

# Fifth Grade Lessons

Each of our activities is designed to be flexible and self-contained. Please feel free to use any of the activities as the basis of your teaching or as supplementary materials.

You do not need to do more than one of the activities in order for them to be useful. However, we have listed them here in the approximate order that we have used them with students. This may be helpful for teachers looking for a series of activities.

Please explore our categorizations by activity type, process, and math concept if you are looking for something specific!

## Fifth Grade Lessons

1. **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.
2. **Arcade** - Students are told a story about two children, each of whom has a certain amount of money, but only one of whom has an amount known to us. After a series of events they happen to end up with the same amount of money.
3. **Solving Equations with One Variable** - Students work on a story about two children who each have a certain amount of money. The amount of one of the children is known but the other is not. After a sequence of transformations they end with the same amount of money. Students will be led to solve for the starting value by relating the equation to the events in the story. After that, they will be asked to solve another similar problem.
4. **Enacting and Solving Equations** - Students enact and discuss a situation where two children have amounts of candies. Some of the candies are visible, others are inside opaque tubes or boxes. After considering multiple possibilities they are told that the children have the same amount of candies. The situation corresponds to the equation  $3x + y + 6 = x + y + 20$ , where  $x$  is the amount of candies per tube and  $y$  is the amount of candies per box. Students will be asked to discuss and to represent the situation, to solve the equation that corresponds to the situation, and to solve other written equations with similar structure.
5. **Fifth Grade Assessment I** - This assessment will focus on writing equations to solve verbal problems and on solving equations using syntactic rules. It is intended as a diagnostic tool to assist teachers in planning future activities.
6. **Fifth Grade Assessment I Review** - This lesson will focus on reviewing the recent in-class assessment, on writing equations for word problems, and on solving equations.
7. **Equations in Groups** - Students first discuss equality situations and how equal changes on both sides of the equality do not change the equality or the solution to the equation. In a second activity, A pair of students begins with a solved equation (e.g.  $N = 4$ ) and passes the equation to their neighbor; the neighbor operates equally on each side of the equation and passes the equations to the following neighbor. They continue this process until the series of equations return to the first two students who, then, check whether the solution still holds. They also check the logic and correctness of their colleagues operations on the initial equation.
8. **Equations in Groups II** - A student (or a pair of students) begins with a solved equation (e.g.  $N = 4$ ) and pass(es) the equation to neighbor (or pair of neighbors); the neighbor(s) operate(s) equally on each side of the equation. And so on, around the table. There should be at least three students or pair of students at each table. When the series of equations returns to the first students, each student (or pair of students) check whether the solution still holds for the solution they had proposed at the beginning. They also check the logic and correctness of the changes implemented by their classmates.
9. **Solving Equations I** - Students will be asked to use the syntactic rules of algebra to solve equations with variables on both sides of the equals sign.
10. **Solving Equations II** - Students will be asked to represent and solve verbal problems requiring algebra and to use the syntactic rules of algebra to solve equations with variables on both sides of the equals sign.
11. **Fifth Grade Assessment II** - This assessment will focus on writing equations to solve verbal problems and on solving equations using the syntactic rules of algebra.
12. **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.
13. **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.
14. **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.
15. **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.
16. **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.
17. **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.
18. **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.
19. **Review on Graphs and Equations** - In this lesson, the students will solve individually or in small groups the set of problems. For each problem, the teacher will lead a discussion based on the students' work (the teacher should identify strong and weak points in the students' work). The class is organized around four main problems. Within each problem students will answer different questions.