1. According to William Harding of morningstar.com,

> "Convertible funds make compelling investment options as they are meant to offer most of the upside potential of stocks while limiting downside risk. Convertible funds earned an average annual return of 18.14% … and the standard deviation during that time is 16.25%. In comparison, domestic-stock funds gained an average annual return of 16.97% … with a standard deviation of 20.92%."[1]

Assume that the annual returns for convertible funds are normally distributed.

a. Suppose an investor owns nine convertible funds selected at random from the population of all convertible funds and has invested an equal amount of money in each. Assume the returns on each fund are independent of returns for the other funds. Find the probability that the portfolio of funds will yield a mean return greater than 15% during any randomly picked year. If it is not possible to calculate a probability, please write "not possible" and explain why this is so. If it is possible, please show your work and make sure you copy the probability to the answer sheet. (10 pts)

$\mu = 18.14\%$, $\sigma = \frac{16.25\%}{\sqrt{9}} = 5.4167$

$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} = \frac{15 - 18.14}{5.4167} = -.58 \Rightarrow .2810$

good

$P(z \geq -.58) = 1 - .2810 = .719$

Probability is .7190 that the portfolio of funds will yield a mean return greater than 15% during any randomly picked year.

b. Suppose an investor owns nine convertible funds selected at random and has invested an equal amount of money in each. Assume the returns on each fund are independent of the other returns. Find the probability that all nine of the funds in the portfolio will yield returns greater than 15% during a randomly picked year. Please show your work and make sure you copy the probability to the answer sheet. (15 pts)

$\mu = 18.14\%$ $\sigma = \frac{16.25\%}{\sqrt{1}} = 16.25\%$

$z = \frac{\bar{x} - \mu}{\sigma} = \frac{15\% - 18.14\%}{16.25\%} = -.19 \Rightarrow .4247$

$P(z \geq -.19) = 1 - .4247 = .5753$

good

Probability that each fund has return of 15% or greater = .5753

Probability that all 9 of the funds will yield returns greater than 15% = $(.5753)^9$

$\boxed{\text{Probability} = .0069}$

[1] "The Pick of the Convertible-Bond Category", 29 November 2000, http://biz.yahoo.com/ms/001129/3971.html

2. (3 points each) Indicate whether each statement is true or false taking into account the following result from a one-sided hypothesis test that used an alpha level of .10:

$$Z = \frac{57-50}{36/\sqrt{25}} = .97 \quad \Rightarrow .8340$$

$1.67 \Rightarrow .9525$

good

2.	True	False	
A	✓		If the numerator were 62-50 instead of 57-50, the results would be considered statistically significant.
B	✓		Increasing the sample size could make it easier to achieve statistical significance
C	✓		If the null hypothesis is correct, it will be rejected in 10% of all possible samples
D	✓		The p-value for this test is approximately .166
E	✓		The most likely one-sided alternative hypothesis being tested is $\mu > 50$.

3. Congratulations, you graduated and now you are working in the marketing and advertising department for a large household products company. The person who had the job you now have, conducted a study by randomly sampling and interviewing 196 consumers to determine which brand of laundry detergent they prefer to use. 61 consumers said they prefer your company's brand, 27 did not mention a specific brand and the remainder preferred other brands. Additional information revealed that the consumers were willing to pay a mean price of \$4.94 per gallon of detergent with a standard deviation of \$1.79. You can use the sample standard deviation as a reasonable estimate of the population standard deviation, σ.

(a) Construct an exact 99% confidence interval for the proportion of consumers who prefer your company's brand of laundry detergent. (5 points)

$\hat{p} = \frac{61}{196} = .3112 \quad \sigma = \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{(.3112)(1-.3112)}{196}} = .03307$

$\hat{p} \pm z^* \sqrt{\frac{p(1-p)}{n}} = \bar{x} \pm 2.576 \sqrt{\frac{p(1-p)}{n}} = .3112 \pm .08519$

$\boxed{(.226, .3964)}$

good

(b) The Director of Marketing has calculated a confidence interval for the proportion of consumers who prefer your company's brand. She is unhappy with the results, so she tells you that she must have a better estimate of the proportion. Specifically she wants to be within .02 of the proportion of consumers who prefer your company's brand, 95 out of 100 times. Is there anything you can do to help her? 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, please explain why you cannot do this for her. (5 points)

Yes, we can sample a larger number of people

$.02 = z^* \sqrt{\frac{p(1-p)}{n}}$

$.02 = (1.96)\left(\sqrt{\frac{(.3112)(1-.3112)}{n}}\right)$

$.0102 = \sqrt{\frac{(.3112)(.6888)}{n}}$

$1.0412 \times 10^{-4} = \frac{(.3112)(.6888)}{n}$

$n = 2058.67 \approx 2059$

$\boxed{\text{SRS of 2059 people}}$

good!

FORM A FORM A FORM A

4. You work for a financial publication that is handing out "hot stock of the month" awards. Your job is to evaluate the stock price of two companies and then issue the award on the basis of superior performance. Here is the information you will need to make your choice:

On any given trading day, Stock A has a value 15% higher than the average stock, 10% of the time; it's value is 9% higher than the average stock, 60% of the time; it's value is 5% lower than the average stock, 10% of the time; and its value is no different from the average stock the rest of the time.

On any given trading day, Stock B has a value 50% higher than the average stock, 10% of the time; it's value is 4% higher than the average stock, 30% of the time; it's value is 15% lower than the average stock, 50% of the time; and its value is no different from the average stock the rest of the time.

(a) What are the means for Stock A and for Stock B? (8 points, show your work)

$\mu_A = 15\%(.1) + 9\%(.6) + (-5\%)(.1) + (0\%)(.2) = 6.4\%$ ✓

$\mu_B: 50\%(.1) + 4\%(.3) + (-15\%)(.5) + (0\%)(.1) = -1.3\%$ ✓

great ✓

(b) What are the Standard Deviations for Stock A and for Stock B? (4 points, show your work)

$\sigma_A^2 : (15-6.4)^2(.1) + (9-6.4)^2(.6) + (-5-6.4)^2(.1) + (0-6.4)^2(.2) = 32.64$ ✓

$\sigma_A = 5.713$ ✓

$\sigma_B^2 = (50-(-1.3))^2(.1) + (4-(-1.3))^2(.3) + (-15-(-1.3))^2(.5) + (0-(-1.3))^2(.1) = 365.61$ ✓

$\sigma_B = 19.121$ ✓

(c) You supervisor instructs you to randomly select 20 trading days and use each company's performance over those days to determine who gets the award. Which company has the higher probability of having a mean in excess of 10%? Circle one (2 points)

COMPANY A COMPANY B ✓

Show the work that led you to your decision. (10 points)

A: $z = \dfrac{\bar{x}-\mu}{\sigma/\sqrt{n}} = \dfrac{10-6.4}{\frac{5.713}{\sqrt{20}}} = 2.82$ ✓ $\Rightarrow .9976$

$P(z \geq 2.82) = 1 - .9976 = .0024$ ✓

Probability $= .0024$

B: $z = \dfrac{\bar{x}-\mu}{\sigma/\sqrt{n}} : \dfrac{10-(-1.3)}{\frac{19.121}{\sqrt{20}}} = 2.64 \Rightarrow .9959$ ✓

$P(z \geq 2.64) = 1 - .9959 = .0041$ ✓

Probability: $.0041$