

# Undergraduate Problem Solving Competition

## Problem 1 - Counting Catastrophe

Due Sept. 11, 2017

Mae is having a rough dream. Placed before her is a math exam concerned with simple arithmetic, but the numbers don't seem to make any sense. She has worked out the following number equivalents so far, and knows that the strange counting system has enough rules such that it expresses every number uniquely:

Traditional Number	1	2	3	4	5	6	7	8	9	10
Catastrophic Representation	1	2	10	11	12	20	100	101	102	110

Traditional cont.	11	12	13	14	15	16	17	18	19	20
Catastrophic cont.	111	112	120	200	1000	1001	1002	1010	1011	1012

Traditional cont.	30	40	50	100
Catastrophic cont.	2000	10102	11011	110020

The only question on the exam is a subtraction problem:

$$10011120 - 10001001$$

What is the correct answer to the exam? Of course it's only a dream, but she really doesn't want to mess this up...

New and old problems are posted online at <http://www.math.utah.edu/ugrad/pscontest>  
 Next problem will be posted Oct. 2, 2017

In the spirit of UPSC, you should not use the internet or look up the solution in a book. Please include your **name, student ID number, and email address** on your solution. Submit answers at the front desk of the T. Benny Rushing Mathematics Center.