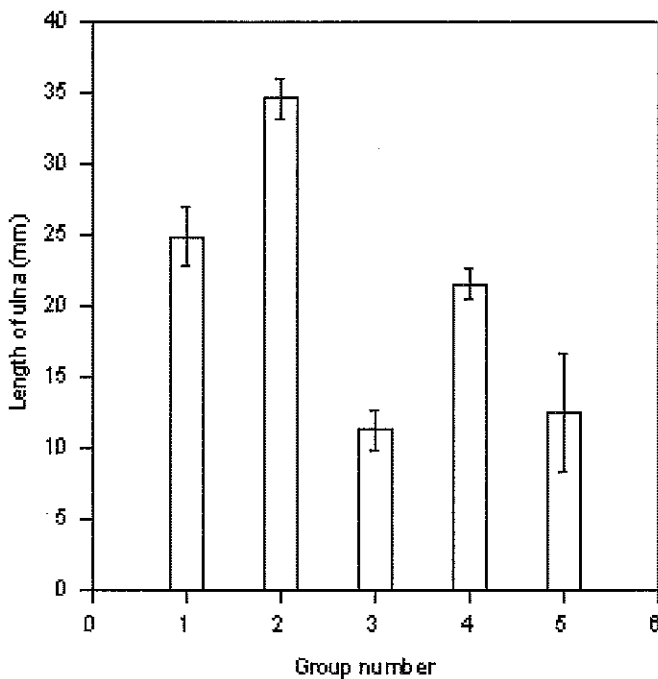


IB BIOLOGY STATISTICAL ANALYSIS PRACTICE TEST

~~stat practice~~
~~Design Lab~~
~~Title, Purpose, Hypothesis~~
~~and Ho, Variables, Procedure~~
~~Materials, Tables - Blank~~

1. What is meant by the following terms?

- a. Mean = *sample mean \bar{x} = central value of a discrete set of numbers*
- b. Standard deviation = *σ or s = measure used to quantify the amount of variation or dispersion of a set of data*
- c. Range/ variability = *the difference between the highest and the lowest values in a set*



2. Error bars can be used to show variability in data (either range of data or standard deviation)

In which two pairs of groups below can we see an overlap in the standard deviation of the data?

- a. 1 and 4
- b. 3 and 5

Graph taken from <http://www.csupomona.edu/~jcclark/classes/bio542/essays/graphtypes.html>

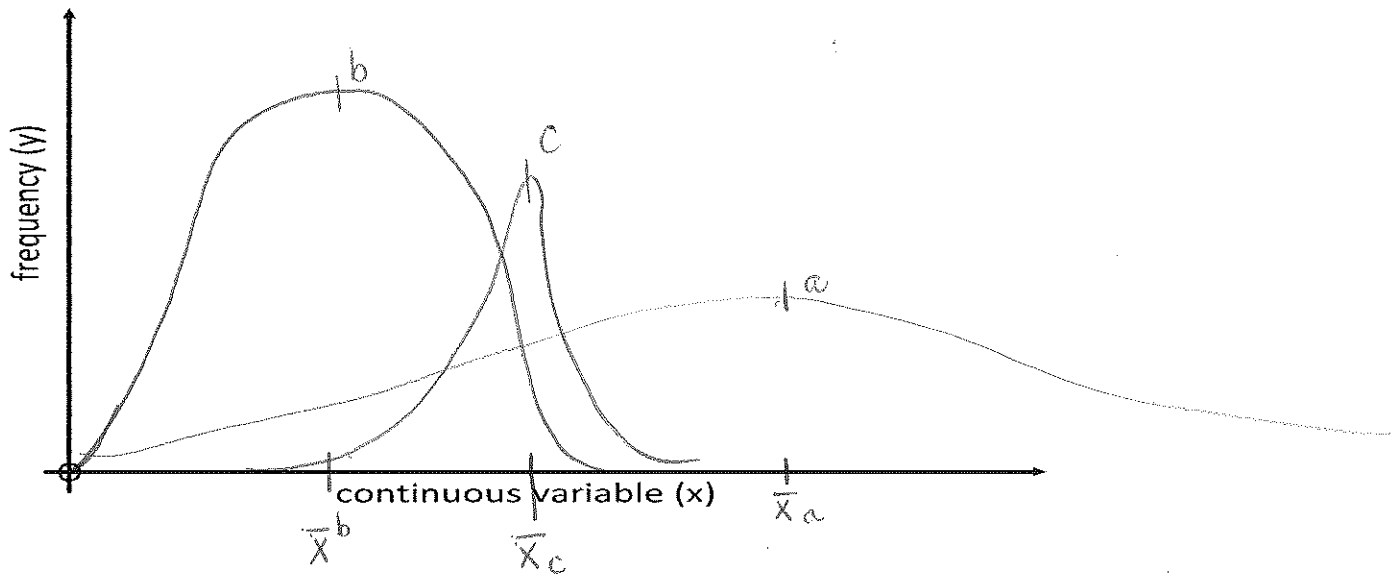
c. In which group is the mean NOT likely to be significantly different to the mean of group 3?

group 5

IB BIOLOGY STATISTICAL ANALYSIS PRACTICE TEST

3. On the axes below, plot the following three curves (all have a normal distribution):

- a. Has the highest mean and a high standard deviation.
- b. Has the lowest mean, but the highest frequency at that mean.
- c. Has a mean between (a) and (b) and has the smallest standard deviation.



4. ± 1 sd (standard deviation) from the mean represents 68 % of all the data points.

In data with a high standard deviation, data are clustered closer to/ further from the mean.

In data with a low standard deviation, data are clustered closer to/ further from the mean.

Overlapping standard deviations suggest two datasets are/are not significantly different.

95 % of all data falls within 2 standard deviations of the mean.

IB BIOLOGY STATISTICAL ANALYSIS PRACTICE TEST

	Group A	Group B
	24	24
	25	29
	26	25
	23	23
	25	29
	25	32
	26	34
	27	31
	23	32
	23	29
Mean	25	29
Stdev	1.4	3.7
P=	0.004 (T-Test)	

6. Calculate the means and standard deviations of these two groups of data (to one decimal place)

Show your working here.

* 24.7 & 28.8 ← Sig. Fig -1.5
 3.7 ← sig fig +1

7. In a t-test comparing Group A and Group B, the P value was calculated as 0.004.

What does this P value tell us about these two sets of data?

Probability that there is no significant difference is 0.004 or 0.4% which would mean that H₀ is rejected
 Explain your answer. and there is a significant diff

8. Why does the scientific community place so much importance on significance tests such as the t-test?

removes bias
 indicates if the diff. btwn two groups averages
 reflects a "real" diff btwn the two sample pop.

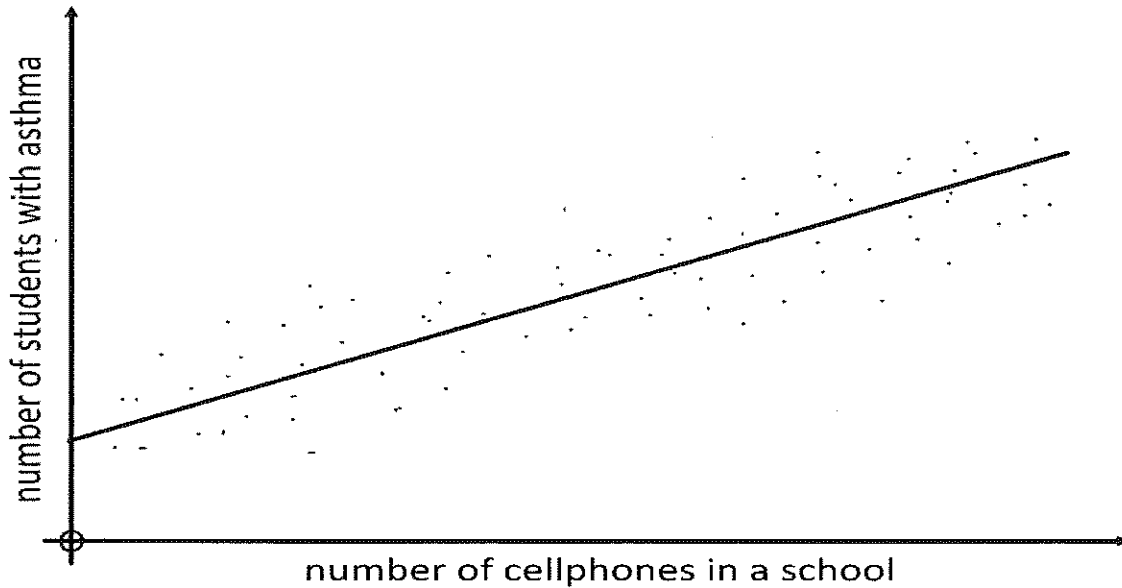
SKILLS CHECK

I can calculate mean and standard deviation using:

- a. A graphical display or scientific calculator
- b. Microsoft Excel 2007

IB BIOLOGY STATISTICAL ANALYSIS PRACTICE TEST

9. Look at the graph below:



Which of the following statements are true?

- a. There is no correlation between number of cellphones and number of students with asthma.
- b. There is a positive correlation between number of cellphones and asthma cases.
- c. There is a negative correlation between number of cellphones and asthma cases
- d. Increased numbers of cellphones cause an increase in numbers of students with asthma.
- e. Increased numbers of asthmatic cause increased numbers of cellphones in a school.
- f. There is no evidence of causality in this graph.

10. Suggest two comparisons in which a causal relationship is likely (e.g. temperature and rate of reaction).

imply
correlation does not mean causation

Use the t-table shown below to perform the t-tests with these examples. Make sure you follow conventions and write everything down correctly each time.

4. Which confidence limit do we normally choose in Biology? Why?

$$P = 0.05 \text{ or } 95\% \text{ confidence}$$

5. After visiting the Farmer's Market, Ms. Chris went to MacNab's Island. She collected 15 snail shells on the north side of the island and 16 on the south. They were having so much fun they decided to write the following words in the sand! Can you help complete their statements?

Confidence probability = 0.05

$$DF = (15 + 16) - 2 = 29$$

Critical value = 1.699

t is calculated as 2.02.

$$t > c.v.$$

Conclusion:

reject H_0

There is a significant difference

df	Significance (α) (confidence = $1 - \alpha$)				
	0.10	0.05	0.025	0.01	0.005
1	3.078	6.314	12.706	31.821	63.657
2	1.886	2.920	4.303	6.965	9.925
3	1.638	2.353	3.182	4.541	5.841
4	1.533	2.132	2.776	3.747	4.604
5	1.476	2.015	2.571	3.365	4.032
6	1.440	1.943	2.447	3.143	3.707
7	1.415	1.895	2.365	2.998	3.499
8	1.397	1.860	2.306	2.896	3.355
9	1.383	1.833	2.262	2.821	3.250
10	1.372	1.812	2.228	2.764	3.169
11	1.363	1.796	2.201	2.718	3.106
12	1.356	1.782	2.179	2.681	3.055
13	1.350	1.771	2.160	2.650	3.012
14	1.345	1.761	2.145	2.624	2.977
15	1.341	1.753	2.131	2.602	2.947
16	1.337	1.746	2.120	2.583	2.921
17	1.333	1.740	2.110	2.567	2.898
18	1.330	1.734	2.101	2.552	2.878
19	1.328	1.729	2.093	2.539	2.861
20	1.325	1.725	2.086	2.528	2.845
21	1.323	1.721	2.080	2.518	2.831
22	1.321	1.717	2.074	2.508	2.819
23	1.319	1.714	2.069	2.500	2.807
24	1.318	1.711	2.064	2.492	2.797
25	1.316	1.708	2.060	2.485	2.787
26	1.315	1.706	2.056	2.479	2.779
27	1.314	1.703	2.052	2.473	2.771
28	1.313	1.701	2.048	2.467	2.763
29	1.311	1.699	2.045	2.462	2.756
30	1.310	1.697	2.042	2.457	2.750
40	1.303	1.684	2.021	2.423	2.704
50	1.299	1.676	2.009	2.403	2.678
60	1.296	1.671	2.000	2.390	2.660
70	1.294	1.667	1.994	2.381	2.648
80	1.292	1.664	1.990	2.374	2.639