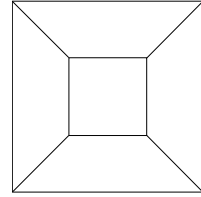


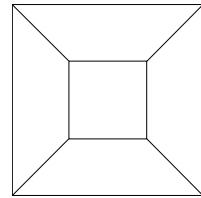
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**Problem 3.** If the average of  $a$  and  $b$  is 20, the average of  $b$  and  $c$  is 30, and the average of  $a$  and  $c$  is 70, what is the average of  $a$ ,  $b$ , and  $c$ ?

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

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

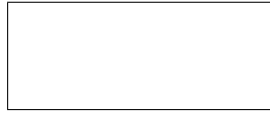
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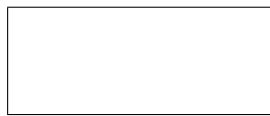
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**Problem 7.** How many ways can 7 people be split into two groups, if each group must contain at least 2 people?

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

$$(10 + 11 + \cdots + 99) - (\overleftarrow{10} + \overleftarrow{11} + \cdots + \overleftarrow{99}).$$

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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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