

Statistics and Probability Unit: Air Quality Activity

Major 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

Time Requirement: 60-75 minutes

Prescribed Learning Outcomes:

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

DIRECTIONS

1. **Have a brief discussion about air quality in the region. (5-10 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. (Eg. transportation, industry, restaurants, tire treading companies, open burning, heating and energy use, fugitive dust, forest fires, etc.). Refer to Air Pollutant Briefing Notes in Appendix D of Resource Package for more detailed pollutant sources and types of pollutants.
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?* (Possible answers will likely include a combination of several types of power plants.)
 - *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, and home heating.)
4. **Build background about connections between energy use and pollution.** Tell students that sulfur dioxide, or SO₂, is an indicator of pollution. Explain to students that chemical reactions in the atmosphere cause SO₂ emissions to contribute to acid rain. Acid rain, which falls in rain or snow, is harmful to plants and animals. One cause of SO₂ 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 subject to weather)

What is a non-renewable energy source? (energy resources that form in extremely slow geological processes)

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.** Draw a 2-column chart on the board with heads: 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 geo-thermal

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 - AQ

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 online or via the AQHI App : <http://www.ec.gc.ca/cas-aqi/default.asp?lang=En&n=E36ED558-1>

1. During a two-week period in the spring 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? _____

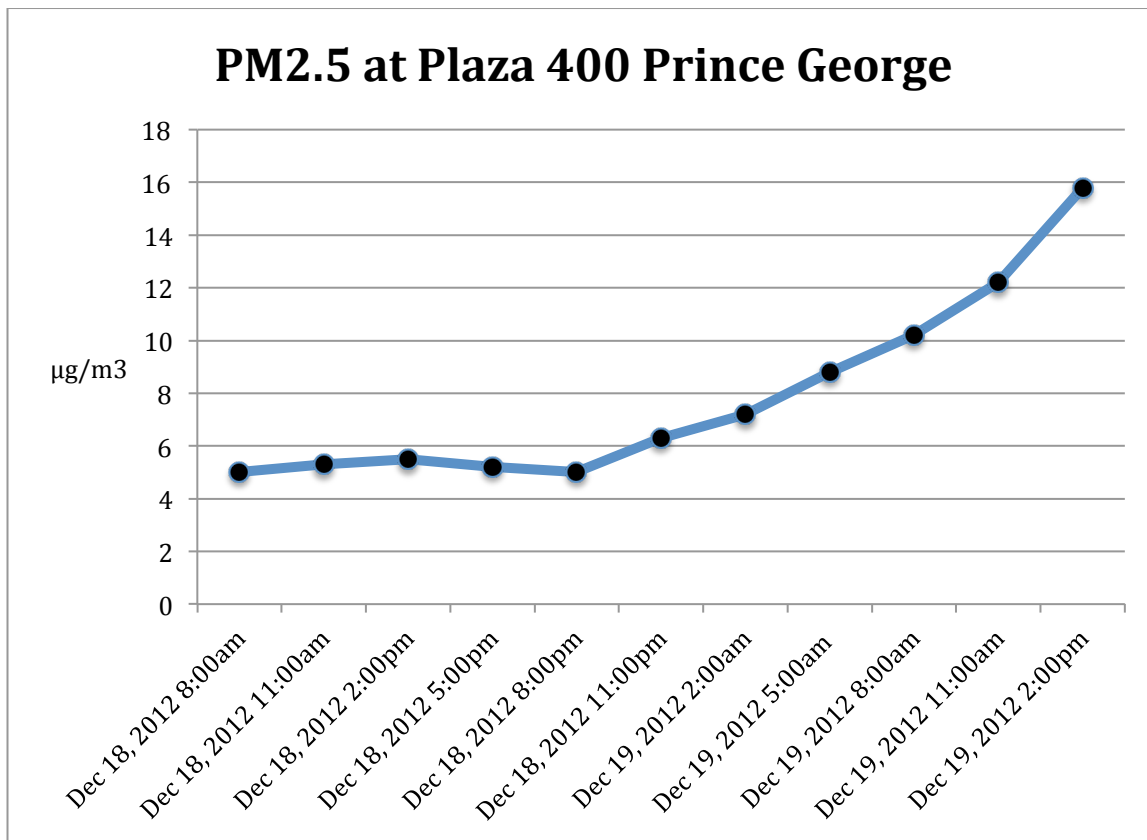
- d. How would the mode change if 2 replaced 5 in the above data set?
 - increase
 - decrease
 - no change

2.

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

Table 1. PM25 at Plaza 400 Prince George

| DATE/TIME | PM25 Value (µg/m3) |
|----------------------|--------------------|
| 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%

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.

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

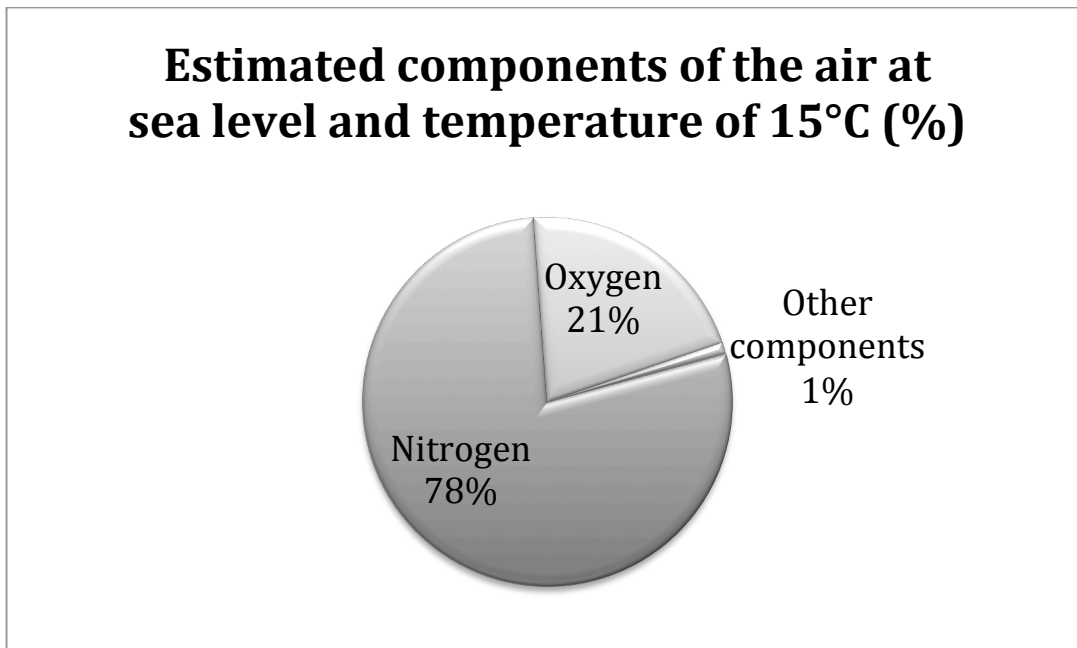
Aircraft = _____

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