



Use license plates and local scenes to take your students on an adventure to sharpen their math skills and explore fun ways to apply them.

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We are all faced with the challenge of engaging and motivating students throughout the school year, but perhaps even more so as we approach their summer vacation. How can we effectively use this time to make math not only meaningful but also fun? And how can we equip students to be more effective observers of the mathematics

that intersects their daily lives? The activities described in this article are a spin-off of what esteemed mathematics educator and author Lola May described as *boxcar math*. While sitting in her automobile at the railroad crossing, waiting for the last car to roll by, she would encourage her children to add the digits on the boxcars—just to keep math skills sharp and to make the time pass more

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quickly. These days, I (Budd) rarely wait for trains to pass, and I certainly cannot bring one into my classroom, so I decided to explore license plates as a possible substitute. Images on the Internet make such substitutions easy to transport into schools. The result is a collection of classroom excursions titled, “Let’s Take a Road Trip,” an interactive, hands-on way to let your students travel

outside the confines of the classroom while never leaving their desks.

Preparing to travel

In mid-May we borrowed a fourth-grade class from a friend and colleague for an adventure. We opened the experience by talking about summer break, anticipated journeys,



immediate responses included money, transportation, entertainment, and food. We added the need for a destination and a map or GPS as essential for a successful tour—to which they readily agreed.

We also brainstormed about what one might see on the road—once they took their eyes off the DVD player in the back of the car. Observing landscapes, vehicles, and highway signage were quick replies. At this point, we directed our attention to possibly the most common element on the road: license plates. Every vehicle is required to have one. We now distributed to each student a color copy of a car's state plate, all of which were unique. (We happened to have a collection of small plates and had made photocopies, but images are readily available on the Internet.) To generate the largest number of possible exercises, we chose examples with at least five digits. The following experiences were received enthusiastically, as evidenced by a student comment:

I really liked the introduction to the activity when you asked us questions. It got me interested and excited about what we were going to do.

Although you could introduce the element of competition, that is probably unnecessary.

Students were already arranged three to a table, and this configuration lent itself naturally to collaboration and cooperation. The children enjoyed sharing ideas, and as one student expressed, "I liked how I got to work with my friends." So we began to explore. Our first challenge was for each student to find the sum of the digits on his or her plate. Next they combined the totals of the three plates in the group to see which table group had the highest value. Third, students looked at their numerals in terms of their total values and arranged the plates in order from smallest to largest. The opportunity to "play" with the digits on their license plates proved to be an excellent opener and provided the chance for students to work together while investigating their individual plates.

The next task was to combine the digits on the student's plate to equal a "target number"—in this case, we chose the date, 12. Students could use any or all operations, but each digit could be used only once. For example, the plate

The "trip" begins with each student working with a unique license plate replica.



Classroom environments can facilitate enthusiastic student collaboration.

and past travel events. Students enthusiastically described visits across town, the state, and the nation as well as trips overseas. Summer vacation was clearly on their minds. The exotic journeys sounded wonderful, but we turned our focus to something to which every child could relate: a trip in the car. On the basis of their past experiences, and anticipating the future excursions, we asked, "What is needed for a road trip? What must you do to prepare?" Students'

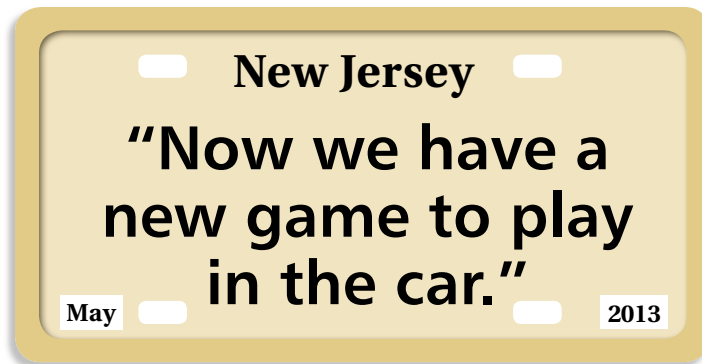
bearing the value 18-231 was used to demonstrate the concept: $(8 + 2) + (3 - 1 \times 1) = 12$. Students entered energetically into the task while my colleague and I circulated around the room, offering suggestions and encouraging strategies. The children excitedly shared their solutions and were quick to help classmates “hit the target.” One student enthusiastically exclaimed, “Finding the target number was like solving a puzzle, and I love puzzles.” This first task was followed by additional activities, which included the following:

1. Combine the numbers on your plate to create a “target.” Give the plate to your neighbor along with the target, and see if he or she can solve the problem. Can you find an equation that uses all four of the basic operations?
2. Create a pattern or fact family with the digits on your plate. Share what you discovered, first with your tablemates and then with the class. Can anyone add to what you have done? Does anyone see another pattern?
3. Choose one license plate at your table that contains three letters. Together, make a sentence using the letters on your plate. You will get a bonus if you can use a math vocabulary word. For example, 752-ARM could be “Aaron remembers multiplication,” “Always read math,” or “Add rocks multiplication!”
4. Use your own plate and the letters it contains to write a three-word sentence of your own. See if you can write more than one sentence. We always give bonus points for using math words.

Students especially enjoyed the link between number and letters, and one boy remarked, “It was interesting to be able to use all parts of the license plates—both letter and numbers.”

Another child stated, “Now we have a new game to play in the car.”

It was time to allow students to move about the room, so an all-class activity was appropriate. We chose one student at random to stand in the front of the class holding a plate for everyone to see. A second student came forward, observed the first license plate, and then stood facing the class so that the two plates were in



alphabetical order by states. The process continued until every student in the class was in line, from Alabama to Wyoming. Before returning to their seats, students “numbered off” so they would know their ordinal position.

Another student was chosen to stand in the front of the room, and for this activity, attention was directed to the number on the plate. Again, the student held the plate so the class could see the number. Successive students came to the front and placed themselves in numerical order.



After the license plates were arranged in the correct numerical order, students numbered off and compared their ordinal number with the ordinal number from the alphabetizing experience. What is the likelihood that any student stands in the same slot for both activities? Considering the probabilities would be an interesting

The rigor of the exploration rose when students were challenged to use the digits on the license plates to write equations that used all four operations.

Students first estimated how many belt system signs they would see on a particular route.



Watching a PowerPoint presentation of local landmarks and roads, they counted how many they saw.



exercise for an older class, but even fourth-grade students quickly grasped that the chance is slim.

The adventure begins

When students settled at their seats once again, we were ready to “hit the road.” Each table was assigned a task. We had prepared a PowerPoint® presentation with a series of slides picturing license plates. Table groups were assigned to add digits as they flashed across the screen—one group finding the sum of the units digits, another finding the tens digits, a third group finding the hundreds digits, and so forth. Then we imagined turning on the engine, fastening our seat belts, and starting the trip. The children immediately focused on the “passing vehicles” and concentrated as they added successive digits from the license plates in their heads. They wrote their totals on their white boards and held them up to see if their sum was correct. Many travelers were excellent “adders” and received rewards for correct totals. Mental math was not required, so several students felt more comfortable writing the numbers and adding them at the end. This method proved less efficient, and we encouraged the children to trust their “heads”—especially in an informal setting.

One student noted, “I never knew there were so many math things you could do with just license plates.”

Another commented, “My favorite part was adding up the place value.”

Are we there yet?

Class time was running out, so we concluded the lesson with a way to answer the question that every parent has heard multiple times. Using an activity one of the adults had used with her own children as they were growing up, we chose something unique to our city. To make travel easier, our metropolitan area has a colored belt system. Because we have few east/west highways due to the terrain, drivers can follow the belt signs, which are posted on routes to enable travelers to go either across town or around it. We posed the question, “How many ‘green dot’ signs will you see if we drive from our classroom to Kennywood?” This local amusement park is a destination with which the entire class was familiar and one that many of them anticipated visiting for a summer excursion.

Students wrote their estimates on their white boards, and we then proceeded with a second PowerPoint journey that included slides of roads from the area, some of which contained the green dots and others that did not. Students enjoyed the “ride,” recognizing landmarks and familiar streets, and several children were quite accurate with their guesses. A student commented, “I thought the green belt signs were fun and tricky to count,” and another student added, “I liked the idea of estimating beforehand.”

Your location may not have the belt system, but this activity is easily adaptable to other localities—just look for different features, such as traffic lights, stop signs, speed limit postings, school zones—the possibilities are endless. The question remains the same: How many will you see before you arrive at your destination? This gives children the opportunity to estimate, test their theories, and pay attention to their surroundings. The activities definitely make the travel time pass quickly.

We closed the lesson with a challenge—a copy of the same plate was given to each student, and the assignment for the next day was to find as many ways as possible to combine the values to equal the target—the date for the next day. Points would be awarded on the basis



Fourth graders had fun learning math from the License Plate activity, which can be adapted for any grade.

of how many digits they could use. If they used all six, they would receive 100 points for each such solution, 80 points for using five numbers, 50 points for four, and so forth. We encouraged multiple solutions.

Bitten by the travel bug

As expected, we had only just begun to delve into the rich content that was available. We had managed to squeeze a lot of mathematics into a 40-minute period, and we were able to conclude our time on a positive note, with the promise of further events to come. Students were eager for more, and a teacher could easily revisit and expand this event to cover several days of class or integrate it into an interdisciplinary unit. Using communication via journaling, students could describe a recent trip or one they hope to take. How far did they travel? How much gas did they use? How much did it cost? What kind of mileage did their car get? Additionally, students could explore various terrains as they trace their trip on a map, and science can be incorporated, because climate and weather play an important role in any excursion. What destinations have class members visited? How many students have been to countries outside the United States? Exploring any or all of these topics could lead to rich dialogue and mathematical applications.

As the lesson ended, we were as enthusiastic as the children. We noticed genuine student involvement and recognized how adaptable this activity is to students in other grade levels. We also saw it as a wonderful way to take math outside the classroom, to involve families in numerical activities, and to help children realize the integral part that math plays in their lives. And, of course, any opportunity we can find to generate enthusiasm and inject fun into an activity that builds number sense, numerical fluency, and problem-solving skills will set us on the road to making math meaningful and enjoyable.



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