MCIT 592 Spring 2022

Homework 2 Questions

This assignment is due in about one week from when the assignment opens. The exact deadline and full instructions for submission are provided in Coursera. To receive full credit all your answers should be carefully justified. Each solution must be written independently by yourself - **no collaboration is allowed**.

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1. [10 pts] Let p, q, and r be the following propositions.

p: Comedies are the best type of movie.

q: Everyone loves comedies.

r: Amy will only watch comedies.

Express the following propositions using p, q, r and logical operators.

For this question specifically, a line or two explaining your answer may help, but don't worry too much about providing justification.

(a) Everyone loves comedies and Amy will only watch comedies.

(b) If comedies are not the best type of movie or not everyone loves comedies, then Amy will not watch only comedies.

(c) It is necessary for everyone to love comedies for comedies to be the best type of movie. It is also necessary for everyone to love comedies for Amy to only watch comedies.

(d) Amy will only watch comedies if and only if comedies are the best type of movie.

(e) Amy will not only watch comedies and comedies are the best type of movie.

(f) Comedies being the best type of movie is sufficient for everyone to love comedies and Amy to only watch comedies.

2. [10 pts] Let A, B, C be three finite sets.

(a) Prove that if $A \subseteq C$ and $B \subseteq C$ then $A \cup B \subseteq C$.

(b) Prove that if $A \subseteq B$ and $A \subseteq C$ then $A \subseteq B \cap C$.

3. [10 pts] Thirteen distinguishable families want to participate in the TV game show "Family Rivalry". Each family consists of a mommy, a daddy, and a child. The game show host must select 20 *people* for the show. The host also wants to see the full family dynamic at play, and thus maximizes the number of times all three members of a family are selected. How many different selections can the host make for this game show?

4. [10 pts] Instructor Tiny and the 14 TAs of an online course are having lunch at a round table (they are all vaccinated and boosted). Two seatings are the same when everybody has the same left neighbor and the same right neighbor. How many seatings are possible such that two of the TAs, Biggie and Tupac, do *not* sit next to each other?

5. [10 pts] A group of children consists of m families, each family consisting of n siblings. The children decide to arrange themselves in a formation of n rows, each row being a sequence of m children from *different* families. In how many different ways can such a formation be arranged?