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**Problem 2.** An x by x square is drawn in the center of a 1 by 1 square, and then the corners are connected as shown. If the 5 regions all have the same area, what is x?





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**Problem 4.** In this problem,  $\log(x)$  denotes the base 10 logarithm of x. Simplify the sum

$$\sum_{k=1}^{9} \log\left(1+\frac{1}{k}\right) = \log\left(1+\frac{1}{1}\right) + \log\left(1+\frac{1}{2}\right) + \log\left(1+\frac{1}{3}\right) + \dots + \log\left(1+\frac{1}{9}\right).$$

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**Problem 5.** On a recent backpacking trip, slow Mo hiked 9 miles per day for the first 6 days. Then fast Dave joined, and they each hiked 16 miles per day for the next 4 days. How many miles per day did Mo average for the entire trip?

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**Problem 7.** How many ways can 7 people be split into two groups, if each group must contain at least 2 people?

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**Problem 8.** Let  $\overleftarrow{n}$  denote the digit reversal of the natural number *n*, so that, for example,  $\overrightarrow{123} = 321$ . Find

$$(10 + 11 + \dots + 99) - (\overline{10} + \overline{11} + \dots + \overline{99}).$$

**Problem 8.** Let  $\overleftarrow{n}$  denote the digit reversal of the natural number *n*, so that, for example,  $\overrightarrow{123} = 321$ . Find

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**Problem 9.** What is the coefficient of  $x^{25}$  in

$$\prod_{k=0}^{\infty} (1+x^{2^k}) = (1+x)(1+x^2)(1+x^4)(1+x^8)(1+x^{16})(1+x^{32})\cdots?$$

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Problem 10. What is the base 10 representation of the binary number

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(That's 5 ones, a zero, and 5 more ones.)



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