mid-range.
(C) The median is equal to the mid-range.
(D) The skew is less than the mean.
(E) The standard deviation is less than the variance.

(11) Which of the following pairs of words or phrases best completes the passage below? The core procedure in inferential statistics is to use mathematical assumptions to calculate an _______ value or distribution for comparison to an _______ value or distribution. If they match, our assumptions are likely true, but if they don't our assumptions are _______ wrong.
(A) expected ... observed ... probably
(B) expected ... observed ... proven
(A) observed ... expected ... probably
(B) observed ... expected ... proven
(E) asymmetric ... abnormal ... demonstrably

(12) Which of the following statements is NOT correct?
(A) Box plots are appropriate for showing the location, spread, and shape of a set of values.
(B) Histograms are appropriate for showing the location, spread, and shape of a set of values.
(C) Bar charts are appropriate for showing proportions of values in different categories.
(D) Histograms are appropriate for showing proportions of values in different categories.
(E) Pie charts are appropriate for showing proportions of values in different categories.

(13) Which of the functions below is a valid depiction of the cumulative probability distribution for a continuous probability distribution?



(14) The recommended number of bins for a histogram showing a data set with several hundred values is closest to which of the following values?
(A) 5 (B) 10 (C) 20 (D) 40 (E) 100

*The **next 3 questions** are based on the list of cognitive biases that you were instructed to read for this exam.*

(15) One of the struggles that Dr. Carter deals with when teaching biostats is recognizing the lack of love for mathematics that his students exhibit. Dr. Carter majored in math as an undergraduate and has experienced the sublime beauty of an elegant mathematical proof. He automatically feels that his students feel this way too, but must often consciously remind himself not to fall prey to this cognitive bias. Which bias does Dr. Carter therefore often face?
(A) Confirmation Bias
(B) Current Moment Bias
(C) Ingroup Bias
(D) Projection Bias
(E) Status-Quo Bias

(16) Political season is here again and candidates are debating. One of the very interesting things you may notice is that perceptions of the "winner" of a debate can be quite polarized. Two people can watch the same debate and claim with truthful confidence that their favorite candidate did better. What cognitive bias or effect listed below best describes this process?
(A) Anchoring Effect
(B) Bandwagon Effect
(C) Confirmation Bias
(D) Ingroup Bias
(E) Observational Selection Bias

(17) A very common tactic in political campaigns and advertising is to talk about how many people support your candidate or purchase your product. Objectively, this doesn't guarantee quality because those people could just be wrong, but one of our cognitive biases draws us to prefer a well-liked candidate and popular product. What cognitive bias or effect listed below best matches this description?
(A) Anchoring Effect
(B) Bandwagon Effect
(C) Ingroup Bias
(D) Observational Selection Bias
(E) Post-Purchase Rationalization

(18) Which is the following is an accurate description of our definitions of “independent” and “mutually exclusive”?
(A) A and B are independent if p(A) = p(B) and mutually exclusive if p(A and B) = 0.
(B) A and B are independent if p(A) = p(B) and mutually exclusive if p(A or B) = 0.
(C) A and B are independent if p(A) = p(A|B) and mutually exclusive if p(A and B) = 0.
(D) A and B are independent if p(A) = p(A|B) and mutually exclusive if p(A or B) = 0.
(E) None of the descriptions above are correct.

*The **next 2 questions** are based on data table to the right.*

2	5	1	9	8	4	2
3	4	5	5	1	4	7
4	3	4	8	5	9	5
5	6	2	5	8	3	3
8	8	8	3	7	7	6
9	7	7	7	4	4	3
5	9	9	2	8	5	1
7	5	3	3	6	1	6

(19) Which is the following is the value of $X_{4,6}$?
(A) 3
(B) 4
(C) 5
(D) 6
(E) 7

(20) Which is the following is the value of the summation shown in the box?

$$\sum_{i=2}^{5}\sum_{j=3}^{6} x_{i,j}$$

(A) 69
(B) 77
(C) 79
(D) 84
(E) 92

(21) CALCULATIONS

Consider the two data sets shown to the right.

Data set A	Data set B
10	8
9	7
6	6
4	4
1	3
	2

(a, 1 pt ea) For each of the two sample data sets shown to the right, calculate the values indicated place them on the blanks below each set. For all **non-integer** values report the value to the closest 0.001.

Mean = _____ _____

Median = _____ _____

Range = _____ _____

Variance = _____ _____

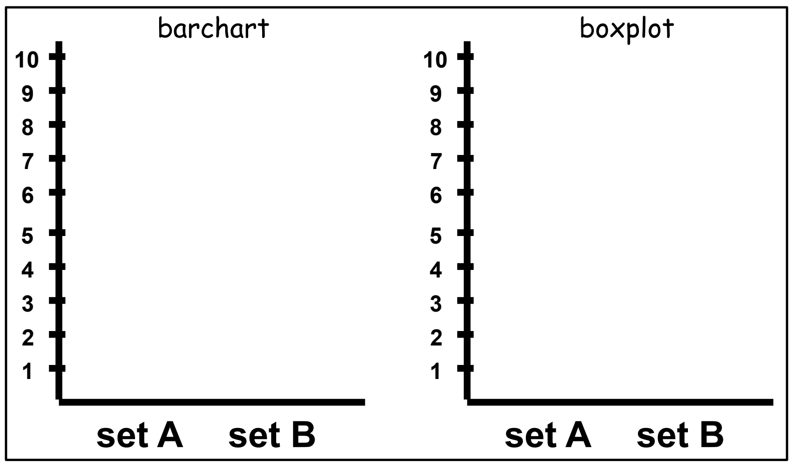
Standard deviation = _____ _____

Skew = _____ _____

(b, 2 pts ea) Complete the blank data figures to the right.

► On the left hand figure you will complete a bar chart showing the mean of each data set with positive error bars indicating one standard deviation.

► On the right hand figure you will complete a boxplot.



(c, 2 pts) The means of these samples are different, but because of sampling error that may or may not indicate that the means of the populations they are from differs. What conceptual approach would you take to decide whether the population means differed? Don't name a statistical test; describe the logic of what you would do in general terms.

(22) PROBABILITY (3 pts ea). For all answers report the value to the **nearest integer**.

Imagine that we have a set of 4 dice (labeled on their sides, 1, 2, 3, 4, 5, 6) and we roll them one million times. How often would we expect to get each of the following results?

(a) All dice land on six # (all 6) = ________

(b) Two of the dice land on even values and two land on odd values. # (2e, 2o) = ________

(c) At least one of the dice shows a five or six. p (1+, 5 or 6) = ________

(23) NORMAL DISTRIBUTION (3 pts each).

Consider a data set with a million values that exhibits a normal distribution in which the mean is 400 and the standard deviation is 70.

(a) How many values are less than 351? # (< 351) = ________
(report the value to the **nearest integer**)

(b) How many values are between 330 and 540? # values = ________
(report the value to the **nearest integer**)

(c) What is the value of Q3? Q3 = ________
(report the value to the **nearest 0.001**)

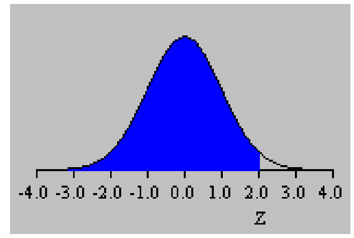
(24) POISSON DISTRIBUTION (4 pts).

Consider a situation in which a motion activated infrared camera records the visits of coyotes to baits that have been doused with skunk scent (part of a real current CSULB M.S. project).

(a) If the mean number of visits per night is 6, what is the probability that the camera records 3 visits? p (3) = ________
(report the value to the **nearest 0.001**)

TABLE OF Z SCORES

Table of probabilities of the standard normal distribution. Table shows the probability that a standard normal variate will have a value less than or equal to z.



z	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
–3.0	**0.0013**	**0.0013**	**0.0013**	**0.0012**	**0.0012**	**0.0011**	**0.0011**	**0.0011**	**0.0010**	**0.0010**
–2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
–2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
–2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
–2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
–2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
–2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
–2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
–2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
–2.1	0.0179	0.0174	0.017	0.0166	0.0162	0.0158	0.0154	0.015	0.0146	0.0143
–2.0	**0.0228**	**0.0222**	**0.0217**	**0.0212**	**0.0207**	**0.0202**	**0.0197**	**0.0192**	**0.0188**	**0.0183**
–1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
–1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
–1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
–1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
–1.5	0.0668	0.0655	0.0643	0.063	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
–1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
–1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
–1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
–1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.123	0.1210	0.1190	0.1170
–1.0	**0.1587**	**0.1562**	**0.1539**	**0.1515**	**0.1492**	**0.1469**	**0.1446**	**0.1423**	**0.1401**	**0.1379**
–0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
–0.8	0.2119	0.209	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
–0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
–0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
–0.5	0.3085	0.305	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
–0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
–0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
–0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
–0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
–0.0	**0.5000**	**0.4960**	**0.4920**	**0.4880**	**0.4840**	**0.4801**	**0.4761**	**0.4721**	**0.4681**	**0.4641**
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	0.7704	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**