8.EE Quinoa Pasta 1

Alignments to Content Standards: 8.EE.C.8.c

Task

A type of pasta is made of a blend of quinoa and corn. The pasta company is not disclosing the percentage of each ingredient in the blend but we know that the quinoa in the blend contains 16.2% protein, and the corn in the blend contains 3.5% protein. Overall, each 57 gram serving of pasta contains 4 grams of protein. How much quinoa and how much corn is in one serving of the pasta?

IM Commentary

This task asks students to find the amount of two ingredients in a pasta blend. The task provides all the information necessary to solve the problem by setting up two linear equations in two unknowns. A-REI Quinoa Pasta 2 and 3 are variants of this task which require students to find the information that is given in this problem themselves. While A-REI Quinoa Pasta 2 provides the information in the statement of the task but this time in the form of the nutritional labels, A-REI Quinoa Pasta 3 is a very open ended modeling task. It poses the question but the students have to formulate a plan to solve it. This progression of tasks helps distinguish between 8th grade and high school expectations related to systems of linear equations.

Note that while the computations shown in the solution are carried out using 3 decimal places, the answer should only be reported as whole numbers since that is the precision given in the problem statement.

This task is best used as a group activity where students cooperate to set up the equations to solve the problem.

The Standards for Mathematical Practice focus on the nature of the learning experiences by attending to the thinking processes and habits of mind that students need to develop in order to attain a deep and flexible understanding of mathematics. Certain tasks lend themselves to the demonstration of specific practices by students. The practices that are observable during exploration of a task depend on how instruction unfolds in the classroom. While it is possible that tasks may be connected to several practices, the commentary will spotlight one practice connection in depth. Possible secondary practice connections may be discussed but not in the same degree of detail.

This task helps illustrate Mathematical Practice Standard 2; where mathematically proficient students make sense of quantities and their relationships in problem situations, create coherent representations of the problem given and attend to the meaning of the quantities, not just how to compute them. Students will need to translate the description of the situation into algebraic equations, decontextualizing. Also, they will need to think about what quantities should be represented by variables and how those variables relate to each other. This will require them to "make sense of quantities and their relationships in problem situations." (MP2) The teacher might direct the students' discussion by asking questions such as: "What do the numbers used in the task represent?" "What operations will we need to use to solve this task?" It is important that students just don't know how to compute the numbers in the tasks, but are able to understand the meaning of the quantities and are flexible in the use of operations and their properties.

Solution

We can write a system of equations to solve this problem. If we let q be the amount of quinoa, in grams, in one serving of pasta and c be the amount of corn, in grams, in one serving of pasta we have $q + c = 57$. We also know that 16.2% of quinoa is protein and 3.5% of corn is protein and one serving of pasta contains 4 grams of protein. We can summarize this information in the equation $0.162q + 0.035c = 4$. Therefore, we have the following system of equations:

$$\begin{aligned} q + c &= 57 \\ 0.162q + 0.035c &= 4. \end{aligned}$$

We can solve this system using the method of substitution or the method of elimination. Using the method of substitution, we solve the first equation for q:

$$q = 57 - c.$$

We substitute this for q in the second equation and solve for c :

$$\begin{aligned} 0.162q + 0.035c &= 4 \\ 0.162(57 - c) + 0.035c &= 4 \\ 9.234 - 0.162c + 0.035c &= 4 \\ -0.127c &= 4 - 9.234 \\ -0.127c &= -5.234 \\ c &= 41.213. \end{aligned}$$

So we have $c = 41$ and $q + c = 57$, which gives $q = 16$. Out of the 57 grams of pasta in one serving, 41 grams are corn and 16 grams are quinoa. In other words, about 72% of the pasta blend is corn and 28% is quinoa.