



## Family Activity

GRADE LEVELS: 3-5, 6-8, 9-12

### ROAD TRIP: GAS MILEAGE EXPERIMENT

#### What factors affect vehicle gas mileage?

With fuel economy an important topic today, everyone is concerned about getting the best gas mileage possible from his or her vehicles. Gas mileage is in large part determined by the design of the vehicle through factors such as weight, aerodynamics, and engine type. But driving habits can also affect gas mileage. This activity will enable you and your child(ren) to investigate the gas mileage of your vehicle by making a few simple changes, collecting some data, and analyzing the data for patterns. Doing this activity reinforces the value of good observation, record keeping, math and engineering for your child.

The U.S. Department of Energy has some very helpful Web sites related to fuel economy that would be worth looking at as you begin this activity. One in particular can be found at: <http://www.fueleconomy.gov/feg/drive.shtml>. The site offers tips on improving gas mileage and has several sections or links worth visiting. Two sections in particular are relevant to this activity: "Drive more efficiently" and "Keep your car in shape." At that Web site you'll also find many valuable links to other fuel economy-related topics.

#### Measuring Gas Mileage

For this activity, you'll want to carefully measure gas mileage so you can determine what effect, if any, a particular modification has on the gas mileage of your vehicle. Clear directions for calculating gas mileage can be found here: <https://www.fueleconomy.gov/mpg/MPG.do?action=calcMPG>.

In summary, the directions state:

1. Fill the vehicle's gas tank.
2. Set the vehicle's trip odometer to zero.
3. After driving for at least 100 miles, refill the tank.
4. Record the number of gallons and cost it took to refill the tank on the worksheet provided.

5. Record the mileage on the trip odometer on the worksheet.
6. Divide the miles driven by the number of gallons of gas needed to refill the tank; this will give you the gas mileage in miles per gallon (mpg).

For example, if it took 7.5 gallons to go 184 miles, the gas mileage would be 24.5 mpg (184 divided by 7.5 = 24.5).

One way to make the data you collect more meaningful to your child might be to convert gas mileage to how much it would cost to drive the vehicle 100 miles. You can do this by dividing the cost of gas per gallon by the gas mileage (mpg) your child calculated, then multiplying by 100.

For example, if gas cost \$2.50 per gallon, and the gas mileage was 24.5 mpg, the cost to drive 100 miles would be: \$10.20 ( $2.50 \div 24.5 = .1020$ ;  $.1020 \times 100 = \$10.20$ ).

This calculation might help your child better understand the effects of any changes you make.

Any changes in gas mileage you'll measure will be small, so the more miles you can drive for a given change, the better. Perhaps you could incorporate this activity into a car trip you have planned with the family where you know you'll be driving for several hours at a time. Doing this activity might be a way to add variety and interest to a multi-day car trip with the family. Changing the added weight might not be feasible in this case, but the other suggested changes listed below could be made.

### **An Important Note on Safety**

In doing this activity with your child, it is extremely important to be safe. You or another designated adult should be the one driving, filling the gas tank, and making any changes to the vehicle or how it is driven. Your child can be involved in any number of active ways: recording data, adding some weight to the trunk, turning on the radio, and/or DVD or CD player in the vehicle, etc. And as you drive, be very aware of conditions around you and either delay the investigation or choose another location (where you can drive more slowly, for example) if necessary.

**All proper precautions should be taken while doing this activity.**

### **Conducting a Scientific Investigation**

In this activity, you and your child will be undertaking an investigation in a scientific way by collecting and recording accurate data, making a specific change regarding your vehicle or how you drive, making some calculations, and then drawing a conclusion. One important thing to keep in mind while doing the investigation is to make only one change at a time; otherwise it won't be possible to attribute any difference in gas

mileage to one specific factor or change you've made – and that's what you want to be able to do.

### Factors to Change

Following are some possible changes you and your child could investigate to see if they influence your vehicle's gas mileage. For each of these changes, use the worksheet at the end of this activity to record your data and enter calculations.

1. Speed:

Try driving at 40 mph, 50 mph, and 60 mph. **You will need to find a safe road on which to do this investigation, and remember to adhere to posted speed limits and to use your best judgment regarding safe driving conditions. Consider how your driving speed will affect those around you.** Try to maintain your chosen speed for as long as is reasonable without speeding up or slowing down. It will be important to refuel your vehicle and calculate the mileage for each different speed. (There is a graph on the Fuel Economy Web site of gas mileage versus speed.)

2. Accessories:

Drive with and without all vehicle accessories on. These could include the air conditioner, radio, DVD player, CD player and any others you might have in your vehicle.

3. Added weight:

Add weight to your vehicle with things such as suitcases, bags of sand, or other heavy items. **Be careful not to overload your vehicle so it becomes unsafe to drive. Safety is paramount.**

4. Driving habits:

Use of cruise control on the highway is supposed to improve gas mileage because it helps you maintain a constant speed. If your vehicle has cruise control, try using it versus not using it and speeding up and slowing down as you drive. **Again, be very aware of vehicles around you and consider doing this investigation at a different time or location if there is traffic.**

### Looking At Your Data

Once you've collected data on gas mileage and the cost to drive 100 miles, it's time to examine this data with your child and try to make some sense of it. Did speed, accessories, weight, or driving habits have any noticeable effect on gas mileage? If so, can you imagine – and calculate – the effect of these changes over longer distances such as the distance the vehicle is driven in a year? And don't forget, there is a cost to lower gas mileage other than the money spent at the pump: lower gas mileage means

using and burning more fuel to drive a set distance, which means more polluting emissions are released into the atmosphere – a cost imposed on everyone. Discuss the implications of your investigations with your child.

It might be more meaningful to revisit the Fuel Economy Web site listed at the beginning of this activity now that you and your child have actually collected your own data.

Happy and safe motoring!



For more resources, visit [www.FuelOurFutureNow.com](http://www.FuelOurFutureNow.com).

## Gas Mileage Experiment Data Log



Change: **Speed of Vehicle**

Speed of vehicle	Distance (miles)	Gas consumption (gallons)	Mileage (mpg)	Gas cost (per gallon)	Cost for 100 miles *
40 mph					
50 mph					
60 mph					



\* gas cost per gallon divided by gas mileage, then multiplied times 100

Change: **All Accessories On or Off**

Accessories	Distance (miles)	Gas consumption (gallons)	Mileage (mpg)	Gas cost (per gallon)	Cost for 100 miles *
On					
Off					



\* gas cost per gallon divided by gas mileage, then multiplied times 100

Change: **Added Weight**

Added weight	Distance (miles)	Gas consumption (gallons)	Mileage (mpg)	Gas cost (per gallon)	Cost for 100 miles *
Very little					
A large amount					



\* gas cost per gallon divided by gas mileage, then multiplied times 100

Change: **Cruise Control On or Off**

Cruise Control	Distance (miles)	Gas consumption (gallons)	Mileage (mpg)	Gas cost (per gallon)	Cost for 100 miles *
On					
Off					



\* gas cost per gallon divided by gas mileage, then multiplied times 100

After analyzing the results, my conclusions are:

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