

## MPA math preparation practice problems

### Basic Algebra, Units of Measure, Order of Operations, and Rounding Problem

Jamal is a big hiker and decides to walk “the loop trail” in Green Lakes State Park in Fayetteville, New York. The loop around Green Lakes is 9.7 miles. After 2 hours of steady hiking, Jamal looks at his step tracker (a pedometer), which tell him that he has taken 10,560 steps since the start of the hike. Jamal knows his step length is exactly 2.5 feet and there are 5,280 feet in a mile.

- a. How many miles has Jamal walked so far?

$$\begin{aligned} 10,560 \text{ steps} * 2.5 \text{ feet per step} / 5,280 \text{ feet per mile} &= \\ 26,400 \text{ feet} / 5,280 \text{ feet per mile} &= \\ 5 \text{ miles hiked} & \end{aligned}$$

- b. How many feet does Jamal have left on his hike?

$$\begin{aligned} 9.7 \text{ miles} * 5,280 \text{ feet per mile} - 10,560 \text{ steps} * 2.5 \text{ feet per step} &= \\ 51,216 \text{ feet} - 26,400 \text{ feet} &= \\ 24,816 \text{ feet left} & \end{aligned}$$

- c. How many steps does Jamal have left on his hike?

$$\begin{aligned} 9.7 \text{ miles} * 5,280 \text{ feet per mile} / 2.5 \text{ feet per step} - 10,560 \text{ steps} &= \\ 20,486.4 \text{ steps} - 10,560 \text{ steps} &= \\ 9,926.4 \text{ steps left} & \\ (\text{should actually round up to } 9,927; \text{ otherwise a half-step short of finishing!}) & \end{aligned}$$

- d. What percentage of the hike has Jamal completed (round to hundredth place)?

*Many options here (which applies information from a, b, and/or c):*

$$\begin{aligned} 5 \text{ miles} / 9.7 \text{ miles} &= 51.55\% \\ 26,400 \text{ feet} / 51,216 \text{ feet} &= 51.55\% \\ 10,560 \text{ steps} / 20,486.4 \text{ steps} &= 52.55\% \end{aligned}$$

### Basic Algebra and Units of Measure

Victoria just purchased an above ground swimming pool and wants to fill it up. Based on the directions, Victoria wants to put 5,400 gallons of water in the pool. Victoria is very precise, so she first tests how long it takes her to fill a 1-gallon bucket with her garden hose on “full blast,” finding it takes exactly 6 seconds.

- a. The most common measure of garden hose flow rate is gallons per minute (GPM). What is the GPM for Victoria’s garden hose (there are 60 seconds in a minute)? (Hint: most garden hoses have a flow rate between 6 and 12 gallons per minute).

$$1 \text{ gallon} / 6 \text{ seconds} * 60 \text{ seconds per minute} = 10 \text{ GPM}$$

- b. Victoria puts the hose in the pool and puts it on “full blast,” how many hours should Victoria run the water to ensure there are 5,400 gallons of water in the pool (there are 60 minutes in an hour and assume no evaporation)?

$$\begin{aligned} &5,400 \text{ gallons} / (1 \text{ gallon} / 6 \text{ seconds} * 60 \text{ seconds per minute} * 60 \text{ minutes per hour}) = \\ &5,400 \text{ gallons} / 600 \text{ gallons per hour} = \\ &9 \text{ hours} \end{aligned}$$

- c. Victoria has to stop filling the pool after exactly 7 hours in order to complete an errand. How many gallons would be in the pool at that time?

$$\begin{aligned} &7 \text{ hours} * 1 \text{ gallon} / 6 \text{ seconds} * 60 \text{ seconds per minute} * 60 \text{ minutes per hour} = \\ &7 \text{ hours} * 600 \text{ gallons per hour} = \\ &4,200 \text{ gallons} \end{aligned}$$