

# MATHCOUNTS<sup>®</sup> Problem of the Week Archive

## **Brood X is Here! – May 10, 2021**

### **Problems & Solutions**

For those of us who live in the affected areas, it is impossible to ignore the new residents of our neighborhoods – the cicadas known as Brood X. They are not locusts, but the 1.5-inch insects definitely come in huge numbers. There can be an estimated 1.5 million per acre. What is the equivalent measure of cicadas per square foot if there are 43,560 square feet per acre? Express your answer as a decimal to the nearest tenth.

*If we have the ratio 1.5 million/1 acre and multiply that by 1 acre/43,560 square feet (which is equivalent to multiplying by 1), we get **34.4** cicadas, to the nearest tenth.*

The cicadas intrigue scientists because of their odd life cycle. The red-eyed ones from Brood X come up out of the ground every 17 years like clockwork. They then only live for 2.5 weeks before laying their eggs and dying. Assuming that the life span of a cicada is 17 years, and 2.5 of those weeks are spent above ground, what percent of their lives is spent above ground? Express your answer to the nearest tenth.

*In 17 years, there are  $52 \times 17 = 884$  weeks. Only 2.5 of these weeks are spent above ground, which is  $(2.5 \div 884) \times 100 = \mathbf{0.3\%}$  of their lives.*

There are also some cicadas that have gotten off the 17-year cycle and gone to a 13-year cycle. “Whether this is Mother Nature’s way of playing with prime numbers remains a mystery,” said Phil Nixon, a bug guru at the University of Illinois-Champaign. Assuming that a group of cicadas comes out every 13 years, another group comes out every 17 years, and both groups come out this year, in how many years will the next occurrence of both groups coming out at the same time take place?

*We know that the 13-year cicadas will come out again in 13, 26, 39, ... years. These are multiples of 13. The 17-year cicadas will come out again in 17, 34, 51, ... years, which are multiples of 17. We need to find the number of years that is both a multiple of 13 and of 17. Since these numbers are relatively prime, the first multiple of both will be  $13 \times 17 = \mathbf{221}$  years.*

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