

QUANTITATIVE METHODS

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Winter 2005

Assignment 19 SOLUTIONS

This assignment is due **Wednesday April 13, 2005**.

Question 1 (5 points)

In a recent survey of 567 college students who recently graduated from the social science program, 489 of the respondents think QM is the best course they have ever taken. Find a 98% confidence interval for the proportion of recently graduated college students who think QM is the best course they have ever taken.

$$S1 \text{ Assumptions: } n\hat{p} = 567 \cdot \frac{489}{567} = 489 > 5$$

$$n(1 - \hat{p}) = 567(1 - \frac{489}{567}) = 78 > 5$$

$$S2 \ c = 98\% = 0.98$$

$$\text{Area to the left} = 0.99$$

$$z_c = 2.33$$

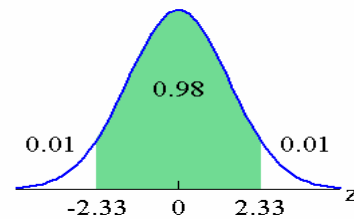
$$S3 \ E = z_c \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = 2.33 \sqrt{\frac{\frac{489}{567}(1-\frac{489}{567})}{567}} = 0.0337$$

$$S4 \ \bar{x} - E < p < \bar{x} + E$$

$$\frac{489}{567} - 0.0337 < p < \frac{489}{567} + 0.0337$$

$$0.8287 < p < 0.8961$$

The 98% confidence interval for the proportion of pharmacists who say a doctor's illegible handwriting causes errors or safety problems is 82.9% to 89.6%.



Question 2 (5 points)

A recent survey of 821 college students who enrolled in a QM course showed that 39% of them prefer quizzes to assignment. Find a 92% confidence interval for the proportion of students enrolled in a QM course who prefer quizzes to assignment.

$$S1 \text{ Assumptions: } n\hat{p} = 821 \cdot 0.39 = 320 > 5$$

$$n(1 - \hat{p}) = 821(1 - 0.39) = 501 > 5$$

$$S2 \ c = 92\% = 0.92$$

$$\text{Area to the left} = 0.96$$

$$z_c = 1.75$$

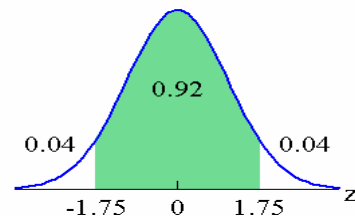
$$S3 \ E = z_c \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} = 1.75 \sqrt{\frac{0.39(1-0.39)}{821}} = 0.0298$$

$$S4 \ \bar{x} - E < p < \bar{x} + E$$

$$0.39 - 0.0298 < p < 0.39 + 0.0298$$

$$0.3602 < p < 0.4198$$

The 92% confidence interval for the proportion of students enrolled in a QM course who prefer quizzes to assignment is 36.02% to 41.98%.



Question 3 (5 points)

Consider the following news article.

Elvis still rules in US rock survey

The Arts Report

Twenty-five years after his death, a poll says Elvis Presley remains the most popular rock musician to the American people.

Presley topped a poll by ABC News that asked, "Who is the greatest rock and roll star of all time?" by a huge margin, with 38 per cent of respondents naming him.

Second place went to guitarist Jimi Hendrix, who was chosen by four per cent of those surveyed.

John Lennon, Mick Jagger, Bruce Springsteen, Paul McCartney, Eric Clapton and Michael Jackson tied for third place. Each of them received two per cent.

The telephone poll by TNS Intersearch surveyed 1,023 adults between Aug. 7 and 11. The results have a three-point error margin.

Presley, 42, died on Aug. 16, 1977 of a heart attack brought on by the effects of drug abuse.

Thousands of fans are gathering this week at Graceland, the Memphis mansion-turned-museum where Presley died, for celebrations Friday to mark the 25th anniversary of his passing.

- a) What is the point estimate for the percentage of Americans who think Elvis is the greatest rock and roll star of all time?

$$\hat{p} = 0.38$$

- b) What is the size of the sample in the survey?

$$n = 1023$$

- c) What is the level of confidence in the survey?

$$c = 95\%$$

- d) What is the margin of error?

$$E = 3\%$$

- e) What is the confidence interval for the percentage of Americans who think Elvis is the greatest rock and roll star of all time?

$$38\% \pm 3\%$$

$$35\% \text{ to } 41\%$$

Question 4 (3 points)

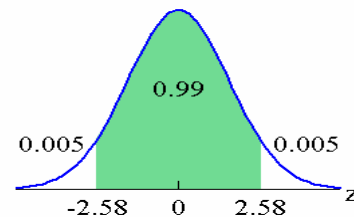
A QM teacher wants to estimate at a 99% confidence level the mean length of time to complete an Excel Lab. A preliminary sample of 25 students yielded a standard deviation of 17 minutes. How many more students should be included in the sample to be within 5 minutes of the population mean?

$$\text{Area to the left} = 0.995$$

$$z_c = 2.58$$

$$n = \left(\frac{z_c s}{E} \right)^2 = \left(\frac{2.58 \cdot 17}{5} \right)^2 = 76.7 = 77$$

Hence 52 more students should be included.



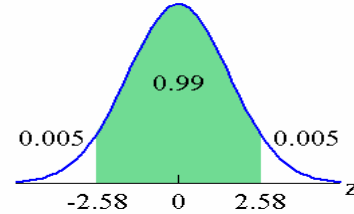
Question 5 (3 points)

A researcher wants to determine the proportion of all high school students who have Internet access at home. He has no idea what the sample proportion will be. How large a sample is required to be 99% sure that the sample proportion is off by no more than 5%?

Area to the left = 0.995

$$z_c = 2.58$$

$$n = \frac{(z_c)^2}{4E^2} = \frac{(2.58)^2}{4(0.05)^2} = 666$$

**Question 6** (3 points)

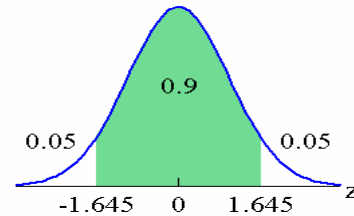
A QM teacher wants to estimate at a 90% confidence level the proportion of students who like to have assignments every class. A preliminary sample of 40 students yielded a proportion of 82%. How many more students should be included in the sample for the sample proportion to be off by no more than 2%?

Area to the left = 0.95

$$z_c = 1.645$$

$$n = \frac{(z_c)^2 p^* q^*}{E^2} = \frac{1.645^2 (0.82)(1-0.82)}{(0.02)^2} = 999$$

Thus 959 more students should be included.

**Question 7** (3 points)

A researcher wants to determine a 95% confidence interval for the mean number of hours that high school students spend doing homework per week. A preliminary study showed that the standard deviation for hours spent per week by all high school students doing homework is 0.7. How large a sample should the researcher select so that the estimate will be within 0.15 hours of the population mean?

Area to the left = 0.975

$$z_c = 1.96$$

$$n = \left(\frac{z_c s}{E} \right)^2 = \left(\frac{1.96 \cdot 0.7}{0.15} \right)^2 = 84$$

