Problem of the Week
Problem A and Solution
Stella's Vegetable Garden

Problem

Stella wants to plant some vegetables in her garden so her family can enjoy them. She has five types of plants in the garden: beans, peas, carrots, lettuce, and tomatoes. She has four more bean plants than tomato plants. She has twice as many pea plants as lettuce plants. She has 10 fewer lettuce plants than carrot plants. She has the same number of bean plants as pea plants. Stella planted 16 carrot plants. How many of each type of plant does Stella have in her garden?

Solution

We know the number of carrot plants without knowing any other information about the garden. All other numbers of plants are related to other the information about other plants. The number of lettuce plants can be determined given the number of carrots, so we can calculate it relatively easily. There are $16 - 10 = 6$ lettuce plants.

Knowing the number of lettuce plants, we can calculate the number of pea plants. There are $6 \times 2 = 12$ pea plants. Since she has an equal number of pea plants and bean plants, she also has 12 bean plants.

If Stella has four more bean plants than tomato plants, that is the same as saying she has four fewer tomato plants than bean plants. Knowing that she has 12 bean plants, she must have $12 - 4 = 8$ tomato plants.

In summary, Stella's garden contains:

- 12 bean plants
- 12 pea plants
- 16 carrot plants
- 6 lettuce plants
- 8 tomato plants

Teacher's Notes

It is possible to solve this problem algebraically. We could assign variables to each of the types of plants and then set up a system of equations that reflects all of the relationships between the numbers of each of the plants. Then we could solve the equations to determine how many of each plant are in the garden. For example if we use variables b, p, c, l, t for the number of beans, peas, carrots, lettuce, and tomatoes, we can describe the relationships as follows:

$$\begin{aligned} t + 4 &= b \\ 2 \times l &= p \\ c - 10 &= l \\ b &= p \\ c &= 16 \end{aligned}$$

There are many algebraic techniques we could use to solve the equations and determine the values for each of the variables. We could also describe the relationships in such a way so that each different variable appears by itself on one side of the equation as follows:

$$\begin{aligned} t &= b - 4 \\ p &= 2 \times l \\ l &= c - 10 \\ b &= p \\ c &= 16 \end{aligned}$$

Using these relationships we can set up formulae in a spreadsheet like this:

	A	B
1	**Type**	**Number**
2	Tomatoes	=B5 - 4
3	Peas	=2 * B4
4	Lettuce	=B6 - 10
5	Beans	=B3
6	Carrots	16

Using this setup, a spreadsheet will show you the same results for each type of plant that we calculated in our solution.