Modeling with Inequalities

Let's look at solutions to inequalities.

17.1 Ordering Sandwiches

The stage manager of the school musical is trying to figure out how many sandwiches he can order with the $83 he collected from the cast and crew. Sandwiches cost $5.99 each, so he lets x represent the number of sandwiches he will order and writes $5.99x \leq 83$. He solves this to 2 decimal places, getting $x \leq 13.86$.

Determine whether each statement about this situation is true. Be prepared to explain your reasoning.

1. He can call the sandwich shop and order exactly 13.86 sandwiches.

2. He can round up and order 14 sandwiches.

3. He can order 12 sandwiches.

4. He can order 9.5 sandwiches.

5. He can order 2 sandwiches.

6. He can order -4 sandwiches.

17.2 Info Gap: Giving Advice

Your teacher will give you either a problem card or a data card. Do not show or read your card to your partner.

If your teacher gives you the problem card:

1. Silently read your card and think about what information you need to answer the question.
2. Ask your partner for the specific information that you need. "Can you tell me _____?"
3. Explain to your partner how you are using the information to solve the problem. "I need to know _____ because . . . ."

   Continue to ask questions until you have enough information to solve the problem.
4. Once you have enough information, share the problem card with your partner, and solve the problem independently.
5. Read the data card, and discuss your reasoning.

If your teacher gives you the data card:

1. Silently read your card. Wait for your partner to ask for information.
2. Before telling your partner any information, ask, "Why do you need to know _____?"
3. Listen to your partner's reasoning and ask clarifying questions. Only give information that is on your card. Do not figure out anything for your partner!

   These steps may be repeated.
4. Once your partner says they have enough information to solve the problem, read the problem card, and solve the problem independently.
5. Share the data card, and discuss your reasoning.

Are you ready for more?

In a daycare group, nine babies are five months old and 12 babies are seven months old. How many full months from now will the average age of the 21 babies first surpass 20 months old?

17.3 Elevator

A mover is loading an elevator with many identical 48-pound boxes. The mover weighs 185 pounds. The elevator can carry at most 2000 pounds.

1. Write an inequality that represents the situation. Check your inequality with your partner.

2. Solve your inequality and explain what the solution means.

3. Graph the solution to your inequality on a number line.

4. If the mover asked, “How many boxes can I load on this elevator at a time?” what would you tell them?

Lesson 17 Summary

We can write inequalities to represent situations and solve problems. First, it's important to decide what quantity we are representing with a variable. Next, we can connect the quantities in the situation to write an expression. Then we choose an inequality symbol and complete the inequality.

When solving the inequality to answer a question about the situation, it's important to keep the meaning of each quantity in mind. This helps us decide if the solution to the inequality makes sense for the situation.

Example: Han has 50 centimeters of wire and wants to make a square picture frame with a loop to hang it. He uses 3 centimeters for the loop. If Han wants to use all the wire, this situation can be represented by the equation $3 + 4s = 50$, where s is the length of each side in centimeters.

If Han doesn't need to use all the wire, we can represent the situation with the inequality $3 + 4s \leq 50$. The solution to this inequality is $s \leq 11.75$. However, not all solutions to this inequality make sense for the situation. For example, we cannot have negative lengths or a side length of 0 centimeters.

In other situations, the variable may represent a quantity that increases by whole numbers, such as numbers of magazines, loads of laundry, or students. In those cases, only whole-number solutions make sense.