Solutions

1. Describe the sampling method used.

   a) A seat belt factory randomly selects a time each hour and then tests the next 10 seat belts on the factory line.

   b) A city randomly selects 500 residential addresses from its database.

   c) A charity mails a survey to its 450 members.

   d) The manager of a golf course knows that about 40% of the members are female. He randomly selects 75 females and 112 males to survey.

a) Systematic - It is a repeatable method of selection.

b) Simple Random - Each person has an equally likely chance of being selected.

c) Voluntary Response - The members can choose whether to complete the survey or not.

d) Stratified Sample - The number of females chosen is the same as the proportion of female members of the golf club.

2. What is the difference between a population and a sample? Use examples to explain.

Population - Contains all the elements being studied. Example - All the teachers at your school.

Sample - A group of elements selected from the given population. Example - All of them that teach math.

3. Write several tweets (140 characters or less) to describe each type of sampling method.

#simplerandomsample each element has an equal chance of selection

#systematicsample elements in the population are ordered and chosen at regular intervals

#stratifiedsample has proportions that are the same as within the population

#clustersample is a group that is randomly selected from a population

#multistagesample has groups that are ordered within the population and random samples are taken from each

#conveniencesample chooses elements of the population that are easily accessible

#voluntarysample allows elements to respond or not respond

4. Use the data to describe three sampling methods you could use to conduct a survey.

	Grade 9		Grade 10		Grade 11		Grade 12	
	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys
	78	91	102	95	91	95	68	62
	Classes		Classes		Classes		Classes	
	7		8		7		7	

Stratified - Could have a sample based upon grade or gender.

Cluster - Could randomly choose a particular class.

Voluntary - Allows students to respond if they want to.

5. Open Question A candy factory wants to do some quality control on its production line to see if it has the right proportion of each flavour in its coloured candy mix. Outline a possible plan to sample the product.

The easiest way would be to take a systematic sample at a given time each hour. Ten (or however many) packages could then be sampled to check for quality.

6. Use the Internet to research Audrey Tobias and her connection to the Canadian census.

Literacy Link

A *census* is a count or survey of a population. For example, surveying everyone at your school.

- Audrey Tobias is an 89-year-old peace activist who refused to fill out the 2011 census because of its link to a U.S. military contractor.
- She faced a criminal charge under the Statistics Act, which makes refusing or neglecting to fill in the census form an offence punishable by a $500 fine and up to three months in prison.
- Her lawyer argued forcing her to complete the census that is processed using software from Lockheed would violate her freedoms of conscience and free expression.
- She was acquitted due to reasonable doubt as to her intent at the time of refusal.

7. Describe how each pair of sampling methods are similar and different. Provide examples to support your answers.
   a) multistage versus stratified
   b) convenience versus voluntary

a) Both are random sampling techniques that divide the population into groups. Multistage uses levels to divide the population into groups and then a sample is taken form each of them. Stratified takes a proportionate sample compared to the population.

b) Both are non-random sampling techniques that may end up providing unreliable results due to the lack of proportionate representation of the population. Convenience will use whichever elements are easiest to obtain for its purpose. Voluntary will only get responses from people who choose to participate

8. A car dealership conducts a phone survey to determine customer satisfaction. The dealership will like to use a stratified sample based on the type of vehicle purchased.

Type of Vehicle	Number of Customers
SUV/truck	858
Minivan	1213
Midsize car	478
Economy car	987
Sports car	221

a) What is the population?

b) If the dealership wishes to conduct 250 surveys, how many calls should it make for each type of vehicle?

c) Why would the dealership choose to do a phone survey rather than mailing a survey to each customer?

d) What else can be done to ensure the survey results represent the population?

a) The population is the total number of customers, in this case, 3757.

b) To find each stratum find the percentage of each type of vehicle and multiply it by the sample size needed:

$$\frac{\text{\# of customers for a given type}}{\text{total \# of customers}} \times 100\% \times \text{sample size}$$

Type of Vehicle	Number of Customers	Percent of Customers	Number of Calls to Make
SUV/truck	858	22.8%	57
Minivan	1213	32.3%	81
Midsize car	478	12.7%	32
Economy car	987	26.3%	65
Sports car	221	5.9%	15

c) They are more likely to get a response from a call, compared to a mailshot.

Percentage x Sample Size (250 in this case)

d) Try to make sure the owner is completing the survey and not just someone who lives at that address.