**Problem 1.** If and , what is ?

**Problem 2.** Find the sum of *n* terms of the arithmetic series whose first term is the sum of the first *n* natural numbers whose common difference is *n*.

**Problem 3.** Martha can paint her room in 5 hours. Working with Guillermo, they finish painting the room in 3 hours. How long would it take Guillermo to paint the room by himself?

**Problem 4.** Lauren and Lily had the same quiz grade on the last calculus quiz. For both of them, it was their highest quiz score this semester. It brought up Lauren’s quiz average from an 83 to an 86 and Lily’s from an 88 to a 90. How many quizzes has each student in the class taken?

**Problem 5.**  A traffic light runs repeatedly through the following cycle: green for [30](http://www.artofproblemsolving.com/Forum/code.php?hash=22d200f8670dbdb3e253a90eee5098477c95c23d&sid=fc26d50ca10156a1bf5167aa74756d1f) seconds, then yellow for [3](http://www.artofproblemsolving.com/Forum/code.php?hash=77de68daecd823babbb58edb1c8e14d7106e83bb&sid=fc26d50ca10156a1bf5167aa74756d1f) seconds, and then red for [30](http://www.artofproblemsolving.com/Forum/code.php?hash=22d200f8670dbdb3e253a90eee5098477c95c23d&sid=fc26d50ca10156a1bf5167aa74756d1f) seconds. Leah picks a random three-second time interval to watch the light. What is the probability that the color changes while she is watching?

**Problem 6.** A shopper plans to purchase an item that has a listed price greater than $100 and can use any one of the three coupons. Coupon A gives 15% off the listed price, Coupon B gives $30 off the listed price, and Coupon C gives 25% off the amount by which the listed price exceeds $100. Let x and y be the smallest and largest prices, respectively, for which Coupon A saves at least as many dollars as Coupon B or C. What is y-x?

**Problem 7.** Right [\triangle ABC](http://www.artofproblemsolving.com/Forum/code.php?hash=29330ac23972c3ef4ca3605987f3266218f36cc2&sid=9b56a4fd0804370a2064fb337f8b0e3e) has AB = 3, BC = 4, and AC = 5. Square XYZW is inscribed in [\triangle ABC](http://www.artofproblemsolving.com/Forum/code.php?hash=29330ac23972c3ef4ca3605987f3266218f36cc2&sid=9b56a4fd0804370a2064fb337f8b0e3e) with X and Y on [\overline{AC}, W](http://www.artofproblemsolving.com/Forum/code.php?hash=53f3d1ba6ad61df78966a3209c31b9153268ea0c&sid=9b56a4fd0804370a2064fb337f8b0e3e) on [\overline{AB},](http://www.artofproblemsolving.com/Forum/code.php?hash=26752bd7038ab6f3958975271e06635db7759e2a&sid=9b56a4fd0804370a2064fb337f8b0e3e) and Z on [\overline{BC}.](http://www.artofproblemsolving.com/Forum/code.php?hash=0838d75d234de728e850d1d6c62bc1c4f087c614&sid=9b56a4fd0804370a2064fb337f8b0e3e) What is the side length of the square?

**Problem 8.** Two non-decreasing sequences of nonnegative integers have different first terms. Each sequence has the property that each term beginning with the third is the sum of the previous two terms, and the seventh term of each sequence is *N*. What is the smallest possible value of *N* ?

**Problem 9.** A teacher gave a test to a class in which 10% of the students are juniors and 90% are seniors. The average score on the test was 84 The juniors all received the same score, and the average score of the seniors was 83 What score did each of the juniors receive on the test?

**Problem 10.** Let *n* denote the smallest positive integer that is divisible by both 4 and 9 and whose base-10 representation consists of only 4's and 9's, with at least one of each. What are the last four digits of *n*?