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# Math 218: Elementary Number Theory

HOMWORK 6 : DUE SEPTEMBER 26

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1.9 #6. Is the function  $\pi(n)$  a multiplicative function? Why or why not? (Recall that  $\pi(n)$  is the number of primes less than or equal to  $n$ .)

1.9 #12. Let  $a$  be a fixed integer. Define the function  $f(n) = (a, n)$ . Prove that  $f$  is multiplicative.

**For the next three problems, be sure to justify your answer using the basic counting rules we learned in class.**

1. A local restaurant offers a meat and cheese sandwich. You can choose one of three kinds of bread, one of four kinds of meat, and one of three kinds of cheese. How many sandwiches are possible? Assume that anyone ordering this particular sandwich wants a piece of bread and a piece of cheese and a piece of meat.
2. How many four digit numbers are there which are multiples of at least one of 2 or 5? Assume 0985 or 0027 are not four digit numbers (i.e. the thousands place should not be 0).
3. In poker, a hand consists of five cards dealt to a player. “Four of a kind” means your hand consists of four cards of the same face value. How many different “four of a kind” hands are there where we do not care what order the cards are dealt to you?

Deck of card background in case you need it. A standard deck of cards has 52 cards. There are four suits (hearts  $\heartsuit$ , spades  $\spadesuit$ , diamonds  $\diamondsuit$ , and clubs  $\clubsuit$ ) and each suit has 13 cards (the numbers 2 through 10 which I call the “number cards”, the Ace, and the “face cards”: king, queen, and jack). A “hand” is the set of cards you are dealt in a game like poker.