

Math 166.200

Exam I

Tuesday, September 18, 2012

Printed Name: _____

Signature: _____

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- **You must show all appropriate work to receive full credit.**
 - If you give a decimal answer that is not money, then round to at least 4 decimal places.
 - There are 100 points possible. Point values for each problem are as indicated.
 - Be careful in converting percentages $2\% = .02$
 - **SCHOLASTIC DISHONESTY WILL NOT BE TOLERATED.**
 - If you need more space to work a problem, you may use the back of the exam. Please indicate where the problem is located.
 - **INFORMATION ABOUT CARDS.** Each standard deck of cards has 52 cards. There are 4 suits in a deck of cards; Hearts, Diamonds, Spades, and Clubs. The Hearts and Diamonds are both red, while the Spades and Clubs are both black. Within each suit there are 13 cards and they are labeled Ace, 2, 3, 4, 5, 6, 7, 8, 9, 10, Jack, Queen, and King. If you feel that you need more information about a card deck please ask.

Good Luck!

1. (9 points) Use this information to determine the truth value of these compound statements.

p	q	r	s
T	F	F	T

(a) $p \wedge \sim (q \vee s)$ **F**

(b) $s \vee \sim r$ **F**

(c) $\sim q \wedge s$ **T**

2. (6 points) Use the statements to express the following sentences in symbolic notation.

- m: The book is a mystery.
- r: The book is written by Agatha Christy
- p: The book is a paperback.

(a) The book written by Agatha Christy is not a mystery.

$$r \wedge \sim m$$

(b) The mystery book is written by Agatha Christy or is a paperback.

~~$$(m \wedge r) \vee p$$~~

$$m \wedge (r \vee p)$$

3. (12 points) A group of 120 people were asked three yes/no questions. The questions were labeled A, B, and C and the Venn diagram shows the number of people who answered yes.

(a) How many people correspond to the region indicated by $A \cup B^c$?

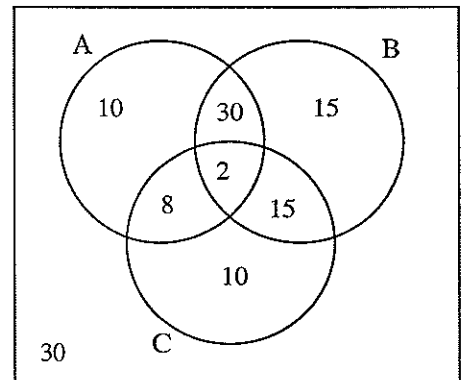
$$10 + 30 + 8 + 2 + 10 + 30 = 90$$

(b) Find the probability that a person selected at random from the survey answered yes to at least 2 questions.

$$\frac{8 + 2 + 30 + 15}{120} = \frac{55}{120}$$

(c) Find the probability that a person who answered yes to question C also answered yes to question B.

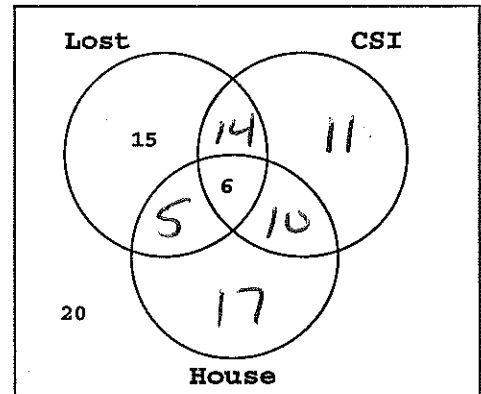
$$P(B|C) = \frac{2 + 15}{8 + 2 + 15 + 10} = \frac{17}{35}$$



4. (5 points) Fill in the Venn diagram with this information.

A group of people were asked which of these TV shows that they regularly watch: Lost, CSI, and House.

- a) 20 said they watched Lost and CSI.
- b) 10 said they watched House and CSI but not Lost.
- c) Of the people that watch House, 15 said that they watched exactly one of the other shows.
- d) 38 said they watched House or CSI but not Lost
- e) 25 said they watched CSI but not House.



5. (12 points) A group of students were asked which of these sports they play: basketball, football, or tennis. The following information was compiled in the chart.

	Fresh.	Soph.	Jrs	Totals
only basketball	30	50	20	100
only basketball and tennis	40	25	60	125
only tennis	80	90	120	290
only football and tennis	5	7	18	30
only football	15	30	10	55
none of these sports	15	13	22	50
Totals	185	215	250	650

A student is selected at random from those in the survey.

(a) What is the probability that they played football or the student is a sophomore?

$$\frac{30 + 55 + 215 - 7 + 30}{650} = \frac{270 - 7}{650} = \frac{263}{650}$$

(b) What is the probability that the freshman selected said they played basketball?

$$P(B|F) = \frac{30 + 40}{185} = \frac{70}{185}$$

(c) Assuming that a freshman is selected from the survey. Find the odds that the freshman only plays tennis.

$$\frac{P(\text{only } T)}{P(\text{only } T)^c} = \frac{\frac{80}{185}}{\frac{105}{185}} = \frac{80}{105} \quad 16 \text{ to } 21$$

6. (6 points) Clearly indicate your answer. $A = \{a, b, c, d, e\}$ and $B = \{1, 2, \{3, 4\}\}$

True False $\{b\} \in A$

True False $\{3, 4\} \subseteq B$

True False $\{c, a, b\} \subseteq A$

7. (3 points) Set A has 10 elements: $\{a, b, c, d, e, f, g, h, i, j\}$. How many subsets of set A do not have any of the letters b, e, and i in them?

$$2^7$$

8. (8 points) Roll a fair six sided die and a fair 4 fair sided die.

(a) What is the probability of getting a 4 on the smaller die and a sum of 5?

$$\frac{1}{24}$$

(b) What is the probability that the sum of the die is 5 if you know that at least one 4 is rolled?

	1	2	3	4	5	6
1				5		
2			5			
3		5				
4	5					

$$P(\text{sum of 5} \mid \text{at least one 4}) = \frac{2}{9}$$

9. (8 points) S is the sample space with events: A, B, and C.

$$S = \{s_1, s_2, s_3, s_4, s_5, s_6\}$$

$$A = \{s_2, s_4, s_5, s_6\}$$

$$B = \{s_1, s_2, s_5\}$$

$$C = \{s_3, s_5\}$$

	B	\bar{B}	C	A	\bar{A}	A
outcome	s_1	s_2	s_3	s_4	s_5	s_6
prob.	$\frac{6}{31}$	$\frac{7}{31}$	$\frac{8}{31}$	$\frac{1}{31}$	$\frac{4}{31}$	$\frac{5}{31}$

(a) $P(C \cup B^c) = \frac{8}{31} + \frac{1}{31} + \frac{4}{31} + \frac{5}{31} = \frac{18}{31}$

$$C \cup B^c = \{s_3, s_4, s_5, s_6\}$$

(b) $P(B|A^c) = \frac{P(B \cap A^c)}{P(A^c)} = \frac{\frac{6}{31}}{\frac{6}{31} + \frac{8}{31}} = \frac{6}{14}$

10. (3 points) There are 6 freshmen, 7 sophomores and 3 juniors in the room. You are outside watching students leave a room one at a time (the students can not return to the room). You know that the first two students were freshmen and the seventh student was a sophomore. What is the probability that the fourth student to leave the room was a sophomore?

$$\frac{6}{13}$$

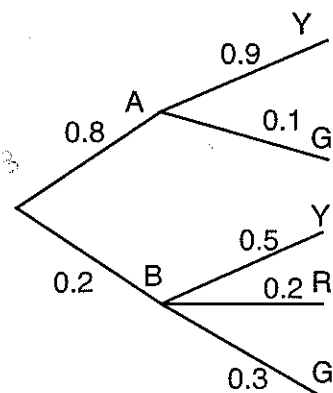
11. (3 points) The odds in favor of event A are 2 to 9. Find the probability that A will not happen.

$$\frac{9}{11}$$

12. (4 points) A box contains 4 defective and 10 non-defective parts. you randomly select a part from the box (without replacement) until you get a non-defective part. What is the probability that you selected two parts?

$$\frac{4}{14} \cdot \frac{10}{13}$$

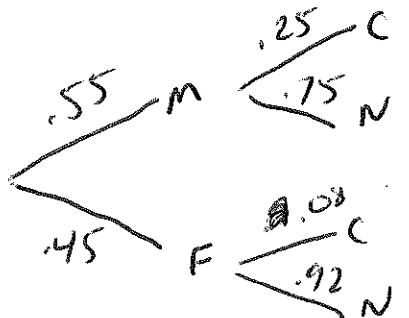
13. (4 points) Use the tree to compute $P(A|G) = \frac{.8(.1)}{.8(.1) + .2(.3)}$



14. (5 points) Your business has received three shipments of parts. The first shipment from company A has a defect rate of 3%. The second shipment from company B has a defect rate of 12%. The last shipment from company C has a defect rate of 18%. One item is to be selected from each shipment. what is the probability that the item from company A is defective and that only one of the other two items is defective?

$$.03(.12)(.82) + .03(.88)(.18)$$

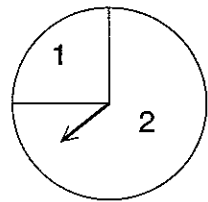
15. (6 points) A typical freshman class here at A&M has 55% guys and the rest girls. It is also noticed that of the guys, 25% of them are cadets and of the girls 92% of them are not cadets. A person from the class is selected at random. Find the probability that the cadet selected is a guy.



$$P(M|C) = \frac{.55(.25)}{.55(.25) + .45(.08)}$$

16. (6 points) A person is going to spin a spinner and then draw either one or two bills (as indicated by the spinner) from a box. Bills are not replaced after they are drawn. Find the probability that the person ends up getting exactly \$10. Note: the spinner landing on a line does not count and the spinner is re-spun.

Box contains
 4 one dollar bills
 3 five dollar bills
 1 ten dollar bill



$$\frac{1}{4} \left(\frac{1}{8} \right) + \frac{3}{4} \left(\frac{3}{8} \right) \left(\frac{2}{7} \right)$$

one ten two five five.

