Collecting Data

11.2

MathLinks 9, pages 422–429

Suggested Timing
80–100 minutes

Materials
• magazines, newspapers, or computer with Internet access

Blackline Masters
Master 2 Communication Peer Evaluation
BLM 11–3 Chapter 11 Warm-Up
BLM 11–8 Section 11.2 Extra Practice
BLM 11–9 Section 11.2 Math Link

Mathematical Processes
✓ Communication (C)
✓ Connections (CN)
☐ Mental Math and Estimation (ME)
✓ Problem Solving (PS)
✓ Reasoning (R)
✓ Technology (T)
☐ Visualization (V)

Specific Outcomes
SP2 Select and defend the choice of using either a population or a sample of a population to answer a question.
SP3 Develop and implement a project plan for the collection, display and analysis of data by:
• formulating a question for investigation
• choosing a data collection method that includes social considerations
• selecting a population or a sample
• collecting the data
• displaying the collected data in an appropriate manner
• drawing conclusions to answer the question.

Category	Question Numbers
Essential (minimum questions to cover the outcomes)	#1, 3, 4, 7–10, 13, Math Link
Typical	#1, 3, 4 and 7 *or* 5 and 6, 8–10, 12, 13, Math Link
Extension/Enrichment	#1–3, 12–16, Math Link

Planning Notes

Have students complete the warm-up questions on **BLM 11–3 Chapter 11 Warm-Up** to reinforce material learned in previous sections.

In this section, students identify the difference between a population and a sample and learn about different types of samples. Next, they justify using a population or a sample for given situations. Ensure that students can confidently defend their choices for using samples

or populations before moving forward. Then, students determine whether results from a sample can be used to make predictions about a population for given situations. It is important that students are able to identify whether a sample is representative of the population in order to make a prediction.

As a class, review the opening text and visual. Read the Did You Know? and check that students are familiar with Internet forums. Direct students to the question posed on the computer screen in the visual, and then using this context, have them discuss the opening questions about Internet forums. Afterward, you might pose the following questions:
• How is the best female vocalist selected each year?
• How do magazines gather information on people's favourite performer?

Students may mention that people are randomly surveyed. If so, ask them whether or not the people in these surveys represent students. Students may conclude that it is important for people in a survey to represent the population in order to avoid making inaccurate predictions.

Explore Using Survey Data to make Predictions

In this Explore, students write a survey question, carry out the survey, and make a prediction based on the survey results. Then, they are asked to justify their prediction.

Make sure that students get your approval for the survey question before they carry out the survey.

Method 1 As a class, have students complete #1 to 3a). Give students an opportunity to discuss how to best organize the results (e.g., table, graph). Next, have students work in pairs to answer #3b) and 4, before discussing the answers as a class.

Direct students to the definitions for *population* and *sample*. Reinforce these terms by using an example that is familiar to students. (The population for a survey of members of Nunavut Tunngavik is all the Inuit of Nunavut. A sample for a survey of members of Nunavut Tunngavik is 100 individuals from each region of Nunavut.) Have students use the definitions to discuss their answers for #5 to 7 with a partner before writing an individual response.

As a class, discuss that a class can be a population or a sample depending on the situation.

Method 2 Complete the Explore as a whole class.

Meeting Student Needs

• You might ask students to share examples of forums that they participate in or you might use an overhead to show a print screen of an online discussion.
• Have students develop a survey question from observing their own classroom, and then conduct the survey. (Example: How many people are wearing white T-shirts?) The next day, have them conduct the survey again. The class could survey additional grade 9 classrooms, thereby increasing the sample size, and then discuss the effect of the increased sample size on the trend observed in their own class.

ELL

• Teach the following terms in context: *forum*, *opinions*, *inaccurate*, and *predictions*.
• Check that English language learners understand the distinction between a *population* and a *sample*. You might use an additional example using a context that is familiar to students.

Answers

Explore Using Survey Data to make Predictions

5. Example: In this case, the class is a sample. The class is part of the population of students at the school.

6. Example: Randomly survey ten students from each grade.

7. Example: Survey the entire population or use a fair sample.

Assessment	Supporting Learning
Assessment *as* Learning	
Reflect and Check Listen as students discuss what they discovered during the Explore.	• For #5, have the class discuss and decide whether a class is a sample or a population. Have students support their position. • For #6, some students may benefit from a class discussion about alternative ways to choose participants for the survey question. For each case, ask if the people would be a sample or a population, and if they would represent the opinions of all students in the school. Record their ideas on the board.

Reproduced textbook page (left, 423)

5. Is your class a population or a sample? Explain.

6. How else might you choose people for your survey to reflect the opinions of all students in your school?

7. How can you reduce the chances of making inaccurate predictions using a survey?

Link the Ideas

There are several different types of samples.

convenience sample
• a sample created by choosing individuals from the population who are easy to access

random sample
• a sample created by choosing a specific number of individuals randomly from the whole population. *Random* means that each individual has an equal chance of being chosen. As a result, a random sample is likely to represent the whole population. Data from a random sample can be used to make predictions about the population. Stratified samples and systematic samples are types of random samples.

stratified sample
• a sample created by dividing the whole population into distinct groups, and then choosing the same fraction of members from each group

systematic sample
• a sample created by choosing individuals at fixed intervals from an ordered list of the whole population

voluntary response sample
• a sample created by inviting the whole population to participate

population
• all of the individuals in the group being studied
• for example, the population in a federal election is all eligible voters

sample
• any group of individuals selected from the population
• for example, a sample of the population in a federal election might be 100 individuals chosen from each province or territory

Example 1: Identify the Population

Identify the population for each situation. Then, state whether you would survey the population or a sample of the population. Explain your reasoning.

a) A bicycle store owner wants to know which brand of mountain bike her customers prefer.

b) The school board wants to know how many hours of homework students do each day.

c) A candle manufacturer wants to know how many of its candles are made with flaws.

11.2 Collecting Data • MHR **423**

Reproduced textbook page (right, 424)

Solution

a) The population is the store's customers. It depends on the size of the store. A small store might survey all of its customers. A large, busy store would likely survey a sample of customers. For them it would be time-consuming and costly to survey all of the customers.

b) The population is students in schools within the school board. The school board would likely survey a stratified sample of its students. They would want to include the same fraction of students at various grade levels because the amount of homework done varies from grade to grade.

c) The population is all candles made by the company. A small company might check each candle made. A large company might check every tenth candle. It would be costly and time-consuming to check every item.

Show You Know

For each scenario, identify the population. Then, indicate whether you would survey the population or a sample. Explain your reasoning.

a) The Royal Garden restaurant needs to know which main dish its customers favour.

b) Stephan wants to find out if teachers in Canada prefer to wear glasses or contact lenses.

c) A junior hockey team wants to find out why some people who bought season tickets last year are not buying them this year.

Example 2: Identify a Sample

For each situation, describe how the sample could be selected. Identify the type of sample.

a) A teacher wishes to get feedback from her class about the school dance. She plans to survey 5 students out of a class of 30.

b) A telephone company wants to determine whether a fitness centre would be well used by its 3000 employees. The company plans to survey 300 employees.

c) A chain store is trying to decide whether to open a store in Camrose, Alberta. The company decides to survey people in Camrose and three nearby towns. The population of each location is shown in the table.

Location	Population
Camrose	16 000
Bashaw	825
Tofield	1 876
Daysland	876

d) A marketing research company mails surveys to all of the adult residents in a town. The survey asks about brands of consumer products. The residents are asked to mail their responses in a prepaid envelope.

e) A restaurant owner wants to know the favourite pizza topping of his customers. He plans to survey every customer who orders a pizza in his restaurant between 5:00 p.m. and 10:00 p.m. one evening.

424 MHR • Chapter 11

Link the Ideas

Begin with an overview of different types of samples. Students will refer to this information throughout the examples. Read and discuss each description and provide an example of each type of sample.

Reinforce that stratified samples and systematic samples are random samples. Discuss how convenience samples and voluntary response samples are not random samples.

Example 1: Identifying a Population

This example illustrates identifying populations and deciding whether to survey the population or a sample for a given situation.

Read through and discuss each situation. For each situation, check that students understand:
• the difference between a population and a sample
• the rationale for choosing a population or a sample

You might invite students to agree or disagree with the provided solutions and explain their reasoning.

Point out how the different scenarios are surveyed. Parts a) and b) can be determined by asking questions, while part c) can be determined by checking or testing candles.

Have students work individually to answer the Show You Know questions, and then discuss their responses in a small group. For each scenario, have them make a group decision about surveying a population or a sample. Where there are differences, have students consider the strengths of the supporting points to help come to consensus. They might also compare their responses with those of another group. As a class, discuss the scenarios for which there are different opinions.

Example 2

This example illustrates selecting samples and identifying appropriate types of samples for given situations.

Read through and discuss each situation. For each situation, check students understand how to select the sample and the type of sample. For some situations, there may be more than one appropriate possibility. Have students provide their reasoning for a different sample and how they would organize it.

Have students work individually to answer the Show You Know questions, and then discuss their responses with a partner. In cases where students choose different types of samples, encourage them to defend their choice.

You can use different types of samples in a survey. These are some possible solutions.

a) The teacher could put all the students' names in a box and draw five names. This is a *random sample*.

b) The company plans to survey 300 out of their 3000 employees. To ensure that the sample fairly represents the population, the company might interview every tenth person on the payroll list. This is a *systematic sample*. This type of sample is time and cost efficient.

c) Since the city has more people who use the company's products than the nearby towns, the company could survey 25% of the population in each location. This is a *stratified sample*. Since 25% of each group is surveyed, the same proportion of each town is represented in the sample. In this case, the company would survey 4000 people from Camrose, 206 people from Bashaw, 469 people from Tofield, and 219 people from Daysland.

d) The marketing research company is inviting all residents to participate. This is a *voluntary response sample*. This sample may not represent the population because only those who are interested will respond.

e) This is a *convenience sample*. It is not random since only customers who order pizza are surveyed. However, the sample does target customers who will provide useful input. These customers are easily accessible. The sample provides the owner with information right away and costs no extra money.

For each situation, is there a different type of sample that might be used? If so, explain what type of sample and how you would organize it.
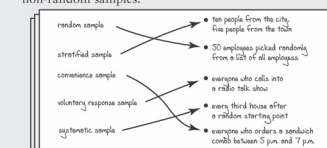
Show You Know

a) For each scenario, what type of sample would you use? How would you select the sample?
- A marketing firm plans to conduct a telephone survey in a city of 800 000 people. The survey asks whether there is interest in a new art gallery.
- A student wants to know the most popular cell phone provider that grade 9 students use.

b) In each case, identify the type of sample.
- A coach puts the names of all of the basketball players into a hat and draws one name for a free basketball.
- A questionnaire is sent to every ninth person on an alphabetical list of a store's credit card customers.
- The student council invites all students to provide ideas for activities.

Key Ideas

- A population is the whole group of individuals being studied. It is not always practical or cost effective to survey everyone in a large population. You might survey a sample of the population.
- A sample is any part of the population.
- A random sample ensures that all people have an equal chance of being selected for a study. You can use data from a random sample to make predictions about the population. Systematic samples and stratified samples are types of random samples.
- Voluntary response samples and convenience samples are types of non-random samples.

random sample → ten people from the city, five people from the town
stratified sample → 50 employees picked randomly from a list of all employees
convenience sample → everyone who calls into a radio talk show
voluntary response sample → every third house after a random starting point
systematic sample → everyone who orders a sandwich combo between 5 p.m. and 7 p.m.

Check Your Understanding

Communicate the Ideas

1. Your friend sends you this e-mail. Write your response.

FROM: Nick
TO: Jonah
I am confused about populations and samples. Would you please explain the difference? It would help if you gave an example of each.
Nick

2. A group can be the population or a sample, depending on the survey question. Do you agree? Give examples to support your opinion.

3. Kim and Scott want to know how many people took public transit to come to the sold-out concert. The seating capacity at the venue is 18 000 people.

Kim: I plan to ask the first 20 people who arrive.

Scott: I plan to ask the first 200 people.

a) Whose sample would provide a more accurate representation of the population? Explain why.
b) Recommend a different type of sample that would give more accurate results. Explain your reasoning.

Key Ideas

The Key Ideas review the terms *population* and *sample*, and use the categories random sample and non-random sample to review different types of samples. Encourage students to make their own summary of the Key Ideas by completing the Key Terms in their Foldable.

As a class, review the examples provided and discuss whether the results of a survey for each situation would accurately represent the population.

Meeting Student Needs

- Consider having students create a chart of different types of samples using the following headings: Type, Description, and Advantages.
- For Example 1, reinforce students' understanding by providing additional scenarios such as the following:
  – Andy's Breakfast Nook wants to know their customers' favorite type of bagel.
  – A ski resort wants to know whether they should add another ski lift.
  – A teacher wants to know which of three field trips the grade 9s prefer.
- For Example 2, reinforce learning by using the scenarios in the previous bullet and asking students to identify an appropriate sample.

- Consider working through the examples as a whole class and having students work in pairs or small groups to complete the Show You Knows. Have students work individually to complete an additional Show You Know related to each example.
  – For Example 1: Show You Know, use the following scenario: The Housing Association wants to know how much water each household uses in a month.
  – For Example 2: Show You Know, use the following scenario: The Hunters and Trappers Association puts the names of all the adult members of the community in a hat and draws five names for the opportunity to hunt a polar bear.
- For the examples in the Key Ideas, some students may find it beneficial for the class to brainstorm words or phrases that help them identify the type of sample.
- For additional practice, consider providing some examples of survey results (presented in headlines or statements). For each survey, have students identify the population, and if possible, the sampling technique used. Ask if the results can be generalized to the population. You might have students contribute to a class collage that includes headlines or survey statements and an accompanying report about the population and the sampling technique.

ELL

- Teach the following terms in context: *convenience*, *easy to access*, *mountain bike*, *brands*, and *prepaid*.
- Some students may benefit from an explanation of terms related to samples. For example:
  – convenience sample: is easy to do
  – random sample: follows no pattern or plan, or happens by chance
  – stratified sample: arranged in layers or levels
  – systematic sample: follows a plan or a pattern
  – voluntary response sample: done of a person's own free will
- Have students add the terms for different types of samples to a class poster.
- Since this lesson is textually dense, walk through each example and check often for understanding.
- Allow English language learners to discuss the Show You Knows in their first language, and then express their thinking in English.

Gifted and Enrichment

- Invite students to practise using sampling terms by going to the related Web Link on this TR page.

Common Errors

- Some students may confuse types of samples.
- **R$_x$** Reinforce the meaning of each type of sample. Use some of the ideas provided for English language learners.

WWW Web Link

For an interactive site for students to practise using sampling terms, go to www.mathlinks9.ca and follow the links.

Answers

Example 1: Show You Know

a) Example: The population is the restaurant's customers. The survey would depend on the size of the restaurant. If it is a small restaurant, survey all the customers. If it is a large restaurant, survey a sample, which would be less time-consuming and costly.

b) Example: The population is teachers in Canada. Survey a sample by asking teachers at his school. This sample represents a population that is very large. Surveying teachers at school is convenient.

c) Example: The population is last year's season ticket holders. Survey a sample of ticket holders, which would be less time-consuming and costly.
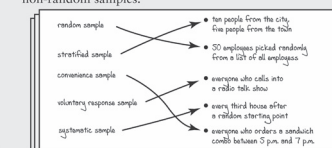
Example 2: Show You Know

a) Example:
  • Systematic sample. Phone every thousandth person listed in the phone book.
  • Convenience sample. Survey students in one class.

b) Random sample; Systematic sample, voluntary response sample

Assessment	Supporting Learning
Assessment *for* Learning	
Example 1 Have students do the Show You Know related to Example 1.	• Encourage students to verbalize their thinking. • You may wish to have students work with a partner. • Some students may not understand the difference between a population and a sample. Reinforce the meaning of each term using a familiar example. Stress the importance of the context to help determine the population or a sample. (For example: If your class is planning a trip, the population is the class, and ten students surveyed is a sample. However, if the school is planning a trip, the school is the population, and your class is a sample.) You might provide additional scenarios and have students identify the population and a sample for each. Then, have them decide whether they would survey the population or a sample. You might ask if it is reasonable to survey the population.

Example 2
Have students do the Show You Know related to Example 2.
	• Encourage students to verbalize their thinking.
	• You may wish to have students work with a partner.
	• For part a), students may need help to choose the type of sample. Reinforce that there is more than one possible solution. Consider having students do the following:
	  – Read the scenario to look for clues that make certain options more reasonable than others.
	  – Refer to the solutions for Example 2 and look for a description of a reasonable sample.
	  – Choose one type, describe how to select the sample, and then decide if their choice is reasonable. Provide an additional scenario and have students explain their thinking.
	• For part b), students may need help to identify the type of sample. Prompt them to compare the wording that describes the method of selecting each sample with the wording in Example 2. Look for similarities to help identify the type of sample.

Check Your Understanding

Communicate the Ideas

These questions allow students to explain their understanding of populations and types of samples. Have students work individually to answer #1 to 3, and then discuss their answers with a partner.

For #1, students explain the difference between a population and a sample. Encourage them to develop their own example to illustrate the difference. Have students present their examples to the class.

Use the responses to #2 to assess students' understanding of how a group could be the population or a sample, depending on the survey question.

For #3, students assess which type of sample better represents the population and they recommend a different type of sample. Check that their rationale is reasonable.

Practise

Consider giving students a choice of either completing #4 and 7, or #5 and 6. These pairs of questions address the same concepts, namely, identifying the population, deciding whether to survey the population or a sample, and describing how to select the sample.

For #7d), you might explain that the Big Valley Jamboree, which is held in Camrose, Alberta, is Canada's biggest country music show.

Apply

For #14, some students may wonder how the survey question addresses people who are allergic to more than one animal, not allergic to any of them, or allergic to an animal(s) not listed. This may help them develop an improved question for part b).

Extend

Note that #16 combines concepts from section 11.1 and 11.2 by asking students to identify potential bias in the headline, rewrite the question, and then select a different sampling method that would be more representative. Prompt students to realize that a poorly worded or incorrectly rewritten question could result in selecting an inappropriate sampling method. You might have students discuss their response with a partner, get feedback, and then make any revisions.

10. Jason, a member of the Graduation Committee, plans to ask each student who enters the cafeteria the following questions.

> What is your favourite paint colour for the cafeteria walls? _____
>
> Should the cafeteria be used for graduation?   YES   NO

a) Identify the population.
b) Identify the sample.
c) Will the results of his survey accurately represent the population? Explain.
d) Is Jason correct in using the same sample for both questions? Explain your thinking.

11. The student council plans to survey students about how best to spend the budget for activities. Enzo prefers to spend the money on baseball equipment. He decides to randomly survey students at a baseball game.

a) Is there a bias in Enzo's sample? If so, what is the bias?
b) Describe a sample that would reflect the overall opinion of students. Explain your thinking.
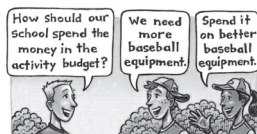
12. Anita and Cindi are asked to find out what type of mural to paint in the entrance of their office tower. There are 1400 employees. Cindi proposes using a random sample of 20 employees. Anita suggests using a stratified sample to get input from every department. Whose sampling method is better? Explain your reasoning.

13. Erin plans to survey her friends to determine the average number of children per household in Canada. Is this a random sample? Explain your reasoning.

14. Ben asked 50 people at random in a mall the following question.

> Are you allergic to any of these animals?
> A   cats
> B   dogs
> C   birds
> D   gerbils
> E   hedgehogs

His results are displayed.

Animal Allergy	Frequency	Total
Cats	|||| |||| |||| |||| ||||		26
Dogs	|||| |||| ||	12
Birds	|||| |||	8
Gerbils	||||	4
Hedgehogs		0

a) Ben made the following predictions based on his data. Do you agree with each prediction? Explain.
 • Almost 25% of the population is allergic to dogs.
 • Hedgehogs do not cause allergies.
b) Improve the survey question. Explain your reasoning.

Extend

15. Search various media for information about a recent survey. Use sources such as magazine and newspaper articles, or radio, television, and Internet reports.
a) Identify and comment on the population and the sample.
b) Are the predictions valid for the population? Explain your reasoning.
c) Was the survey well conducted? What improvements, if any, would you recommend?

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16. Five firefighters conducted a survey to assess how well the fire department is performing. They asked local residents the following question.

> Which of the following choices best describes your opinion of how well the fire department is doing?
> A   Excellent
> B   Very Good
> C   Good
> D   Poor

A week later, the local paper has the headline as shown.

THE DAILY NEWS
Survey Reveals Majority Very Satisfied With Fire Department

a) How might the wording of the question affect the collection of data? Rewrite the question to produce more accurate responses.
b) What else may have influenced the collection of data? Describe how to conduct a survey that would reflect opinions more accurately.

Math Link

For your research project, choose one of the research questions you wrote for the Math Link on page 421.
a) What is your question?
b) Write a hypothesis that clearly states what you want to prove or disprove.
c) Identify and describe the population for your question.
d) To answer your question, you will need to find data from studies and surveys that have already been done. You will do the research in the Math Link on page 439. What sampling methods do you think would be used to collect data related to your question? Explain your reasoning.

An example is shown.

Literacy Link
A *hypothesis* is a statement put forward to guide an investigation.

> **Research Question:** What are the population trends for beluga whales in Canada?
>
> We predict that all beluga whale populations in Canada are threatened.
>
> We hypothesize that there are few differences in the population trends for the whale populations in Canada.

> The beluga whale populations in Canada can be organized into seven groups.
>
> 1. St. Lawrence   5. Cumberland Sound
> 2. Ungava Bay   6. High Arctic
> 3. Eastern Hudson Bay   7. Beaufort Sea
> 4. Western Hudson Bay
>
> We expect that studies will use samples of beluga whale populations since there are large numbers of whales spread out over large areas.

Beluga whale, Somerset Island, Nunavut

Literacy Link Direct students to their concept map, and have them complete definitions for *population*, *sample*, *convenience sample*, *random sample*, *stratified sample*, *systematic sample*, and *voluntary response sample*. They should connect each oval containing a definition to the respective oval labelled population or sample. Consider having students attach an oval to each type of sample and use the oval to summarize their own example.

It may be helpful for students to show the relationship between random samples and stratified and systematic samples on the concept map. Have them draw two additional ovals attached to the oval for random sample. They can use the ovals to write the labels stratified sample or systematic sample. Similarly, they can show the relationship between non-random samples and convenience and voluntary response samples. Have them draw two additional ovals attached to an oval labelled non-random sample. They can use the ovals to write the labels convenience sample and voluntary response sample.

Math Link

The Math Link allows students to apply their understanding of populations, samples, and sampling methods.

For part a), students choose one of the research questions they developed for the Math Link on page 421. For part b), students develop a hypothesis. Remind students that since they are relying on secondary data, they need to develop a hypothesis based on the research results that are available. Students may need to do more research before they decide on a hypothesis and/or they may need to refine their hypothesis. For part c), students need to decide on and describe the population for their question. For part d), students conjecture what sampling methods might be used to collect the data related to their question. Reassure them that the studies they find may likely use different sampling methods than the ones they proposed.

As a class, read through the Math Link and highlight what students are to do. Provide access to magazines or the Internet to help them research their topic. As they work, circulate and coach students as needed to assist them with the research process.

Literacy Link Point out the explanation for the term *hypothesis* on page 429. Most students will recall the term from earlier science courses. You might point out the hypothesis in the example on page 429, or provide another example such as the following: The population of burrowing owls will continue to decline in Canada.

You might use the following prompts to help students write their hypothesis:
- What is your research question?
- What is your prediction? Make your best guess about the direction of the relationship expressed in your research question.
- What is your hypothesis? Choose something that can be tested true or false through scientific studies. Write what you think might happen. Be concise and specific and limit your hypothesis to one sentence.

Meeting Student Needs
- Provide **BLM 11–8 Section 11.2 Extra Practice** to students who would benefit from more practice.

ELL
- Allow English language learners to discuss #1 to 3 in their first language, and then express their thinking in English.
- Ensure students understand the following terms: *public transit*, *seating capacity*, *venue*, *bus transit*, *proposed by-law*, *parachutes*, *mural*, *gerbils*, *hedgehogs*, and *beluga whale*.
- For #4 and 5, clarify that students need to explain why they chose their answers.
- Consider assigning fewer questions due to the text-dense nature of this section.

Gifted and Enrichment
- Ask why companies offer free activities on the Internet when it costs them money to develop the activities and maintain the sites. Ask how they use the free aspect to eventually sell a product or a service.

Common Errors
- Some students may confuse the terms *population* and *sample*.
- R_x Reinforce the meaning of each term using a familiar context. (The people living in Canada represent a population. In this context, the people living in Manitoba represent a sample of the population.) Provide additional scenarios and have students identify the population and a sample for each.

Answers

Communicate the Ideas

1. Example: A population is the whole group of individuals being studied. A sample is any part of the population. For example, a population could be all the students in a school. A sample would be one class in the school.

2. Example: I agree. For instance, the class would be the population for a question that asks about favourite TV programs of students in the class. The class would be a sample for a question that asks about teens' favourite TV programs.

3. **a)** Example: Scott's sample because the sample is larger
   b) Example: A systematic sample of every 200th person to arrive would be more accurate. This sample would include people arriving at different times and using different methods of transportation.

Assessment	Supporting Learning
Assessment *as* Learning	
Communicate the Ideas Have students complete #1 and 3.	• Encourage students to verbalize their thinking. • Allow students to discuss #1 to 3 with a partner before writing a response. • For #3, students may find it useful to record the reasons for their choices, as well as those of a partner for future reference. Encourage them to identify the words or phrases that prompted them to choose the survey question they did. • You may wish to have students use **Master 2 Communication Peer Evaluation** to assess each other's responses to #1 to 3.
Assessment *for* Learning	

Practise and Apply
Have students do #4, 7 to 10, and 13. Students who have no problems with these questions can go on to the remaining Apply questions.
	• Students who need assistance with #4 may benefit from additional coaching with Example 1. Coach them through #4 by asking questions including:
	  – Who is the population? Is it reasonable to survey all members of the population? Explain.
	  – Who would you survey? Explain.
	  Coach students through #4, and then have them try #5 on their own.
	• Students who need assistance with #7 may benefit from additional coaching with Example 2. Reinforce that there is more than one possible solution. Have students use the cues provided in each scenario to identify the population. This may help them decide an appropriate sample. Coach students through #7, and then have them try #6 on their own.
	• Refer students who need help with #9 to Example 2 part c). Have them verbalize their thinking about how to select the sample.

Math Link The Math Link on page 429 is intended to help students work toward the chapter problem wrap-up titled Wrap It Up! on page 443.	• It is recommended that all students complete the Math Link. • You may need to point out that in the Math Links students are working with a research question, not a survey question. • Some students may need help to select their question. You might prompt them to research what information is available, which may help them select the most promising one. Provide coaching as needed to help students verbalize their thinking. • You might point out that a hypothesis is an "educated guess." • Students who need help getting started could use **BLM 11–9 Section 11.2 Math Link**, which provides scaffolding.
Assessment *as* Learning	
Literacy Link By the end of section 11.2, have students complete definitions for the terms related to population and different types of samples.	• Some students may benefit from using their Foldable to record definitions for terms as they are introduced. Then, at the end of the chapter, have them summarize the definitions for each term in their own words and organize them on the concept map.
Math Learning Log Have students respond to the following question: • Describe a situation when a population and a sample are the same.	• Encourage students to refer to their notes about populations and samples in their Foldable or concept map. • Depending on students' learning styles, have them provide oral or written answers. • Encourage students to use the What I Need to Work On section of their Foldable to note what they continue to have difficulties with.