Problem of the Week
Problem C and Solution
An Average Error

Problem

At POTW Farms, Maggie is responsible for collecting eggs each day. She recorded the number of eggs collected each day for one week, and then calculated that the average number of eggs collected in one day that week was 77. When she double-checked the number of eggs she recorded for each day, she noticed that she had recorded 18 eggs on Wednesday. However, she had actually collected 81 eggs.

What is the corrected average number of eggs collected in one day for that week?

Solution
Solution 1

This first solution works primarily with the definition of an average.

To calculate the average, we add the recorded number of eggs for each of the seven days and divide by 7.

$$\frac{\text{sum of recorded number eggs for the seven days}}{7} = 77$$

To then obtain the sum of the recorded number of eggs collected for the seven days, we would multiply the average by 7.

$$\text{sum of recorded number of eggs for the seven days} = 7 \times 77 = 539$$

Now this sum includes the wrong number of eggs recorded on Wednesday of 18. So, we need to adjust the sum by subtracting the wrong number of eggs and adding the corrected number of eggs.

$$\text{correct sum of number of eggs for the seven days} = 539 - 18 + 81 = 602$$

We can now obtain Maggie's corrected average by dividing the corrected total by 7.

$$\text{correct average} = \frac{\text{correct sum of number of eggs for the seven days}}{7} = \frac{602}{7} = 86$$

Therefore, the corrected average is 86 eggs per day.

Solution 2

The second solution looks at how an increase in the number of eggs on one day will affect an overall average.

For an average based on seven days, an increase of 1 egg will cause the overall average to increase by $\frac{1}{7}$ of 1 egg. So, for each increase of 7 eggs, the overall average will increase by 1 egg. That is, the average number eggs will increase by 1 egg for every 7 eggs increased on Wednesday.

The number of eggs on Wednesday increases by $81 - 18 = 63$ eggs. Since $63 \div 7 = 9$, her average will increase by 9 eggs from 77 to 86 eggs.

Therefore, the corrected average is 86 eggs per day.