

## MATHEMATICS 201-510-LW

Business Statistics

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### XVI – Estimating Proportions

1. What is the percentage of Canadians who are not exposed to second hand smoke? A sample of 200 nonsmokers revealed that only 22 of them did not show traces of a chemical that appears in the blood of people exposed to secondhand smoke. Construct a 99% confidence interval for the percentage of all Canadians not exposed to second hand smoke.
2. A random sample of 250 registered voters revealed that 63 of them feel that education is the most important issue when deciding on a candidate. Construct a 90% confidence interval for the proportion of all registered voters who feel that education is the most important issue when deciding on a candidate.
3. A local buffet restaurant has many patrons that are senior citizens. The manager of the restaurant claims that at least 60% of her customers are senior citizens. A random sample of 50 diners revealed that 33 of them are senior citizens.
  - a) Construct a 95% confidence interval for the true proportion of customers that are senior citizens.
  - b) Is the manager's claim consistent with your interval? Explain.
4. A sample of 75 renters in Quebec City showed that 40 were under that age of 35. Construct a 99% confidence interval for the percentage of all renters that are under the age of 35.
5. A mail-order company promises its customers that the products ordered will be mailed within 72 hours after an order is placed. The quality control department at the company checks from time to time to see if this promise is fulfilled. Recently the quality department took a sample of 50 orders and found that 42 of them were mailed within 72 hours of the placement of the orders.
  - a) Construct a 98% confidence interval for the percentage of all orders that are mailed within 72 hours of their placement.
  - b) Suppose that the confidence interval obtained in part (a) is too wide. How can the width of this interval be reduced?
6. A recent poll showed that 92% of Quebec male drivers rated their driving as excellent or good. Suppose that this percentage was based on a random sample of 400 Quebec male drivers.
  - a) What is the point estimate of the corresponding population proportion? What is the margin of error associated with this estimate?
  - b) Find a 95% confidence interval for the corresponding proportion.

7. A random sample of 340 Americans was taken where each was asked whether they had ever seen a UFO. Twenty said that they had. Construct a 90% confidence interval for the proportion of all Americans who claim to have seen a UFO.
8. Tony's pizza guarantees all pizza deliveries within 30 minutes of the placement of the orders. An agency wants to estimate the proportion of all pizzas delivered within 30 minutes by Tony's. What is the most conservative estimate of the sample size that would limit the maximum error to within 2% of the population proportion for a 99% confidence interval?
9. A consumer agency wants to estimate the proportion of all drivers who wear seat belts while driving. Assume that a preliminary study has shown that 76% of drivers wear seat belts while driving. How large should the sample size be so that the 99% confidence interval for the population proportion has a maximum error of 3%?
10. 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 95% sure that the sample proportion is off by no more than 5%?
11. A student wants to determine what percentage of college students smoke. How large a sample should she take to be 90% confident that her sample proportion is off by no more than 4.5%?
12. Consider the following news article.

### **Canadians want crackdown on drunk driving: poll**

**From random breath tests to lowering blood-alcohol limits for drivers, survey shows a willingness to walk the hard line**

ANDRÉ PICARD

From Tuesday's Globe and Mail

December 11, 2007 at 9:55 AM EDT

Canadians strongly support harsh new measures to crack down on impaired drivers, including random breath tests, vehicle confiscation and lowering the legal blood-alcohol level for drivers, according to a new survey.

According to a new survey, 66 per cent of respondents think police should be able to conduct random breath tests.

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The poll, conducted by Ekos Canada, involved 1,514 respondents. The margin of error is 2.5 percentage points, 19 times out of 20.

- a) What is the point estimate for the percentage of Canadians who think police should be able to conduct random breath tests?
- b) What is the size of the sample in the survey?
- c) What is the level of confidence in the survey?
- d) What is the given margin of error?
- e) What is the confidence interval for the percentage of Canadians who think police should be able to conduct random breath tests?

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## ANSWERS

1. 5.30% to 16.70%
2. 20.68% to 29.72%
3. a) 52.87% to 79.13%                      b) Yes
4. 38.50% to 68.16%
5. a) 71.9% to 96.1%  
b) Decrease the level of confidence or, preferably, increase the sample size
6. a) point estimate: 92%    Margin of Error:  $\pm 2.66\%$                       b) 89.3% to 94.7%
7. 3.78% to 7.98%
8. At least 4161 deliveries
9. At least 1350 drivers
10. At least 385 high school students
11. At least 335 college students
12. a) 66%    b) 1514                      c) 95%                      d) 2.5%                      e) 63.5% to 68.5%