

Name: _____

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Worksheet - Sep. 05

MAT 3501

Fall 2019

1. If d, m, n, a, b are all integers, show that if $d|m$ and $d|n$, then $d|(am + bn)$.

2. For numbers in base 10, state and prove a divisibility criterion by 8.

3. (adapted Pb. 10, section 2.2) True or False? Justify your answer. "Let $a_1, a_2, \dots, a_{2019}$ be integers. If the product $a_1 a_2 \dots a_{2019}$ is an odd number, then the sum $a_1 + a_2 + \dots + a_{2019}$ is an odd number."

4. (a) Pick three distinct digits. Write all possible 3-digit numbers you can form with the three chosen digits and then find the sum of all these numbers. Divide the result by the sum of your digits. Compare what you get and then find an algebraic explanation.
(b) Repeat the problem starting with 4 distinct digits.
(c) Can you comment on the restriction that digits are distinct?

5. (Some magic!) Write a number with at least 4 digits. From this number select a non-zero digit and write it separately. This is your secret digit that I am going to find using "magic". Do the following:
From your number, subtract the number written backwards (if the result is negative take absolute value). To the result, add your secret digit. Finally, add all the digits of the last result and tell me the number you got. Then I'll guess your secret digit.
What is the mathematical explanation of the "magic"?