



Try these problems before watching the lesson.

1. If  $4^x + 4^x + 4^x + 4^x = 2^8$ , what is the value of  $x$ ?
2. Find all values of  $x$  for which  $|x| = |x + 1|$ .
3. If  $b(b^4 \cdot b^3)^2 = b^{3x}$ , what is the value of  $x$ ?
4. Find the positive difference between the solutions to  $|\frac{x}{2} - 6| = 20$ .



**First Problem:** What is the sum of all values of  $x$  that satisfy the equation  $\frac{x^{x-3}}{x} = \frac{x}{x^{\frac{4}{x}}}$ ?

**Second Problem:** Suppose that  $a$  is a number such that the system of equations

$$\begin{aligned} |2x| - y &= 5 \\ x - |2y + 2| &= a \end{aligned}$$

has an odd number of distinct solutions. What is the product of all possible values of  $a$ ?



5. Each of the integers  $1, 2, 3, \dots, 16$  is written on a separate slip of paper and these slips are placed in a pile. Jillian will randomly draw slips from the pile without replacement and will continue drawing until two of the numbers she has drawn from the pile have a product that is a perfect square. What is the maximum number of slips that Jillian can draw without obtaining a product that is a perfect square?
6. For the list of five integers below, the mean and the median are equal. What is the sum of the three possible values of  $x$ ?

$$35, 15, 5, 25, x$$


7. What is the smallest possible value of the sum  $|x - 2| + |x - 4| + |x - 5|$ ?
8. What is the sum of all real values of  $x$  that are solutions to the equation  $(\frac{2}{3}x^2 - x - \frac{2}{3})^{(x^2 - 9x + 20)} = 1$ ? Express your answer as a common fraction.
9. Larry tells Mary and Jerry that he is thinking of two consecutive integers from 1 to 10. He tells Mary one of the numbers, and he tells Jerry the other number. Then the following conversation occurs between Mary and Jerry:

Mary: I don't know your number.

Jerry: I don't know your number, either.

Mary: Ah, now I know your number.

Assuming both Mary and Jerry used correct logic, what is the sum of the possible numbers Mary could have?

 *Share Your Thoughts*

Have some thoughts about the video? Want to discuss the problems on the Activity Sheet? Visit the MATHCOUNTS Facebook page or the Art of Problem Solving Online Community ([www.artofproblemsolving.com](http://www.artofproblemsolving.com)).