

Are we there yet? (STEM Principle: Math)

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When going anywhere for a long time, like hiking up a mountain or driving to a trailhead, your kids will probably ask frequently “Are we there yet?,” “How much farther to the top?” or “When are we going to stop for a snack?” Having a few tools on hand will help you answer the question more precisely, and in so doing give the kids a sense of accomplishment along the way with each incremental advance. You may even be able to figure out the answers together and kill some time while you’re at it.

You probably remember $distance = rate * time$, so $time = distance \div rate$

First, find out how far you have to go: the **distance**. If you have a GPS and know how long the hike is to the turnaround point, just subtract your distance traveled from the total. If you’re driving, look for road signs that say how far away your destination is.

Next you’ll need your **rate**, or the speed at which you’re traveling. If you’re driving, this is easy. If you’re out walking, use your GPS to find out your moving average (it’s one of the readouts in your trip computer).

Once you have your speed in miles per hour, just divide that number by how many miles you have left to go! So, if you’re driving in the car at 60 miles an hour and need to go 30 miles, that’s half an hour. Since you probably won’t have such even numbers, try multiplying the whole equation by 60 to find your time in minutes!

Ex: 24 miles to go, and traveling 35 mph: $24/35 = 0.68$ hour (or $0.68 * 60 = 41$ minutes)

If you’re out hiking, your moving average will likely be in miles per hour. If not, you can also use feet. Divide your distance by your speed again. (If you’re working in feet, just remember there are 5,280 feet in a mile.)

Ex: 0.7 miles to go, and traveling at 1.7 mph: $0.7/1.7 = 0.41$ hour (or $0.41 * 60 = 25$ minutes)

Another thing that changes how long it takes to get somewhere is how steep the slope is – the steeper it is, the slower you’ll go. Most steep roads will have signs that tell you the **percent grade**, helpful for truckers to know. The grade is a simple rise over run calculation (remember slope from algebra?). So for every 140 feet you go with a 20% grade, you’re going 100 feet up! Generally, the steeper the grade, the longer things will take.

Ex: 2000 feet elevation change to the top of the summit, and the hike is 2 miles to the top
Grade is $2000 \div 2(5280) = 2000 \div 10,560 = 19\%$

A simple rule of thumb is 1000 ft elevation change for every mile is a 20% grade. That’s a pretty good climb for kids. Most hiking books recommend adding a mile on to the planned hiking time for every 1000 ft elevation gain. You may find this to be an overestimate of the time you need, but it’s better to leave more time than too little as you get accustomed to what your group can handle.