Math 9 Chapter 10 Data Collection and Analysis Name:
Introduction

Do you agree or disagree with the following. Explain your answer

1. If you want to know the favorite music of all the Grade 9's, you can determine the answer by asking a few students in your Math class

Disagree:
1) small sample size
2) Math class may not represent all Gr 9's

2. If you ask people if they have ever committed a crime, they are likely to be honest with you

Disagree:
1) answer may embarras respondents

3. Most people would be comfortable with a stranger asking them questions about their personal habits

Disagree:
1) sharing personal info with strangers uncommon

4. You are likely to get a different response from people waiting a bus stop about a plan to add more buses to the bus route

Agree:
1) Most bus users would be in favor of adding more buses

5. You are likely to get a different response from people, attending a hockey game, about their favorite sport

Agree:
1) hockey would probably be their favorite sport

Math 9 10.1 Collecting Data: Asking Appropriate Questions Name:

When you wish to know how people feel about a topic or you wish to know their opinions, you collect DATA (information).

One way of collecting DATA is to conduct a SURVEY.

RESPONDENTS are people who respond to (or answer) the survey questions

In order to gather accurate DATA, it is important to ask APPROPRIATE QUESTIONS

EXAMPLE 1

The city is planning to build a new theater. It plans to conduct a survey of the citizens to determine how much support it has for the theater

Comment on the following survey questions. What are the advantages and disadvantages?

Do you think people would use the theater? No way of knowing what others think

- It is a Yes/No question - easy to answer

Do you think the city should build a new theater? Most would say yes.

- Does not include info about cost.
- It is a Yes/No question - easy to answer

Comment on the following survey questions. What are the advantages and disadvantages?

Order the following in order of preference

This question does not determine opinions re: new theater ... only in relation to other projects

A new school
A new library
A new theater
A new highway overpass

Please choose one of the following

CLEAR, but 1st Question should ask Theater Yes/No

I support the building of a theater
I support a new theater, but I don't wish my taxes to increase to pay for it
I support a new, theater, but not near my home
I don't support a new theater

EXAMPLE 2

The cafeteria is planning to serve spaghetti at lunch and wishes to survey the students as to its popularity as a cafeteria food. Comment on the following questions.

What is your favorite cafeteria item?

- too open ended
- should be M/C question

Do you like spaghetti?

- Yes / No
- but vague

How often do you buy cafeteria meals?

- choices
  - once/wk
  - twice/wk
  - etc

Would you buy spaghetti from the cafeteria?

- Yes / No
- Clearer needs to be etc
- should include · price
  · frequency

EXAMPLE 3

A group of business students is planning to sell popcorn at lunch in the lounge. Design a survey of 5 questions to determine the popularity. Comment on the questions

1. Would you buy our popcorn? 3rd simple yes/no

2. How much should we charge per bag? 4th contains choices
   a) Less than 25 cents?
   b) Between 25 and 50 cents?
   c) More than 50 cents?

3. Order the following in popularity. shows how popular popcorn is in relation to other products
   a) Chocolate bars
   b) Popcorn
   c) Candy
   d) Cupcakes

4. What kind of popcorn would you prefer to buy? - Could be last Question
   a) Plain
   b) Buttered
   c) Cheese popcorn
   d) Other

5. How often per week would you buy popcorn? - Could be Q#1

EXAMPLE 4

A survey was conducted to determine the popularity of a movie. Rearrange the questions so the order makes more sense. Explain your choice

1. Rate the movie regarding the following..
    a) Action
    b) Story
    c) Acting
    d) Cinematography

2nd – Gets respondent thinking about movie

2. Would you recommend this movie to your friends?

4th – assesses the value of the movie

3. Have you seen this movie?

1st – no sense continuing unless they saw movie

4. Did you enjoy the movie?

3rd – purpose is enjoyment

Math 9 10.2 Notes Name:

Bias, Sensitivity and Method

A ~~BIASED~~ question encourages respondents to answer questions in a particular way, either in a POSITIVE or a NEGATIVE way. The question cannot influence a response one way or the other.

For example: Do you agree that apple pie is the absolute best dessert

In order for a survey question to gather the appropriate data, the question must not be BIASED

Determine the BIAS in the following questions and suggest a corrected question

1. Don't you think that the Christmas holiday is too short?
   a) Is there bias? Yes
   b) What is the bias? everyone would answer yes
   c) Re-write the question? How long should Christmas holiday be
      a) b) c) d)

2. Do you prefer Rapp or boring classical music?
   d) Is there bias? Yes
   e) What is the bias? applies a "value judgement" to classical
   f) Re-write the question?
      Which form of music do you prefer
      a) b)

3. What is your favorite food?

   fruit_____ pizza_____ salad_____ rice cakes_____

   a) Is there bias? NO
   b) What is the bias?
   c) Re-write the question

4. Nike's is on sale at the sports store. What is your favorite running shoe?

a) Is there bias? Yes
b) What is the bias? Nike (on sale) has the advantage due to price
c) Re-write the question What is your favorite running shoe
a) b) c) d)

5. Why is green your favorite color?

a) Is there bias? Yes
b) What is the bias? applies a positive value to "green"
c) Re-write the question
What is your favorite color?
a) b) c) d)

Comment on any bias in the following

6. A survey about people's favorite sports store was conducted outside of The Running Room. Comment on the bias involved Not a neutral location

7. 5 students were questioned about food choices in the cafeteria. Comment on the bias involved Sample size too small

8. Individuals living near the airport were surveyed about the possibility of adding more runways Individuals ~~#~~ near airport would be affected by noise of added runways

9. Students were surveyed by e-mail about a new lunch time entertainment in the theater not all students would have an equal chance to answer questio

10. Students wandering the lounge at lunch were asked about their lunch choices

~~Does Not Represent~~ Rep

Not a representative sample

SENSTIVITY

Survey questions must be sensitive to a person's personal privacy. The questions should try not to offend or be embarrassing. Questions involving income, religion, personal habits must be asked with care

How could you re-phrase the following questions in order to make them more sensitive?

* DON'T REQUIRE NAMES on surveys

1. Have you ever cheated on a test?

   How widespread is cheating (in your opinion)

   or

   ~~How often many (in your op~~

2. Have you ever been bullied?

   How often do you think bullying occurs in the school

   a) b) c) d)

3. To what religion does your family belong?

4. How many in your house have graduated from high school?

5. What is the annual income of your family?

6. Who did your parents vote for in the last election?

METHOD

Information can be gathered in many ways.
Surveys
Interviews
Experiments
Observations

Which method would be most appropriate to gather information about the following?

1. People's opinion about a proposed tax increase

   Survey

2. Are the average marks of Claremont students higher than the average marks of the rest of the province?

   - observation
   - collect statistics

3. Do the sparrows prefer bird food A or bird food B?

   Observation

4. The opinion of local residents about the building of a highway overpass

   Survey

Math 9 10.1/10.2 Worksheet Name: _____

There are several factors that could lead to problems with collecting data

- Bias-question influence the response one way or the other
- Use of language-could lead to a particular answer
- Privacy-some respondents may not want to participate or may not their responses shown
- Cultural Sensitivity-Be aware of other cultures. Avoid culturally offensive questions

A. Jesse wants to find out if there is a relationship between household income and how much people spend on Christmas shopping

Not everyone celebrates Christmas. What might be a beginning question?
Does your family participate in gift giving over Christmas

Information about income and spending habits is personal, so people may feel uncomfortable responding to those topics. Survey should be anonymous.
Use of language can influence responses
"How much to make?" or "How much do you spend?" or "What do you spend your money on?" may be inappropriate. Design a better question

B. Determine the problem with each question, and then re-design the question.

1. How much time do you spend on the computer each week?

a) b) c) d)

2. Do you think cancer causing cigarettes should be banned?
omit

3. Do you waste time playing computer games?

How much time do you spend on computer each week

a) b) c) d)

4. When you exercise, do you like to run or to lift weights?

more choices

5. Should students be permitted to wear religious head coverings in school?

Yes / No

6. Grade ~~9~~ 12 students are surveyed about the use of the student parking lot.

Gr 9's don't drive

7. Do you smoke? Give choices re: frequency

a) b) c) d)

what does this mean

8. Which is the greatest hockey country in the world?

Biased toward Canada.

Rank hockey countries

1 to 5

or

~~ask people from all host~~

Which country has host international record

C. Suppose that the cafeteria is thinking about introducing some new dessert choices?

Design a survey of 3 questions.

Surveys questions can come in different forms

1. *Yes or No type responses*
2. *True or False responses*
3. *4 – 5 choices*
   Question: How often do you text per day?
   a) *never*
   b) *0 -5 times per day*
   c) *6 – 10 times per day*
   d) *More than 10 times per day*

1. Do you buy ~~food~~ dessert in cafeteria
   Yes / No

2. Rank popularity of these dessert
   1)
   2)
   3)
   4)

3. Would you buy this new dessert
   Y/N

   How often

Math 9 10.3 Selecting a Sample or Population Name:

- The school wishes to know what the students feel about a new mural proposed for the student lounge.
- The school could take a CENSUS of the entire POPULATION, or it could take a SAMPLE.
- A CENSUS would give 100% accuracy in the results
- Will the SAMPLE results give similar results to surveying the whole population?

CENSUS-collects data about and for the whole population

POPULATION-total set of people or things being investigated

SAMPLE-part of a population, selected to give information about the whole

How can you ensure that the results from the sample will resemble the whole population?

- Sample size?
  Large enough to be representative
- Who should be selected?
  Sample should be representative of the ENTIRE POPULATION
  -should contain same % of girls/boys and each grade 9-12

REPRESENTATIVE SAMPLE-
Similar to ENTIRE POPULATION
ie gender, age, etc

Why does using a SAMPLE make sense, rather than surveying the entire POPULATION?

- Easier
- Quicker
- Less expensive

Students Council would like to determine whether the students would favor a school dance.

How should the Council design the sample used to conduct the survey?

1. How large should the sample be?

   Perhaps 40 students

2. What group(s) should be part of the sample?

   - Grades 9-12
   - boys + girls

   } amounts should be in same ratio as the school

3. How should the respondents be selected?

   Respondents should be RANDOMLY

Ma 9 10.3 Methods of Sampling Name:

1. **Simple Random Sample**

Every member of the population has an equal chance of being selected.

For example: If the population is Claremont students then the sample is all Boys and girls in Grades 9 - 12

2. **Systematic Sample**

Every nth member of a population is selected

For example: every 3rd person

3. **Convenience Sample**

Every convenient member of a population is selected

For example: A survey of the popularity of hockey made at a Canucks game

4. **Stratified Random Sample**

Every member of different segments of a population has an equal chance of being selected

For example: school survey includes an equal number of Grade 9, 10, 11, and 12 students

5. **Cluster Sample**

Every member of a randomly drawn population subdivision is selected

For example: Either Grade 9, 10, 11, or 12 is chosen at random or every student in that grade is surveyed

6. **Self Selected Sample**

Only interested members of a population participate

For example: For a survey sent out on the internet, only people who have read it on the computer can respond

Identify the sampling method most appropriate for each of the following

1. Every 4th person is selected

   Systematic

2. Five randomly chosen players from each school team are selected

   stratefied random sample

3. A table at the mall was set up and people who came to the table were surveyed

   self selected
   ~~Convenience~~ sample

4. Ask all the guests at a party

   convenience

5. Generate random numbers and assign to people

   simple random

6. Randomly select a block in a neighborhood and survey everyone living on that block

   Cluster sample

7. Post a sign asking people to phone a number and express their opinions

   Self selected

Ma 9 10.4 Communicating about Data Name:

Example Survey

1. **Do you have a part-time job? Yes_____ No_____**
2. **If so, how many hours per week do you work?**

   a) less than 5 hrs b) 5 to 12 hrs c) 13 to 20 hrs d) more than 20 hrs
3. **Do you enjoy your job Yes_____ No _____**
4. **Do you work on school days? Yes_____ No_____**
5. **What is your hourly wage?**
6. **Are you satisfied with your hourly wage? Yes_____ No_____**

Are the questions clear and easy to answer?

For question #5, should options be included?

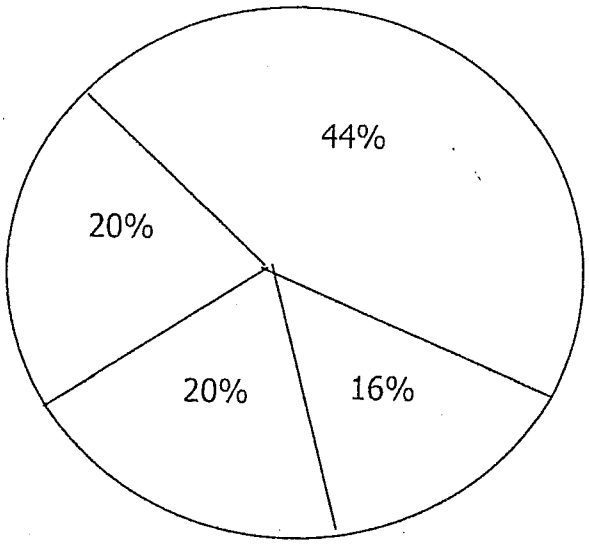
Are the questions arranged in the most appropriate order?

A total of 40 students were surveyed with the following results

Question	Yes	No	a	b	c	d
1	25	15				
2			5	11	5	4
3	17	8				
4	20	5				
5						
6	7	18				

Question # 5—Answers ranged from $6/hr to a high of $20/hr

Results for Question # 2 as a Pie Graph



a) 5/25 = 20%

b) 11/25 = 44%

c) 5/25 = 20%

d) 4/25 = 16%

$\frac{25}{40} = 62.5\%$

From the results, I have concluded that 62.5% of Claremont students have a part time job

From the results, I have concluded that 44% of Claremont students work between 5 and 12 hrs per week

Things to consider about communicating the data:

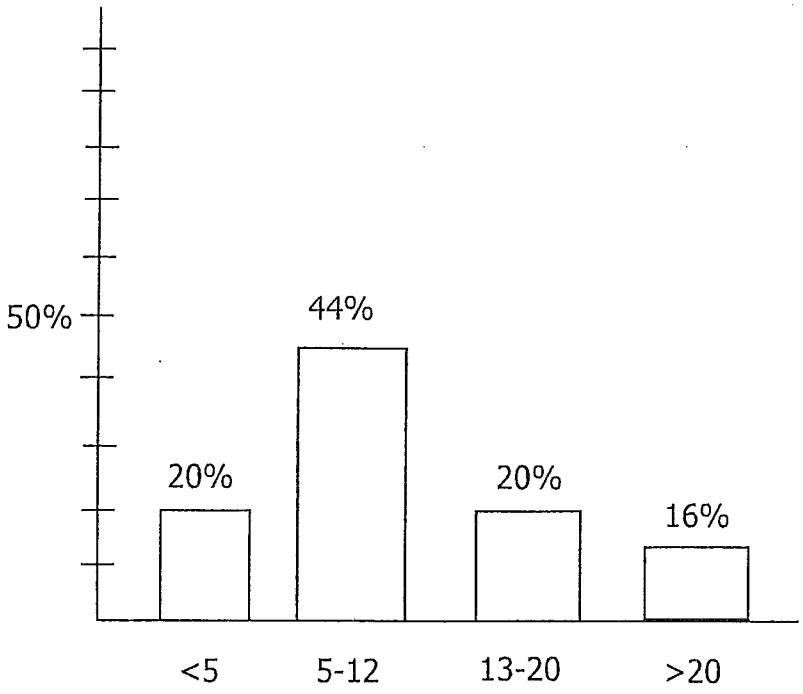
1. Was the sample size large enough to draw a conclusion?

2. Was the sample representative of the population?

3. Were any of the questions biased one way or the other?

4. Communication?
   a) Were all the important details included?
   b) Was the choice of sample justified?
   c) Was the type of graph appropriate?
   d) Did you make reasonable conclusions and justify them?

The results for Question # 2 can be shown as a Bar Graph



Math 9 10.4 Tally Sheet and Conclusions Name:

Question	Total Respondents		Tally	Sum	___out of ____	Percentage
1.	27	Yes No	𝍸 𝍸 || 𝍸 𝍸 𝍸	12 15	12/27 15/27	45% 55%
2.	10	a) Less than 5 hrs b) 5 – 12 hrs c) 13 – 20 hrs d) More than 20 hrs	𝍸 |	6 1 1 2	6/10 1/10 1/10 2/10	60% 10% 10% 20%
3.	10	Yes No	𝍸 ||| ||	8 2	8/10 2/10	80% 20%
4.	10	Yes No	𝍸 𝍸 ||| ||	8 2	8/10 2/10	80% 20%
5.		a) less than $6 b) $6-8 c) $9 or more	| || 𝍸 || 𝍸 𝍸	1 2 7	1/10 2/10 7/10	10% 20% 70%
6.		Yes No	𝍸 𝍸 𝍸	5 5	5/10 5/10	50% 50%

Conclusions:

Question 1:

. Generally, we found that, of the students surveyed, 45% had a part time job, while 55% did not

. We were surprised that the 45% figure was this high

. We explain this — - = - - -

Ma 9 10.4 Survey Conclusions Name: _____

Explain whether you would accept or reject each conclusion based on the Sample. Assume all samples are random.

1. Conclusion: 27% of students at school have red hair.
   Sample: 20 students were observed in the hall at lunch

2. Conclusion: 97% of students prefer to communicate via Facebook
   Sample: A Facebook page was set up so students could respond

3. Conclusion: 97% of calculators were determined to be reliable
   Sample: 1000 calculators were tested and 30 were defective

4. Conclusion: 4 out of 5 dentists recommend 'Brite White' toothpaste
   Sample: 5 dentists were surveyed

5. Conclusion: 45% of Claremont students speak a second language.
   Sample: Students on the third floor of the school were surveyed during Block 1