When Will They Meet? Presenter Notes

The Problem: At noon, a car and a bike start travelling down the same straight road. The car travels at 80 km per hour. The bike travels at 30 km per hour. The bike starts 150 km ahead of the car. At what time will the car and bike meet?

Suggested order to post solutions (left to right):

1. Number line
2. Whole Number rods
3. Car starts at position 0 km, bike, at position 150 km:
    a. table of values
    b. graph (quadrant 1)
    c. algebraic equation 150 + 30t = 80t
4. Car starts at position -150 km, bike at position 0 km:
    a. table of values
    b. graph (quadrants 1 and 4)
    c. algebraic equation 30t = 80t - 150

Where's the math?

The Whole Number Rod and Number Line solutions are similar representations. The rods allow a physical representation of the movement of the two vehicles. Each purple rod represents one hour of travel by the car (80 km). Each orange rod represents one hour of travel by the bike (30 km). The head start by the bike is represented by one pink and one green rod. Notice how the relationships between the rods are used to precisely represent this solution. Each horizontal line of rods shows the position each vehicle is from the starting point of the car. After 3 hours, shown by three purple and three orange rods, the car and the bike are at the same place. See how the number line solution is similar.
The tables of values are similar except that one considers the starting point to be where the bike is at noon and the other considers the starting point to be where the car is at noon.

The positions of the vehicles from the starting point are represented linearly. The vertical axis represents position from the starting point in km and the horizontal axis represents time in hours. The point where the lines intersect shows the position and time where the car and bike meet.

The two graphical solutions are similar except that one considers the starting point to be where the bike is at noon and the other considers the starting point to be where the car is at noon.

The algebraic equations represent the two linear relations. The variable is time *t*. The two algebraic solutions are similar except that one considers the starting point to be where the bike is at noon and the other considers the starting point to be where the car is at noon.

In the set of sample solutions, the graph, table, and equation that consider the same starting point have been grouped together. As the consolidation proceeds be sure to generate discussion and highlight connections between and among these solutions.

Questions to Consider

1. Any Aha's, wonderings, comments about the mathematics?

2. What are the connections between and among the solutions?
   - What part do the speeds of the car and bike play in each of the solutions?
   - How does each solution show the 150 km head start of the bike?

3. How do the tables of values connect to the corresponding graphs?
   - Time (h) is along the horizontal axis
   - Distance from the start (km) is along the vertical axis
   - The pair of numbers in each row of the table is the ordered pair of a point on the corresponding graph.

4. How do you know the car and bike will meet?
   - The car begins behind the bike on the same straight road. The car travels faster and will eventually catch up and pass the bike.
   - The graph of any linear function that begins lower (lower constant) on the vertical axis but rises at a faster rate (greater multiplier) than another linear function will eventually cross it.

5. How would the solutions change if the bike had a smaller head start?
   - It would take less time for the car to catch up so it would take less time for the car and the bike to meet.
   - The graph representing the car would not start as far below the graph representing the bike. The graphs would rise at the same rates and cross at a time less than 3 h.
   - In the whole number rods solution, the head start rods (pink and green) would be smaller so, it would take fewer of the rods representing the car and the bike to match vertically, indicating less time until they meet. This is similar to the number line solution.

6. How would the solutions change if the bike was travelling faster than 30 km/h?
   - It would take more time for the car to catch up so it would take more time before the car and the bike meet.
   - The graph representing the bike would start at the same place on the vertical axis, but would rise faster. The graphs would cross at a time greater than 3 h.
   - In the whole number rods solution, the rod representing the bike would be longer. It would take more of the car and bike rods to match vertically. This indicates more time until they meet. This is similar to the number line solution.