

Social Studies 201
Second Midterm Examination
8:30 – 9:20, Wednesday, March 16, 2005

Answer any three (3) questions. Each question has equal value.

1. Variability in number of friends – young and old people. Using Table 1,

(a) Calculate the standard deviation of the number of close friends for

- (i) respondents aged 15-24.
- (ii) respondents aged 75 plus.

(For these calculations, assume that the more than 25 category is centred at 30).

(b) The numbers in the age 15-24 column of Table 1 are very different from each other, ranging from 2 to 76. But the numbers in the age 75 plus column are less varied, ranging from only 9 to 39. How do you reconcile this seemingly greater variability for the 75 plus group with the standard deviations you obtained in (i) and (ii) of part (a)?

Table 1. Number of Saskatchewan respondents with each number of close friends, 2003, ages 15-24, 45-54, and 75 plus

Number of close friends	Number of respondents of			Total
	Age 15-24	Age 45-54	Age 75 plus	
None	2	10	16	28
1 or 2	28	33	22	83
3 to 5	76	57	39	172
6 to 10	52	48	29	129
11 to 25	19	20	19	58
More than 25	3	5	9	17
Total	180	173	134	487

Source: Adapted from Statistics Canada. General Social Survey of Canada, 2003. Cycle 17: Social Engagement [machine readable data file]. 1st Edition. Ottawa, ON: Statistics Canada [publisher and distributor] 10/1/2004.

2. Probabilities of events. Suppose a respondent is randomly selected from the 487 persons in Table 1.

(a) What are the following probabilities?

- (i) Selecting a person of age 45-54.
- (ii) Selecting a person with less than six close friends.
- (iii) Selecting a person with 11 or more close friends and who is age 75 plus.
- (iv) Selecting a person aged 75 plus given more than 25 close friends.

(b) Explain whether the following events are independent or dependent.

- (i) Age 45-54 and having 6-10 close friends.
- (ii) Having 2 or less close friends and being age 75 plus.

3. Variation in divorce rates. Last week Statistics Canada released the data in Table 2 concerning provincial divorce rates by the 30th wedding anniversary.

- (a) Use the data in Table 2 to compute the standard deviation of divorce rates for
- (i) the five eastern provinces.
 - (ii) the five western provinces.
- (b) In a sentence or two, explain why the two standard deviations differ in the way they do.
- (c) In 2003, the combined divorce rate for Nunavut, Yukon, and the North West Territories was 27.6. If these territories were added to the list of five western provinces, explain whether this would decrease or increase the standard deviation from that found in part (ii) of (a).

Table 2. Divorce rate per 100 marriages, by the 30th wedding anniversary, eastern and western provinces of Canada, 2003

Eastern provinces	Divorce rate	Western provinces	Divorce rate
Newfoundland and Labrador	17.1	Ontario	37.0
Prince Edward Island	27.3	Manitoba	30.2
Nova Scotia	28.9	Saskatchewan	29.0
New Brunswick	27.6	Alberta	40.0
Quebec	49.7	British Columbia	39.8

Source: Statistics Canada, "Divorces," *The Daily*, March 9, 2005. <http://www.statcan.ca/Daily/English/050309/d050309b.htm>

4. Interpretations of probabilities

- (a) Explain which interpretation of probability (classical, frequency, subjective) appears to be used in each of the following.
- (i) In a study of who cares for seniors, Statistics Canada reported "Although these middle-aged caregivers are just as **likely** to be men as women, the women dedicate almost twice as much time to their tasks – 29.6 hours per month, compared with 16.1 hours for men. Working outside the home does not significantly reduce the amount of time middle-aged people spend providing care." (*Canadian Social Trends*, Autumn 2004, p. 2).
 - (ii) From the normal distribution, the **probability** is 0.05 that $Z < -1.645$.
 - (iii) A Statistics Canada report on immigrants to Canada taking Canadian citizenship reports that "the longer newcomers stay in Canada, the more **likely** they are to become citizens." (*The Daily*, March 8, 2005).
- (b) From quotes (i) and (iii) above, identify one pair of independent events and one pair of dependent events. Explain your reasoning.

5. Distribution of income. From the Saskatchewan respondents in the General Social Survey of Canada, Cycle 17, 2003, the mean personal income is 33.0 thousand dollars and the standard deviation of personal income is 26.4 thousand dollars.

(a) If personal income is normally distributed, what are the following?

- i. Proportion of persons with incomes of less than ten thousand dollars.
- ii. Percentage of persons with incomes of fifty to seventy thousand dollars.
- iii. The fifty-fourth percentile of income.

(b) From part (a), Figure 1, and Table 3, comment on how the distribution of personal income differs from that of a normal distribution.

Figure 1. Histogram of personal income distribution, Saskatchewan, 2003

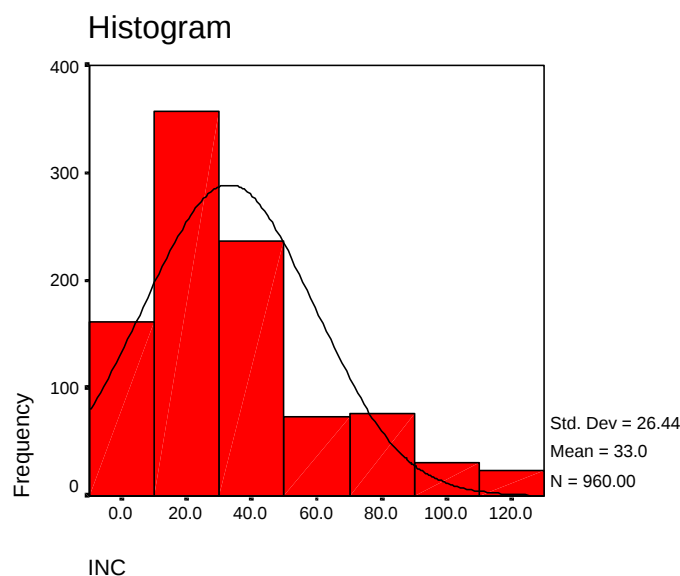


Table 3. Percentage distribution of personal income, Saskatchewan, 2003

Income in thousands of dollars	Percentage of cases
Less than 10	16.9
10-30	37.2
30-50	24.7
50-70	11.6
70 plus	9.6
Total	100.0

Source: Data for this question adapted from Statistics Canada. General Social Survey of Canada, 2003. Cycle 17: Social Engagement [machine readable data file]. 1st Edition. Ottawa, ON: Statistics Canada [publisher and distributor] 10/1/2004.

6. Estimation of incomes of employed females. Table 4 provides the means and standard deviations of income for Saskatchewan females of various ages who were employed full-time and full-year in 2003. Data come from Statistics Canada, General Social Survey, Cycle 17, with sample sizes shown for each of the age groups.

(a) Obtain 90 per cent interval estimates for the true mean income for females of each of the four age groups. (Four interval estimates).

(b) Briefly comment on the pattern of true mean income by age group, using data from Table 4 and from part (a).

Table 4. Income statistics, Saskatchewan females employed full-time and full-year, 2003

Age group	Income in thousands of dollars		Sample size
	Mean	Standard deviation	
25-34	33.3	13.5	55
35-44	40.3	20.7	57
45-54	45.1	24.1	37
55-64	40.1	25.9	31

Source: Data for this question adapted from Statistics Canada. General Social Survey of Canada, 2003. Cycle 17: Social Engagement [machine readable data file]. 1st Edition. Ottawa, ON: Statistics Canada [publisher and distributor] 10/1/2004.