1. The CEO of company A bids on consulting jobs so that if awarded the job, company A will make a $300,000 profit on that job. The CEO of company B bids on consulting jobs so that if awarded the job, company B will make a $500,000 profit. Each company has a probability distribution of the number of jobs the company is awarded per year…unfortunately, there is a little bit of missing information:

a. Fill in the missing information (2 points each company, 4 points total)

Company A

F(x)	0	1	2	3	4
P(x)	.00	.04	.21	.32	.43

Company B

F(x)	0	1	2	3	4
P(x)	.13	.31	.26	.30	.00

b. What is the expected profit for each company? (3 points each company, 6 points total) (Assume A correct.)

$\mu_A = (1 \times .04) + (2 \times .21) + (3 \times .32) + (4 \times .43) = 3.14$

$b \cdot \mu_A = (300{,}000) \cdot 3.14 = 942{,}000$

$\mu_B = (0 \times .13) + (1 \times .31) + (2 \times .26) + (3 \times .30) = 1.73$

$b \cdot \mu_B = (500{,}000) \cdot 1.73 = 865{,}000$

c. Find the standard deviation of the number of consulting jobs awarded per year for each company. (5 points each company) ASSUME A + B CORRECT

$\sigma_A = \sqrt{(1-3.14)^2(.04) + (2-3.14)^2(.04) + (3-3.14)^2(.32) + (4-3.14)^2(.43)}$

$(1-3.14)^2(.04) = .1832$ $\quad (2-3.14)^2(.04) = .2729$ $\quad (3-3.14)^2(.32) = .0063$ $\quad (4-3.14)^2(.43) = .3180$

$\sigma_A^2 = .7804 \qquad \sigma_A = .8834$

$\sigma_B = \sqrt{(0-1.73)^2(.13) + (1-1.73)^2(.31) + (2-1.73)^2(.26) + (3-1.73)^2(.30)}$

$(0-1.73)^2(.13) = .3891$ $\quad (1-1.73)^2(.31) = .1652$ $\quad (2-1.73)^2(.26) = .0190$ $\quad (3-1.73)^2(.30) = .4839$

$\sigma_B^2 = 1.0572 \qquad \sigma_B = 1.0282$

d. What is the difference between the number of consulting jobs awarded per year for the two companies? What is the standard deviation of this difference? Assume the number of jobs awarded to the companies are independent. (10 points) ASSUME A, B, & C ARE CORRECT

difference $= \mu_A - \mu_B = 1.41$

Std Dev of Diff $= \sqrt{\sigma_A^2 + \sigma_B^2} = \sqrt{.7804 + 1.0572} = 1.356$

2. A food-products company conducted a market study by randomly sampling and interviewing 625 consumers to determine which brand of snacks (e.g. chips, pretzels) they prefer. Suppose 217 consumers or .347 were found to prefer the company's brand.

(a) (5 points) Construct a 95% confidence interval for the proportion of consumers who prefer the company's brand.

$.347 \pm 1.960\left(\sqrt{\frac{(.347)(.653)}{625}}\right) = .347 \pm (1.96)(.019)$

$.347 \pm .0373$

$(.3097, .3843)$

(b) The Director of Marketing walks by and is unhappy with your results. She tells you that she wants a better estimate. Specifically she wants you to be within .020 of the proportion of consumers who prefer the company's brand, 99 out of 100 times. Is there anything you can do to honor her request? Answer yes or no and if you answer yes, please tell us what you can do and supply a numerical solution. If you answer no, explain why you cannot do this for her. (5 points) YES! → CHOOSE A LARGER SAMPLE

$.020 = 2.576\left(\sqrt{\frac{(.347)(.653)}{n}}\right)$ solve for n

$n \approx 3754$

(3753.26 to be exact)

3. (3 points each) Indicate whether the statement is true or false about the following confidence interval which was generated from a sample of 256 with a sample mean of 17.8 and sample standard deviation of 8.1:

$17.8 \pm 1.960(8.1/\sqrt{256}) = 17.8 \pm .99$

3.	True	False	
A	X		In 95% of all samples the true mean μ will lie within $\bar{x} \pm .99$ approximately
B	X		Decreasing the sample size will increase the width of the interval
C	X		This is a 95% confidence interval for the population mean
D		X	Increasing the confidence level will decrease the width of the interval.
E		X	There is a 95% chance that the population mean lies in the interval (16.81,18.79)

4. Congratulations, you finished college and became a portfolio manager for a large financial services firm. The bad news is that your portfolio return of 5.6% (with a standard deviation of 55.5%) is well below the historical Wall Street average return of 10.0% (with a standard deviation of 9.2%). You are worried since your supervisor is only willing to employ you if your return is greater than Wall Street's . You call "the Oracle" for help. The Oracle says two things (a) increase the number of stocks in your portfolio from 36 to 169 and (b) use his stock selection method because you will get an average return of 11.6% (with a standard deviation of 44.1%). Treat Oracle's selection method as if it is random.

a. (5 points) What are the appropriate null and alternative hypotheses to test whether implementing the Oracle's recommendations will help your portfolio return more than the historical Wall Street average?

$H_0 : \mu = 10.0\%$

$H_a : \mu > 10.0\%$

b. (10 points) What is the appropriate test for part (a)? If it is possible to conduct a test, do so in the space below and give a resulting p-value. Show your work and clearly identify the resulting p-value. ASSUME A IS CORRECT

Z test

$$Z = \frac{11.6 - 10}{9.2/\sqrt{169}} = \frac{1.6}{.7077} = 2.26$$

p-value is .0119 or 1.19%

c. (5 points) If you performed a test in part (b) above, what are your conclusions? Is there enough evidence for you to switch to Oracle's stock selection method? Use a 5% level of significance to help you render your decision. Explain. Be brief. ASSUME B IS CORRECT

Clearly communicate to you that
1.19% < 5% (significant)
And from this result, the 11.6% is not due to chance and therefore we reject the null. There appears to be a difference - switch methods.