

The Great Equation Race

A Journey Around the World Combining Teamwork,
Problem Solving, and Algebra



About the author

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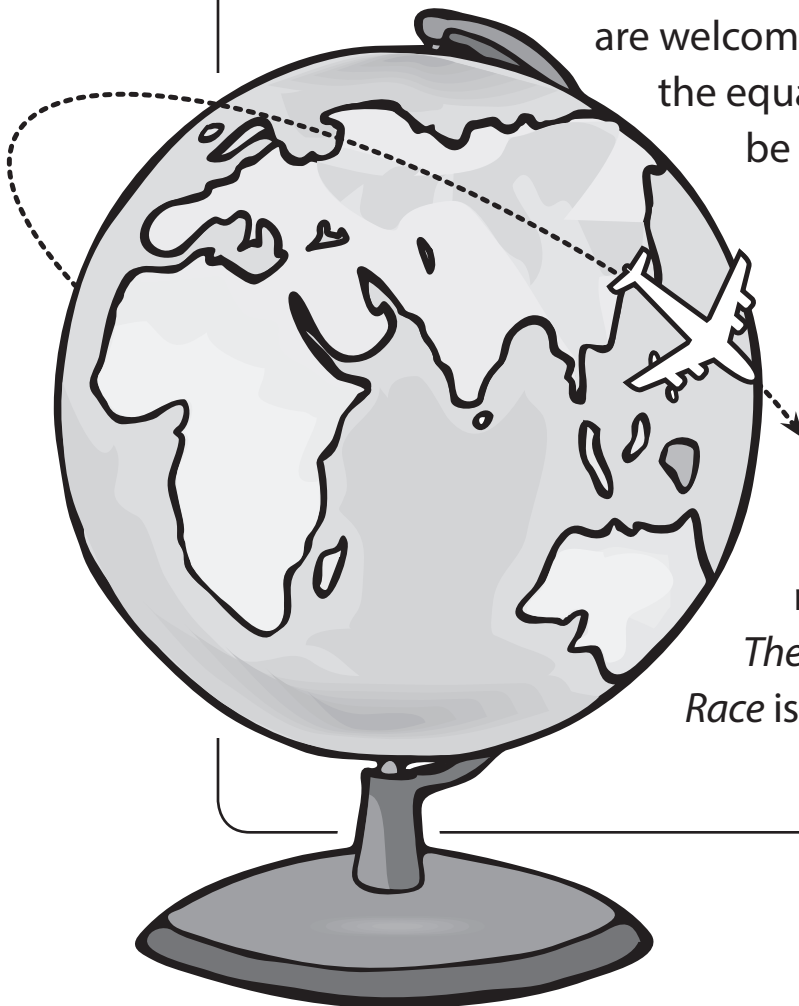
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Welcome to *The Great Equation Race!*

The Great Equation Race is a fun, interactive unit that will motivate middle school students to solve equations as they travel in a race around the world. During this interdisciplinary five day unit students will solve equations, earn mileage, measure and track their course on a map, and research facts about different cities around the world all in a quest for the finish line. All learning levels are welcome in this race as the equations used can

be differentiated to challenge each student. Teachers will love watching all students achieve success. Get ready because *The Great Equation Race* is about to begin!



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Purpose and Overview

Welcome to *The Great Equation Race*!

The Great Equation Race is an interactive mathematics unit for students in grades 5–9 who have had instruction and practice solving linear equations. In the unit, teams of students are given the challenge of completing a journey to five different cities around the world. The teams are faced with a daily challenge: each student must solve his/her own equations on problem cards in order to earn a plane ticket. These plane tickets enable the students to travel to their Destination City and each day move one step closer to completing the race. As they travel, students must keep track of the cities and countries they visit, chart the mileage they have traveled using a map and scale, research facts about each destination, and mark the path of their journey on a team map. This is a race in which all can participate and have their achievements recognized. At the finish line, students receive a travel postcard, which they can decorate to create a bulletin board commemorating their race.



Because of the wide age range of students who can participate in this simulation, the unit has been created with three different levels of equations. Level One comprises one-step problems without negative numbers. This level is perfect for students who are new to equations or face learning challenges. Level Two focuses on one-step equations with negative numbers and provides teachers with a smooth transition from Level One. Level Three is for more advanced students, or students in higher grades. These problems are multi-step equations with negative numbers incorporated into them. There are also Challenge Cards to provide advanced/more-experienced students with additional challenges. *The Great Equation Race* is not designed to teach the steps necessary in solving linear equations, but was created to reinforce the skills already taught. In the unit, students are given many different opportunities to demonstrate their proficiency in solving both simple and complex equations.

Purpose and Overview

What Do Students Learn?

The Great Equation Race was designed to incorporate standards from the National Council of Teachers of Mathematics. In today's mathematics classroom, students are encouraged to express their thinking and knowledge through problem solving and verbal expression. Our students must be able to demonstrate what they have learned and apply this knowledge in daily work, both independently and collectively with peers.

The Great Equation Race provides teachers and students with a fun, interactive way to achieve all of these goals. The math content and skills in the unit encompass standards from Numbers and Operations, Functions and Algebra, Problem Solving and Communication. On page 25 of the teacher's guide, you will find the standards from the National Council of Teachers of Mathematics. These standards describe what students will learn and how they will demonstrate that knowledge.

Knowledge

In this unit, students will demonstrate:

- An ability to identify different types of equations
- Prior mathematical knowledge
- The use of an atlas and map
- Proficiency in researching facts and figures about different cities
- The ability to chart distances and mileage traveled using a map and scale
- The location and names of different cities and countries around the world
- Organizational skills
- An ability to identify the steps required in solving linear equations and the use of those steps
- Mathematical thinking through verbal communication
- Time management

Skills

- Apply prior knowledge in identifying and solving linear equations
- Follow written and oral instructions
- Organize completed work
- Record and plot travel information
- Use a map and scale to determine distances traveled

- Research facts and figures about different destination cities
- Organize time to facilitate task completion
- Listen to the opinions and explanations of others
- Maintain focus and work independently
- Maintain focus and work as a team
- Explain the steps used in solving linear equations

Attitudes

- Develop an understanding of the importance of teamwork
- Appreciate and respect different learning styles
- Value each individual's contribution toward a common goal
- Respect each person's thoughts and opinions
- Appreciate the importance of communication
- Value the learning process
- Enjoy and have fun with mathematics

Learning Styles

Students learn in different ways, and *The Great Equation Race* affords them the opportunity to demonstrate how they learn best while still challenging each individual to grow in new ways. Students are encouraged and required to work as a team. This teamwork encourages communication, allowing students to demonstrate their knowledge and build confidence. Students who excel in verbal communication will enjoy this aspect of the race, while students who are challenged in this area will have a chance to stretch and grow. Move time has been incorporated into this unit, taking into account that many students learn best when their bodies are in motion. Students walk around the room to collect materials, examine maps, turn in completed work, and receive plane tickets. Creative skills are used to design passport stamps and postcards. While there is a lot of focus on the ability to complete individual problem cards successfully, student teams must also work together to solve any interpersonal conflicts peacefully and efficiently. Students can also use each other as a resource, incorporating a peer-teaching aspect to *The Great Equation Race*.



Teaching tip

In teaching this unit, I did both. One time, I chose the pairs because I wanted to encourage community and to see different students work together. I also chose to match up teams who were at different skill levels to promote a peer-teaching aspect. Another time, I allowed students to select their own pairs. Both ways were equally successful.

Purpose and Overview

Teaching tip

If letter grading is a practice at your school, you may wish to count the completed cards as a classwork/quiz grade.



Student Travel Teams

During *The Great Equation Race*, students travel with a teammate. These travel teams of two remain the same throughout the race. You can choose the teams, or allow students to pair themselves up. Students do not compete against each other, so you can pair up students who are at different skill levels without creating a conflict (for example, one student gets frustrated because he/she can or can't solve the equations at the same rate as his/her partner). While it is ideal for students to work in pairs, due to class numbers, it may be necessary to include groups of three. This can work, but may require additional observation to ensure that each student completes his/her own work.

How long is this race?

The Great Equation Race is designed to last seven class days. Teachers are welcome to extend the race by adding their own Daily Destination Cities and by incorporating other levels of problem cards.

How will learning be assessed?

There are several different ways to assess learning in *The Great Equation Race*. One way is through student problem cards. Students are assigned problem cards daily. These cards are completed, corrected by a peer, and kept until the end of the race. At the end of the race, they can be reviewed and assigned a letter grade or rubric score. This manual includes a Teacher Final Evaluation Form.

Another assessment method is through teacher observation. The teacher works as an observer and facilitator during *The Great Equation Race*. Once the initial question/answer period has ended, you should have plenty of time to walk around and observe your students as they work. To aid in this observation process, this manual includes a Teacher Observation Form.

Students will complete daily self-assessments during the race. These assessments not only focus on one's ability to solve equations, but also require students to examine their focus and cooperation. They provide teachers with an inside view into the mind of learners.

After completing the race, the teacher completes a Final Evaluation, the form that is included in this manual.

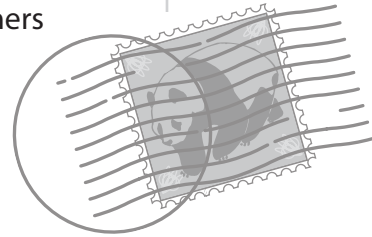
Why use *The Great Equation Race*?

The Great Equation Race engages students in the world of solving equations in a motivating, interactive environment. Often, the mathematics classroom can only involve paper and pencil—a class that revolves around worksheets, tests, and quizzes. *The Great Equation Race* provides necessary practice while at the same time incorporating students in a game—a race in which all students can achieve and win. Students are required to communicate with

each other while discussing problem-solving methods and solutions, and the race around the world will motivate students to work in a focused, efficient manner, which will then aid their team in crossing the finish line.

Teacher and Student Benefits

Using *The Great Equation Race* in the classroom provides both teachers and students with many different benefits. For teachers, the unit is easy to use, and once students have learned the Travel Rules and Guidelines, they will be able to work independently. This allows teachers time to observe and assess how students work with others, how they work independently (i.e., ability to focus and time management), and the mathematical strengths and weaknesses of each student. To facilitate teacher preparation, all of the problem cards have already been created, and there are several different levels from which to choose. Teachers will also find Practice Problems to select from for Day One, and answer keys have been provided for all of the problem cards. Students will find *The Great Equation Race* fun and interactive. It's something different, and it breaks away from traditional methods of teaching equations that involve worksheets or problems from a textbook. While both of those methods are useful, *The Great Equation Race* makes math intriguing and shows students that they can learn in new ways. Because of the number of problem cards and challenge cards, students will receive a lot of practice time. Students will also complete self-evaluations that encourage them to look inward and think about their own learning.



Differentiation

There are several different ways to differentiate instruction while teaching *The Great Equation Race*. The first is through the use of the problem cards. You can choose any of three different options when selecting problem cards for students. Level One contains one-step problems without negative numbers. This level could be used with students new to solving equations, in combination with other levels, or in the upper grades as a review of past skills learned. Level Two problem cards have one-step equations with negative numbers. This level provides a natural transition from Level One, or could be used in combination with Level Three. Level Three problem cards involve solving multi-step equations with negative numbers. Some of these problems use the Distributive Property, and require students to combine like terms. This level would be a nice addition to a Pre-Algebra or Algebra I class. Students working with Level Three cards will have already demonstrated proficiency in solving one-step equations. In one class, a teacher may choose to use all of one level, require students to work through all three levels, or designate which students will be working on different cards of different levels. Because each student completes his/her own card, the level selection can be left to the discretion of the instructor. On the first day of the race, students will complete practice problems, which help you to determine appropriate problem cards for each student.



Teaching tip

One year, I used this with a group of students who had challenges with focus and behavior. I found that the teams were focused, required minimal redirection, and expressed a desire to want to move forward during each class. Even my most reluctant learners expressed that they "loved" the race and many wanted to know if we could play it again.

Purpose and Overview

Challenge Cards are for advanced instruction and would fit perfectly in an eighth or ninth grade algebra class. The equations contain negative numbers, fractions, and decimals. These Challenge Cards can be incorporated into the daily problem cards or used at student request.

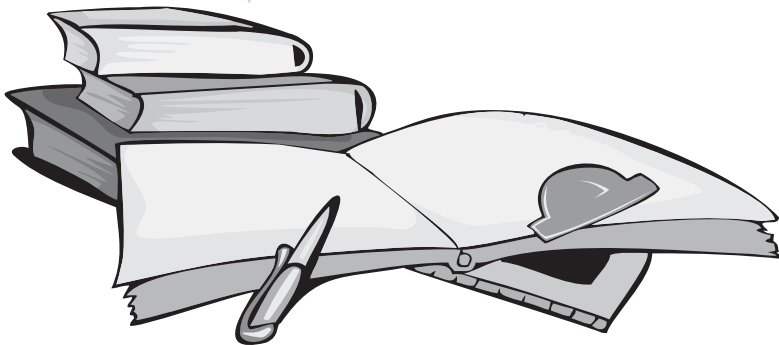
Another way to differentiate instruction is with the number of problem cards assigned. Although the Daily Directions say that a student will complete one card per class, you may choose to assign more than one. In the upper grades, Level One problems may be used as a review and if students have already demonstrated proficiency with the one-step equations, then you may want to assign more than one card per class. You could also choose to assign additional problems as homework.

Motivation

The biggest motivation in *The Great Equation Race* is the desire students will have to cross the finish line. Each day, students will want to solve equations and complete their required teamwork so that they can receive a plane ticket and travel to the next destination in the race. While each student works independently, you will find your students encouraging each other to complete his/her problem cards so that the team can move forward. Because students want to cross the finish line, behavior issues are easily eliminated or cease to exist at all.

Flexibility

What makes *The Great Equation Race* so flexible is that you can choose the equations that the students will solve. This feature already exists in the design of the program. While you could create different problem cards, it is not necessary because you have many different levels of problem cards from which to choose. This allows students the flexibility of working at a level that they find challenging personally, and students who are on different levels can work side by side on the same team.



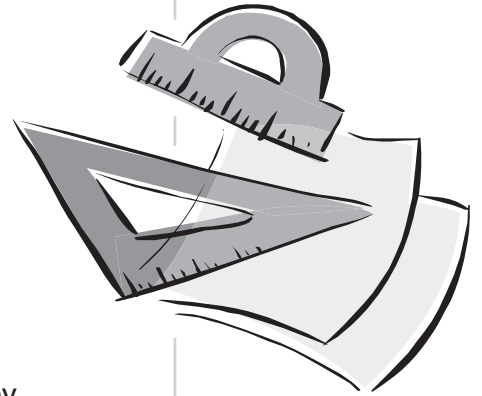
Components

The Great Equation Race includes a Teacher's Guide which offers everything needed to run a great race.

Components include:

- Daily Directions
- Student Guidebooks
- The Mission Overview
- Travel Rules and Guidelines
- Practice Problems and Answer Key
- Problem Cards and Answer Key
- Day Six Problem Cards (Student Take Home) and Answer Key
- Challenge Cards and Answer Key
- Plane Tickets
- Bonus Vouchers
- World Map
- Travel Postcards
- Teacher Observation Form
- Teacher Final Evaluation Form

**There are a few additional items required—and a suggestion to cut down on duplication expenses. See the next section.



Daily Directions

Day One

Materials

- Pocket Folder—one per team
- Guidebooks—one per person
- World maps—one per team
- Notebook for solving problem card equations
- Colored pencils/markers/crayons
- Rulers
- Paper, pens, pencils
- Star stickers
- Abridged Handout of Travel Guidelines—one per person



Whole class

Directions

1. Before handing out any materials or assigning teams, read the following **Mission Overview** aloud to the students.

Mission Overview

Welcome to *The Great Equation Race*! You are about to go on an exciting adventure race in which you will travel with a partner to five cities around the world. Given that this is math class, your ability to solve equations will determine your ability to successfully complete this race. This is not a competition; it is a race where everyone who participates and reaches his or her daily goals will win.

Your race will begin and end in New York City. What happens during the race is up to you. You will be traveling with a teammate. You and your teammate will each have your own equations to solve, but will be responsible for helping each other to complete daily team tasks. On a daily basis, your team will solve equations, work together to determine the amount of mileage you have traveled, research information about different places around the world, and earn plane tickets for travel. You will have to keep track of all of this information. At the end of the trip, all work will be collected for a **Final Evaluation**.

Your team will receive a handout that will outline all of the race rules and guidelines. Good luck! Your Great Equation Race is about to begin!



Read or say

Travel Data

| | Starting City | Destination City | Destination City | Date of Arrival |
|-------|---------------|------------------|------------------|-----------------|
| Day 2 | | | | |
| Day 3 | | | | |
| Day 4 | | | | |
| Day 5 | | | | |
| Day 6 | | | | |

Bonus Travel

By completing Challenge Cards, I was able to travel to the following cities and countries:

1. _____
2. _____
3. _____
4. _____

Mileage Traveled

Day Two From NYC to London _____ miles

Day Three From London to Florence _____ miles

Day Four From Florence to Cape Town _____ miles

Day Five From Cape Town to Auckland _____ miles

Day Six From Auckland to NYC _____ miles