

Problem Solving Competition – Problem #1

- Your submission should contain a FULL solution. Not just the answer, but your entire argument.
- Submit solutions to Nancy in MCT 250, or Dr. Taylor in MCT 281.
- Questions?? Ask Dr. Taylor in MCT 281 or by email at pttaylor@ship.edu.
- Problems and occasional updates on solutions and winners will be posted at webpace.ship.edu/pttaylor/PSC/index.html

You ask a friend to do the following:

- Pick three consecutive numbers between 1 and 60 (such as 10-11-12, or 47-48-49), and keep them secret.
- Announce a multiple of 3 less than 100.
- Add all four numbers.
- Multiply the result by 67.
- Tell you the last two digits of the result.

Explain how you can figure out the three secret numbers.

For example, I pick three secret, consecutive numbers. I announce the number 18. After adding the numbers and multiplying by 67, the last two digits are 26. What were my three secret numbers?

Suppose the 3 numbers are $n-1$, n , $n+1$, and the announced number is $3k$.

Add all four numbers = $3n + 3k$

Multiply by 67 = $201(n+k)$

The last two digits will be $(n+k)$ since $n < 60$ and $k < 34$ so $(n+k) < 100$, and $200(n+k)$ has zeroes in the last two digits.

Since we know $(n+k)$ and k , we can easily find n , $n-1$, $n+1$.

In the example, $3k = 18$, so $k=6$. $(n+k)=26$, so $n=20$. The 3 numbers are 19,20,21.

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Solutions for this problem are due **Wed, September 14** at 4pm.

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