Math 7
Statistics and Probability: Air Quality

Abstract

Through activities, students learn about air pollution and how information can be recorded and presented.

Logistics

Time Required

- **Class Time:** One 60-75 minute class.
  Extensions will take additional time.
- **Prep Time:** 20 minutes

Materials

- Student Worksheet – Air Quality

Classroom Requirements

- Computer(s) with Internet access (optional)

Learning Objectives:

Using an interdisciplinary approach students:

- Increase mathematical skills of central tendency and range, as well as the construction, labeling and interpretation of circle graphs
- Gain an understanding of local issues and increased awareness of air quality

Prescribed Learning Outcomes, B.C. Curriculum:

- D1 demonstrate an understanding of central tendency and range by determining the measures of central tendency and range
- D2 determine the effect on the mean, median, and mode when an outlier is included in a data set
- D3 construct, label, and interpret circle graphs to solve problems

Classroom Implementation

1. **Have a brief discussion about air quality in the region. (5 to 10 minutes)**

Help students identify that local issues can be relevant to and incorporated into our learning, even mathematics. Discuss contributors to pollutants in the airshed. For example, transportation, industry, restaurants, tire treading companies, open burning, heating and energy use, fugitive dust, forest fires, agricultural activities and so on. Refer to the Background section of the resource package for more information on air pollutants, their sources and impacts.

2. **Students complete Questions 1-4 on Student Worksheet. (15-20 minutes)**

3. **Have students discuss their personal and family energy use.** Ask:

   How does the local power company generate electricity used in homes in your area? (Most answers will focus on hydroelectricity.)
   What other types of energy does your family use, and for what purposes? (Possible answers for types of energy include electricity, natural gas, oil, wood. Possible answers for purposes include for lighting, electronics, cars, cooking, yard work, music and home heating.)

4. **Build the background connections between energy use and pollution.** Tell students that sulfur dioxide, or SO_2, is an indicator of pollution. Explain to students that chemical reactions in the atmosphere cause SO_2 emissions to contribute to acid rain. Acid rain, which falls in rain or snow, is harmful to plants and animals. One cause of SO_2 emissions is the burning of non-renewable resources.
   Ask:

   What is a renewable energy source? (Energy resources that are replenished naturally, but the supply of which can be endangered by overuse or be subject to weather. Examples include solar, wind, hydro.)

   What is a non-renewable energy source? (Energy resources that form in extremely slow geological processes. Examples include oil (and therefore gasoline, diesel), natural gas, coal.)

   Have students brainstorm a list of energy sources. Write their ideas on the board.

5. **Have students sort energy sources into renewable and non-renewable types.**
   Draw a two-column chart on the board with the headings: Renewable Resources and Non-Renewable Resources. As a class, sort the energy sources they brainstormed into the correct columns in the chart. Answers should include:

   Renewable: timber, solar, wind, hydro-electric, biomass, biogas and liquid biomass, and geothermal

Non-renewable: coal and coal products, oil, natural gas, and nuclear power

6. **Have students create and label a circle graph of the estimated energy use of the class.** Have students use the completed chart to estimate the percentages of their energy use that are renewable and non-renewable, then sketch a circle graph for estimated energy for the class as whole, and label the two categories.

Student Worksheet – Air Quality Name: _____

CENTRAL TENDENCY AND RANGE

The Air Quality and Health Index is a scale from 1 to 10 designed to help people understand what the condition of the air around them means to their health. The higher the number the greater the health risk associated with the air quality.

The following AQHI ratings are hypothetical. Current ratings are available via the AQHI website: www.ec.gc.ca/cas-aqhi/default.asp?lang=En&n=E36ED558-1

1. During a two-week period in the spring of 2012, the Air Quality Health Index (AQHI) had the following daily ratings:

1	3	2	2	3	4	7	5	3	2	1	1	1	2

Please show work where applicable.

a. What is the range of this data set?

b. What is the median?

c. What is the mode?

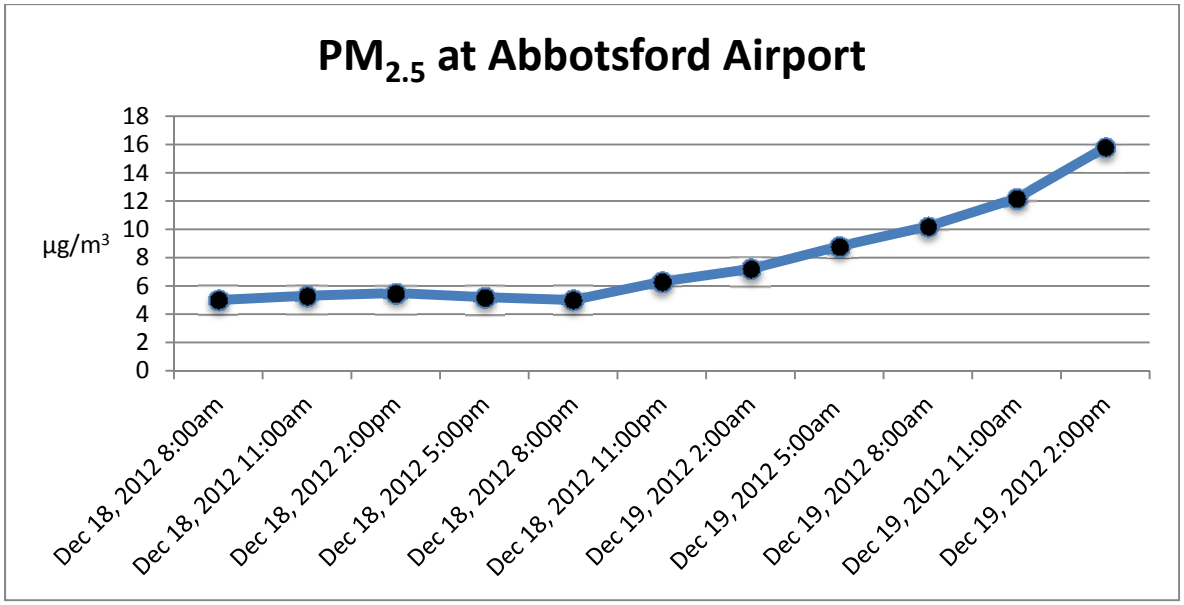
d. How would the mode change if 2 replaced 5 in the above data set?

- increase
- decrease
- no change

2. Given the following graph and data set, answer the following questions.

Table 1. Fine Particulate Matter ($PM_{2.5}$) at Abbotsford Airport Monitoring Station

DATE/TIME	$PM_{2.5}$ Value ($\mu g/m^3$)
Dec 18, 2012 8:00am	5.0
Dec 18, 2012 11:00am	5.3
Dec 18, 2012 2:00pm	5.5
Dec 18, 2012 5:00pm	5.2
Dec 18, 2012 8:00pm	5.0
Dec 18, 2012 11:00pm	6.3
Dec 19, 2012 2:00am	7.2
Dec 19, 2012 5:00am	8.8
Dec 19, 2012 8:00am	10.2
Dec 19, 2012 11:00am	12.2
Dec 19, 2012 2:00pm	15.8



What is the range? _____

What is the median? _____

What is the mode? _____

3. a) Draw and label a circle graph using the following information:

The Prince George Airport Authority reports that its 2007 Greenhouse gas emissions inventory is comprised of:
Aircraft = 64%
Vehicles = 19%
Buildings = 16%
Other = 1%

3. b) What type of emission contributed the most to the Prince George Airport Authority Greenhouse gas emissions inventory in 2007?

_____

Does this surprise you? Explain why or why not.

3. c) Please convert the percentages listed above to decimals and the lowest possible fraction.

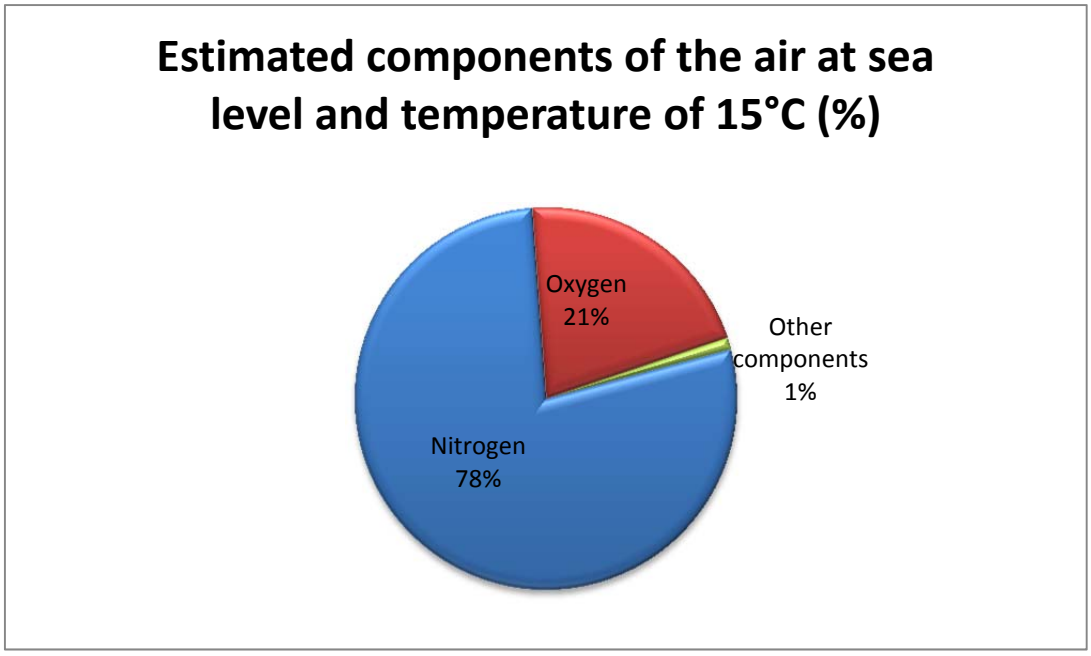
Aircraft = _____

Vehicles =_____

Buildings =_____

Other =_____

4. Using the circle graph below answer the following questions.



a. How much less oxygen than nitrogen is present in the air? _____%

b. Which list arranges the components in the air from greatest to least?

- oxygen, other components, nitrogen
- nitrogen, oxygen, other components
- other components, oxygen, nitrogen
- nitrogen, other components, oxygen

For additional lessons and to complete an evaluation survey, visit: www.fvrd.ca/airquality