

*AP Statistics Quiz B – Chapter 18**Name* _____

1. It is generally believed that electrical problems affect about 14% of new cars. An automobile mechanic conducts diagnostic tests on 128 new cars on the lot.
 - a. Describe the sampling distribution for the sample proportion by naming the model and telling its mean and standard deviation. Justify your answer.

 - b. Sketch and clearly label the model.

 - c. What is the probability that in this group over 18% of the new cars will be found to have electrical problems?

2. Herpetologists (snake specialist) found that a certain species of reticulated python have an average length of 20.5 feet with a standard deviation of 2.3 feet. The scientists collect a random sample of 30 adult pythons and measure their lengths. In their sample the mean length was 19.5 feet long. One of the herpetologists fears that pollution might be affecting the natural growth of the pythons. Do you think this sample result is unusually small? Explain.

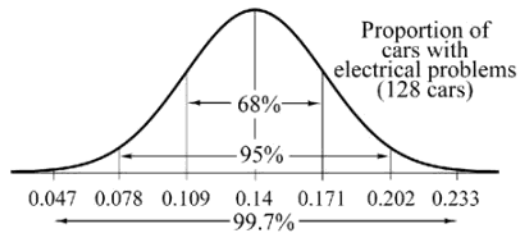
AP Statistics Quiz B – Chapter 18 – Key

1. It is generally believed that electrical problems affect about 14% of new cars. An automobile mechanic conducts diagnostic tests on 128 new cars on the lot.
- a. Describe the sampling distribution for the sample proportion by naming the model and telling its mean and standard deviation. Justify your answer.

We can assume these cars are a representative sample of all new cars, and certainly less than 10% of them. We expect $np = (128)(0.14) = 17.92$ successes (electrical problems) and $nq = (128)(0.86) = 110.08$ failures (no problems) so the sample is large enough to use the sampling model $N(0.14, 0.031)$.

$$SD(\hat{p}) = \sqrt{\frac{pq}{n}} = \sqrt{\frac{(0.14)(0.86)}{128}} = 0.031$$

- b. Sketch and clearly label the model.



- c. What is the probability that in this group of new cars over 18% will be found to have electrical problems?

$$z = \frac{\hat{p} - p}{SD(\hat{p})} \quad P(\hat{p} > 0.18) = P(z > \frac{0.18 - 0.14}{0.031}) =$$

$$P(z > 1.30) = 0.096, \text{ about } 10\%$$

2. Herpetologists (snake specialists) found that a certain species of reticulated python have an average length of 20.5 feet with a standard deviation of 2.3 feet. The scientists collect a random sample of 30 adult pythons and measure their lengths. In their sample the mean length was 19.5 feet long. One of the herpetologists fears that pollution might be affecting the natural growth of the pythons. Do you think this sample result is unusually small? Explain.

We have a random sample of adult pythons drawn from a much larger population. With a sample size of 30, the CLT says that the approximate sampling model for sample means will be $N(20.5, 0.42)$. A sample mean of only 19.5 feet is about 2.38 standard deviations below what we expect. The sample mean of 19.5 feet is unusually small.

AP Statistics Quiz B – Chapter 19

Name _____

The countries of Europe report that 46% of the labor force is female. The United Nations wonders if the percentage of females in the labor force is the same in the United States. Representatives from the United States Department of Labor plan to check a random sample of over 10,000 employment records on file to estimate a percentage of females in the United States labor force.

1. The representatives from the Department of Labor want to estimate a percentage of females in the United States labor force to within $\pm 5\%$, with 90% confidence. How many employment records should they sample?
2. They actually select a random sample of 525 employment records, and find that 229 of the people are females. Create the confidence interval.
3. Interpret the confidence interval in this context.
4. Explain what 90% confidence means in this context.
5. Should the representatives from the Department of Labor conclude that the percentage of females in their labor force is lower than Europe's rate of 46%? Explain.

AP Statistics Quiz B – Chapter 19 – Key

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1. The representatives from the Department of Labor want to estimate a percentage of females in the United States labor force to within $\pm 5\%$, with 90% confidence. How many employment records should they sample?

$$ME = z^* \sqrt{\frac{\hat{p}\hat{q}}{n}} \quad \text{They should sample at least 269 employment records.}$$

$$0.05 = 1.645 \sqrt{\frac{(0.46)(0.54)}{n}}$$

$$\sqrt{n} = \frac{1.645 \sqrt{(0.46)(0.54)}}{0.05}$$

$$n = 268.87 \approx 269$$

2. They actually select a random sample of 525 employment records, and find that 229 of the people are females. Create the confidence interval.

We have a random sample of less than 10% of the employment records, with 229 successes (females) and 296 failures (males), so a Normal model applies.

$$n = 525, \hat{p} = 0.436 \text{ and } \hat{q} = 0.564, \text{ so } SE(\hat{p}) = \sqrt{\frac{\hat{p}\hat{q}}{n}} = \sqrt{\frac{(0.436)(0.564)}{525}} = 0.022$$

$$\text{margin of error: } ME = z^* \times SE(\hat{p}) = (1.645)(0.022) = 0.0362$$

$$\text{Confidence interval: } \hat{p} \pm ME = 0.436 \pm 0.0362 \text{ or } (0.3998, 0.4722)$$

3. Interpret the confidence interval in this context.

We are 90% confident that between 40.0% and 47.2% of the employment records from the United States labor force are female.

4. Explain what 90% confidence means in this context.

If many random samples were taken, 90% of the confidence intervals produced would contain the actual percentage of all female employment records in the United States labor force.

5. Should the representatives from the Department of Labor conclude that the percentage of females in their labor force is lower than Europe's rate of 46%? Explain.

No. Since 46% lies in the confidence interval, (0.3998, 0.4722), it is possible that the percentage of females in the labor force matches Europe's rate of 46% female in the labor force.