Welcome to Nancy Gardner's Chemistry Lab Procedures from the California State University, Long Beach: Episode 6, Weigh by Difference.

Accurately measuring very small amounts of solid can sometimes be a challenge. In the chemistry lab, we use very sensitive equipment, called balances or scales to measure mass. Some scales are used to measure mass to the nearest milligram, or 0.001 g.

When a more precise measure is required, we can use a balance. Balances are more sensitive and can be used to measure mass to the nearest 0.0001 g.

Notice that the balance pans are enclosed with a glass case. This is to prevent airflow around the balance or scale which may interfere with your measurement.

Let's say that your experiment calls for two 0.5 g samples of our solid, each in a 150 mL beaker. Using the sample weighing vial next to the reagent bottle as a guide, place a similar amount of solid into your own weighing vial. This should be approximately 1.0 gram.

If your experiment says you need a mass of 0.5 grams, accurate to 0.001 gram, this does not mean each sample has to be exactly 0.500 grams. It means that the sample must be weighed precisely to 0.001 gram, but the mass of the actual sample may be between 0.450 gram and 0.550 gram. A little over or under is also acceptable.

To measure small amounts of solid accurately we use a method called "weigh by difference". Since our experiment requires 2 different samples each in its own 150 mL beaker, we will number the beakers to make sure our samples do not get mixed up.

To start, make sure that the balance pan is clean. Press the "on tare" button to zero the scale. When the star appears in the readout, the scale is ready.

Place the capped weighing vial containing the solid on the scale to determine its total mass. Once the star appears in the readout, record the mass of the capped vial and its contents on your report form.
The mass of the vial and its contents is: 15.896 grams.

Remove the vial from the scale and sprinkle a small amount of the solid (approximately 1/2 of your sample) by slowly rotating the vial allowing the solid to fall into the #1 beaker.

Reweigh the vial containing the remainder of the sample on the scale, 15.559 grams.

Since the amount of the missing mass is only 0.337 grams, we add more solid to the beaker and reweigh the vial until the sample size is acceptable.

The mass of the vial and remaining contents now reads 15.360 grams.
This means that the mass of solid in the beaker is 15.896 minus 15.360 grams and the mass of the sample is 0.536 gram. This is within our parameters.

On the report form, we enter our data, and note that the final mass from sample #1 becomes the initial mass of sample #2.

To measure the second sample, we pour the remaining sample in our vial into the #2 beaker and the reweigh the empty vial.

The mass of the vial is now 14.794 grams. To determine the mass of sample in the #2 beaker, we subtract this amount from our previous mass.

15.360 minus 14.794 grams which equals 0.566 gram, close enough to our needed sample size.

To make sure that your mass is accurate, remember the following tips:

1. Always remember to wait for the star on the scale readout before recording the mass.

2.Make sure the balance is clean.

3.Since these scales are very sensitive, and may be affected by air movement, make sure that the doors to the container around the balance pan are always closed.

5. Leave the scale on, the instructor will turn them off at the end of the lab period.