Please put away all papers and electronic devices except for a calculator. Show enough work that it is clear how you arrived at your answer. Answers can be given as frations or decimals rounded to 4 decimal places. Box/circle your final answers. Good luck!

1. An experimaent can result in 6 possible simple events

$$S = \{E_1, E_2, E_3, E_4, E_5, E_6\}$$

with the following probabilities.

$$P(E_1) = .05, \quad P(E_2) = .10, \quad P(E_3) = .25,$$

$$P(E_4) = P(E_5) = P(E_6).$$

Suppose the events A and B are defined as follows.

$$A = \{E_1, E_3, E_4\}$$
$$B = \{E_1, E_2, E_3\}$$

(a) (4 points) Find the probability $P(E_4)$.

(b) (4 points) Find the probability $P(B)$

(c) (4 points) Find the probability $P(A \cap B)$.

(d) (4 points) Find the probability $P(A|B)$.

(e) (4 points) Are A and B mutually exclusive? Why or why not?

(f) (4 points) Are A and B independent? Why or why not?

2. Provide formulas for the following.

   (a) (4 points) The number of ways to choose and arrange r distinct objects from a collection of n distinct objects, i.e. P_r^n.

   (b) (4 points) The number of ways to choose r distinct objects from a collection of n distinct objects, i.e. C_r^n.

3. (4 points) How many ways can the letters Q, W, E, R, T, and Y be ordered?

4. (4 points) How many ways are there to select 3 (different) side dishes from a restaurant that serves 6 side dishes?

5. Suppose a particular club has 20 members.

   (a) (6 points) How many ways can the club select 4 people to work on a particular project?

   (b) (6 points) How many ways can the club elect a president, vice president, and secretary?

6. (8 points) How many ways are there for Noah to select 2 sheep, 2 goats, and 2 camels from a group of 5 sheep, 6 goats, and 7 camels?

7. A drawer contains 7 new batteries and 3 dead batteries. You grab 2 of the batteries.

   (a) (8 points) What is the probability that they are both dead?

   (b) (8 points) What is the probability that at least one of the batteries is new?

8. An experiment can result in events A, B, both A and B, or neither with the following probabilities.

	A	A^c
B	.16	.56
B^c	.06	.22

(a) (4 points) Find $P(A)$.

(b) (6 points) Find $P(A|B)$.

(c) (6 points) Are A and B independent? Why or why not?

9. (8 points) Suppose the probability that a pea plant is tall is .4, the probability that a pea plant has smooth leaves is .25, and the probabilty that a pea plant is neither tall nor has smooth leaves is .5. Find the probability that a pea plant is both tall and has smooth leaves.