Name _____ Date _____

Master 9.16

Extra Practice 1

Lesson 9.1: Probability in Society

1. Indicate whether each decision is based on theoretical probability, experimental probability, or subjective judgment. Explain how you know.

a) The last 10 times Jerome tried to access a certain Internet website, he got an error message saying that the site was unavailable. So, he decides the site no longer works and does not try to access it again.

b) When Karen's mother learns she is pregnant, she celebrates by buying a pink baby blanket because she has a feeling the baby will be a girl.

c) Aaron chooses a long email password because it is more difficult to determine a long password than a short one.

2. An advertisement for a desktop computer claims it is 80% smaller than other computers.

a) Why do you think the advertisers decided to include this statistic in the ad?

b) How could someone use this statistic to justify not buying the computer?

3. Angela visits a website to read reviews about a new MP3 player. There were three reviews: two people thought it was great, and one person thought it was terrible. So, Angela concludes that there is about a 66% chance that she will be happy with the MP3 player.

a) What assumptions did Angela make?

b) If each assumption changes, how might the predicted outcome change?

4. An ad for a sugar-free hard candy claims it has 50% fewer calories than the leading brand.

a) Explain how a person's decision about whether to try this candy could be based on probability and subjective judgment.

b) If the person does decide to try the candy, what assumptions might he be making? For each assumption, explain how the predicted outcome might change if the assumption changes.

Name _____ Date _____

Master 9.17

Extra Practice 2

Lesson 9.2: Potential Problems with Collecting Data

1. Name a problem with each data collection.

a) To discover common fears, Chris asks his classmates if they are frightened by spiders, snakes, rats, or slugs.

b) To find out the proportion of people who recycle tin cans, a person counts the number of households with tin cans in their recycling bins.

c) To estimate how much meat to buy for a barbecue party, Sarah asks her guests: "Do you prefer beef or chicken kebabs?"

2. Kevin thinks his drama club should spend more money on props. During the intermission of the spring play, he surveys the audience and the cast to see if they agree.

a) Describe how the timing of his question may influence the responses.

b) In what setting might the responses be different than those Kevin received?

3. Rena wanted to find out how often people in her neighbourhood used the local bike paths or walking trails. She asked her neighbours the question: "How much time do you spend outdoors each month?"

a) How do you think her neighbours will interpret this question?

b) How could the question be rewritten so it would more accurately reflect what Rena wants to know?

c) Who might be interested in her findings? Why?

4. **a)** Describe how each question reveals a bias of the questioner.

i) Do you think it would be a good idea to ban French fries because they contain trans fats?

ii) Old gasoline-powered lawn mowers pollute more than cars. Do you agree that the government should offer rebates to people who replace them with more efficient mowers?

iii) Which sport is your favourite: soccer, tennis, or judo?

b) Rewrite each question to eliminate the bias. Explain how your question is an improvement.

Name _____ Date _____

Master 9.18

Extra Practice 3

Lesson 9.3: Using Samples and Populations to Collect Data

1. In each case, describe the population.
- **a)** A social networking site wants to know the typical age of a person who uses the site.
- **b)** A book retailer wants to know which demographic groups buy travel books.
- **c)** A music store wants to know how many school-aged students take piano lessons.

2. Should a census or sample be used to collect data about each topic? Explain your choice.
- **a)** The number of people in your neighbourhood who use public transit at least once a week
- **b)** The number of grade 9 students in your school who participate in extra-curricular sports programs
- **c)** The number of hours members of your family spend on the computer in a week
- **d)** The effectiveness of a new vaccine

3. Suppose you are on the town council. You want to know whether residents would prefer a new tennis court or soccer field.
- **a)** What population are you interested in surveying?
- **b)** Would you survey a sample or population? Explain.
- **c)** If you had to use a sample, what would you do to make sure your conclusions are valid?

4. In each case, do you think the conclusion is valid? Justify your answers.
- **a)** Ingrid surveyed 20 residents to find out if they thought pesticides were harmful to the environment. All of the residents said yes. Ingrid concluded that all residents in the town were in favour of a ban on pesticide use.
- **b)** A reporter asks 5 people on the street this question: “In light of the many recent home invasions, do you think police are doing all they can to keep us safe?” Four of those interviewed say the police are not keeping us safe. The reporter concludes “4 out of 5 citizens are worried about personal safety.”

Name _____ Date _____

Master 9.19

Extra Practice 4

Lesson 9.4: Selecting a Sample

1. Identify a potential problem with each sampling method.

a) A politician wants to know what people think of the healthcare system. He interviews people as they leave a walk-in medical clinic about their opinions.

b) A movie theatre wants to predict the success of several new movies. On its website, it posts a poll asking people to vote for the movie they most want to see.

2. Explain whether each sample is appropriate. Justify your answer.

a) Suppose you want to know what sports equipment people in your community are most likely to purchase. You survey every 10th customer who makes a purchase at your store.

b) A researcher phones every 10th person on a union's membership list to determine union members' opinions about the services the union provided.

c) A town's recreation director wants to know what residents think about building a swimming pool in the community centre. He posts a survey in the local newspaper and tells people they can mail it to him or drop it off at the community centre.

3. **a)** In each case, will the selected sample represent the population? Explain.

i) To find out consumers' reaction to a new soft drink, a soft-drink company invites people to rate how much they like the new drink on its website.

ii) To discover the most popular shoe brands purchased at a mall, Laurel asks every customer entering a shoe store which brand they are most likely to buy.

iii) To determine the effectiveness of a new advertisement campaign, a company tracks sales of the product at every tenth store on the list of stores to which they distribute the product.

b) If the sample does not represent the population, suggest another sample that would. Describe how you would select that sample.

4. Describe an appropriate sampling method for each situation. Justify your answers.

a) The city council wants to know what citizens who live near a two-lane road think about widening the road to four lanes.

b) A college wants to know high school students' opinion of a career in the entertainment industry.

Name _____ Date _____

Master 9.20

Extra Practice Sample Answers

Extra Practice 1 – Master 9.16

Lesson 9.1

1. **a)** Jerome has noticed that the experimental probability of being able to access the website is 0 out of 10. So, he makes a subjective judgment that the website must not work.
   b) Karen's mother's decision is based on a feeling, which is a subjective judgment.
   c) Aaron's decision is based on the theoretical probability that a longer password is harder to crack because there are a greater number of other possible passwords of the same length.

2. **a)** I think advertisers included the statistic to show that the computer would leave more room for other things you might be working on while using the computer and that it can be placed in smaller spaces.
   b) Someone could use the statistic to argue that the computer would not contain all the outlets or hardware features they need, meaning they would have to buy more pieces, like USB hubs, portable hard drives, or portable DVD burners.

3. **a)** Angela assumed that she has the same level of comfort with technology as the reviewers and is interested in the same features.
   b) If Angela is not comfortable with technology, she may be less likely to be happy with the MP3 player. If Angela is more comfortable with technology than these reviewers, she is less likely to be happy with the MP3 player since she may find it too simple. If Angela is interested in different features of the MP3 player than the reviewers, she may be more or less happy, depending on the features important to her.

4. **a)** The person would use probability to decide to try the candy if he thinks he will consume fewer calories by eating this candy rather than a different brand's candy. The person would use subjective judgment to decide not to try the candy if he thinks that whatever has been done to the candy to make it have fewer candies will make it have a less-appealing taste.
   b) The person may assume that the sugar-free candies are the same size as the other brand's candies. If the candies are smaller, the person may end up eating more candies and consuming more calories than he thought he would. If they are larger, the person may end up eating fewer candies and consuming fewer calories.

Extra Practice 2 – Master 9.17

Lesson 9.2

1. **a)** Use of language: Chris is trying to find out about common fears, but he is only asking about fears about insects and animals.
   b) Privacy: The person should not be examining the contents of households' recycling bins without their knowledge.
   c) Cultural sensitivity: Some of Sarah's guests may be vegetarian.

2. **a)** Since most people have just had a chance to see the props used in that production, they will probably be making their decision based primarily on what they just saw instead of considering other productions, as well.
   b) If Kevin surveys people after several months, they may be more likely to consider the props used in other productions.

3. **a)** They will probably think she is referring to all the time they spend out-of-doors, including in their backyards, at parks, or on vacation.
   b) "How much time do you spend using the local bike paths or walking trails each month?"
   c) The city might be interested in her findings. If they find these paths or trails are used frequently, they may consider creating more. If they find that they are not used frequently, they might do more research to determine whether it is because the trails are inconvenient,

Name _____ Date _____

Master 9.21

Extra Practice Sample Answers

poorly-maintained, or because people prefer other activities.

4. **a) i)** The expected answer is "Yes." The question presents a negative feature of most French fries: they contain trans fats.
   ii) The expected answer is "Yes." The question presents a negative feature of older gas-powered lawn mowers: they pollute more than cars.
   iii) There are only 3 options, so respondents have to say their "favourite" sport is one of the 3 given, even if they dislike them all.
   b) i) "Do you think it would be a good idea to ban French fries?"
   ii) "Do you think the government should offer rebates to people who replace old gas-powered lawn mowers with more efficient mowers?"
   iii) Which of these sports do you prefer: soccer, tennis, or judo?

Extra Practice 3 – Master 9.18

Lesson 9.3

1. **a)** People who use the social networking site
   b) People who buy travel books
   c) Students in grades K-12 who take piano lessons

2. **a)** Sample: It would take too long to survey every person in your neighbourhood.
   b) Census or sample: It depends on the size of the school and how easy it would be to get rosters of students who participate in extra-curricular sports.
   c) Census: It is easy to ask each of your family members.
   d) Survey: It would be almost impossible to survey every person who took the vaccine.

3. **a)** City residents
   b) Sample: It would be too expensive and time-consuming to survey every person.
   c) I would make sure it included people who represented different groups within the city population.

4. **a)** No, the conclusion is not valid. The sample is not large enough, and Ingrid may have surveyed people who were similar, instead of from different groups.
   b) No, the sample size is too small and the question is biased: it leads people to answer yes since it reminds them of the "many recent home invasions."

Extra Practice 4 – Master 9.19

Lesson 9.4

1. **a)** Only people at the medical clinic will have an opportunity to be surveyed.
   b) Only people who visit the website and are very interested in a particular movie will vote.

2. **a)** Not appropriate: not all people in your community who participate in sporting activities buy their equipment at your store. Also, customers who came, then left without purchasing anything may be most likely to purchase equipment not available at your store.
   b) Appropriate: the sample should be representative of all union members.
   c) Not appropriate: only people who read the newspaper and care about the survey will respond.

3. **a) i)** No: people who visit the soft-drink company's website are likely fans of the product or have a complaint.
   ii) No: people entering the store are probably choosing the store because they like the brands it carries.
   iii) Yes: the trends at these stores are probably true in general since they will likely be in different regions and serve different groups of people.
   b) i) Set up taste tests at several grocery stores in different regions.
   ii) Have people survey every 10th person who leaves the mall, asking whether they bought any shoes, and if so, which brands did they purchase?

4. **a)** Mail a survey to every 5th residence in the affected neighbourhoods and ask people to respond by dropping off the

Name _____ Date _____

Master 9.22

Extra Practice and Activating Prior Knowledge Sample Answers

survey at city hall, returning it by mail, or by email.

b) Survey a random selection of students from several local high schools.

Activating Prior Knowledge Master 9.23

1. a) Answers will vary. For example:
Use a table to organize the results from each toss.

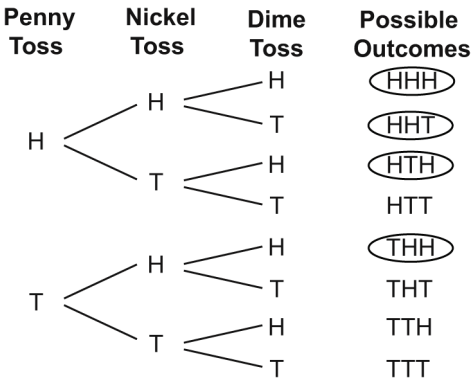
Toss	Penny	Nickel	Dime
1	H	H	H
2	T	T	H
3	T	T	H
4	T	T	H
5	H	T	H
6	T	T	H
7	H	H	H
8	H	T	H
9	T	T	T
10	H	T	T
11	H	H	T
12	T	T	T
13	T	H	T
14	T	T	H
15	T	H	H
16	H	T	H
17	T	H	T
18	T	H	T
19	T	H	T
20	T	T	T

Experimental probability

$= \frac{\text{number of tosses with at least 2 heads}}{\text{total number of tosses}}$

$= \frac{7}{20}$, or 0.35

b) Use a tree diagram to organize the possible outcomes.



Theoretical probability

$= \frac{\text{number of outcomes with at least 2 heads}}{\text{number of possible outcomes}}$

$= \frac{4}{8}$, or 0.5

2. Theoretical probability

$= \frac{\text{number of \$100 prizes}}{\text{number of promotional labels}}$

$= \frac{20}{5\,000\,000}$

$= \frac{1}{250\,000}$

Name _____ Date _____

Master 9.23

Activating Prior Knowledge

Experimental and Theoretical Probability

The **experimental probability** of an event occurring is: $\frac{\text{number of times the outcome occurs}}{\text{number of times the experiment is conducted}}$

The **theoretical probability** of an event occurring is: $\frac{\text{number of outcomes favourable to that event}}{\text{number of possible outcomes}}$

After many trials, the experimental probability should be about the same as the theoretical probability.

Example

a) A telemarketer made 200 phone calls and 35 new customers signed up. What is the experimental probability, as a percent, that the next person she calls will sign up?

b) Suppose it is equally likely that a child is a boy or a girl. What is the theoretical probability that, in a family with 2 children, the children have opposite genders?

Solution

a) Experimental probability: $\frac{\text{number of new customers}}{\text{total number of phone calls}} = \frac{35}{200}$, or 17.5%

The experimental probability that the next person will sign up is 17.5%.

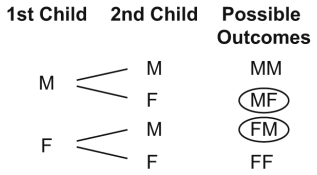
b) Use a tree diagram to organize the possible outcomes.

Theoretical probability

$= \frac{\text{number of outcomes with 1 M and 1 F}}{\text{number of possible outcomes}}$

$= \frac{2}{4}$, or 0.5

The theoretical probability that a family will have two children with opposite genders is 0.5.



Check

1. **a)** Toss a penny, nickel, and dime 20 times and record each outcome.
What is the experimental probability of tossing the coins and getting at least 2 heads?
b) Determine the theoretical probability of tossing the coins and getting at least 2 heads.

2. A beverage company runs a promotion. Customers check the back of the beverage label to find out if they have won a prize. They print 5 000 000 promotional labels. There are 20 instant cash prizes of $100. What is the theoretical probability of winning a $100 prize?