[redacted]

Name____________

Period____________

A		552 beans 91.5 grams total
B		552 beans 266.1 grams total
C	 	552 beans 121.4 grams total

1. IF we arbitrarily choose **the lightest substance** and divide the others by it, we can get relative ratios of the mass of single pieces. Do this for each substance.
   a. Relative Mass of Substance A

   $\frac{91.5g}{91.5g} = 1$

   b. Relative Mass of Substance B

   $\frac{266.1g \text{ Pinto}}{91.5g \text{ Navy}} = 2.9 \frac{\text{pinto}}{\text{navy}}$ mass ratio

   c. Relative Mass of Substance C

   $\frac{121.4g \text{ Black}}{91.5g \text{ Navy}} = 1.3 \frac{\text{black}}{\text{navy}}$ mass ratio

1. A bag of beans has a mass of 454 grams. How many of each bean are in the bag? (3 calculations)

   $454g \text{ NAVY} \times \left(\frac{552 \text{ NAVY}}{91.5g \text{ NAVY}}\right) =$

   $454g \text{ PINTO} \times \left(\frac{552 \text{ PINTO}}{266.1 g \text{ PINTO}}\right) =$

   $454g \text{ BLACK} \times \left(\frac{552 \text{ BLACK}}{121.4 g \text{ BLACK}}\right) =$

2. Black beans are delivered to the store in boxes. Each box contains 24 bags. How many beans are in a box of black beans?

   $1 \text{ box black} \times \left(\frac{24 \text{ bags BLACK}}{\text{box black}}\right) \times ($

3. You can buy a large bag of Navy beans. The bag contains 3 pounds. (1 lb = 454 g) How many navy beans are in the large bag?

4. For quality control inspector will randomly measure the mass of a box of bean to make sure there is the correct number of bags. During one of these inspections it was determined that the mass of a box of black beans was 10.4 kg. Does this box have the correct number of bags? Explain why or why not? (use conversions from previous questions to help.)

5. Someone gave you a container containing 2500 pinto beans. You are given the task to put these pinto beans in bags. How many bags of pinto beans can you make and how many pinto beans are leftover?

6. If you had 1 million beans which bean would give you the most bags?

7. If you had 1 million black beans. Is this enough beans to form a box? How many boxes can 1 million black beans form?

1,000,000 black beans × (black box / black beans) = black boxes

From #2

5. Assuming that each human being has 60 trillion body cells (6×10^{13}) and that the earth's population is 6 billion (6×10^{9}), calculate the total number of living human body cells on this planet. Is this number smaller or larger than a mole? Divide the larger value by the smaller to determine the relative size of the two values.

7. A supercomputer, nicknamed Roadrunner, built by IBM for the Los Alamos National Labs can perform about 1.03 petaflop/s (1 petaflop is 10^{15} calculations). Determine how many seconds it would take this computer to count a mole of things. Convert this figure into years.

1 mole of calculations × (6.02×10^{23} calc / 1 mole)(1 peta flop / 10^{15} calc)(1 sec / 1.03 peta flop) = sec

(1 hr / 3600 sec)(1 day / 24 hr)(1 yr / 365 day) = 18.5 years

8. If you started counting when you first learned how to count and then counted by ones, eight hours a day, 5 days a week for 50 weeks a year, you would be judged a 'good counter' if you could reach 4 billion by the time you retired at age 65. If every human on earth (about 7×10^{9}) were to count this way until retirement, what fraction of a mole would they count?

7×10^{9} people × ( ) = counts