_____

Date: _____

Activity Sheet 1

Archimedes's Principle

Aim: To discover Archimedes' principle and how boats are able to float.

Apparatus:

Bucket	Metal objects (masses)	Plastic cup	Balance Scale	Measuring Cylinder

Method:

_____ 1) Put a title in your notes and make a results table with 4 columns (# of metal objects, mass, volume of cup, ratio of mass/volume). How many tests will you perform? (***hint: read the rest of the method before starting***)

_____ 2) Fill the bucket 3/4 full with water.

_____ 3) Measure the mass of the cup with 5 metal objects in it. Place the cup in the water. The cup should float upright. ***Record this information in your table.***

_____ 4) Keep the 5 masses in your cup and add more metal objects, one at a time, until the cup is just floating in the water. Take out the cup and find out the mass. ***Record the information in your table.***

_____ 5) Put the cup, with all the masses, back in the water. Continue to add one metal object at a time until the cup sinks. Remove the cup from the water and dry off the metal objects. Find out the mass of the cup and metal objects and ***record the information in your table.***

_____ 6) Find out the volume of the cup and ***record in your table.***

_____ 7) Calculate the ratio of mass to volume for the 3 tests and ***record in your table.***

_____
Date: _____

_____ 8) Make a ***conclusion***, then ***read the story on back and answer the questions.***

Conclusion:
What is the relationship between the mass and volume for the three different scenarios? What must be true in order for an object to float?

Activity Sheet 2

Archimedes's Reading

Date: _____

The Greek mathematician and physicist Archimedes (287-212 B.C.) was born in Syracuse, Sicily, and was educated in Alexandria, Egypt. Little is known about Archimedes' childhood except that his father was an astronomer. We know a bit more about his adult life from the prefaces to some of his writings and a few stories written by others. In one amusing story, he described sending math ideas to his mathematician friends in Alexandria. He was surprised when some of those who had received the ideas claimed them as their own. Archimedes suspected that these men did not really understand the ideas, so, to expose them, he sent more ideas but included two that he knew to be incorrect. No mention is made of the results, but Archimedes' plan was that the dishonest mathematicians would be discredited for promoting false ideas.

In another story, Archimedes was asked by the king to discover whether the king's crown was made of pure gold. The king had given a goldsmith a specific amount of gold to make a crown. He had heard that the goldsmith was trying to cheat him by not using all of the gold in the crown. Instead, he might have used a mixture of gold and silver. The gold and silver crown weighed as much as the gold given him to use. How could Archimedes figure out if the crown was pure gold or not?

Archimedes was a very observant person and one day while taking a bath, he is said to have noticed that when he got into the full tub, some of the water was pushed out. He realized that his body had **displaced** (taken the place of something) the water in the tub and that the amount of displacement had to do with his body's volume. That meant he could determine the volume of the king's crown by water displacement. Archimedes knew that silver was lighter than an equal volume of gold, so for an object made of a mixture of silver and gold to weigh as much as a pure gold object, more of the silver/ gold mixture would have to be used. This would mean that a crown of gold and silver mixed would be larger than one made of pure gold that had the same weight. Archimedes weighed the crown in question by balancing it with a piece of gold. He then lowered the gold into a container of water and marked how high the water rose. When he did the same with the crown, the crown caused the water to rise higher than it had when the gold was in it, indicating that the crown had a greater volume than the gold did. Therefore, the crown was not made of pure gold, and the goldsmith had stolen gold from the king.

_____
Date: _____

The most unlikely part of this story is that when Archimedes discovered how to solve the king's problem, he became so excited that he jumped from his bath and ran naked through the streets, screaming "Eureka! (I've got it!)

Archimedes was also known for inventing new war machines that managed to hold off Roman soldiers who were attacking his city. These machines included lenses that focused sunlight onto ships, causing them to catch on fire, and pulleys that were used in special machines that could lift and overturn invading ships. It is said that Archimedes' death came about because he was so absorbed in working on a math diagram that he didn't realize that the Romans had finally broken through the city's defenses. When an enemy soldier entered his room and demanded that Archimedes come with him, Archimedes paid no attention and commanded the intruder not to mess up the diagrams that he was drawing. The insulted soldier drew his sword and killed Archimedes.

One **principle** (a basic truth, law, rule, or belief) that resulted from Archimedes' bathing discovery is now called Archimedes' Principle. This principle is that an object in a **fluid** (a gas or a liquid) is lifted by **buoyancy** (the upward force on a fluid on an object placed in it). The buoyancy of an object is equal to the weight of the fluid displaced by the object. This principle applies to both floating and **submerged** (sunken or pushed beneath the surface of a fluid) objects and to all fluids, and it explains why boats float.

Questions:

1) What does "***Archimedes Principle***" say?
2) What is **buoyancy**? Describe it.
3) A rock has a volume of 50 Liters. How much water will it ***displace*** when thrown into a pool?