Name:_____

Student ID:_____

> "For You light my lamp; the LORD my God illumines my darkness.
> For by You I can run upon a troop; and by my God I can leap over a wall.
> As for God, His way is blameless; the word of the LORD is tried;
> He is a shield to all who take refuge in Him."
> -- Psalm 18:28-30

- Please show all your work! No partial credit will be given for incorrect answers with no work shown. Please draw a box around your final answer.
- Calculators are permitted, but no notes, text, laptops, PDAs, or electronic dictionaries. Cell phones should be muted and left in your pocket or bag.
- Table 3 is attached to the back. You may detach it for your reference.

1. Mark each of the following **variables** as nominal (N), ordinal (O), discrete (D), or continuous (C): **[5]**

   (a) Hemoglobin count, in g/dL

   (b) How many children are in a family

   (c) Age, divided into categories "0-10", "11-18", "19-25", "26-39", "40-59", "60 and up"

   (d) Whether a student passes a course or not

   (e) Satisfaction with current family doctor, rated as "Very Dissatisfied", "Dissatisfied", "Satisfied", or "Very Satisfied"

2. Classify each of the following statements (which may or may not be true) as either **(D)escriptive** or **(I)nferential**: **[4]**

   (a) 30.1% of male registered nurses (RNs) are under the age of 40.

   (b) About 90% of students in our MATH108 class are nursing students.

   (c) 19.2% of BC residents in 2004 were clinically obese.

   (d) Of the children and adolescents studied in the 2004 Canadian Community Health Survey, 8% were clinically obese.

3. A particular screening test for breast cancer has a 18% false-positive rate (i.e., 82% **specificity**) and a 5% false-negative rate (i.e., 95% **sensitivity**).

   (a) Suppose the test is applied to a group of patients, 40% of whom are known to have breast cancer. Draw an **event tree** for the outcomes of the test. Label the tree with probabilities for each branch. Also calculate the probabilities of each final outcome (leaf of the tree). **[4]**

(b) What is the probability that a random patient from this group will **test positive** for breast cancer using this screening test?**[2]**

(c) What is the probability that a patient from this group who tested positive **actually** has the disease? **[2]**

4. The home provinces of 16 students in a class are listed below. Draw a **Pareto** chart showing the distribution of home province in this sample. **[4]**

ON, BC, BC, SK, AB, SK, BC, ON, SK, BC, BC, AB, BC, ON, MB, SK

5. The table below lists the number of purple starthistle plants (a noxious invasive weed in WA state) in nine equally-sized plots.

41, 57, 47, 33, 42, 28, 36, 53, 41

(a) Construct a relative frequency **histogram**, classifying the data by bins of width 10 plants/plot.**[4]**

(b) Find the sample **mean**. Show your work. **[2]**

(c) Find the **mode** and the **midrange**. **[2]**

(d) Find the sample **standard deviation**. Show your work. **[4]**

(e) Draw a **boxplot** for the data. Show your work. **[4]**

6. Say that in a certain town 63% of the people vote Conservative, and the probability that a townsperson drives a large truck is 4/7. If you pick a random townsperson, there is a 27% chance that the townsperson is a Conservative driving a large truck.

(a) What fraction of Conservatives in this town drive large trucks? **[3]**

(b) In this town, is voting Conservative **mutually exclusive** of driving a large truck? Why or why not? **[1]**

(c) In this town, is voting Conservative **independent** of driving a large truck? Why or why not? Interpret what this means in the context of the townspeople.**[3]**

(d) The town council is a randomly-selected group of 6 townspeople. What is the chance that exactly **half** of the town council votes Conservative? **[3]**

(e) What is the chance that a **majority** of the town council votes Conservative? **[4]**

(f) The small business association is a randomly-selected group of 50 townspeople. What is the chance that more than **half** of the small business association votes Conservative? **[4]**

7. Suppose that when a job candidate comes to interview for a staff position at TWU, the probability that he or she will want the job (A) after the interview is 70%. The probability that TWU wants the candidate (B) is 40%. Also, P(A|B)=0.90.

   (a) Find P(A ∩ B), draw a **Venn** diagram, and **interpret** it in words. **[3]**

   (b) Find P(B | A), and **interpret** it in words. **[3]**

   (c) Are events A and B **independent**? Explain. Interpret (in the context of job interviews) what it means for A and B to be independent. **[2]**

8. An assay (test) measuring inorganic phosphate in blood is imprecise, with values normally distributed around the true phosphate concentration, with a standard deviation of 0.2 mmol/L. Blood phosphate values of over 1.6 mmol/L are considered "high".

   (a) What is the probability that this assay returns a result **within** ±0.15 mmol/L of the true value? **[2]**

   (b) If the true concentration of phosphate is 1.45 mmol/L (not "high"), what is the probability that the assay could still return a value that is considered "**high**"? **[2]**

   (c) The standard deviation is just one way of measuring the dispersion (imprecision) of the assay results. The **interquartile range (IQR)** is another. Find the IQR for this assay. **[3]**