

**MAT 321-1**  
**HOMEWORK ASG. #1**                      **HAND IN THURSDAY, JAN. 26**

For each problem, show your work or give reasons on a separate piece of paper.

1. The Division Algorithm assures us that every integer has exactly one of the forms:

$5q$	purple
$5q + 1$	orange
$5q + 2$	brown
$5q + 3$	gray
$5q + 4$	yellow

Using the colors as names for these types of integers,

- a) Show that the product of a brown integer times a gray integer is always orange.
  - b) What can be said about the sum of a gray integer and a yellow integer? Prove your answer.
2. Calculate the check digit for this UPC code:            5-24016-00431-\_\_
3. Calculate the check digit for this ISBN number:        1-862-50112-\_\_
4. a) Convert the EAN-13 number 9-782554-781024 to an ISBN-10 number.
- b) Convert the ISBN-10 number 1-693-41225-X to an ISBN-13 (EAN-13) number.
5. Use the definition of divisibility to prove that:
- $$a \mid c \text{ and } a \mid d \Rightarrow a^2 \mid cd$$
6. Find  $q$  and  $r$  in the Division Algorithm if  $a = -295$  and  $b = 30$ .
7. How many integers between 1000 and 5000 are divisible by 17? (Show your work, but don't list them all!)
8. Use the Sieve of Eratosthenes to "sift" out all primes up to 200. (Use the attached sheet, and attach that sheet to the homework you hand in.)
- a) How many such primes are there? (Count carefully!)
  - b) How many primes does the Prime Number Theorem predict up to 200?