



*Drexel-SDP GK-12 ACTIVITY*

## Activity: Seasonal Statistics Tracker

**Subject Area(s)** Data Analysis and Probability

**Associated Unit** Environments, module 4

**Associated Lesson** None

**Activity Title** Activity: Seasonal statistics tracker

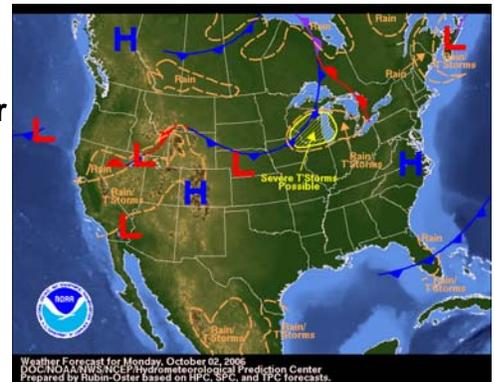
**Grade Level** 6 (4-8)

**Activity Dependency** None.

**Time Required:** 5 minutes each day

**Group Size** 1

**Expendable Cost per Group** \$0



**Image 1**

**ADA Description:** Picture shows barometric pressure patterns in the U.S.

**Caption:** Barometric pressure patterns in the U.S.

**Image file name:** img1.png

**Source/Rights:** Copyright ©<http://www.noaa.gov/>

### Summary

How can we use our four known arithmetic operations (addition, subtraction, multiplication and division) in combination to make meaningful statements about the weather (averages, percentages, probabilities)?

In this activity, students will participate as a class in charting the weather over a long-term period. Each day, we will collect data (just like scientists and engineers do) that include the previous day's high and low, amount of precipitation, moon phase, and sunrise/sunset times. The objective is to learn about averages, percentages and probabilities as being a combination of basic arithmetic operations, and for practice of basic arithmetic skills.

### **Engineering Connection**

Engineering testing and engineering research depends upon collecting and analyzing data to ensure certain properties hold true, identify trends and outliers, and to make predictions on future data. For example, a civil engineer testing the tensile strength of a new material will collect data under a variety of conditions (wet, dry, cold, hot) over long periods of time to investigate whether the new material is suitable for use in building structures, and, for what types of structures. This exercise will have students practice data collection, data analysis, graphing, identification of trends, and forecasting.

### **Keywords**

Environments, meteorology, statistics, temperature, weather

### **Educational Standards (PA)**

- Science: Earth Sciences - Meteorology 3.5.C.
- Math: Statistics and Data Analysis 2.6, Computation and Estimation 2.2

### **Pre-Requisite Knowledge**

Some practice in computing averages and graphing data.

### **Learning Objectives**

After this activity, students should be able to:

- **Explain where to look in the newspaper for yesterday's weather**
- **Associate trends in sunrise/sunset times with the seasons**
- **Associate trends in average temperature with the seasons**

### **Materials List**

Each individual needs:

- A computer or newspaper to track yesterday's weather
- Data recording sheet used by the student each day

### **Introduction / Motivation**

Most of you are aware that the days are longer in the summer than in the winter, but do they really know why? Have you ever seen the trendlines for sunrise/sunset times over a season, and can they predict what will happen during the next season? How can we use our four known arithmetic operations (addition, subtraction, multiplication and division) in combination to make meaningful statements about the weather (averages, percentages, probabilities)? Engineers and

scientists use statistical data collection all the time in order to make predictions about what will happen in the future.

(In this activity, students will participate as a class in charting the weather over a long-term period. Each day, we will collect data (just like scientists and engineers do) that include the previous day's high and low, amount of precipitation, moon phase, and sunrise/sunset times. The objective is to learn about averages, percentages and probabilities as being a combination of basic arithmetic operations, and for practice of basic arithmetic skills.)

### **Vocabulary / Definitions**

<b>Word</b>	<b>Definition</b>
Meteorology	The study of weather
Sunrise time	The moment when the Sun peeks above the astronomical horizon.
Sunset time	The moment when the last visible bit of the Sun passes below the astronomical horizon.
Average	Sum of values divided by the number of values.
Percentage	A way of expressing a number as a fraction of 100 (per cent meaning "per hundred").
Probability	The likeliness or chance of an event occurring. Probability is conventionally expressed on a scale from 0 to 1; a rare event has a probability close to 0, a very common event has a probability close to 1.

### **Procedure**

#### **Background**

Discuss averages, percentages and probabilities with the students during math class

#### **Before the Activity**

Show students where to obtain yesterday's weather information, either from the newspaper or on the internet.

#### **With the Students**

Step 1: Explain to the students that we will be tracking the weather to collect data about temperature and precipitation. We will use this as data (input) to a few formulas. A formula is just a combination of basic arithmetic operations, used together to give us meaningful information (output) about the data.

Step 2: Ask the students what information about the weather would be useful. For example, if they were moving to New Orleans, what kind of information would be helpful to know - so they can plan what clothes they will need, what kind of sports you can play? (Expected highs, expected lows, daily average, rainfall, sunrise and sunset times).

Step 3: Ask the students, then discuss, if they know what an average is? What a percentage is? What a probability is? Not all the concepts will be reviewed at one time, they will be introduced one-by-one, at a rate of perhaps one math concept per week.

Step 4: Show the weather tracking chart. Ask them why we are tracking the previous day's weather (because today's is still just a forecast, meaning, it's an estimate about the future - we don't actually know what the weather will be). The chart will include the day's high and low, whether it rained, and how much it rained. Explain that we will be collecting data on **temperature, rainfall, sunrise time, and sunset time.**

Step 5: After one week of tracking: Introduce averages. Ask the students to add up a week's worth of temperatures. Is this useful? Can it really be 490 degrees over a week? What do we have to do to make this meaningful? Use division by the number of days (samples) to find an average for the week's temperature. Show how we use addition (sum the samples) with division (divide by the number of samples) to get an average value of the week's temperature. What would they expect the temperature to be tomorrow?

Step 6: After two weeks of tracking: Introduce percentages. Ask the students to add the number of occurrences of rain over the last week. Not how much it rained, just a yes/no value to indicate if it rained. Like the average temperature, we will add the number of occurrences, divide by the number of samples, multiply by 100, and find the percentage of time it rained.

Step 7: After at least two weeks of tracking: Introduce probability. Ask the students if we were looking backward or forward in time to compute our percentage of time it rained (we looked backward in time). Now, can we use our percentage to make a prediction about the future? Could we say that there is a xx% chance that it will probably rain tomorrow? Explain how percentages calculated from past data can be applied as probabilities for tomorrow's weather.

Step 8: Ask the students if they can use the information they collected to predict tomorrow's weather, and when the sun will set. Ask the students how a NASA engineer might utilize this process of collection weather data to plan to missions of the Mars Rover (e.g. if winds are increasing, delay a lengthy mission of the Rover to decrease the chance of damage).

### **Attachments**

See sample data collection sheet.

See the charted sunrise and sunset times for days since October 1, attached to this activity.

### **Safety Issues**

None

## **Troubleshooting Tips**

Make sure the students are looking at yesterday's recorded weather and not today's forecast.

## **Activity Extensions**

Child-friendly activity websites on weather and meteorology:

<http://www.kidsolr.com/science/page14.html>

<http://www.wxdude.com/>

## **Investigating Questions**

Average the temperature for the entire data set, then average the data for just a particular window of time, for example, just September-October, and compare it to the averages for October-November. What trends can the students identify? Do the same for rainfall. Was there a 'rainy season' during the school year?

## **Assessment**

### **Pre-Activity Assessment**

Quiz students on vocabulary

### **Activity Embedded Assessment**

Give students some math problems to make sure they understand how to calculate an average, a percentage and a probability.

### **Post-Activity Assessment**

Assign a worksheet of data analysis to be completed by the students, on any topic of your choosing (averages, percentages, probabilities) including graphing.

Students will be evaluated on a scale from 0 to 4 on:

\_\_\_\_\_

Participation In-Class

\_\_\_\_\_

Task Completion – When Assigned

\_\_\_\_\_

Correctness

## **Contributors**

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# Sunrise and Sunset Times Since 10/1/06

