

# THE HARDEST MATH PROBLEM STUDENT CONTEST

## 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](http://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  $m$

$$\begin{array}{rcl} 55 - 2/3m & = & 29 - 1/6m \\ & +2/3m & +2/3m \\ 55 & = & 29 + 1/2m \\ -29 & -29 & \\ 26 & = & 1/2m \end{array}$$

**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.

$$\begin{array}{rcl} 26 & = & 1/2m \\ 1/2 & & 1/2 \end{array}$$

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

$$52 = m$$

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