

## Physics

### No Reason to Speed

**One reason people give for speeding is that they want to save time. Since  $t = x/v$ , then a greater speed would save time. It turns out a spreadsheet is a perfect way to check out calculations that would otherwise be too time consuming to repeat over and over again.**

#### Here's what to do:

1. Pick a driving route that you or someone close to you (A parent or sibling) makes nearly every day. This might be your drive to school.
2. Divide up the route into parts according to the speed limit. (On my drive home, I have a 35 mph, a 30 mph, a 35 mph, a 55 mph, a 40 mph a 30 mph and a 25 mph part) Your route should have at least 4 parts, and take at least 10 minutes to complete.
3. Drive the route home with a partner, and note the odometer reading before and after each part to measure the length of each part in miles. Round to the nearest tenth.
4. When you sit down at a computer, you should have a table that shows the speed limit and length of each part of the route you are analyzing.
5. Run Chrome, and create a new Google Sheet in your drive. Give it a name you will remember.
7. Type the words "Distance", "Speed", and "Time" in cells A1, B1, and C1 respectively. (Click on the cell, and type. Hitting the **Return** key or clicking on another cell makes it appear down below)
8. Enter your distance data in the "Distance" column, and your speed limit data in the "Speed" column.
9. Click in the first cell below "Time" (Cell C2) Make that cell equal to the distance divided by the Speed limit. (=A2/B2) Don't forget to hit return after entering your formula. Remember, the spreadsheet will "type" the cell names for you if you just click on the cell. (So click on cell C2, press "=", click on A2, press "/", click on B2, press return would work)
10. Click in the cell you just defined (C2) and notice that there is a handle in the lower right corner, place your cursor over this handle, and notice that your cursor changes. Drag the handle down to the bottom of your cells, and it will generalize the formula for those cells.
11. Click in the cell below the last calculated time in the "Times" column, and make that cell equal to the sum of the times. This would look like "=sum(C2:C10)" if C10 contained the last value for that column. (The spreadsheet will type ranges like "C2:C10" for you if you drag the mouse. Type "=sum(", drag with the mouse from C2 to C10, and then type ")" and you're done.) I will henceforth call this cell the *Total time* cell.
12. Now the *Total time* cell (The cell you just changed in step 11) contains the time (In hours) that it takes to complete the route going the speeds listed in the "Speed" column.
13. Make the next cell down from the *Total time* cell equal to the *Total time* cell multiplied by 60, and the cell beneath that one equal to the cell above it times 60. Label these cells one cell to the right of them "Hours", "Minutes", and "Seconds".
15. Now you can select your spreadsheet so far, and paste three more copies of it. If you are clever, you can make this print out on one sheet of paper. (You will need to log into Chrome on a PC in the classroom to print. Always do a print preview before you print) In the three new copies, you can make the speeds 5, 10 and 15 miles per hour faster than the speed limit. The spreadsheet will automatically calculate the travel time in hour, minutes and seconds. You will want to subtract the three new travel times from the original travel time (at the speed limit) to answer the questions on the next page.
16. Answer these questions and **cite your data** directly in your answer to support your answers where applicable:
  1. **How much time in seconds do you save going 5, 10 and 15 MPH over the speed limit? (you will need to subtract to figure this out) Is it worth speeding to save this amount of time?**
  2. **Suppose you tried to obey the speed limit all the way home. Would the values from the spreadsheet be totally accurate? Why or why not? Would the time estimate from the spreadsheet be over or under what you would really do? (Is it possible to average the speed limit without exceeding it in a real traffic situation?)**
  3. **Tinker around with the speeds column. How fast do you have to go to cut the speed limit travel time in half? Is this realistic? Why or why not?**
  4. **In your opinion, is "saving time" a good reason to speed on short commuting trips? On longer trips?**