

Instructions

- Answer all the questions.
- Write your name and discussion section number (**one of 20D, 21D, 22D**) on each page.
- Complete work must be shown where necessary to earn full credit.
- A bonus 1 point overall on the exam will be awarded if you calculate every numerical answer to its integer or decimal value correctly up to two decimal places.

Last Name:**First Name:****Dis. Section #:****1. Fill in the blanks:**

- a. (2 points) If $n(A) = 3$ and $n(B) = 4$, then the maximum possible value of $n(A \cap B) = \underline{3}$.
- b. (1 point) A set is a well-defined collection of objects.
- c. (2 points) The number of distinguishable permutations that can be formed from the letters of the word HIPPOPOTAMUS = $\frac{12!}{3!2!} (= 39916800)$
- d. (2 points) Student Painters, which specializes in painting the exterior of residential buildings, has eight people available to be organized into three-person and five-person teams. Within a team, each person has a different job. Using the generalized multiplication principle, determine how many ways a three-person team can be formed? $8 \cdot 7 \cdot 6 (= 336)$
- e. (4 points) A 5-card poker hand is dealt from a well-shuffled deck of 52 cards. The possible number of 'three of a kind' hands is 54912. ('three of a kind' is defined as a hand consisting of 3 cards of the same rank and 2 unmatched cards) $13 \cdot C(4,3) \cdot \frac{48 \cdot 44}{2!} (= 54912)$
- f. (4 points) Evaluate:
- i. $C(6,3) = \underline{20}$ ii. $C(n, n-1) = \underline{n}$ iii. $P(9,6) = \frac{9!}{3!}$ iv. $P(n, n-3) = \frac{n!}{3!}$ or $n(n-1) \dots 4$
- g. (2 points) In how many ways can five men and five women be seated at a round table at a dinner party if each guest is seated between members of the opposite sex? $4!5! (= 2880)$
- h. (1.5+1.5=3 points) Let S be any sample space and let E and F be any two events associated with the experiment. Describe the events below using the symbols \cup , \cap , and c .
- i. The event that E does not occur. E^c
- ii. The event that E but not F occurs. $E \cap F^c$

2. Multiple choice questions: choose the most appropriate answer.

a. (1 point) Which of the following represents an empty set?

i. $\{0\}$

☒ ii. $\{\}$

iii. $\{\emptyset\}$

iv. 0

b. (2 points) If A and B are any two finite sets, then $n(A \cup B)$ is _____ $n(A)$.

i. greater than

iii. less than

☒ ii. equal or greater than

iv. equal or less than

c. (2 points) Choose an appropriate truth value combination.

I) $\{1,2,3,4\} = \{2,4,1,3\}$

II) If A is any set, $A \subseteq A$.

☒ i. TT

ii. TF

iii. FT

iv. FF

d. (2 points) Let $S = \{a, b, c, d\}$ represent the sample space of an experiment. Which of the following is/are possible probability distribution(s) for the experiment?

i. $p(a) = .1, p(b) = .5, p(c) = -.2, p(d) = .6$

ii. $p(a) = .4, p(b) = .4, p(c) = 0, p(d) = .1$

☒ iii. $p(a) = .2, p(b) = .2, p(c) = .2, p(d) = .4$

iv. $p(a) = .5, p(b) = .4, p(c) = .2, p(d) = -.1$

e. (3 points) Choose an appropriate truth value combination.

I) Two fair dices are rolled, and the outcome is recorded as the sum of the faces they land on. This is an experiment with a uniform sample space.

II) MATH 230 professor chooses a day of the week randomly for a surprise test on canvas. This is an experiment with a uniform sample space.

i. TT

ii. TF

☒ iii. FT

iv. FF

Last Name:

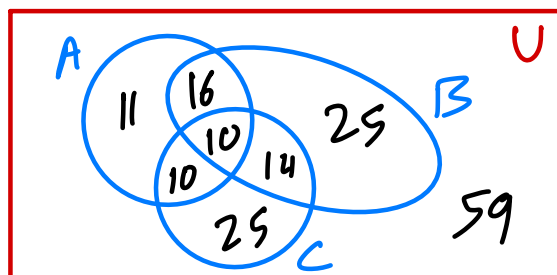
First Name:

Dis. Section #:

3. In a survey, 170 consumers were asked about their buying preferences concerning a product that is sold in the market under three labels. The results were as follows.

11 buy only those sold under label A.
 25 buy only those sold under label B.
 25 buy only those sold under label C.
 16 buy only those sold under labels A and B.
 10 buy only those sold under labels A and C.
 14 buy only those sold under labels B and C.
 10 buy the product sold under all three labels.

- a. (6 points) Draw a Venn diagram to represent the above information after describing the labels used for different sets. Fill all parts of the Venn diagram.



$$\begin{aligned}
 &170 - (11 + 16 + 10 + 10 \\
 &\quad + 25 + 25 + 14) \\
 &= 170 - 111 \\
 &= 59
 \end{aligned}$$

- b. Answer the following questions (not needed to show work): How many of the consumers surveyed buy the product sold under

- i. (2 points) At least one of the three labels? 111
 ii. (2 points) Labels A and B but not C? 52
 iii. (1 point) None of these labels? 59

4. (2 points) State the principle of multiplication.

If task A can be done in m ways and task B in n ways and the two tasks are independent, then both tasks in a sequence can be done in mn ways.

5. (2 points) State the De Morgan's laws for two sets A and B.

$$\begin{aligned}
 1) & (A \cup B)^c = A^c \cap B^c \\
 2) & (A \cap B)^c = A^c \cup B^c
 \end{aligned}$$