35.4: Procedures

You will model the processes of radioactive decay and carbon dating.

Rolling the Cubes

1. The cubes represent atoms. As a color is rolled face-up, it is considered to have decayed into a new type of atom. Assume the 25 blocks start as the same color. Predict and record the number of throws it will take to reach the half-life for each color, to have half of a particular color removed from the set.

Table 35.4.1

Color	Predicted Half-life (Number of Throws)
Red	
Black	
White	

2. You will be making a separate list for each color to track the number of cubes that have decayed such that the color is face-up. Start your first list for red cubes face-up.

Table 35.4.2: Red Cubes Data

Throws	Cubes Remaining	Red Cubes Decayed
0	25	-
1	22	3

3. Assume that all cubes are starting as one isotope. Shake all cubes and roll them onto a table, this counts as throw number 1. Remove and record the number of cubes that are red side up and set them aside (they have decayed). Count and record the number of cubes remaining; the ones that were not red side up. Continue this process until all of the cubes have decayed to red (rolled so red was face-up). Track each throw, including throws for which none of the cubes decayed to red.
4. Repeat the process with the cubes for the black sides.
5. Repeat the process with the cubes for the white sides.

Dating the Beans

6. Draw a table in which to record the number of black beans, red beans, and white beans in each sample. **Do not fill in the data until you have read the instructions for obtaining that data.**

Table 35.4.3: Bean Count Data

Sample	Black Beans	Red Beans	White Beans	Total
1				
2				
3				
4				
5				

2. The colored beans represent atoms. Assume the black beans are carbon atoms and the red beans are nitrogen. Assume the white beans are all of the other types of atoms in the sample. Count and record the number of black beans, red beans, and white beans in each sample. Add and record the total number of beans in each sample. Check the counts with your instructor to ensure that your samples have the correct numbers of beans.

3. Assume that each sample started with 32 black beans, 32 carbon atoms from a live sample, and that each sample is a model of a fossil that has been decaying for a different amount of time with black beans (carbon) decaying into red beans (nitrogen). Determine the fraction of carbon atoms that have not decayed for each of your samples, based on your counts. Record your answers.

***Example**:*

$$\frac{20 \text{ not black}}{32 \text{ total}} = \frac{20}{32} = \frac{5}{8} \qquad (\text{fraction is } 5/8\text{th})$$

Table 35.4.4

Sample	Fraction Black
1	
2	
3	
4	
5	

Contributors and Attributions

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