

THE HARDEST MATH PROBLEM STUDENT CONTEST

Huh, low battery again?! Samantha had just charged her phone up to **76%**, and now it was already down to **16%**. She had only streamed...oh...oops...three whole episodes of *The Haunted Cave* this morning (each episode is exactly thirty minutes).

That afternoon, after having her phone plugged in for the past hour, she hopped on a bus to meet her friend Jorge at the zoo. During the 24-minute ride, she listened to her

favorite playlist, *Top Pop*, noticing her charge had only dropped from 63% to 59%. Not bad!

At the edge of the monkey habitat, Samantha pulled out her phone to snap a photo. Suddenly, the monkeys started doing amazing flips and tricks. It was as if they were creating a distraction... "Wait! No!" One of those crafty monkeys swiped her phone right out of her hand! The other monkeys gathered around, guffawing, as the first monkey began tapping the screen.

Be sure to
ONLY answer the
question that
matches your
grade!

GRADE 6

After what felt like an hour—it had actually been 42 minutes—a zookeeper finagled the phone from the monkey's hand.

If Samantha's phone had been at 46% and the monkey had listened to *Top Pop* the entire time, **what percentage of battery should be left?**

GRADE 7

Thinking of the huge elephants she had just seen, Samantha wished she had an elephant-level external battery pack. "I bet it could keep my phone charged for a million hours!" she sighed.

If she created an elephant-inspired battery pack that could charge her phone to 100% 80 times, and had it plugged into her phone when it hit 0% charge, **how many extra episodes of *The Haunted Cave* could the monkey watch?**

GRADE 8

When Samantha finally got her phone back, the monkey had drained the battery all the way to 31%, boo! On the bus home, Samantha turned on *Top Pop* to calm herself. "Too bad your battery's at 29% now. I'm still at 55%," Jorge said, while watching *The Haunted Cave*. Samantha eyed their phones thoughtfully. If Jorge's phone battery drains at the same rate as Samantha's, and they continue playing their current media, **how many minutes will it be before the two phones have the same battery level?**

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CHALLENGE 1 ANSWER KEY

Each problem has multiple pathways to the solution depending on how students set it up, although each problem does have a single numeric solution.

Teachers, if your student(s) answered Challenge 1 correctly, they are invited to enter Challenge 2! Get the Challenge 2 materials at scholastic.com/hardestmathcontest.

GRADE 6

Step 1: I set up a ratio of 24:4 to compare the time, 24 minutes, with the battery percentage it used up when listening to music, 4%. The unit ratio for minutes of time to percentage of battery used when listening to music is 6:1.

Step 2: Using this unit rate, I set up a proportion to find x , which is the percentage of battery remaining after 42 minutes of the monkey listening to Top Pop:

$$6 \text{ min} / 1\% \text{ battery} = 42 \text{ min} / x$$

Step 3: I can write this equation more simply as $6 = 42/x$. To make it easier to perform the calculations, I multiply both sides of the equation by x in order to rewrite the equation as $6x = 42$.

Step 4: Now I divide each side of the equation by 6 to isolate the x so I can find out its value. $42/6 = 7$. Therefore, $x = 7\%$ of battery charge was used when the monkey listened to Top Pop for 42 minutes.

Step 4: Since Samatha's battery started at 46%, I subtract the 7% to get to 39%.

Therefore, Samantha's phone has 39% battery remaining.

GRADE 7

Step 1: If each charge is 100%, then 80 charges would be 80 times that amount, which is 8,000%.

Step 2: 76% - 16% tells me how much battery was used to watch three episodes, 60% of battery.

Step 3: I find a rate by setting up a comparison. If 3 episodes take 60% of battery, then, $60/3$ tells us the unit rate—that each episode takes 20%.

Step 4: $8000\% / 20\% = 400$, which tells me that I need to use a scale factor of 400. 1 episode times 400 gives the solution.

Therefore, the extra 80 full charges would allow the monkey to watch 400 episodes.

GRADE 8

Step 1: I found the rate of battery decline for each activity. For the music, it was 4% for 24 minutes. $4/24$ minutes gives a rate of $1/6\%$ per minute.

For the video, it was 60% for 90 minutes. $60/90$ minutes gives a rate of $2/3\%$ per minute.

Step 2: $55\% - 2/3\%$ per m represents Jorge's battery
 $29\% - 1/6\%$ per m represents Samantha's battery

Step 3: Set up the equation for when the batteries are the same
 $55 - 2/3m = 29 - 1/6m$

Step 4: Find the value of m

$$\begin{array}{r} 55 - 2/3m = 29 - 1/6m \\ \quad +2/3m \quad \quad +2/3m \\ \hline 55 \quad \quad = 29 + 1/2m \\ -29 \quad \quad -29 \\ \hline 26 \quad \quad = \quad 1/2m \end{array}$$

Step 5: Since dividing by a fraction is the same as multiplying by its reciprocal, I can isolate m by dividing it by $1/2$ and dividing the other side of the equation, 26, by $1/2$ as well.

$$\begin{array}{r} 26 \quad \quad = \quad 1/2m \\ \hline 1/2 \quad \quad \quad 1/2 \end{array}$$

26 divided by $1/2$ is the same as $26(2)$, which equals 52.

$$52 \quad \quad = \quad m$$

Therefore, Samantha and Jorge's phones will be at the same charge in 52 minutes.