5.NF Do These Add Up?

For each of the following word problems, determine whether or not $(\frac{2}{5} + \frac{3}{10})$ represents the problem. Explain your decision.

a. A farmer planted $\frac{2}{5}$ of his forty acres in corn and another $\frac{3}{10}$ of his land in wheat. Taken together, what fraction of the 40 acres had been planted in corn or wheat?

b. Jim drank $\frac{2}{5}$ of his water bottle and John drank $\frac{3}{10}$ of his water bottle. How much water did both boys drink?

c. Allison has a batch of eggs in the incubator. On Monday $\frac{2}{5}$ of the eggs hatched, By Wednesday, $\frac{3}{10}$ more of the original batch hatched. How many eggs hatched in all?

d. Two fifths of the cross-country team arrived at the weight room at 7 a.m. Ten minutes later, $\frac{3}{10}$ of the team showed up. The rest of the team stayed home. What fraction of the team made it to the weight room that day?

e. Andy made 2 free throws out of 5 free throw attempts. Jose made 3 free throws out of 10 free throw attempts. What is the fraction of free throw attempts that the two boys made together?

f. Two fifths of the students in the fifth grade want to be in the band. Three tenths of the students in the fifth grade want to play in the orchestra. What fraction of the students in the fifth grade want to be in one of the two musical groups?

g. There are 150 students in the fifth grade in Washington Elementary School. Two fifths of the students like soccer best and $\frac{3}{10}$ of them like basketball best. What fraction like soccer or basketball best?

h. The fifth grade at Lincoln School has two mixed-sex soccer teams, Team A and Team B. If $\frac{2}{5}$ of Team A are girls and $\frac{3}{10}$ of Team B are girls, what fraction of the players from the two teams are girls?

i. Wesley ran $\frac{2}{5}$ of a mile on Monday and $\frac{3}{10}$ of a mile on Tuesday. How far did he run those two days?

Commentary

This task addresses common errors that students make when adding fractions.

It is very important for students to recognize that they only add fractions when the fractions refer to the same whole, and also when the factions of the whole being added do not overlap. While these questions could be approached as separate tasks, here the idea is to sort out the appropriate operation in problems that are superficially alike but may differ mathematically.

This set of questions is designed to enhance a student's understanding of when it is and is not appropriate to add fractions. Individual parts could be used separately but it would work well to generate a classroom discussion of the similarities and differences among these questions.

Solution: Solution

a. In the problem the two fractions refer to the same whole (namely the 40 acres of land). Adding the fractions is appropriate since none of the land is planted with both crops. We add and get the answer of $\frac{7}{10}$ of the 40 acres is planted in wheat or corn.

b. In this problem there are several aspects that make the addition of fractions wrong. First, the fractions given are of different bottles and they don't need to have any relationship to one another. Second, the question asked how much water they drank and no information is given about the amount of water in either bottle, only the fraction of what was in each bottle.

c. In this problem, the two fractions are both parts of the same whole (the number of eggs in the incubator) and could be added together to find the fraction of the eggs that hatched in all. However, since the question asks for the number of eggs hatched, it cannot be answered without more information. Adding the fractions might be part of the solution to the question of how many eggs hatched.

d. In this problem, the two fractions are related to the same whole, namely the total number of members of the team. Since no one arrived after 7:10, then the question can be answered by adding the two fractions to determine that $\frac{7}{10}$ of the team arrived.

e. This problem may serve as a preview to a sixth grade standard relating to ratios. While Andy made $\frac{2}{5}$ of his free throws and Jose made $\frac{3}{10}$ of his free throws, the fractions are of a different number of throws and thus cannot be added. For this problem, the total fraction of free throws is the sum of the number completed out the total number attempted. Thus the total is 5 out of 15 or $\frac{5}{15}$ of the total throws.

f. In this problem, both of the fractions refer to the same whole, namely the total number of students in the fifth grade. However, it is likely that some of the students want to play in both groups, so it is not appropriate to add the two fractions.

g. In this problem, the two fractions refer to the same whole, the number of students in the fifth grade. Since the rating is of their favorite sport, it is probable that each student was only allowed to select one favorite sport so that there is no overlap between the two sets. Thus it is appropriate to add the fractions to find that $\frac{7}{10}$ like one of these two sports best. Note that the total number of students in the fifth grade is given and is not necessary to answer the question. It is useful for students to see some questions where not all of the information is necessary to solve the problem.

h. In this problem, the two fractions are not of the same whole; rather each is a fraction of a different team. Thus it is not appropriate to add the fractions to find the fraction of the two teams that are girls. To answer the question of what fraction of the whole are girls, it would be necessary to know how many people are on each team. One would add together the number of players on the two teams to form the denominator of the new fraction. To find the number of girls on each team, one would multiply the fraction of girls on each times the number of members of the team and add together the total number of girls to get the numerator of the fraction that represents the total.

i. In this problem, both fractions are parts of the same whole, namely one mile, so it is appropriate to add them to find he ran a total of $\frac{7}{10}$ of a mile.