MATH E-3 PRACTICE QUIZ #2 Solutions

Question 1.

a)   16%

b)   50%

c)   68%

d)   2.5%

e)   81.5%

f)   5.5% (need z-tables)

g)   95%

h)   34%

i)   13.5%

j)   40.3% (need z-tables)

k)   5.5% (need z-tables)

l)   56.3% (need z-tables)

Question 2.

A 95% confidence interval takes 0.19 (494/2600) as the proportion, and 2600 as the sample size. We get 1 standard deviation = about 0.8%, and 2 standard deviations = 1.6%. This gives a 95% confidence interval for the true proportion of oxygen in the atmosphere: as from **17.4% to 20.6%.**

Extra credit: If you wanted your confidence interval to have a smaller margin of error, namely 1.2% (i.e. a standard deviation of 0.6%), you would need a sample size of **4275**.

Question 3.

a) The **Null Hypothesis** is that p = 0.62, or "62% is the true percentage of Seabrook residents in favor of the station operating at full power." We find the standard deviation of samples of size 25. It comes out to 9.7%. So there is a 95% chance that our sample should be between 42.6% and 81.4%, which it is (it is 48%). Thus we <u>cannot</u> reject the 62% claim at a 5% level of significance. It appears that the 62% figure <u>may be</u> correct. (Don't say that it **is** correct.)

b) The sample is so small (25), and the spread so large, that the results must be considered very unreliable. Just about any hypothesis would be unable to be rejected. You cannot say, however, that the sample was biased because it only included Seabrook residents. The original purpose was to test the opinions of Seabrook residents only.

c) The **Null Hypothesis** is still that p = 0.62. We find the standard deviation of samples of size 100. It comes to 4.9%. So there is a 95% chance that our sample should be between 52.3% and 71.7%, which it is not (it is 47%). Thus we <u>can now reject</u> the 62% claim at a 5% level of significance. The 62% claim now appears to be incorrect.

This part not on the test:

d) *The two populations being compared are completely different: a town in New Hampshire versus the whole state of Massachusetts. Naturally the interests and opinions of each group will be quite different. The 71% of Mass. voters <u>against</u> the power station (i.e. only 29% <u>for</u>) reflects this wide divergence. The number of people voting is not really relevant to our question (an election does not really involve a <u>sample</u>, unless only a very small percentage of people vote), except that it makes the 71% figure reasonably reliable (here we are not told what percentage of eligible voters actually voted).*

Question 4.

The Null Hypothesis is: "Men and women are no different in their chances of getting management positions, i.e. p = 50% or 0.5." The standard deviation for samples of size 250 is 3.2%. So there is a 95% chance that our observed sample (140/250 = 56%) should be between 43.6% and 56.4%. It is indeed between these two figures – but only just! So we are <u>unable</u> to reject the NH at a 5% level of significance. It appears that men and women may have an equal chance of getting management positions.

Extra credit: We should take into account factors such as: how many men and women applied for the management positions; what kinds of companies were involved; and probably others.