

Lesson Title: Chickens and Pigs Intro to Systems Alg 6.4**Utah State Core Standard and Indicators** Algebra Content Standard 2.2 Process Standards 1-5**Summary**

In this lesson, students use trial and error to figure the solution to the chickens and pigs problem. In the process, they deal with the ideas for two equations. First, they combine numbers which add to be the number of heads. Then they try combinations of numbers which work for the chicken and pig legs. From this experience, they create a table and a graph and then write two equations to enter into the calculator or computer. They then explain the equations and graphs.

Enduring Understanding

Algebra helps us solve complex problems involving interrelated situations with common variables. By communicating the information in a “system” of equations, you can use algebra to manipulate the system and find the commonality at a given point in time—the solution to the problem.

Essential Questions

How do you represent interrelated information mathematically? How does this communication help us solve problems?

Skill Focus

- Writing and solving linear systems using a graph

Vocabulary Focus

linear equations, systems of linear equations, intersection, solution

Assessment**Materials:** Calculators and Computers**Launch ideas:**

“we will use question one as our launch”

“In groups of three, students solve the chickens and pigs problem by guess and check. As a group solves the problem, check their answer and give them another set of data from problem 5 & 6. Continue this process until every group solves the original chicken and pigs problem.”

Explore ideas:

“After the students have time to work in groups to solve question one, the teacher will discuss with the students their results. Then the teacher will continue with the lesson as a teacher directed lesson. She will have to guide the students in making the equations, help with calculators, as well as direct the students through the rest of the activity. Students will have to first solve the problem any way they can think of then apply their knowledge of calculators and systems of equations to finish the activity.”

“Individually, with the help of their group, students should create their table, plot the points and draw the lines. Create the heads and legs equations. In the high school classes, this required a class discussion. Graph the equations on a calculator and compare with their hand drawn graphs.”

“We made a full page graph for problem #2 with large grid paper so the students could clearly see the intersection of the lines.”

Summarize ideas:

“For homework the students will have to make up their own system of equations problem and show how to solve it using systems of equations.”

“Have students write equations for problem #6 and graph the equations on the overhead calculator to demonstrate for the class. Compare these solutions with the group solutions found by the faster groups using guess and check .”

“We thought this is a great summary lesson so there will not be a need for more guided practice.”

Apply

Directions: Use the chickens and pigs problem as the intro to systems of equations.. Have students divide into small groups and solve the problem using trial and error. Once they have arrived at a solution, have them share the way they came up with the solution. Then write the equations. Students may need assistance writing the equations. Coach them by asking what they did—they usually come up with combinations of numbers which add to 60—or $\text{pigs} + \text{chickens} = 60$. It's an easy jump from here to an equation for legs.

The teacher will need to demonstrate to students how to find enter equations into the calculator or computer and then find the trace to the solution.

Students can now graph the equations by plotting points, using a graphing calculator or graphing software such as TI Interactive.

Facilitate a short discussion about how difficult it would be to solve this equation if the numbers in the problem were more complicated. Students can immediately understand the value of algebra and specifically a system of equations for finding the solutions to problems involving two equations.

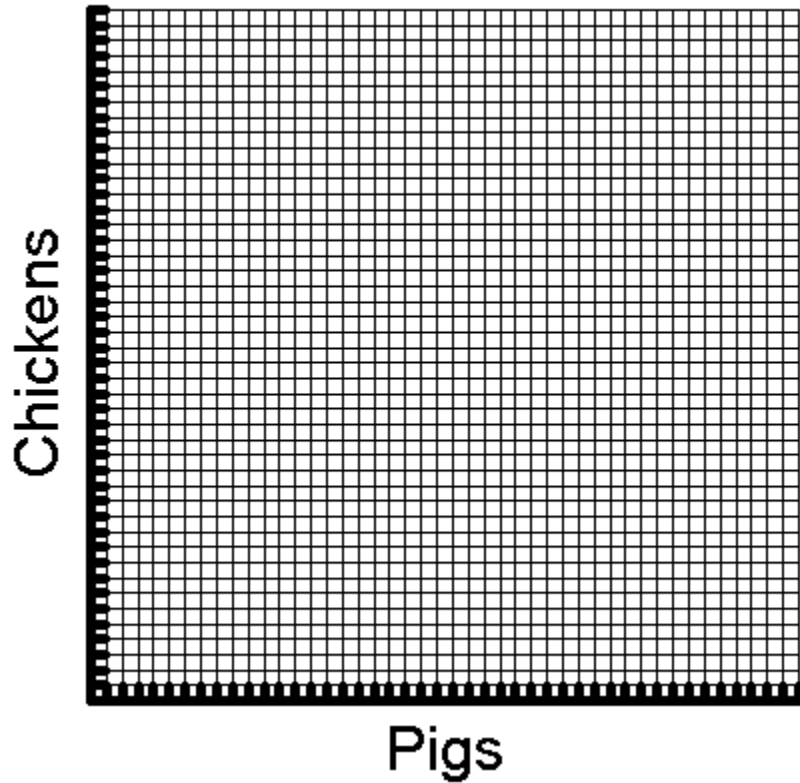
Alg 6.4a**The Chickens and Pigs Problem**

1) A farmer saw some chickens and pigs in a field. He counted 60 heads and 176 legs. Problem solve with your group to find out exactly how many chickens and how many pigs he saw. Show your strategies below.

2) Create a table of possible values and solve graphically. The second table should relate to the first.

Head Combinations	
Pigs x	Chickens y

Leg Combinations	
Pigs x	Chickens y



3) Create two equations and solve graphically on a calculator or computer.

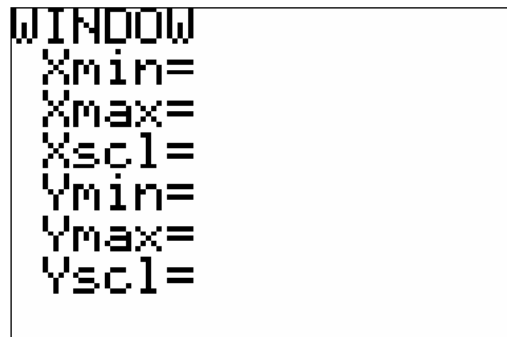
a) Heads equation: _____ Legs equation: _____

b) Rewrite the equations in slope intercept form.

Heads equation: _____ Legs equation: _____

c) Put the equations into the calculator or computer. Record the calculator window you should use to show these equations?

d) Compare the graph on the calculator or computer to the one you created. Explain how the graphs and equations work to show the solution.



4) Compare the methods you have used to find the solution; trial and error, a table and a graph, equations and a graph. How are they alike? How are they different? Which is easier? Why?

5) What if the farmer counted 146 legs and 45 heads? How could you solve this problem quickly by graphing?

6) Using the graphing calculator to find the solution for the following combinations of legs and heads. Write the equations (in slope-intercept form) that you used for each combination to the side of the table.

Heads	Legs	Solution
26	80	
32	84	
36	108	
40	144	
54	180	

Equation for Heads

Equation for Legs

7) In your own words, describe the meaning of a “solution” to two linear equations.