MATH 101
SPRING 2021
EXAM 3

NAME:

1. [10 pts.] Determine whether the argument is valid using a truth table:

$$\begin{array}{l} p \wedge (q \vee r) \\ q \to r \\ \hline \therefore\ p \wedge r \end{array}$$

2. [15 pts.] Translate the argument into symbolic form, then determine whether the argument is valid using a truth table: "If the prescription was called in to Big Pharma Pill-o-Rama, then you can pick it up by tea time. You cannot pick it up by tea time. Therefore, the prescription was not called in to Big Pharma Pill-o-Rama.

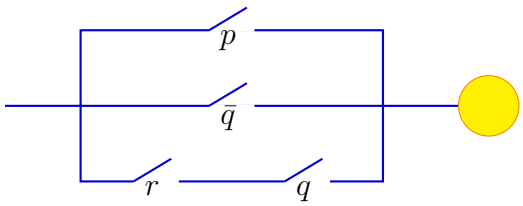
3. [15 pts.] Translate the argument into symbolic form, then determine whether the argument is valid using a truth table: "If Neroon wins the contest, then he will be rich. If Neroon is rich, then he will stop working. Therefore, if Neroon does not stop working, then he did not win the contest."

4. [10 pts. each] Use an Euler diagram to determine whether the syllogism is valid.

   (a) No poodles are noodles.
   No noodles have common sense.
   ∴ No poodles have common sense.

   (b) Some circus clowns are scary.
   Some who are scary are insurrectionists.
   All insurrectionists are circus clowns.
   ∴ Some insurrectionists are not scary.

5. [15 pts.] Write a symbolic statement that represents the switching circuit below, then construct a truth table to determine when the lightbulb will be on.



6. [10 pts.] Draw a switching circuit that represents the symbolic statement $(p \wedge q) \vee (r \wedge s)$.

7. [5 pts. each] In a given week a veterinarian treated 56 dogs, 45 cats, 12 parakeets, and 7 ferrets.

   (a) Determine the empirical probability that the next animal she treats is a cat.

   (b) Determine the empirical probability that the next animal she treats is a ferret or a dog.

8. [10 pts.] A traffic light is red for 25 sec, yellow for 5 sec, and green for 55 sec. What is the probability that when you reach the light it will be yellow?

9. [10 pts.] One card is selected at random from a deck of cards. Find the probability that the card selected is a card greater than 3 and less than 9.

10. [10 pts.] One card is selected at random from a deck of cards. Find the probability that the card selected is not a 5.

11. [10 pts.] A six-sided die is tossed. Find the odds against rolling a number less than 3.

12. [10 pts.] The odds against Morticia winning a funny hat are 13:8. Find the probability that Morticia wins the funny hat.

13. [10 pts.] A 16-sided die is rolled once. If an even number comes up you win \$8; if a 1 or 3 comes up you lose \$6; if a 5, 7, 9, or 11 comes up you lose \$2; if a 13 comes up you lose \$40; and if a 15 comes up you break even. What's your expected value if you play this game?

14. Two thousand raffle tickets are sold for \$3 each. Three prizes will be awarded: one for \$1200 and two for \$600. Professor Chalkdust purchases one of these tickets.

    (a) [10 pts.] Determine the professor's expected value.

    (b) [5 pts.] Determine the fair price of a ticket.