Students's work

Sometimes a problem that looks as if it could be solved by setting up a proportion actually can't be solved that way. Analyze the students' work presented below before answering the questions.

1. For every \$3 Max saves, his dad will contribute \$5 to his savings account. Max was able to raise \$51 with his summer job and wanted to find how much would be in the account. He set up the following equation to calculate how much his father would have added to the account:

$$\frac{3}{51} = \frac{x}{5}$$

   a. Max was confused by the result he obtained. Is this problem appropriate to solve using a proportion? Why?
   b. What might be the origins of Max's confusion? How could you help him?

2. John is working on the following story problem:
   In a cookie factory, 4 assembly lines make enough boxes of cookies to fill a truck in 10 hours. How long will it take to fill a truck if 8 assembly lines are used?

   John sets up the proportion

$$\frac{10 \text{ hours}}{4 \text{ lines}} = \frac{x \text{ hours}}{8 \text{ lines}}$$

   a. Is this proportion appropriate for this situation? Why or why not?
   b. If John set up is correct, find the answer to the problem. If not, explain what might be the origins of John's misunderstanding. How would you help him?
   c. Does the problem require proportional thinking?

3. Robyn is trying to find how long will it take to fill a truck if 6 assembly lines are used. She used the following reasoning:

   Since 4 assembly lines fill a truck in 10 hours, 8 assembly lines should fill a truck in half that time, namely in 5 hours. Since 6 assembly lines is halfway between 4 and 8, it ought to take halfway between 10 hours and 5 hours, or 7 $\frac{1}{2}$ hours to fill a truck.

   Robyn's reasoning seems quite reasonable, but is it really correct? Let's look carefully. Fill in the following table by using logical thinking about the assembly lines:

# of assembly lines	# of hours to fill a truck
1	
2	
4	10 hours
8	
16	
32	

Now apply Robyn's reasoning again, but this time comparing 1 assembly line and 32 assembly lines. Sixteen assembly lines is approximately halfway between 1 and 32. But is the number of hours it takes to fill a truck using 16 assembly lines approximately halfway between the number of hours it takes to fill a truck using 1 assembly line versus using 32 assembly lines? What can you conclude about Robyn's reasoning?

4. Ken used 3 loads of stone pavers to make a circular (i.e., circle-shaped) patio with a radius of 10 feet. Ken wants to make another circular patio with a radius of 15 feet, so he sets up the proportion

$$\frac{3 \text{ loads}}{10 \text{ feet}} = \frac{x \text{ loads}}{15 \text{ feet}}$$

a. Is this correct? If not, why not?
b. If correct, find the solution. If not, explain what might be the origins of Ken's misunderstanding. How would you help him?

5. Students were assigned the following problem:

The ratio of games won to games lost is 4 to 3 for the girl's field hockey team. If the team played 56 games, how many games did the team win?

Two students set up the equations and explained their reasoning as shown below. For each case, answer the following questions:

a. Does the student demonstrate a correct approach to solving the problem?
b. Does the explanation provide a complete and meaningful justification of their reasoning?

> Linda wrote: $4x + 3x = 56$. She said: "Since the ratio of games won to games lost is 4 to 3, then a way of representing that ratio is $\frac{4x}{3x}$, where x is the common factor that is shared by both the number of games lost and the number of games won. Since the total number of games is 56, then adding the two numbers $4x$ and $3x$ should equal 56. Once this equation is solved for x, then it can be multiplied by 4 to determine the number of games won."
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> Jimmy wrote: $w = \frac{4}{7} \times 56$. He said: "I noticed that the ratio given in the problem was a part/part ratio, that is, wins to losses. The question, however, wants us to find the total number of wins given the total number of games played. I changed my ratio problem to a fraction problem. I noticed that the team wins 4 out of 7 games they play. So, the total number of games won is $\frac{4}{7}$ of 56 or $w = \frac{4}{7} \times 56$.