S520 Homework 1

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Chapter 1, Section 5, #2:

(a) I used a new, green aluminum ruler, which I bought for the purpose of this experiment. No other students used this rule. The rule has two sets of marks on each side: one for inches (12) and other for centimeters (30). Also, the rule is flat on one end and round at the other end where a hole is made so that one can hang it.

(b) I positioned the ruler on the ground, with the marks facing up, touching on one pillar (the nearest to Franklin Hall) on the 0 inch mark. I mark the place where the 12 inch is on the rule with my finger, and then I repositioned the rule. I repeated this process until reach the opposite pillar. I ensure a measure on a straight line by following a cement trail on the floor.

(c) I measured on Wednesday 18, starting at 9:15 a.m. and ending at 9:25 a.m.

(d) 229 inch

Chapter 2, Section 5, #3: Let $S = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$, let $A = \{1, 3, 5, 7, 9\}$ and let $B = \{1, 2, 3, 5, 7\}$

(a) $A^c = \{x|x \notin A\} = \{2, 4, 6, 8, 10\}$

(b) $B^c = \{x|x \notin B\} = \{4, 6, 8, 9, 10\}$

(c) $(A \cup B)^c = \{x|x \notin A \cup B\} = \{4, 6, 8, 10\}$

(d) $(A \cap B)^c = \{x|x \notin A \cap B\} = \{2, 4, 6, 8, 9, 10\}$

Chapter 2, Section 5, #4:

(a) $1(I) + 1(man) + 7(wives) + 343(cats) + 7 \times 343(kites) = 2753$

(b) $\sum_{i=1}^{4} 7^i = 7(wives) + 7^2(sacks) + 7^3(cats) + 7^4(kites) = 2800$

Chapter 2, Section 5, #6:

(a) Let us consider all the possible results of this game. The results can be thought of as 4-tuples from the following set:

$$R = \{\{1, 3, 4, 6\} \times \{1, 3, 4, 6\} \times \{1, 3, 4, 6\} \times \{1, 3, 4, 6\}\}$$

In other words, a result of this game $r \in R$, is (r_1, r_2, r_3, r_4), where r_i is the result of the astragali i. Thus, by the multiplication principle, there are $4^4 = 256$, possible results, only one of them being all one's. Therefore, there is only one way, i.e., each astragalus produce 1.

(b) $4! = 24$, i.e., choose one out of four possible outcomes as the first one, then choose one out of only 3 possible, and so on.

Chapter 2, Section 5, #13:

(a) The range of ϕ is $\{1964, 1965, 1966, 1968, 1972, 1984\}$

(b) $\phi^{-1}(1968) =$ Once upon a time in the West

(c) $\emptyset$ (empty set)

(d) $\phi^{-1}(\{the.sixties\}) = \{$A fistful of Dollars, For a few Dollars More, The good the bad and the ugly, Once upon a time in the west$\}$

Chapter 2, Section 5, #15:

$$C = \{x | x \in N \wedge x = 10^k, k \in Z\}$$

(a) C is denumerable because there exists a one-to-one correspondence f from C to N (natural numbers). Here it is:
$f : C \mapsto N, f(10^0) = 0, f(10^1) = 1, f(10^{-1}) = 2, f(10^2) = 3, f(10^{-2}) = 4, f(10^3) = 5, f(10^{-3}) = 6, ...$

(b) y_n does not converge to a limit because one can always find a $n \in C$ for which $y_n = 1$