Production of Graphs

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1. **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.
2. **How Many Points?** - Students work with: (a) a context — distance as a function of time; (b) generating coordinates.
3. **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.
4. **Human Graph II** - Students graph the functions k x 2 $/h and k x 3 $/h. The idea is to show that for each linear function the points fall onto a straight line.
5. **Maps to Graphs** - Students will be given two linear distance-time graphs and asked to tell a story about each graph and to compare them. They will later explore comparisons between points in each line.
6. **Rates vs Totals** - Students compare points on an hours/pay Cartesian space. The main challenge lies in recognizing that, although one student earned more, the other student was paid better, that is, at a higher rate of pay. They must indicate the difference in pay and the differences in amount worked.

1. **Cartesian Candy Bars I** - We compare ratios of various ordered pairs in a Cartesian grid. The initial discussion concerns the space as a whole; the task will focus on selected points and on the ratio of the dependent variable to the independent variable.
2. **Cartesian Candy Bars II** - Children work on sharing different amounts of candy bars among different numbers of people. They compare ratios (candy bars per person) and plot points in a Cartesian grid.
3. **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.
4. **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.
5. **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.
6. **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.
7. **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.
8. **Intervals** - Students reason about graphs showing growth over time. They compare heights of children and heights of two animals at different time intervals.
9. **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?
10. **Swimming Pools I** - Compare how two swimming pools fill up with water over several hours.
11. **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.
12. **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.
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 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.

1. **Basic Function Shapes** - In this lesson, the students will (a) discuss, represent, and solve a verbal problem involving the choice between two functions; (b) choose, among 8 basic graphs (7 distinct shapes), the one that matches specific situations; and (c) write stories to match a specific graph shape.
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. **Phone Plans** - Students will compare two linear functions in the context of evaluating phone plans. One plan has two parts: a basic charge plus a charge based upon the number of minutes used. The other plan has no basic charge; it only charges according to the minutes used. However the per-minute charge is higher than in the other plan. Students are asked to determine the circumstances in which the monthly 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.
5. **Varying Rates of Change** - Students will compare three functions, two of which are nonlinear, that tell the story of three cousins who all save $1,000 in one year. One saves a lot the first day and less and less each day as time goes on; one saves very little the first day and more and more each day throughout the year; the last cousin saves the same amount each day. Students will be asked to predict the shape of the graph for each function and, later, to look at and describe graphs of all three cousins' savings.
6. **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.

1. **Area of a Square as a Function** - Students will develop a quadratic equation to represent the area of a square.
2. **Biggest Output** - Students will decide on what linear and quadratic functions will result in the greatest output, starting from an algebraic expression, and using tables and graphs to help them make these decisions.
3. **Box of Clay Activity** - Students will compare two cubic functions based on the context of the volumes of a box of clay.
4. **Candy Experiment** - Students will create their own data to construct a graph and equation of negative and fractional slope.
5. **Compare and Contrast** - Students will identify the y-intercept and slope using equations and then use that data to create corresponding tables and graphs.
6. **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.
7. **Curves in a Cubic** - Students will explore different kinds of cubic functions through graphs and tables.
8. **Function Challenges - 20 Questions** - Students will compete in a game to generate equations for functions that meet certain criteria, as given by the instructor.
9. **Graphing Equations** - Students will practice moving between graphs and equations of functions, as well as identifying the y-intercept and slope.
10. **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.
11. **Guess My Rule - Linear** - Students will try to determine the equation to match their partner's created graph and work together to correct their own mistakes.
12. **Guess My Rule - Non-Linear** - Students will produce algebraic expressions starting from non-linear graphs produced by other students in the class.
13. **It Depends** - Students will think about how we can show a dependent relationship between two quantities, using a variety of representations.
14. **Jason's Tree House** - Students will extract data from a story and use tables and graphs to answers questions about proposed scenarios.
15. **Lotto Winnings** - Students will generate a graph for a nonlinear function, point by point, in order to realize that there are different types of functions that they might not know about yet.
16. **Relating Graphs and Equations - Linear and Quadratic Functions** - Students will generate graphs from given equations and equations from given graphs.
17. **x2 and x** - Students will look at x squared and x as functions, and for which values of x one function value is greater than the other.