

SOML MEET
EVENT 2
Problem Solving

NAME: _____
TEAM: _____
SCHOOL: _____

1. [2 Points] A certain identification system consists of all three number combinations in which each number may be any of the digits 0 through 9. For example, 123, 022, and 987 are all valid identification numbers. How many identification numbers are there in this system?

ANS: _____

2. [3 Points] A dresser drawer contains 100 socks, 50 of which are black and 50 of which are brown. What is the least number of socks you can pull out and be guaranteed at least one matching pair of socks (either black or brown)?

ANS: _____

3. [5 Points] Suppose we have three line segments AB, CD, and EF with the following properties:
- 1) The length of EF is 1.
 - 2) The lengths of AB and CD add up to 1.
 - 3) The ratio of the length of AB to the length of CD is equal to the ratio of the length of CD to the length of EF.

What is the length of AB? Give an exact answer, not an approximate one.

ANS: _____

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Problem Solving

NAME: KEY
TEAM: _____
SCHOOL: _____

1. [2 Points] A certain identification system consists of all three number combinations in which each number may be any of the digits 0 through 9. For example, 123, 022, and 987 are all valid identification numbers. How many identification numbers are there in this system?

ANS: 1,000 (don't forget "000")

2. [3 Points] A dresser drawer contains 100 socks, 50 of which are black and 50 of which are brown. What is the least number of socks you can pull out and be guaranteed at least one matching pair of socks (either black or brown)?

Solution: Once you have two socks, you either have a pair already, or you have one of each color, in which case the third sock will match one or the other of them.

ANS: 3

3. [5 Points] Suppose we have three line segments AB, CD, and EF with the following properties:
- 1) The length of EF is 1.
 - 2) The lengths of AB and CD add up to 1.
 - 3) The ratio of the length of AB to the length of CD is equal to the ratio of the length of CD to the length of EF.

What is the length of AB? Give an exact answer, not an approximate one.

Solution: Let x stand for the length of AB and let y stand for the length of CD. Property (2) tells us $x + y = 1$, so $y = 1 - x$. Property (3) tells us $\frac{x}{y} = \frac{y}{1}$, so $x = y^2$, and using property (2), $x = (1 - x)^2$. This is equivalent to $0 = x^2 - 3x + 1$, which by the quadratic formula has solutions $x = \frac{3 \pm \sqrt{5}}{2}$. Since we know $x < 1$, the solution must be $\frac{3 - \sqrt{5}}{2}$.

ANS: $\frac{3 - \sqrt{5}}{2}$