Sample Exam 2 Problems

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Warning. This "practice" exam is about twice the length of a normal 50 minute exam. This practice set was made longer in order that a wider variety of problems could be included. However, NO CLAIM is made that all types of exam problems are included in this practice set.

1. A shipment is composed of 90 crates of mangoes. Of those crates, 30 are infected with a fly. A sample of 10 is taken. Pay close attention to the difference between problems that ask for a *count* and those that ask for a *probability*

    A) How many different samples of 10 crates are there?

    B) How many different sample containing only undiseased crates are there?

    C) What is the probability that the sample will contain at least one diseased crate?

    D) What is the probability that the sample will contain exactly one diseased crate?

    E) What is the probability that the sample will contain at least two rotten crates?

    F) How many samples contain exactly two rotten crates?

2. How many different looking arrangements are there of 8 "F"s and 3 "S"'s?

3. How many different ways can you arrange 3 red balls, 4 green balls a,d 2 yellow balls? (assume balls of the same color all look the same.)

4. A red and green die are tossed. Use the following choices to answer the next two questions.

    A)$\frac{1}{6}$ B) $\frac{7}{9}$ C)8   D)$\frac{2}{9}$ E) $\frac{1}{3}$ F) $\frac{11}{36}$ G) $\frac{13}{36}$

    i) What is the probability that the red die is a six or the green die is a six?

    ii) What is the probability that the sum is neither a seven nor an eleven?

5. A food store surveyed 65 shoppers. Of these 40 bought hamburgers, 30 bought hot dogs, and 5 bought neither. How many bought both? (if possible.)

6. How many different ways can a 5 question true/false quiz be answered?

7. $P(A) = \frac{1}{2}$ and $P(B) = \frac{4}{5}$ and $P(B \cap A^c) = \frac{2}{5}$

Find:

A) $P(B^c \cap A^c)$

B) $P(B \cup A^c)$

8. Of 600 tu students surveyed,

213 could count to 10

117 could sing the alphabet song

74 could list all the colors

only 1 could do all three

162 could count to 10 but couldn't do anything else

15 could count to 10 and knew all the colors, but couldn't sing the alphabet song

281 couldn't do any of these things

A) Draw a Venn diagram describing this scenario.

B) How many tu students could sing the alphabet song and list all the colors but not count to 10?

C) How many students could just list the colors and nothing else?

D) How many tu students could do **EXACTLY** one of these tasks?

E) How many students could do at least one of these tasks?

9. A survey of 1000 people is made to determine the relationship between sex and being color-blind. Of the people surveyed, 28 were color-blind, 460 were male, and 538 were normal females.

A) Draw a Venn diagram illustrating this.

B) Use the Venn diagram to find the probability that a person is not color-blind.

C) Use the Venn diagram to find the probability that a person is eithyer color-blind or male.

A survey of 1000 people is made to determine the relationship between sex and being color blind. To answer the following questions use the information in the table below. Notice the similarity between Venn diagrams and tables.

	$Female$	$Male$	$Totals$
$colorblind$	2	24	26
$normal$	518	456	974
$Totals$	520	480	1000

10. Find the probability that a person selected at random is both female and color-blind.

11. Find the probability that a person selected at random is either male or color-blind or both.

12. Find the probability that a person chosen at random is color-blind.

13. Find the probability that a person chosen at random is either color-blind or normal?

14. What mathematical term describes the relationship between the events "male" and "female"?

15. Draw and shade a Venn diagram illustrating $A^c \cap (B \cup C)$

16. Draw and shade a Venn diagram illustrating $A^c \cup (B \cap C)$

17. True or False

i) A is always a subset of $A \cup B$

ii) A is always a subset of $A \cap B$

iii) A can be a subset of $A \cap B$

iv) $A \cap B$ is always a subset of $A \cap B$

v) $A \cup \emptyset = A$

vi) $A \cap \emptyset = A$

A single card is drawn from a deck of 52 cards

vii) the events "the card is a heart" and "the card is a spade" are mutually exclusive

viii) The events "the card is a king" and "the card is a diamond" are mutually exclusive.

18. The experiment: two fair dice are tossed.

i) Describe a uniform sample space for this experiment.

ii) Describe a non-uniform sample space for this experiment.

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19. $A = \{a, b, c, d\}$ $\qquad\qquad$ $B = \{c, d, e, f, g\}$ $\qquad\qquad$ $C = \{a, b, c, d, e, f, g\}$

$\quad$ i) Find $A \cap B$

$\quad$ ii) Find $A \cup B^c$

$\quad$ iii) Is $A \subseteq C$?

$\quad$ iv) Is $A \subseteq B$?

$\quad$ v) Are A and B mutually exclusive?

20. The Aggie Pen Company makes two kinds of pen: a silver model and a gold model. the silver model requires 1 minute in a grinder and 3 minutes in a bonder. The gold model requires 3 minutes in a grinder and 4 minutes in a bonder. the grinder can be operated no more than 30 hours per week. the bonder can be operated no more than 50 hours per week. the company makes $2 on each silver pen and $7 on each gold pen. Furthermore, becuase of contractual obligations the company must make at least 400 silver pens each week. *How many of each type of pen should be produced and sold each week in order to maximize profit?*

$\quad$ i) Set up the linear programming problem. Be sure to define all of your variables.

$\quad$ ii) Graph the feasible region. Be sure to label all corner points correct to at least 3 decimal places.

$\quad$ iii) Answer the question. How many types of each pen should be produced each week? What is the maximum profit attainable?

21. The solution to a linear program is guaranteed to exist when _____

22. Give an example of two inequalities whose graph is an empty feasible region.

23. Explain what happens when the optimal value of a linear programming problem occurs at exactly two cornerpoints. (Is this even possible?)

24. What is wrong with the following statement? Fix it.

$\quad$ $P(A \cup B) = P(A) + P(B)$

25. $D = \{x | x \text{ is a Democrat}\}$ $\qquad$ $L = \{x | x \text{ is a lawyer}\}$ $\qquad$ $F = \{x | x \text{ is a female}\}$

$\quad$ $U = \{x | x \text{ is a U.S. senator}\}$

$\quad$ i) Describe using set notation the set of all male Democratic senators who are not lawyers.

$\quad$ ii) Describe using set notation the set of all senators who are either Democratic or female but not both.

26. You are arranging 5 math books, 4 history books, and 3 biology books on a shelf.

    i) How many different ways can they be arranged?

    ii) How many different ways can they be arranged if books of the same subject must be put together?

27. Find the probability that a family of 3 children will have

    i) at least one girl

    ii) exactly one girl

    iii) a girl then a boy then a girl

28. Find the probability that in a room of 5 people at least two have the same zodiac sign. (Assume each Zodiac sign is equally likely.)

29. A student studying for a vocabulary test knows the meanings of 10 words from a list of 15. The test will contain 8 words from the study list. The student must get at least 6 right to get a "C".

    i) What is the probability the student gets exactly 6 right?

    ii) What is the probability the student gets at least 6 right?

30. A 13 card hand is dealt from a well shuffled standard deck. What is the probability that:

    i) You get a four of a kind

    ii) Your hand is divided in 3 suits of 3 each, and one suit of 4.

    iii) You don't have any spades.