Freshman Science Summer Work

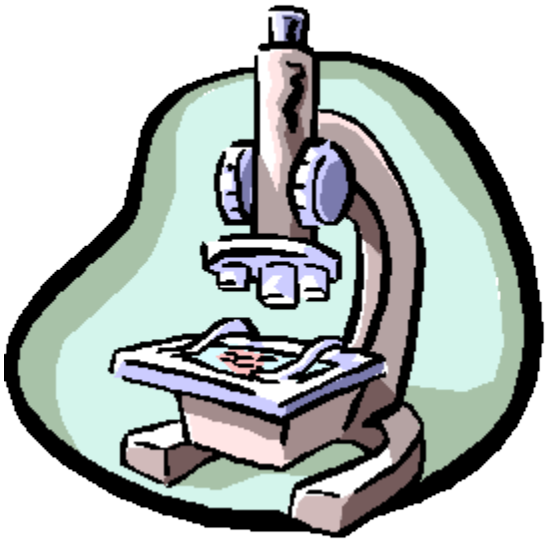
This summer review packet should be completed over the summer to prepare you for the upcoming school year. The packet should be completed and brought to school on the first day of your science class; it will be collected and graded.

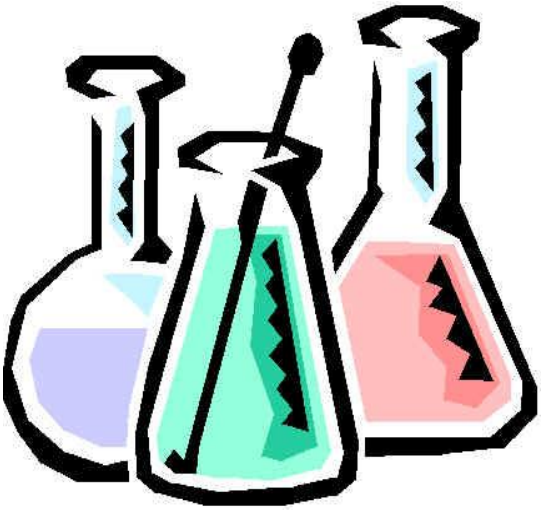
The packet consists of five parts:

1. **Reading Comprehension**
2. **Metric System**
3. **Scientific Method**
4. **Graphing**
5. **Laboratory Safety Contract – This needs to be signed by you and a parent/guardian and will be handed in to your teacher.**

Enjoy your summer and we will see you in September!!!

Freshman Science Teachers ☺





Section 1: Reading Comprehension

Read the article below and answer the questions that follow in complete sentences.

To Help Jaguars Survive, Ease Their Commute

Steve Winter/Panthera

LAS LOMAS, Costa Rica — Héctor Porras-Valverdo tried to adopt a Zen attitude when he discovered recently that jaguars had turned two of his cows into carcasses.
The jaguars' numbers may have dwindled, but they still roam the forests here in eastern Costa Rica, making their presence known by devouring the occasional chicken, pig or cow.

"I understand cats do this because they need to survive," said Mr. Porras-Valverdo, 41, a burly dairy farmer.

A few years ago, he acknowledged, his first reaction might have been to reach for a gun. But his farm now sits in the middle of land that Costa Rica has designated a "jaguar corridor" — a protected pathway that allows the stealthy, nocturnal animals to safely traverse areas of human civilization.

In the past few years, such corridors have been created in Africa, Asia and the Americas to help animals cope with 21st-century threats, from encroaching highways and malls to climate change.

These pathways represent an important shift in conservation strategy. Like many other nations, Costa Rica has traditionally tried to protect large mammal species like jaguars by creating sanctuaries — buying up land and giving threatened animals a home where they can safely eat, fight and breed to eternity.

But in the past decade or so, scientists have realized that connecting corridors are needed because many species rely for survival on the migration of a few animals from one region to another, to intermix gene pools and to repopulate areas devastated by natural disasters or disease. Placing animals in isolated preserves, studies have found, decreases diversity and risks dulling down a species— like preventing New Yorkers and Californians from getting together to procreate.

“It was kind of an epiphany,” said Alan Rabinowitz, a zoologist who is president of Panthera, an organization that studies and promotes conservation of large cats. “We were giving them nice land to live on when what they were doing — and what they needed — was an underground railway.”

He said critical migration routes were especially vulnerable in rapidly developing countries, where new roads, shopping malls, dams, playgrounds and subdivisions could spring up overnight, blocking the animals’ passage. To correct this oversight, Costa Rica and other countries have begun identifying and protecting corridors for jaguars and other large mammals, like tigers, snow leopards and pandas.

Most of the corridors are not obviously demarcated pathways, but virtual trails, “protected” in the sense that builders and planners are not permitted to introduce obstacles to the animals’ movements through the area.

The idea is not to stop building entirely, but to adjust development so that animals can move through landscapes that humans also occupy. A tall fence surrounding a shopping mall may be forbidden, for example, or a two-lane road may have to be substituted for a proposed four-lane highway.

Local residents must also be persuaded not to shoot wild intruders or otherwise drive them away when they are in transit, a shift in thinking that is already taking root here.
“Of course jaguars sometimes have conflicts with communities, but now people have been educated to change their thinking — not to see them as so dangerous,” said Víctor Fallas Ramírez, an agronomist who grows ornamental plants here.

The threat of global warming has added to the urgency of creating corridors because animals will need to shift habitats as temperatures rise from climate change.

“This is an idea that people are finding very compelling, and especially compelling now because with changing climate, species will need the capacity to move,” said Norman Christensen, a professor of ecology at Duke University, whose team is working to define corridors in Central America, India and Africa.

While Dr. Christensen called Costa Rica “the poster child” for its efforts, he said corridors for large mammals were also being created in places like Uganda and China. The World Bank is financing corridor projects in Brazil and Peru; more important, the bank’s transportation planners are working with conservationists to ensure that building highways and laying train tracks so humans can move freely does not destroy that movement for animals, Dr. Christensen said.

Part of the reason that conservationists had in the past focused exclusively on preserves was that there was a lack of good data on the travel and breeding patterns of large animals like jaguars; these big predators favor dense jungles and are nocturnal and extraordinarily shy.

So when new techniques allowed scientists to take a first look at the jaguar genome a decade ago, they were shocked to discover that jaguars from the northern reaches of Mexico had exactly the same genetic makeup as those from the southern tip of South America.

That meant that over time, some jaguars were moving up and down the Americas to breed; otherwise, the isolation of jaguar populations in different regions would have caused their genetic makeups to diverge. At least some males from Colombia were traveling to Panama to mate, and others were moving from Mexico to Belize.

“It was surprising, but it seemed to say they had one continuous habitat,” said Dr. Rabinowitz.

Scientists were convinced that jaguars would never cross a water barrier as wide as the Panama Canal, smack in the middle of their extended habitat. But when they set up cameras to spot jaguars near the canal, they discovered that, every so often, a brave animal took the plunge, ensuring the continuity of genes in the north and south.

Costa Rica now requires developers to consider whether a new construction project would interrupt an essential corridor, or else to make other arrangements for jaguars to travel safely through the area.

The fact that jaguars and other large cat species travel at night and do not hunt when they are on the move makes it easier for them to co-exist with humans.

“The bottom line is big cats can live with people,” Dr. Rabinowitz said. “That’s not true of all animals.”

He continued, “The problem with the paradigm of conservation is it’s been seen as a confrontation between nature and development, that won’t let progress happen.”

In Costa Rica, Panthera is conducting research to better define the routes taken by jaguars and lobbying politicians and developers to respect them. The organization also sponsors community outreach programs to resolve what the researchers term “jaguar conflict issues.”

“Many places don’t want the corridors,” said Roberto Salom, Panthera’s regional coordinator here. “We’ve made alliances with lots of leaders and educators, but it’s a very slow process.”

Here in the jungles of Central America, jaguars are regarded as mystical and dangerous. According to local legend, indigenous people turn into jaguars when they enter the jungle, and then shake off their spots when they return to the village.

“I’ve seen the tracks, but never an animal,” said Enoc Bajo Chiripó, an indigenous leader who is working with the group. “But you can smell when they’re around.”

Families in the region tell jaguar stories the way New Yorkers talk about their families’ arrivals at Ellis Island.

“My grandmother saw it at the place where agouti and peccaries come to eat,” said Jordi Ortiz-Camacho, 12, speaking of a jaguar. “My grandfather killed it with a stick because his gun didn’t work.”

While local farmers are now willing to forgive a dead cow or two to allow jaguars to survive as a species, they are often reluctant to make larger sacrifices. Just outside Las Lomas, a proposed hydroelectric project would involve building a huge dam across a valley, creating a body of water a third of a mile wide and more than three miles long. As planned, it would block a jaguar corridor.

The new project will mean jobs, an increase in property values and improved basic services for the area, including roads and piped water, said Mr. Fallas Ramírez, the agronomist. And the community, he said, cannot just forsake all that.

“For us, and the jaguars, it’s just an obstacle,” said Mr. Salom, the biologist, who is looking into alternative solutions, like an animal bridge or a smaller dam. “So we’re thinking, ‘How can we mitigate this?’ ”

Analysis Questions

1. Write a paragraph in your own words, summarizing the main idea(s) from the article.

2. What is the purpose of the “jaguar corridor”?

3. How is the creation of these corridors different from past efforts to create sanctuaries for these animals?

4. In what ways have people’s ideas or perceptions about jaguars had to change to go along with this new strategy?

5. What piece of evidence led scientists to believe that creating these corridors would be beneficial for the jaguars?

6. If you were living in Costa Rica, would you support the creation of the jaguar corridors? Why or why not? Be sure to give at least two reasons.

Section 2: Metric System

The Metric System & Conversions

In the United States we use the English system of measurement; however, in much of the rest of the world the International System of Units (SI Units) or metric system is used. The metric system is the standard way of measuring and provides consistency so that scientists can share their results and data easily throughout the world.

In the metric system there is only one unit of measurement, known as a base unit, for each quantity that is measured (length, mass, etc.). The three most common base units in the metric system are the meter, gram, and liter. The meter is used to measure length, the gram is used to measure mass, and the liter is used to measure volume.

Very large and very small objects are expressed as multiples of ten of the base unit. For example, the prefix “kilo” means 1000, so rather than saying that you traveled 1,000 meters, you can say that you traveled 1 kilometer. Metric prefixes can be used with any base unit, so a kilometer is 1,000 meters, a kilogram is 1,000 grams, and a kiloliter is 1,000 liters.

Metric conversions are much simpler than English conversions because everything is based on the number 10. Since each unit is a multiple of ten, converting from one unit to another consists of moving the decimal point. In contrast, conversions within the English system are not consistent. For example, there are twelve inches in a foot and three feet in a yard.

Prefix	Meaning	Numerical Value
Milli	One thousandth	.001
Centi	One hundredth	.01
Deci	One tenth	.1
BASE UNIT	**(Meter, Liter, or Gram)**	**1.0**
Deka	Ten	10.0
Hecto	One Hundred	100.0
Kilo	One Thousand	1,000.0

Part 1: Match the SI units to the value they measure

_____1. length a. °C or K

_____2. volume b. liter (L) or milliliter (mL)

_____3. mass c. meter (m), centimeter (cm), kilometer (km), or millimeter (mm)

_____4. temperature d. gram (g), kilogram (kg), or milligram (mg)

Part 2: Match the tool to the value they measure (you may use the values more than once)

_____1. balance a. mass

_____2. meter stick b. length

_____3. graduated cylinder c. volume

_____4. beaker d. temperature

_____5. ruler

_____6. thermometer

Part 3: Match the tool to the unit they measure in (you may use the units more than once)

_____1. balance a. grams(g)

_____2. meter stick b. meter (m), centimeter (cm), or millimeter(mm)

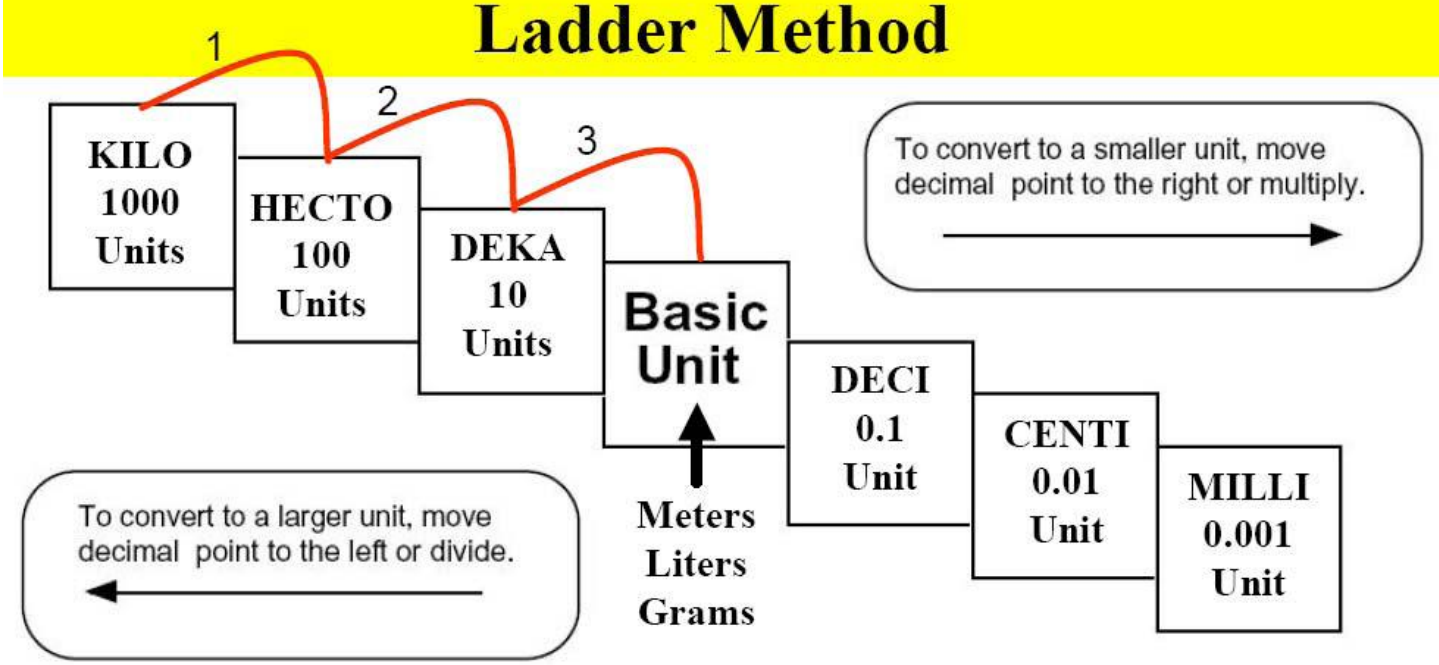
_____3. graduated cylinder c. liter (L) or milliliter (mL)

_____4. beaker d. °C

_____5. ruler

_____6. thermometer

Ladder Method



How do you use the "ladder" method?

1st – Determine your starting point.

2nd – Count the "jumps" to your ending point.

3rd – Move the decimal the same number of jumps in the same direction.

4 km = _____ m

Starting Point Ending Point

How many jumps does it take?

4._._._. = 4000 m

1 2 3

Kilometers are a larger unit than meters so we need to multiply or move the decimal point 3 places to the right.

Part 4: Convert the following measurements:

1. 5 L = _____ ml

2. 104 km = _____ m

3. 8 mm = _____ cm

4. 120 mg = _____ g

5. 75 ml = _____L

6. 0.00573 kg = _____ g

7. Swimming phenomenon Michael Phelps, won gold medal #6 at the 2008 Beijing Olympics in a time of 1.54.23 for the 200 meter Individual Medley. How many centimeters long was the race?

8. Hurricane Hannah brought 52 milliliters of rain to some parts of the east coast in the fall of 2008. How much rain would this be in liters?

Section 3: Scientific Method and Experimental Design

What is the scientific method?

All scientists use a variety of scientific methods to obtain knowledge and formulate strategies to answer questions.

Observe and Ask Questions

- All scientific understanding of our natural world is based on observation
- *Observation is the most important part of the scientific method*
- Observation involves one of our five senses
- There can be many questions at the beginning of an investigation, but generally, a scientist will try to answer one at a time.

Collect Initial Data and Hypothesize

- Initial data is usually obtained by observation, measurement, or sampling
- Data needs to be organized
- Ex. Graph, chart, or table
- Data is then used to make a **hypothesis,** statement that explains the observations and can be tested, to answer the question.

Setting up the Experiment

- All experiments will contain 2 groups
    1. Control group – under normal conditions
    2. Experimental group- contains the manipulated factor (a variable is changed)

- There will also be 2 variables in each experiment
    1. Independent variable- factor that gets changed/manipulated
    2. Dependent variable- what you measure

- Example: Identify the control group, experimental group, independent and dependent Variable for the scenario below:

  On what surface (other than hard) does a tennis ball bounce higher?
    - Control group= hard surface
    - Experimental group= grass, clay
    - Independent variable= surface of court
    - Dependent variable= height of bounce

Analyze Data and Draw Conclusions

- After collecting data in the experiment, we then analyze it and infer to determine a conclusion.
- Determine if the data taken is reliable
- Determine if the data supports or denies the hypothesis
- Answer: NO we change our hypothesis and start over
- Answer: YES check to make sure our data agrees again, if it continues to be upheld scientific theories and laws may result!
- Compare the data to other studies that have been done
- Report our findings to the scientific community

Practice Problems – Answer all questions in **complete sentences.**

1. Mr. Krabs created a secret ingredient for a breath mint that he thinks will "cure" the bad breath people get from eating crabby patties at the Krusty Krab. He asked 100 customers with a history of bad breath to try his new breath mint.

He had fifty customers (Group A) eat a breath mint after they finished eating a crabby patty. The other fifty (Group B) also received a breath mint after they finished the sandwich; however, it was just a regular breath mint and did not have the secret ingredient.

Both groups were told that they were getting the breath mint that would cure their bad breath. Two hours after eating the crabby patties, thirty customers in Group A and ten customers in Group B reported having better breath than they normally had after eating crabby patties.

a. Which people are in the control group?

b. What is the independent variable?

c. What is the dependent variable?

d. What should Mr. Krabs' conclusion be?

e. Why do you think 10 people in group B reported fresher breath?

2. Patrick and SpongeBob love to blow bubbles! Patrick found some Super Bubble Soap at Sail-Mart. The ads claim that Super Bubble Soap will produce bubbles that are twice as big as bubbles made with regular bubble soap.

Patrick and SpongeBob made up two samples of bubble solution. One sample was made with 5 oz. of Super Bubble Soap and 5 oz. of water, while the other was made with the same amount of water and 5 oz. of regular bubble soap.

Patrick and SpongeBob used their favorite bubble wands to blow 10 different bubbles and did their best to measure the diameter of each one. The results are shown in the chart below.

Bubbles
(Diameter in centimeters)

Bubble	Super Bubble	Regular Soap
1	15	10
2	10	5
3	12	16
4	18	14
5	22	11
6	13	12
7	16	11
8	18	15
9	15	15
10	12	6

a. What did the Super Bubble ads claim?

b. What is the independent variable?

c. What is the dependent variable?

d. Using the data in the table above, calculate the average diameter for each bubble solution.

Super Bubble = _____ cm Regular Soap = _____ cm

e. What should their conclusion be?

f. Are the results reliable? Why or why not?

Section 4: Graphing

All graphs should always include the following components:

The Title

The title offers a short explanation of what is in your graph. This helps the reader identify what they are about to look at. It can be creative or simple as long as it tells what is in the graph.

The Legend

The legend tells what each line represents. Just like on a map, the legend helps the reader understand what they are looking at.

Y-Axis

In line graphs, the y-axis runs vertically (up and down). Typically, the y-axis has number for the amount of stuff being measured. The y-axis usually starts counting at 0 and can be divided into as many equal parts as you want it to.

X-Axis

In line graphs, the x-axis runs horizontally (flat). Typically, the x-axis has numbers representing different time periods or names of things being compared.

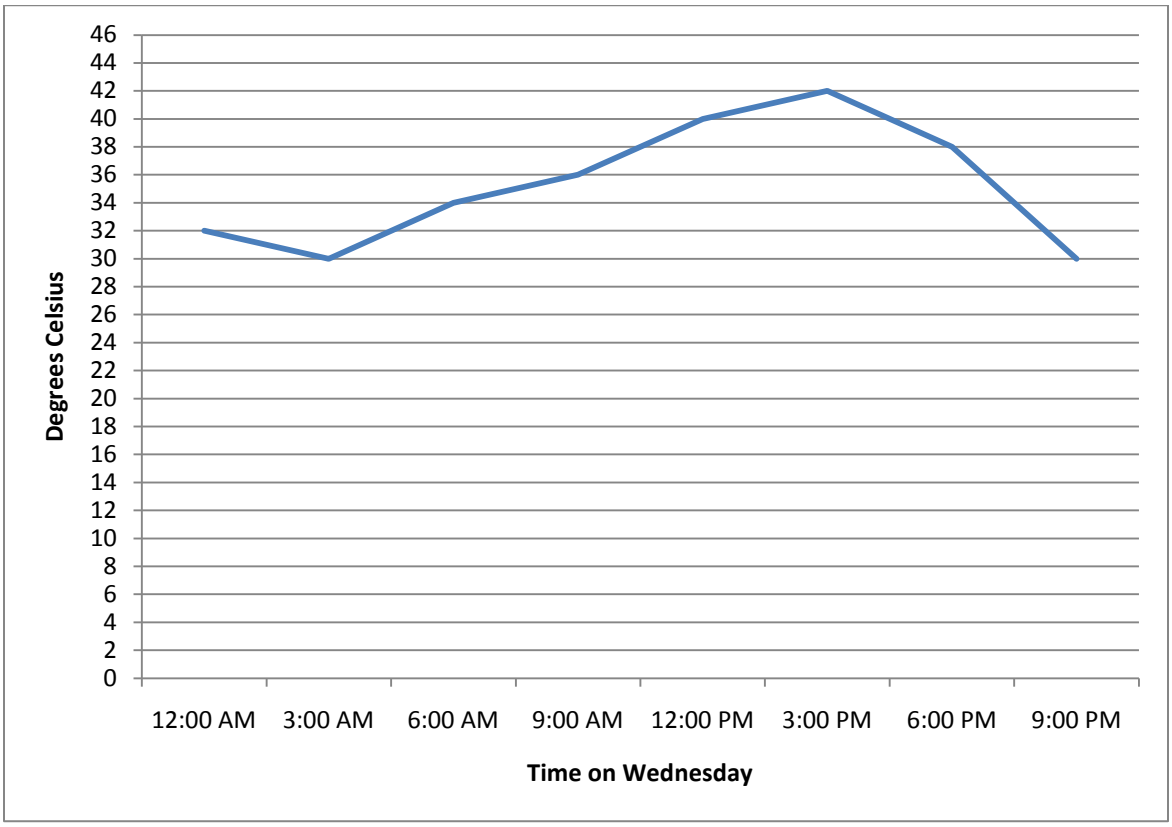
The Data

The most important part of your graph is the information, or data, it contains. Graphs can present more than one group of data at a time.

LINE GRAPHS

Line graphs can be used to show how something changes over time. Line graphs are good for plotting data that has peaks (ups) and valleys (downs), or that was collected in a short time period.

Use the graph below to answer the following questions.



1. What component is missing from the line graph above?

2. Add the missing component by writing it into the correct spot on the graph above.

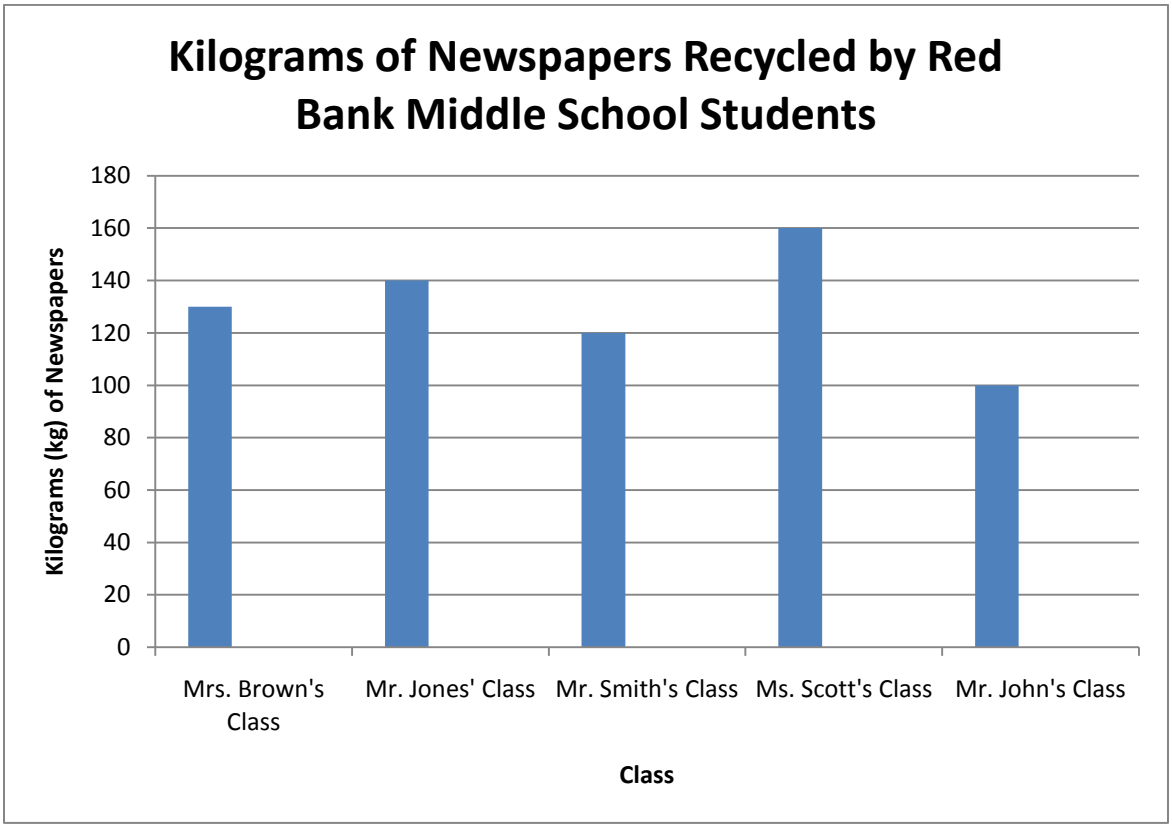
3. What is the difference in air temperature between midnight and noon?

4. At what time was the air temperature the warmest?

5. What type of data is best shown by a line graph?

BAR GRAPH

Bar graphs can be used to compare different data sets or to show changes over time. Bar graphs are good for plotting data that spans many years (or days, or weeks…), or has big changes from year to year (or day to day, etc.). The can also be used for comparing different items in a relate category (for example: comparing something between different states).



1. How many more kilograms did Ms. Scott's class recycle than Mr. John's class?

2. Which class recycled the most newspapers?

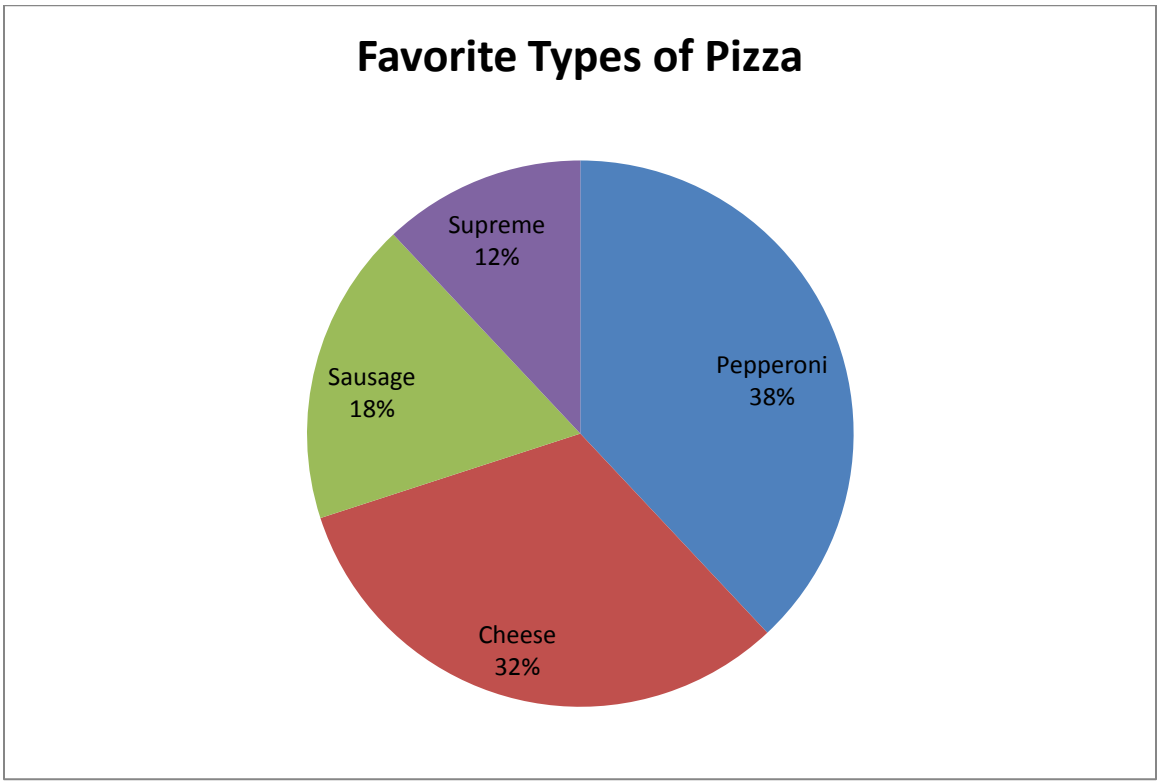
3. How many kilograms of newspapers were recycled in all?

4. There are 2.2 pounds in every kilogram. How many <u>pounds</u> of newspapers were recycled by Mrs. Brown's class? Show your work.

5. What type of data are bar graphs best at showing?

PIE CHARTS

Pie charts can be used to show percentages of a whole, and to represent percentages at a set point in time. Unlike bar graphs and line graphs, pie charts do now show changes over time.



1. Did more or less than half of the people surveyed like pepperoni pizza the best?

2. Did more or less than one-fourth of the people surveyed like sausage pizza the best?

3. Did more or less than one-fourth of the people surveyed like cheese pizza the best?

4. How are pie charts different from line graphs and bar graphs?

Safety Contract – Freshman Science

I, (*please print*) _____, have read and understand all safety rules listed below. I recognize my responsibility and pledge to observe the rules in my science class at all times. I also understand that failure to follow the rules could lead to consequences, such as ejection from class, or substitution of written work for lab activities.

Lab rules:

1. Wear protective gear at all times during a lab requiring such gear.

2. No open-toed shoes may be worn when completing labs using glassware or chemicals.

3. Always be alert and ready for directions during a lab.

4. Never fool around during a lab.

5. Read the entire procedure before starting a lab.

6. Only perform the designated experiment; never mix chemicals unless the lab indicates to.

7. Report any accidents, spills, or injuries to the teacher immediately.

8. Never pour chemicals back into the original container.

9. When using graduated cylinders, keep the bumper towards the top to protect from breakage.

10. If glass breaks, DO NOT clean it up! Notify the teacher immediately.

11. When an experiment is completed, clean and return all materials to the area indicated by the teacher.

12. Clean off your lab area properly and wash your hands before leaving the lab area.

13. DO NOT eat in the lab area.

Student signature: _____ Date:_____

Parent or Guardian Signature :_____

<u>Please sign both copies and retain one for your notebook.</u>

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