

# Sample Problems For Exam 1

Fall 2009 Compiled by Joe Kahlig

This collection of questions is intended to give an idea of different types of question that might be asked on the exam. This is not intended to represent an exam.

These question cover chapter L and chapter 1 in the Applied Finite Mathematics, 2<sup>th</sup> edition by Tomastik and Epstein.

Video solutions can be found at this link: <http://www.math.tamu.edu/~kahlig/166WIRpage.html>

1. Give the truth table for  $(\sim p \wedge q) \vee \sim q$
2. The statements  $p$ ,  $s$ , and  $r$  have truth values of True and the statements  $q$  has a truth value of False. Determine the truth value of the compound statement.

$$\sim (p \vee s) \wedge (q \vee r)$$

3. Use the statements for the following.

d: John has a dog as a pet

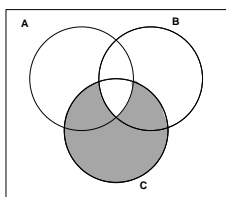
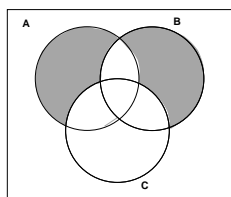
c: John has a cat as a pet

f: John has a fish as a pet

- (a) i.  $\sim d \wedge \sim c$   
ii.  $(d \vee c) \wedge \sim f$
  - (b) i. John had a dog or he did not have a cat as a pet.  
ii. John has a cat and a fish but does not have a dog as a pet.
4. True or False.  $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$  and  $A = \{0, 1, 2, 3, 4, 5\}$

T	F	$\phi \in A$		T	F	$n(A) = 5$		T	F	$n(\{3, 4\}) = 2$
T	F	$\phi \subseteq A$		T	F	$\{1, 3, 5\} \in A$		T	F	$n(\phi) = 1$
T	F	$\{1, 2, 3\} \subseteq A$		T	F	$2 \in A$		T	F	$3 \in A^C$
T	F	$2 \subseteq A$		T	F	$\{\phi\} = \phi$		T	F	$0 = \phi$

5.  $A = \{a, b, c\}$ 
  - (a) List all subsets of A.
  - (b) List all of the proper subsets of A.
  - (c) Give an example of two subsets of A that are disjoint. If this is not possible, then explain why.
6. Shade the part of the Venn diagram that is represented by
  - (a)  $(A^C \cup B) \cap (C \cup A)$
  - (b)  $(B \cup C) \cap A^C$
7. Write down the set notation that would represent the shaded portion of the Venn diagram.



8.  $U = \{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ ,  $A = \{1, 3, 5, 7, 9\}$ ,  $B = \{1, 2, 4, 7, 8\}$ , and  $C = \{2, 4, 6, 8\}$ . Compute the following.
- a)  $(A \cap B) \cup C$                       b)  $A \cap (B \cup C)^C$
9. In a survey of 300 high school seniors:  
 120 had not read *Macbeth* but had read *As You Like It* or *Romeo and Juliet*.  
 61 had read *As You Like It* but not *Romeo and Juliet*.  
 15 had read *Macbeth* and *As You Like It*.  
 14 had read *As You Like It* and *Romeo and Juliet*.  
 9 had read *Macbeth* and *Romeo and Juliet*.  
 5 had read *Macbeth* and *Romeo and Juliet* but not *As You Like It*.  
 40 had read only *Macbeth*.
- Let  $M = \text{Macbeth}$ ,  $R = \text{Romeo and Juliet}$ , and  $A = \text{As You Like It}$ .
- (a) Fill in a Venn diagram illustrating the above information.  
 (b) How many students read exactly one of these books?  
 (c) How many students did not read *Romeo and Juliet*?  
 (d) How many students read either *Macbeth* or *As You Like It* and read *Romeo and Juliet*?  
 (e) Compute  $n(M \cup (R^C \cap A)) =$
10. Find  $n(A \cap B)$  if  $n(A) = 8$ ,  $n(B) = 9$ , and  $n(A \cup B) = 14$ .
11. An experiment consists of tossing a 4 sided die and flipping a coin.
- (a) Describe an appropriate sample space for this experiment.  
 (b) Are the events, E: getting a head and F: rolling a 2 on the die, mutually exclusive? Justify your answer.  
 (c) Give two events of this sample space that are mutually exclusive.
12. Roll a 6 sided die and an 8 sided die. What is the probability that
- (a) A sum of 8 and at least one of the die was a 6.  
 (b) A sum of 8 or at least one of the die was a 6.  
 (c) A sum of 8 is rolled if the six sided die has an even number on it.  
 (d) A sum of 12 is rolled provided a six is cast (at least one six is rolled).
13. If  $S = \{a, b, c, d\}$  with  $2P(a) = P(b) = 3P(c)$  and  $P(d) = 0.2$ , find  $P(a)$ .
14. Let E and F be two events and  $P(E) = 0.35$ ,  $P(F) = 0.55$ , and  $P(E \cap F^C) = 0.15$ . Answer the following questions.
- (a) Compute the probability of exactly one of these events occurring.  
 (b) Are E and F mutually exclusive?  
 (c)  $P(E \cup F) =$   
 (d) Are E and F independent?  
 (e)  $P(F|E) =$   
 (f)  $P(E^C|F) =$

15. A clothing company selected 1000 persons at random and surveyed them to determine a relationship between age of purchaser and annual purchases of jeans. The results are given in the table. A person from the survey is selected at random.

(a) What is the probability that the person is 12-18 if they purchases 0 pairs of jeans annually.

(b) What is the probability that the person purchases 2 pairs of jeans annually if we know they are younger than 12.

(c) What is the probability that the person is older than 18 given they purchase 2 or more pairs of jeans annually.

Age	0	1	2	3 or More	Totals
Under 12	60	70	30	10	170
12-18	30	100	100	60	290
19-25	70	110	120	30	330
Over 25	100	50	40	20	210
Totals	260	330	290	120	1000

16. A box contains four red, five white, and eight yellow marbles. Two marbles are drawn without replacement.

(a) What is the probability that the first marble is red?

(b) Assuming that the first marble is red, what is the probability that the second marble drawn is red?

(c) What is the probability that a red marble is not drawn in neither the first nor second draw?

17. Phredd has a box that contains 8 Dr Peppers and 5 Cokes. If he pulls out three drinks in succession, without replacing the draws, what is the probability that

(a) all the drinks will be the same brand?

(b) exactly one Coke will be selected?

18. A manufacturer of automobiles receives 300 car radios from each of three different suppliers. Unknown to the manufacturer, there are ten defective radios from supplier A, twenty from supplier B, and five from supplier C. As a means of quality control, one radio is selected at random from each of the shipments. What is the probability that

(a) All the radios selected are in working order?

(b) exactly one of the selected radios is defective?

19. A new test for a disease will give a positive result 92% of the time when a person has the disease. The test will give a false positive 12% of the time. The test is give to a person selected at random from a group of subjects where 56% of them are healthy. What is the probability that

(a) the disease will not be detected if the person has the disease?

(b) the person has the disease if the test comes back positive?

(c) If the person takes the test twice, what is the probability that the person has the disease if both test are positive.

20. Find the odds of drawing an ace, from a standard deck of cards, on the second draw if we know that the first card drawn was a king and cards are not replaced after they are drawn.

21. The odds against an event E occurring are 3 to 19. What is the probability of E occurring?