

## Counting by Weighing

**Problem:** You will be given a box containing a large number of particles of the agriculturally-generated substance Riceium. Devise a procedure to calculate the number of particles in the box without counting every single particle.

### Materials:

- 1 box of Riceium (Ri)
- 1 balance and miscellaneous weighing equipment
- 1 container of another substance (ex. Beanium or Cornium)

### Directions:

1. Devise a procedure to find the number of grains of Riceium in one box without counting each grain.
2. *Show each calculation using conversion factors.*

### Analysis questions:

1. Let the number of grams of Riceium in one box equal the quantity "1 box."

1 box Riceium = \_\_\_\_\_ grams Riceium

Write **2 conversion factors** from this equality in the space below:

A. What is the mass of 0.38 box of Riceium? Use a conversion factor and show your work.

B. How many boxes are equal to 20.0 g Riceium?

2. Find the number of particles of Riceium in one box of Riceium:

\_\_\_\_\_ particles of Riceium = \_\_\_\_\_ grams of Riceium

Write **2 conversion factors** from this equality in the space below:

Knowing the number of grams in 1 box of Riceium and the mass of some particles of Riceium, calculate the number of particles in 1 box of Riceium. Use conversion factors.

Let the number of particles in one box of Riceium equal the quantity "1 box."  
Fill in the following equality:

1 box Riceium = \_\_\_\_\_ particles of Riceium

Write **2 conversion factors** from this equality in the space below:

- A. How many boxes are equal to 57,435 particles of Riceium? Use a conversion factor. Show work.
- B. How many particles of Riceium would be found in 0.46 boxes of Riceium?
3. What is the mass of 10,000.0 particles of Riceium? (Use 2 conversion factors.)
4. How many particles are equal to 15.0 kilograms of Riceium?

Now, repeat the process for the element Beanium.

5. Let the number of grams of Beanium in one box equal the quantity "1 box."

1 box Beanium = 454 grams Beanium

Write **2 conversion factors** from the equality.

- A. What is the mass of 0.38 box of Beanium? Use a conversion factor and show your work.
- B. How many boxes are equal to 2.55 kg Beanium?

6. Find the number of particles of Beanium in one box of Beanium:

\_\_\_\_\_ particles of Beanium = \_\_\_\_\_ grams of Beanium

Write **2 conversion factors** from this equality in the space below:

Knowing the number of grams in 1 box of Beanium and the mass of some particles of Beanium, calculate the number of particles in 1 box of Beanium. Use conversion factors.

Let the number of particles in one box of Beanium equal the quantity "1 box."  
Fill in the following equality:

1 box Beanium = \_\_\_\_\_ particles of Beanium

Write **2 conversion factors** from this equality in the space below:

A. How many boxes are equal to 57,435 particles of Beanium? Use a conversion factor. Show work.

B. How many particles of Beanium would be found in 0.46 boxes of Beanium?

7. What is the mass of 10,000.0 particles of Beanium? (Use 2 conversion factors.)

8. How many particles are equal to 15.0 grams of Beanium? (Use 2 conversion factors.)
9. How many particles of Riceium would have the same mass as 1 particle of Beanium? Show how you determined this.
10. If you mixed equal masses of Beanium and Riceium, would you use a greater number of Beanium or Riceium particles? Explain. Why wouldn't you have the same number of particles of each?
11. If you mixed equal numbers Beanium particles and Riceium particles, which would have the greater mass before being mixed?
12. What would be the mass of a number of particles of Beanium equal in number to the particles of Riceium in your box?

**Reflection:**

Explain why is this process called Counting by Weighing.