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## MathEdge Level Contest Sample Problems

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### Advance Level Sample Problems:

- 1) The average of the nine numbers in the set  $\{9, 99, 999, 9999, \dots, 999999999\}$  is a 9-digit number  $A$ , all of its digits are distinct. Which is the digit out of the ten digits: "0, 1, 2, 3, 4, 5, 6, 7, 8, 9"  $A$  does not contain?

Hint: "Use the definition of average or mean, then factor"

**ANS: 0**

**SOL:** Average/mean is defined as the sum of the numbers then divided by the total number in the sum. Thus, the number  $A$  is equal to:

$$\frac{1}{9} (9 + 99 + 999 + \dots + 999,999,999) = 1 + 11 + 111 + \dots +$$

**111,111,111**

**= 123,456,789. The number  $A$  does not contain the digit "0".**

- 2) What are the factors of 30? When all positive integral factors of 30 are multiplied together, the product is  $30P$ . What is the value of  $P$ ?

**ANS:** The factors are **1, 2, 5, 10, 3, 6, 15, 30**

**$P = 4$**

**SOL:** Given  $30 = 2 \times 5 \times 3$ , the factors =  $(2^0 + 2^1) (5^0 + 5^1) (3^0 + 3^1) = (1 + 2) (1 + 5) (1 + 3) = (1 + 2 + 5 + 10) (1 + 3) = (1, 2, 5, 10, 3, 6, 15, 30)$ .

**The product of factors =  $1 \times 2 \times 5 \times 10 \times 3 \times 6 \times 15 \times 30 = 30 \times 4 = 30P \Rightarrow P = 4$**

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