Two Worlds Collide, Part 3

Systems of Linear Equations: Applications

Brittany VanCleave, Teresa Lansford, Michell Eike
Published by *K20 Center*

Grade Level	9th – 11th Grade	**Time Frame**	90-120 minutes
Subject	Mathematics	**Duration**	2-3 class periods
Course	Algebra 1, Algebra 2		

Essential Question

How can systems of equations be used to represent situations and solve problems?

Summary

This lesson focuses on the application of systems of equations. Using prior knowledge of substitution and elimination from the "Two Worlds Collide, Part 2" lesson, students will apply systems of equations to solve for the prices of individual items in different fast food combos. This is the final lesson of three in the "Two Worlds Collide" lesson series.

Snapshot

Engage

Students watch a video and make connections between a real-world scenario and systems of equations.

Explore

Students solve for the prices of individual items in different fast food combos.

Explain

Students review the substitution and elimination methods.

Extend

Students create their own food truck combo scenarios.

Evaluate

Students complete a Gallery Walk to view their peers' food trucks and solve systems of equations to determine which items they would like to buy.

Standards

Oklahoma Academic Standards Mathematics (Algebra 1)

A1.A.1.3: Analyze, use and apply mathematical models to solve problems involving systems of linear equations with a maximum of two variables by graphing, substitution, and elimination. Graphing calculators or other appropriate technology may be utilized. Interpret the solutions in the original context.

Oklahoma Academic Standards Mathematics (Algebra 1)

A2.A.1.7: Represent and evaluate mathematical models using systems of linear equations with a maximum of three variables. Graphing calculators or other appropriate technology may be used.

Attachments

- Fast-Food-Combos-Two-Worlds-Collide-Part-3 - Spanish.docx
- Fast-Food-Combos-Two-Worlds-Collide-Part-3 - Spanish.pdf
- Fast-Food-Combos-Two-Worlds-Collide-Part-3.docx
- Fast-Food-Combos-Two-Worlds-Collide-Part-3.pdf
- Food-Truck-Design-Two-Worlds-Collide-Part-3 - Spanish.docx
- Food-Truck-Design-Two-Worlds-Collide-Part-3 - Spanish.pdf
- Food-Truck-Design-Two-Worlds-Collide-Part-3.docx
- Food-Truck-Design-Two-Worlds-Collide-Part-3.pdf
- Food-Truck-Gallery-Walk-Two-Worlds-Collide-Part-3 - Spanish.docx
- Food-Truck-Gallery-Walk-Two-Worlds-Collide-Part-3 - Spanish.pdf
- Food-Truck-Gallery-Walk-Two-Worlds-Collide-Part-3.docx
- Food-Truck-Gallery-Walk-Two-Worlds-Collide-Part-3.pdf
- Food-Truck-Planner-Two-Worlds-Collide-Part-3 - Spanish.docx
- Food-Truck-Planner-Two-Worlds-Collide-Part-3 - Spanish.pdf
- Food-Truck-Planner-Two-Worlds-Collide-Part-3.docx
- Food-Truck-Planner-Two-Worlds-Collide-Part-3.pdf
- Lesson-Slides-Two-Worlds-Collide-Part-3.pptx

Materials

- Lesson Slides (attached)
- Fast Food Combos handout (attached; one per student; printed front only)
- Food Truck Planner handout (attached; one per pair; printed front only)
- Food Truck Design handout (attached; one per pair; printed front only)
- Food Truck Gallery Walk handout (attached; one per student; printed front only)
- Paper
- Pencil
- Coloring utensils

15 minutes

Engage

Introduce the lesson using the attached **Lesson Slides**. Display **slide 3** to share the lesson's essential question. Display **slide 4** to go over the lesson's learning objectives. Review these slides with students to the extent you feel necessary.

Go to **slide 5**. Ask students to think about the following questions as they watch the video on the next slide:

- How does the video relate to a system of equations?
- What math components do you see in the video?

Teacher's Note: Video Length

The following video examines how fast food chains advertise their menus. The video is about 6 minutes long. If time is a concern, however, you may stop the video at the 4-minute mark.

Go to **slide 6** and play the video, titled "Sneaky Ways Fast Food Restaurants Get You To Spend Money."

Embedded video
https://youtube.com/watch?v=VooHiweb1sw

After the video, go to **slide 7** and have a whole-class discussion about the questions above.

Teacher's Note: Guiding the Activity

If students struggle to start the conversation, have them first discuss what comprises a system of equations (variables, end values, etc.) to help lead them into the activity.

10 minutes

Explore

Display **slide 8**. Pass out the attached **Fast Food Combos** handout to each student.

Read aloud the following scenario to students: *You and a friend go to Pat's Burgers. You're not that hungry, so you just want to order a couple items. However, the menu lists only the prices of combos—not any single items. Use the combo prices on your handout to determine the prices of each of the following single items: fries, drink, and burger.*

Have students use the pictures and prices on the handout to create equations. Then, they can use those equations to solve for the cost of a single item using any algebraic method.

Remind students to show their work, as they may need to reference their steps in the next portion of the lesson when they discuss their findings in pairs.

Teacher's Note: Guiding the Activity

Do not tell students how to write the equations or how to solve the system; instead, let them discover this process on their own. Students' processes are going to differ depending on the method(s) they choose.

15 minutes

Explain

Display **slide 9**. Have students work in pairs to compare and contrast their findings. Ask them to determine the cost of each of the three items and discuss how they solved the problem. If there are any discrepancies in their findings, they should talk through the problem as a team.

Once student pairs have come to a consensus, have a whole-class discussion about the problem. Call on several pairs to share out their findings.

Go to **slide 10**. Discuss how to translate a pictorial representation into a statement and into an equation. Students need to become able to work with any of these representations. For example, B+2F=6 means "*The cost of one burger and two orders of fries totals six dollars*." This could also be written as "*One burger and two orders of fries cost 6 dollars*," as shown on the slide.

Emphasize to students that the variables represent the cost of the food items and not the quantity of the food items, which is a common misconception. The ability to work flexibly between different representations is an important skill for students to develop as they reach higher levels of math.

Encourage students to write algebraic equations with the variables in alphabetical order to aid in the process of solving a system of linear equations. If time allows, discuss with the class how this could be helpful.

Optional Slides

If students need more help with understanding how to create an equation, break it down by asking students to observe each picture in the boxes and then consider how they could represent each picture mathematically using a variable. To give students more practice with writing equations using variables and words, unhide and transition through **slides 11–15**.

If students struggle to solve the system of equations, consider working through this problem as a class. You may unhide and show **slide 16** to review examples of how students should write their answers as complete sentences.

Teacher's Note: Pacing the Lesson

If you have a traditional 45-minute class period, it is recommended that you end Day 1 of this lesson by reviewing the Fast Food Combos handout with the class and begin the next class period with the Extend portion. If time allows at the end of Day 1, consider passing out the attached Food Truck Planner handout for students to start brainstorming food truck ideas with their partners. Then, students can bring their ideas to the next class period.

Depending on your class, you may want to consider spending two days on the remainder of this lesson. In this case, students would spend Day 2 completing the Food Truck Planner and Food Truck Design handouts and Day 3 completing the Gallery Walk. If students need extra practice with solving systems of linear equations, extending this lesson is recommended.

30 minutes

Extend

Display **slide 17**. Pass out the attached **Food Truck Planner** handout to each student pair.

Read aloud the following scenario to students: *You recently bought a food truck—but what will you sell? This is your time to decide. On your Food Truck Planner handout, include your food truck's name, a description of your restaurant, three different items you plan to sell (and the cost of each item), and six different combos (and the cost of each combo).*

Give students time to determine the prices of their items and calculate the total cost of each combo. Then, have them record this information on the Food Truck Planner handout as a space for them to organize their thoughts. Remind students to make sure each individual item always costs the same, no matter what combo it's in.

Go to **slide 18** to give students further guidance on filling out their handouts. If students are confused about creating their own combos, ask them to think back to the Explore portion of the lesson, where they were given different combos and had to find the cost of each individual item on the Fast Food Combos handout. Encourage students to be creative with their combos.

When students are ready to bring their plans to life, go to **slide 19** and pass out the attached **Food Truck Design** handout to each student pair. Use the slide to review what students need to include on their trucks: the name, six combos with their prices, and a thematically relevant design that showcases the name and meaning behind their brand. Remind students to include only the combo prices and not the prices of their individual items.

Go to **slide 20** to give students further guidance on filling out their handouts. Inform students they are going to post their designs around the room for the class to complete a Gallery Walk in the next activity. This is when students get to solve for the prices of individual items from their peers' food trucks.

20 minutes

Evaluate

Teacher's Note: Multiple Copies

The attached Food Truck Gallery Walk handout provides space for students to solve for the prices of items from *only two* food trucks. If you would like students to have more practice, you may print more than one handout per student and have a stack available for students to pick up another copy if they finish early. Alternatively, you may have students who finish early use the back of the handout or a piece of notebook paper to show their work for items from more than two food trucks.

Display **slide 21** and pass out the attached **Food Truck Gallery Walk** handout to each student.

Once students' Food Truck Design handouts are posted around the room, read aloud the following scenario: *Once a month, your town puts on a festival with live music and food trucks. Many of the trucks come to town just for this event. It's time for your foodie heart to go wild! You want to sample food from as many trucks as possible, so stay away from those combos. Use your math skills to find the individual prices for each item you want to try. Can you be a* Bargain Shopper *and spend the least money? Can you be a* Super Foodie *and visit the most trucks? It's up to you!*

Have students complete a Gallery Walk by viewing their peers' food trucks and deciding which ones they'd like to try. Inform students they can select only one item per food truck.

On the handout, have students solve for the prices of individual items from their chosen food trucks based on the combo prices. Remind students to show their work and write the name of the food truck they chose, the three items available, and the prices of each individual item.

Once students have had time to find the prices of individual items from at least two food trucks, have the class come back together to share out. Ask for volunteers to share which items they would like to buy and why (including the price of each selected item).

To determine which students were "Bargain Shoppers," ask the class: *Who was able to spend the least money? What was your strategy?* After a few responses, ask about the "Super Foodies": *Who was able to visit the most food trucks? What was your strategy?*

To conclude the lesson, ask students to share out which algebraic method they used to solve the different systems of equations. If needed, remind students that both substitution and elimination always work. You may use this activity as an assessment to evaluate students' understanding of the concept.

Resources

- Business Insider. (2019, March 18). Sneaky Ways Fast Food Restaurants Get You To Spend Money [Video]. YouTube. https://www.youtube.com/watch?v=VooHiweb1sw
- K20 Center. (n.d.). Gallery Walk/Carousel. Strategies. https://learn.k20center.ou.edu/strategy/118