

# Production of Tables

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### Third Grade Lessons

1. **Candy Boxes** - This class centers on the possible amounts of candies two children, John and Maria, have. They each have the same, unspecified number of candies inside their own candy box. John has, in addition, one extra candy and Maria has three extra candies. What are the possible total candies they might have?
2. **Comparing Different Functions** - The students will discuss, represent, and solve a verbal problem involving the choice between two functions.
3. **Comparing Graphs** - Students are given an hourly rate of pay and infer coordinates for (h, \$) over a range of hours. They produce a table and a graph of work-pay. Then they produce another graph for another rate of pay and discuss differences in time and pay.
4. **Comparison Problems & Tables** - This class will be used to review concepts and representations as applied to the solution of verbal comparison problems and to work on function tables.
5. **Dinner Tables I** - Students work with a function relating number of tables to the number of available seats. One table seats 4, two tables seat 8, three tables seat 12....
6. **Dinner Tables II** - Students work with a function relating the number of tables (in a straight line) to the number of available seats. One table seats 4, two tables seat 6, three tables seat 8...
7. **Dots Problem** - We present to the students a problem dealing with a growing pattern over time. To begin, there is one dot. With each passing minute four more dots are drawn around the previous dot(s).
8. **Formulas and Stories** - The students will be required to work with the relation between different mathematical expressions (formulas) and stories.
9. **Functioning Together** - Students work together to develop multiple representations of a function. The students split up into groups of three with each student having a separate responsibility. When all the input values have been used up, the students are asked to, together, make up a story that describes their function.
10. **Functions - Earning Money** - The students will create tables and equations from given stories. The functions are additive and multiplicative.
11. **Functions II** - The students will use three functions that are represented as a sequence of patterns and create a sequence of hops on the number line, a data table, and an algebraic expression to express the functions.
12. **Functions from Tables** - Students work with a function, beginning with a table and then a formula, to generate ordered pairs that follow the rule of the function.
13. **Guess my Rule - Multiplicative Tables** - Two children create secret rules for transforming input numbers. The teacher uses a doubling or tripling rule.
14. **Guess my Rule - Tables** - Two children create secret rules for transforming input numbers. The teacher uses a doubling rule.
15. **How Many Points?** - Students work with: (a) a context — distance as a function of time; (b) generating coordinates.
16. **Human Graph I** - Students plot themselves on a Cartesian plane. Each student will get a large card with a place for an ordered pair: (x, y), where x refers to hours worked, and y refers to amount earned. The students must name the coordinate pair for the point they themselves are standing on.
17. **Multiple Number Lines** - Students continue to learn that two partial changes that start at different points on the number line are equivalent. At the end, they will work with notation for variables ( $N + 5 - 3$  or  $N + 2$ ).
18. **N-Number Line II** - Students use the N-Number line to make generalizations about an unknown amount of money in a piggy bank.
19. **Piggy Banks** - The whole lesson revolves around a multipart story problem involving changes in two quantities over several days of a week. The initial quantities are equal yet unknown. Then transformations are applied to the quantities. Students are asked to compare the quantities throughout the week even though only their relative relationship can be determined.
20. **Recipes that Exchange** - The lesson focuses on a function that multiplies input by two but also changes the ingredient to another type of ingredient.
21. **Rules and Formulas** - Students are given a rule and a data table supposedly generated according to the rule. Students evaluate whether: (1) the proper rule has been applied and (2) the result is correct.
22. **Starting With A Rule** - Students focus on whether given outputs are consistent with a given rule.
23. **Three Heights** - In this class we will explore: (a) How the children deal with comparisons, (b) How they draw inferences from comparisons, and (c) How they represent comparisons between three unknown amounts.
24. **Times Two** - The lesson focuses on a function that multiplies the input by two. New notations are introduced.

### Fourth Grade Lessons

1. **Comparing Functions** - This lesson is split into two days. In the first class, the students will analyze eight basic graph shapes and will represent and solve a verbal problem involving the choice between two functions. In the second one they will be asked to choose, among the eight basic graph shapes, the ones that matches specific situations.
2. **Evaluation Problem** - Students will be given a problem that asks about the amount of money each person has, based on the amount in a piggy bank. They will be given one graph and asked to draw the second graph.
3. **Graphing A Story** - A trip is described in miles, hours, and miles/hr. Students produce a graph from the description. They then produce a table from the graph and answer questions about the trip.
4. **Graphing Halves and Doubles** - Children work on a problem about distance and time and compare two rates: half a meter per second and two meters per second.
5. **Graphing Thirds and Triples** - Children work on a problem about distance and time and compare two rates: one third of a meter per second and three meters per second.
6. **Multiplicative Candy Boxes I** - This class centers on the possible amounts of candies two children, Juan and Marcia, have. Juan has a box of candy and Marcia has twice as much candy. What are the possible amounts of candies they might have?
7. **Multiplicative Candy Boxes II** - This class is a continuation of the Multiplicative Candy Boxes I lesson. It centers on the possible amounts of candies two children, Juan and Marcia, have. Juan has a box of candy and Marcia has twice as much candy. What are the possible amounts of candies they might have?
8. **Swimming Pools I** - Compare how two swimming pools fill up with water over several hours.
9. **Swimming Pools II** - Students will examine the rate of pools filling over several hours.
10. **The Better Paying Job I** - Children work on a problem about rate of pay per hour of work. They compare ratios (dollars earned per hour of work) and discuss and plot points in a Cartesian plane.
11. **The Better Paying Job II** - Children work on a problem about rate of pay per hour of work. They compare ratios (dollars earned per hour of work) and discuss and plot points in a Cartesian plane.

12. **Three Heights Review** - In this class we will explore: (a) How children deal with comparisons, (b) How they draw inferences from comparisons, and (c) How they represent comparisons between three unknown amounts.
13. **Two Phone Plans I** - Students compare two phone plans, one of which has a lower rate, but a monthly basic charge; the other has a higher rate but no basic charge.
14. **Wallet Problem I** - Students compare the amounts of money two students have. The amounts are described relationally but not through precise dollar amounts.
15. **Wallet Problem II** - Students will be given a wallet problem. They will be asked to compare the amounts of money two students have. The amounts are described relationally but not through precise dollar amounts.
16. **Wallet Problem III** - Students will continue working with the wallet problem. They will be shown a graph for Mike's amounts and asked to (a) determine whether it represents Robin's or Mike's money and (b) to predict where the line for Mike would fall. Later they will plot Mike's amounts and will discuss why the lines cross.

#### Fifth Grade Lessons

1. **Elapsed Time** - A variant of the train crash problem is used to address questions about elapsed time. The task is to determine where a train is, given a certain time.
2. **Equations and Graphs** - Students will further compare two linear functions in the context of evaluating two plans for shoveling snow. One plan has two parts: a basic charge plus a charge based on the number of square meters cleared. The other plan has no basic charge; it only charges according to the number of square meters cleared. However the per-meter charge is higher than in the other plan. Students are asked to determine the circumstances in which the bill from each plan would be the same. They then examine the graph of the two functions and discuss how equations and inequalities relate to the graph.
3. **Fifth Grade Assessment III** - This assessment will focus on writing equations to solve verbal problems and on solving equations using the syntactic rules of algebra.
4. **Train Crash** - Students will compare two linear functions represented in a graph. They reason about the problem using (a) the word problem and two diagrams; (b) a graph of position vs. time; (c) a table of values (d) making expressions for each position function; and (e) solving the equation algebraically.
5. **Wallet Review Problem** - This activity is a review of the Wallet Problem done in fourth grade. It is intended to introduce new students to some of the concepts we have covered and to refresh the memories of our old students. Students compare the amounts of money two students have. The amounts are described relationally but not through specific dollar amounts.

#### Middle School Lessons

1. **Compare and Contrast** - Students will identify the y-intercept and slope using equations and then use that data to create corresponding tables and graphs.
2. **Coupon Activity** - Students will create graphs, tables and equations to explain their stories and look at how a graph changes depending on the y-intercept.
3. **Curves in a Cubic** - Students will explore different kinds of cubic functions through graphs and tables.
4. **Graphing Equations - Nonlinear Functions** - Students write equations for three graphs and examine their slopes by comparing and contrasting the graphs. Students also look at the same functions graphed on differently scaled coordinate planes.
5. **It Depends** - Students will think about how we can show a dependent relationship between two quantities, using a variety of representations.
6. **Jason's Tree House** - Students will extract data from a story and use tables and graphs to answer questions about proposed scenarios.
7. **Sound Loudness** - Students will examine a non-linear function depicted in a graph and generate the corresponding function table and equation.