

MATHCOUNTS® Problem of the Week Archive

Neuroscience Research – March 25, 2024

Problems

*The following information and problems were submitted by a MATHCOUNTS volunteer, Emily Koithan.
Thank you, Emily!*

Neuroscientists use a special type of brain scanning called functional magnetic resonance imaging, or fMRI, to answer questions about how our brains work. It can tell us what areas of the brain are active when we move, listen and think.

A researcher asks a study participant to tap their finger during an fMRI scan and observes activity in 10 different brain regions. If the activity in each region is compared to the activity in every other region, how many comparisons are made?

The researcher then plays music and looks at activity in the participant's auditory cortex, one part of the brain active when you hear sounds. She plays the music louder, and the activity in the auditory cortex increases by 60%. Then, she plays the music softer, and the activity in the auditory cortex decreases by 14%. If x represents the original activity level, by what percent does the activity in the participant's auditory cortex increase while the music is playing? Express your answer as a decimal to the nearest tenth.

Researchers often study the brain using voxels, which are tiny three-dimensional cubes. The researcher finds that in one participant, the inferior parietal lobule (a region of the brain active when performing arithmetic) has a volume of 22 cubic centimeters. Suppose the inferior parietal lobule in that participant contains 2,750 voxels. How long is the side of one voxel in *millimeters*?