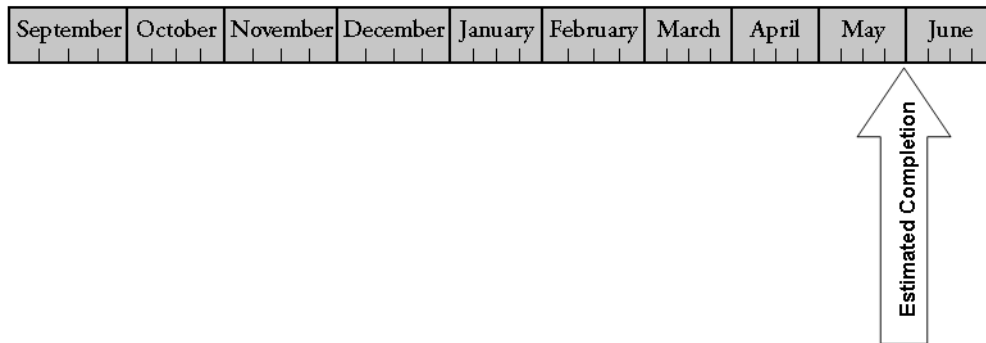


# Probability and Statistics

Suggested Time: 2 Weeks



# Unit Overview

## Focus and Context

In this unit, the data collection process will be analyzed and critiqued. Students will develop and implement a project plan for the collection, display and analysis of data. They will consider such factors as the method used, the reliability and usefulness of data, and the ability to make generalizations about the population from a sample. Students will describe the effect of bias, of language use, ethics, cost, time and timing, privacy, and cultural sensitivity on the collection of data. They will also create a rubric that can be used to assess the project.

Students will also demonstrate an understanding of the role of probability in society. They will explain how decisions based on probability may be a combination of theoretical probability, experimental probability and subjective judgement. To complete the unit, students will examine the validity of using calculated probability to make decisions.

## Math Connects

The use of statistics is pervasive in our society. Statistics is the art and science of gathering, analyzing, and making conclusions from data. Every day we are exposed to examples of statistics in the media. Graphs and statistics bombard the public in advertisements, opinion polls, reliability estimates, population trends, and health risks.

An integral of statistics is probability. It is referred to when the weather forecaster predicts a 40% chance of snow, when medical researchers predict the chance of people contracting diseases, or when advertisements claim that you have a 1 in 5 million chance of winning the lottery.

The concepts taught in data analysis and statistics are used to make important decisions in industries such as marketing, research, sports, medicine, law-making, law enforcement, business, and government. Being familiar with these ideas will equip students to make intelligent and informed decisions in the future.

## Process Standards

- |   |                      |
|---|----------------------|
| [C] Communication                         | [PS] Problem Solving |
| [CN] Connections                          | [R] Reasoning        |
| [ME] Mental Mathematics<br>and Estimation | [T] Technology       |
|   | [V] Visualization    |

## Curriculum Outcomes

STRAND	OUTCOME	PROCESS STANDARDS
Statistics and Probability (Data Analysis)	Describe the effect of: <ul style="list-style-type: none"> <li>• bias</li> <li>• use of language</li> <li>• ethics</li> <li>• cost</li> <li>• time and timing</li> <li>• privacy</li> <li>• cultural sensitivity</li> </ul> on the collection of data. [9SP1]	C, CN, R, T
Statistics and Probability (Data Analysis)	Select and defend the choice of using either a population or a sample of a population to answer a question. [9SP2]	C, CN, PS, R
Statistics and Probability (Data Analysis)	Develop and implement a project plan for the collection, display and analysis of data by: <ul style="list-style-type: none"> <li>• formulating a question for investigation</li> <li>• choosing a data collection method that includes social considerations</li> <li>• selecting a population or a sample</li> <li>• collecting the data</li> <li>• displaying the collected data in an appropriate manner</li> <li>• drawing conclusions to answer the question.</li> </ul> [9SP3]	C, PS, R, T, V
Statistics and Probability (Chance and Uncertainty)	Demonstrate an understanding of the role of probability in society. [9SP4]	C, CN, R, T

**Strand: Statistics and Probability (Chance and Uncertainty)**

**Outcomes**

*Students will be expected to*

**9SP4 Demonstrate an understanding of the role of probability in society.**

[C, CN, R, T]

**Achievement Indicator:**





9SP4.1 *Provide an example from print and electronic media, e.g., newspapers, the Internet, where probability is used.*

**Elaborations—Strategies for Learning and Teaching**

Students are familiar with terminology related to probability and have previously solved problems involving the probability of independent events (6SP4, 7SP4, 7SP5, 7SP6 and 8SP2). The concepts taught in data analysis and probability are used every day to make important decisions in various industries. Being familiar with these ideas will equip students to make intelligent and informed decisions.

An example such as the following could be presented to illustrate one use of probability in society.

**Short Term Forecast** Updated: Friday, August 14, 2009, 8:30 NDT

	<b>Friday Afternoon</b>	<b>Friday Evening</b>	<b>Friday Overnight</b>	<b>Saturday Morning</b>
				
	Sunny	Mainly sunny	Isolated showers	Cloudy periods
Temp.	24°C	20°C	17°C	14°C
Wind	SW 25km/h	SW 20km/h	SW 10km/h	W 5km/h
Humidity	50%	69%	84%	88%
P.O.P.	10%	10%	60%	20%
Rain	-	-	close to 1mm	-

Reference: *www.theweathernetwork.com*

To produce a probability forecast, the forecaster studies the current weather situation, including wind and moisture patterns and determines how these patterns will change over time. When discussing this example, ask students what assumptions a weather forecaster might make when making a probability forecast. This can lead into a discussion of other societal uses of probability.

*Continued*

---

**General Outcome: Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.**

---

**Suggested Assessment Strategies**

*Journal*

- Ask students to provide a report on examples of where probability is used in print and electronic media. (9SP4.1)
- Ask students to think of a TV game show where players consider probabilities when deciding how to proceed, and then explain the extent to which probability is involved. (9SP4.1)
- Ask students to look through print media and the Internet to find examples of cases such as the following:
  - (i) a situation where decisions affecting your community were made that might have been based on probabilities
  - (ii) a situation where a medical organization might make a decision based on probabilities
 Ask them to describe how probabilities were involved. (9SP4.1)

**Resources/Notes**

*Math Makes Sense 9*

Prep Talk Video: Probability and Statistics

Try It Virtual Manipulatives

*This program allows you to display data on graphs using spreadsheets.*

**Lesson 9.1: Probability in Society**

ProGuide: pp.4-9

Master: 9.6a, 9.6b

CD-ROM: Master 9.16

Student Book (SB): pp.424-429

Preparation and Practice Book (PB): pp. 347-352

## Strand: Statistics and Probability (Chance and Uncertainty)

### Outcomes

*Students will be expected to*

9SP4 Continued

#### Achievement Indicators:

9SP4.1 *Continued*

9SP4.2 *Identify the assumptions associated with a given probability and explain the limitations of each assumption.*

9SP4.3 *Explain how a single probability can be used to support opposing positions.*

### Elaborations—Strategies for Learning and Teaching

It should be brought to the attention of students that within some print or electronic media, probability is often implied without the use of specific terminology. For example, this can be illustrated through discussion of a news story similar to the following:

*Premier Danny Williams says he's confident there is big oil to be found off the west coast of the island and he's pleased to see NALCOR taking steps to move the industry forward. Opposition Leader Yvonne Jones raised concerns this week after the energy corporation invested 20 million dollars in such exploration; she compared it to a risky poker game. Williams says some minor discoveries bode well for NALCOR's recent investment, but he's hoping for more. Williams admits the oil business is risky, but he says the Opposition is just playing politics.*

Reference: VOCM, Aug14, 2009

From this story, the investing of 20 million dollars is justified based on previous smaller oil finds and the assumed probability of even greater finds. Students need to realize that predictions based on probability are affected by many factors and the assumption that these factors are constant. The article assumed that the investment in oil is appropriate based on previous oil finds, as well as the price and demand for oil. These assumptions would change as factors such as price and demand for oil changed.

Calculations of probability are always based on assumptions. Students should be encouraged to identify and examine the assumptions to help them determine whether the calculated probability is meaningful when making a decision.

Since probabilities involve assumptions and personal decisions about risks, it is possible to come to different probability conclusions when using the same information. Students could discuss how a single probability, such as the following, could be used to support opposing positions.

*The Weather Network says there is a 90% chance that 40 cm of snow will fall within the next 24 hours.* This probability could elicit different reactions from members of society.

---

**General Outcome: Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.**

---

**Suggested Assessment Strategies***Paper and Pencil*

- Wayne thinks that a good way to model the performance of a baseball player who gets a hit 1 time in 4 at bats is to use a spinner with 4 sections. What assumptions is he making? Are his assumptions valid? (9SP4.2)

*Journal*

- Ask students to find an article that includes probabilities and discuss the possible opposing viewpoints. (9SP4.3)

**Resources/Notes***Math Makes Sense 9***Lesson 9.1: Probability in Society**

ProGuide: pp.4-9

Master: 9.6a, 9.6b

CD-ROM: Master 9.16

SB: pp.424-429

PB: pp. 347-352

**Strand: Statistics and Probability (Chance and Uncertainty)****Outcomes**

*Students will be expected to*

**9SP4 Continued**

**Achievement Indicator:**

9SP4.4 *Explain, using examples, how decisions based on probability may be a combination of theoretical probability, experimental probability and subjective judgment.*

**Elaborations—Strategies for Learning and Teaching**

A review of how to determine probability and the difference between theoretical and experimental probabilities may be necessary.

Students should relate to how decision making is affected by the combination of probability and subjective judgements. For example, consider the variety of strategies people use when choosing their lottery numbers. Some use the same numbers for repeated lotteries, others use past frequencies to select their numbers, while others allow their numbers to be randomly selected.

A discussion of games of chance could lead to an explanation of how theoretical probability, experimental probability and subjective judgement would play a role in decisions made when playing such games. Students could play a game such as SKUNK. The instructions for a version of this game, along with follow-up activities, can be found on the NCTM website at <http://illuminations.nctm.org/LessonDetail.aspx?ID=L248>.

Students might engage in evaluating situations that lend themselves to reasonably accurate predictions, those that are questionable, and those for which the unknowns are not quantifiable. Road accidents with/without seatbelts is a good example for safe prediction. Health professionals predicting that people of lower socioeconomic status will have more health problems is a more questionable situation. There are many situations where the unknowns are too great to make probabilistic arguments. For example, attempting to find the probability of someone having the same name, age and birthdate as yourself involves too many unknowns to make an accurate prediction. Teachers could discuss with students: What are the reasons for the uncertainty? What are the important questions to ask regarding a situation in order to reduce it to probabilistic form?

## General Outcome: Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.

### Suggested Assessment Strategies

#### *Paper and Pencil*

- Students could be asked to give a written or oral report on scenarios such as the following:
  - (i) Jolene’s mother has an important presentation to make in the morning at a conference 200 km away. She has an evening meeting at work tonight. The weather network has reported a 50% probability of snow in the morning. The company she works for would pay for her hotel. What are the probabilities Jolene’s mother has to consider when deciding whether to make the drive tonight or in the morning? Which probability do you think would have the most impact on her decision? Explain.
  - (ii) What probabilities might a government consider when deciding whether to turn a two-lane highway to into a four-lane highway?  
(9SP4.4)
- Many insurance companies charge drivers under the age of 25 higher insurance premiums based on the probability of accidents. Ask students to find an article about car insurance costs based on the probability of collision and answer the following questions.
  - (i) In the article, what are the assumptions associated with each probability? Explain.
  - (ii) In your opinion, is there a bias against young drivers?
  - (iii) “Discussions about car insurance costs are based on a combination of experimental probability, theoretical probability, and subjective judgement.” Do you agree or disagree with this statement? Explain. (9SP4.1, 9SP4.2, 9SP4.4)

#### *Journal*

- Odette knows that theoretically she has a 1 in 2 chance of getting a head when she flips a coin. Claude had a particular coin that, when flipped 50 times, came up heads 40 of the 50 times. Ingrid feels that even if there is an equal chance of getting heads, heads will appear more often because she feels it is her lucky choice. Ask students to categorize whether or not the three individual’s decisions are based on subjective, experimental, or theoretical probabilities, and describe how each can play a part in decision making. (9SP4.4)

### Resources/Notes

#### *Math Makes Sense 9*

#### Lesson 9.1: Probability in Society

ProGuide: pp.4-9

Master: 9.6a, 9.6b

CD-ROM: Master 9.16

SB: pp.424-429

PB: pp. 347-352

## Strand: Statistics and Probability (Data Analysis)

### Outcomes

*Students will be expected to*

9SP1 Describe the effect of:

- bias
- use of language
- ethics
- cost
- time and timing
- privacy
- cultural sensitivity

on the collection of data.

[C, CN, R, T]

### Achievement Indicators:

9SP1.1 *Analyze a given case study of data collection, and identify potential problems related to bias, use of language, ethics, cost, time and timing, privacy or cultural sensitivity.*

9SP1.2 *Provide examples to illustrate how bias, use of language, ethics, cost, time and timing, privacy or cultural sensitivity may influence the data.*

### Elaborations—Strategies for Learning and Teaching

In Grade 8, the focus of instruction was to critique ways in which data was presented (8SP1). The emphasis in grade 9 is to analyze and critique the data collection process.

There are many factors within the data collection process that have the potential to influence the results. Students should consider factors such as the method used, the reliability and usefulness of data, and the ability to make generalizations about the population from a sample. To critically analyze data collection, students must have an understanding of the factors that might lead to problems in the data collection process. A good way to approach this would be for students to analyze survey questions showing only one problem. For example, the following situation illustrates how timing can affect data collection.

*Free samples of sunscreen are sent to every home in the fall and winter. A mail reply card asks people if they would use the product again.*

When preparing to collect data, appropriate questions are important. Students should consider the following:

- appropriate questions are clearly written, easy to answer, and effective in generating the desired data
- multiple choice questions are useful for identifying respondents' preferences
- questions should be ordered appropriately

Students should analyze how the phrasing of questions might affect the data collected. For a given case study, they should ask questions such as:

- Does asking this question collect the required information?
- Does the question make one response sound right and another one wrong, i.e., does it have bias?
- Is the question respectful?

When wording survey questions, factors that may influence the responses should be considered.

---

**General Outcome: Collect, display and analyze data to solve problems.**


---

**Suggested Assessment Strategies**
*Journal*

- Ask students to write about the following:  
Your friend is unclear what the term *bias* means. Develop an example to help explain the term. (9SP1.2)

*Paper and Pencil*

- Students could be given a case study such as the following and asked to determine the factor(s) that might affect the data collection. Ask students to rewrite the scenario without any bias.

*A marketing agency wants to determine how Canadians spend their clothing dollars. Jody wrote this question to determine how much is spent on imported clothing.*

*What does your closet contain more of?*

*A. less expensive, foreign made clothes.*

*B. high-quality, made-in Canada clothes.*

- (i) What specific information is Jody trying to obtain?
- (ii) Rewrite the question to avoid bias and sensitivity issues. (9SP1.1)
- Students could be asked to develop their own survey question that involves factor(s) that affect data collection. They could then identify the factor(s) involved and rewrite the question to collect accurate data. (9SP1.2)

**Resources/Notes**
**Lesson 9.2: Potential Problems with Collecting Data**

ProGuide: pp.11-16

CD-ROM: Master 9.17

SB: pp. 431-436

PB: pp. 353-357

Statistics Canada: [statcan.gc.ca](http://statcan.gc.ca)

**Census at School**

*This is an international classroom project for students aged 8 to 18. It provides a real survey project which engages students in data collection, graphing and data analysis.*

## Strand: Statistics and Probability (Data Analysis)

### Outcomes

*Students will be expected to*

**9SP2 Select and defend the choice of using either a population or a sample of a population to answer a question.**

[C, CN, PS, R]

#### Achievement Indicators:

9SP2.1 *Identify whether a given situation represents the use of a sample or a population.*

9SP2.2 *Provide an example of a situation in which a population may be used to answer a question and justify the choice.*

9SP2.3 *Provide an example of a question where a limitation precludes the use of a population and describe the limitation, e.g., too costly, not enough time, limited resources.*

9SP2.4 *Identify and critique a given example in which a generalization from a sample of a population may or may not be valid for the population.*

### Elaborations—Strategies for Learning and Teaching

To analyze whether a given situation represents a sample or a population, students must clearly understand these terms in the context of data collection and analysis.

Students may think that the term population only refers to a group of people. In fact, the term population can refer to a complete group of anything, such as all of the light bulbs produced by a factory.

Students may not recognize that a group of people referred to as a population could also represent a sample. Examples such as the following could clarify this: all the people living in Gander would be considered a population if a survey only required responses from residents of Gander. If a survey were conducted involving the residents of Newfoundland, then Gander residents would only represent a sample.

Different types of sampling may be examined here. This will be beneficial to students when they are developing a project plan (9SP3) and have to consider the choice of a data collection method.

Students should also be able to determine when it is best to use a population versus a sample when limitations are present. Suppose students want to conduct a survey to find out where to go on a class trip. It would be appropriate to ask everyone in the class. With a large population, however, it is impractical to survey everyone, so students need to use a representative sample group. Suppose they want to conduct a survey to determine if people in their community support year-round schooling. They would have to carefully consider whom to ask and how many people to ask. There are many factors that affect the feasibility of using the entire population.

Students should be encouraged to carefully consider any generalizations made from a sample to a population, as sometimes they may not be valid. For example, students could consider the following scenario: All Grade 9 students in the province were surveyed to determine the start time for the school day. 90% of the students in the St. John's area wanted school to start at 7:50 a.m. as they wanted to finish up early. This sample might not represent the majority of students outside St. John's because they would be considering different factors, such as length of time spent on bus travel to school, when completing their survey.

---

**General Outcome: Collect, display and analyze data to solve problems.**


---

**Suggested Assessment Strategies**
*Paper and Pencil*

- Ask students to identify whether a sample or a population is used in each of the following situations:
  - (i) All residents of a town are asked where a new school for the town should be located.
  - (ii) One out of every 100 MP3 players is tested for defects.
  - (iii) A student from each junior high class is questioned about removing chocolate milk from the lunch menu.

(9SP2.1)

*Discussion*

- Students could be asked to explain why data collection should include the entire population for situations such as the following:
    - (i) Jet engines, produced by a factory, should be tested before use.
    - (ii) A government official is elected.
    - (iii) Determine whether or not a junior high school should have a uniform.
- (9SP2.2)
- Students could be asked to explain the factors that would determine using a sample rather than a population in the following scenarios:
    - (i) Is there a need in Newfoundland for a mass vaccination for the flu virus?
    - (ii) Is there a need to check each light bulb coming off an assembly line for defects?
    - (iii) Is there a need to survey all people in an electoral district before an election to predict the winner?
- (9SP2.3)

**Resources/Notes**
*Math Makes Sense 9*
**Lesson 9.3: Using Samples and Populations to Collect Data**
**Lesson 9.4: Selecting a Sample**

ProGuide: pp. 17-23, 25-29

Master 9.7, 9.8a, 9.8b

CD-ROM: Master 9.18, 9.19

SB: pp.437-443, 445-449

PB: pp.358-362, 365-370

## Strand: Statistics and Probability (Data Analysis)

### Outcomes

*Students will be expected to*

**9SP3 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.**

[C, PS, R, T, V]

### Achievement Indicators:

9SP3.1 *Create a rubric to assess a project that includes the assessment of:*

- *a question for investigation*
- *the choice of a data collection method that includes social considerations*
- *the selection of a population or a sample and justifying the choice*
- *the display of the collected data*
- *the conclusions to answer the question.*

### Elaborations—Strategies for Learning and Teaching

Students will plan and carry out a data project to answer a question, and create a rubric to assess the project. The project will include formulating an appropriate question, collecting data from a sample or population, displaying the data, and drawing conclusions. Students will, individually or as a group, design a rubric to assess the project. Proper planning should identify potential problems with questions or data collection methods. Problem solving should permeate the whole process, as students decide on interesting topics, formulate questions, plan the collection of data, implement plans, and analyze results. This outcome should incorporate many of the other Statistics and Probability outcomes. This outcome is meant to be assessed based on the development and implementation of an individualized or group project.

In the mathematics curriculum, this would be the first exposure students have had developing rubrics. Individually or as a group, students will design a rubric to assess the project. The rubric should be developed before completing the project plan so they can reflect on appropriate data collection and analysis strategies from previous outcomes. A rubric can help focus students as they create the plan. One approach to preparing students to develop and carry out their own plan would be through a guided example. Students could use a rubric developed by the class to develop, carry out and assess their own project.

- List the criteria in column 1. Students may find it useful to order the criteria according to the sequence of the project.
- For each criterion, record an indicator for each of the four levels of performance. The first row in the example is completed to provide suggestions when students develop their own rubric.
  - Level 1 reflects work that shows little evidence of expected results.
  - Level 2 reflects work that meets minimum expected standards.
  - Level 3 reflects work that meets the expected standards.
  - Level 4 reflects work that is beyond the expected standards.

An example of what a rubric for a data analysis project could look like follows.

*Continued*

---

**General Outcome: Collect, display and analyze data to solve problems.**


---

**Suggested Assessment Strategies**
*Project*

- The following represents a list of ideas for use in the development of statistics projects. Each can be shaped by the students to better reflect their interests. Ask students to:
  - (i) Determine what type of transportation students in their school use to get to school. Does it differ with the time of year? Does it differ by grade level?
  - (ii) Determine the most popular types of after-school activities of students in their school. Does it differ by grade level?
  - (iii) Approach the student council, school council, or community council to suggest issues they would like investigated. Use this as a source for project work.
  - (iv) Survey or interview Grade 9 students to determine preferred part-time jobs and the amount of money typically earned. They may wish to include jobs such as babysitting, lawn mowing, and paper routes.
  - (v) Conduct a survey to find out information related to:
    - (a) their favourite sports team
    - (b) their favourite musical instrument

**Resources/Notes**
*Math Makes Sense 9*
**Lesson 9.5: Designing a Project Plan**

ProGuide: pp. 34-39

SB: pp. 452-453, 454-456

PB: pp. 371-373

*[webquest.sdsu.edu/rubrics/rubrics.html](http://webquest.sdsu.edu/rubrics/rubrics.html)*

*[teach-nology.com/web\\_tools/rubrics/](http://teach-nology.com/web_tools/rubrics/)*

*[teach-nology.com/tutorials/teaching/rubrics/print.htm](http://teach-nology.com/tutorials/teaching/rubrics/print.htm)*

**Strand: Statistics and Probability (Chance and Uncertainty)**

**Outcomes**

*Students will be expected to*

9SP3 Continued

**Achievement Indicators:**

9SP3.1 *Continued*

**Elaborations—Strategies for Learning and Teaching**

Criteria	Level 1	Level 2	Level 3	Level 4
The survey question	<i>- not clear and not related - limited or missing</i>	<i>- fairly clear but not related - some description</i>	<i>- mostly clear and related - adequate description</i>	<i>- very clear, concise, and related - detailed description</i>
The choice of data collection method				
Appropriate choice of sample or population				
The data collection process				
Appropriate data display				
Appropriate conclusions made from results				

Rubrics do not necessarily need four levels of achievement. The following shows a section of a rubric that has three levels of achievement.

Criteria	3 Good	2 Acceptable	1 Not Acceptable
Survey/Interview Question (1)	<i>Appropriate questions are asked; questions should generate all needed data.</i>	<i>Fairly appropriate questions are asked; questions should generate most of the needed data.</i>	<i>Inappropriate questions are asked to gather needed data.</i>
Survey/Interview Question (2)	<i>Questions are sensitive and do not create bias.</i>	<i>Questions are fairly sensitive; some may create bias.</i>	<i>Questions are biased and/or likely to offend respondents.</i>

---

**General Outcome: Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.**

---

**Suggested Assessment Strategies***Project*

- The following are suggested project topics that may be of interest to students.
  - (i) healthy eating
  - (ii) facebook
  - (iii) bullying
  - (iv) mandatory physical education

**Resources/Notes***Math Makes Sense 9***Lesson 9.5: Designing a Project Plan**

ProGuide: pp. 34-39

SB: pp. 452-453, 454-456

PB: pp. 371-373

## Strand: Statistics and Probability (Chance and Uncertainty)

### Outcomes

*Students will be expected to*

9SP3 Continued

#### Achievement Indicators:

9SP3.2 *Develop a project plan that describes:*

- *a question for investigation*
- *the method of data collection that includes social considerations*
- *the method for selecting a population or a sample*
- *the method to be used for collection of the data*
- *the methods for analysis and display of the data.*

9SP3.3 *Complete the project according to the plan, draw conclusions and communicate findings to an audience.*

9SP3.4 *Self-assess the completed project by applying the rubric.*

### Elaborations—Strategies for Learning and Teaching

In some situations, projects may be such that each group of 3 or 4 students takes a different project topic, and tasks are sub-divided to individual members of this smaller group.

Alternatively, it may be desirable to develop a whole-class project in which small groups work on components of a larger question. Later the parts are combined to answer the larger question. For example, a large group wishing to study a common issue may split into smaller groups, with each assigned to study one of the following:

- parental or community opinions
- student views
- teacher or administration views

You may wish to have students present their findings. They could do a written or oral report, incorporating technology if desired. The presentation should outline the project plan and conclusions. To judge if conclusions are reasonable, communication about how data was collected should describe the method of collection, the sample or population used, and why the survey was conducted. The report should also include:

- the question(s) asked in the survey
- appropriate display of the data
- valid conclusions based on the data.

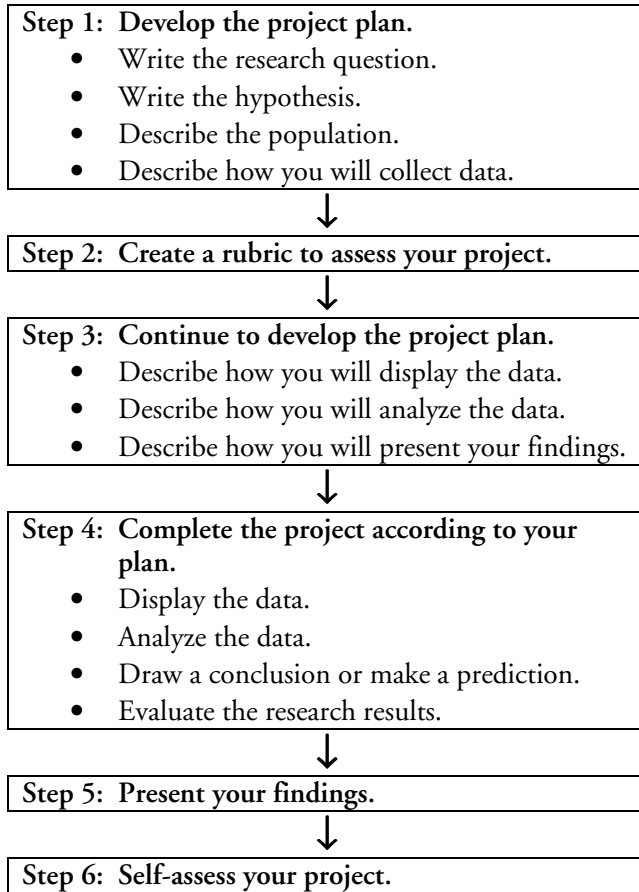
Completing the project will allow students to revisit the various display methods developed in previous grades.

**General Outcome: Use experimental or theoretical probabilities to represent and solve problems involving uncertainty.**

**Suggested Assessment Strategies**

*Graphic Organizer*

- Ask students to create an organizer, such as the flow chart below, to help organize the research project and carry out the plan.



**Resources/Notes**

*Math Makes Sense 9*

**Lesson 9.5: Designing a Project Plan**

ProGuide: pp. 34-39

SB: pp. 454-456

PB: pp. 371-373

