MATH 166
FALL 2011
EXAM 1
REVIEW

LOGIC

1. Which of the following are statements?
   - Math is hard.
   - There was measurable rainfall yesterday at the airport.
   - How hot is it?

2. Translate the sentence into symbolic form: "The food is sweet and it is not spicy".

3. Write a truth table for $(p \vee q) \wedge \neg (q \veebar r)$

4. Write the negation for each of the statements below
   (a) The car is blue
   (b) No cars are blue
   (c) Some cars are blue

5. Write the compound statement $\sim p \veebar q$ as a sentence given that
   p: The birds are hungry
   q: The birds are thirsty

① Not a statement – need to define "hard"

A statement

Not a statement – a question

② p: the food is sweet
q: the food is spicy
} $p \wedge \sim q$

③

p	q	r	pVq	q⊻r	(pVq)∧(q⊻r)
T	T	T	T	F	F
T	T	F	T	T	T
T	F	T	T	T	T
T	F	F	T	F	F
F	T	T	T	F	F
F	T	F	T	T	T
F	F	T	F	T	F
F	F	F	F	F	F

④ a) The car is not blue
b) At least one car is blue
c) No cars are blue
d) ⑧ below

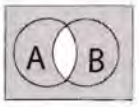
⑤ Either the birds are not hungry or they are thirsty

NNN, NBB, NNB ↔ BBB

⑧ Some cars are not blue ↔ All cars are blue

SETS

MATH 166
FALL 2011
REVIEW
EXAM 1

1. Express the shaded region in set notation: 

2. A class of math students can be grouped in the following sets:
$A=\{x|x$ is a woman$\}$ $B=\{x|x$ has taken Economics$\}$
Find the set of women who have not taken Economics in set builder notation

3. A store has sold 100 microwaves. 80 of the microwaves have turntables and 40 of them have programs. If 90 of them have programs or turntables, how many have only turntables?

4. A survey of two hundred students is done at a school cafeteria. Use the information given to fill in a Venn diagram:
55 students like pizza and burritos.
130 students did not like chicken.
30 students like all three items.
35 students like burritos but did not like chicken.
55 students like only pizza.
60 students like exactly 2 of these dishes.
15 students like chicken and pizza but not burritos.

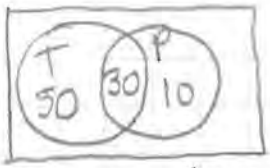
5. Shade the region corresponding to
(a) $\{x \mid x \notin A \text{ or } x \in B\}$ (b) $(A \cup B)^c$ (c) $(A \cap B^c) \cup C$ (d) $(B \cup C) \cap A^c$

6. Define the following sets. Note that U is the universal set. Decide if each statement is true or false.
$U = \{0, 1, 2, 3, 4, 5, 6, 7, 8\}$ $A = \{1, 2, 3\}$ $B = \{2, 4, 6\}$ $C = \{3, 5, 7\}$

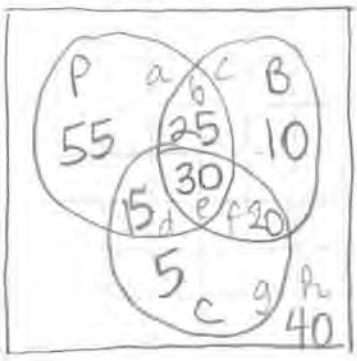
(a) B and C are disjoint (b) $1 \subseteq A$ (c) $B \subset B$ (d) $\{3,5\} \in C$
(e) $A \cap B = 2$ (f) $A \cup C = \{1,2,3,3,5,7\}$

① $(A \cap B)^c$ or $A^c \cup B^c$

② $A \cap B^c = \{x \mid x \in A \text{ and } x \notin B\}$

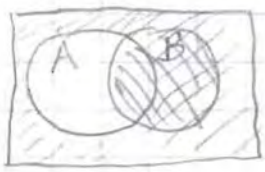
③ 

$n(U) = 100, n(T \cup P) = 90, n(T) = 80, n(P) = 40$
$n(T \cup P) = n(T) + n(P) - n(T \cap P)$
$90 = 80 + 40 - n(T \cap P) \rightarrow n(T \cap P) = 30$
only turntables $= n(T \cap P^c) = 50$

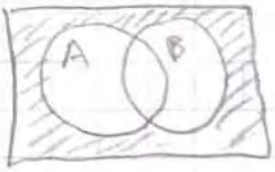
④ 

$200 = a+b+c+d+e+f+g+h$
$55 = b+e$
$130 = a+b+c+h$
$30 = e$
$35 = b+c$
$55 = a$
$60 = b+d+f$
$15 = d$

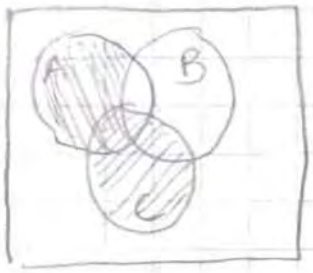
⑤ ⓐ $\{x \mid x \notin A \text{ or } x \in B\}$



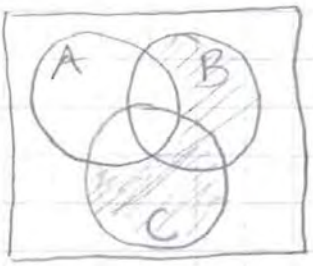
ⓑ $(A \cup B)^c = A^c \cap B^c$



ⓒ $(A \cap B^c) \cup C$



ⓓ $(B \cup C) \cap A^c$



⑥ a) True – nothing in common

b) False. $1 \in A$ and $\{1\} \subseteq A$ are true

c) false. $B \subseteq B$ is true

d) false. $3, 5 \in C$ and $\{3,5\} \subset C$ are true

e) false. $A \cap B = \{2\}$

f) false $A \cup C = \{1, 2, 3, 5, 7\}$

↑ not two of these

Exam 1 Review
Basic Probability

MATH 166
Fall 2011

① $S = \{g, s, b\}$, $n(S) = 3 \Rightarrow 2^3 = 8$ events (subsets of S)

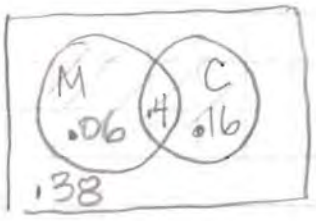
② $S = \{w, o, o, d\} \Rightarrow n(S) = 4$

③

1-1	2-1	3-1	4-1	5-1	6-1	at least one "5"
1-2	2-2	3-2	4-2	5-2	6-2	
1-3	2-3	3-3	4-3	5-3	6-3	
1-4	2-4	3-4	4-4	5-4	6-4	
1-5	2-5	3-5	4-5	5-5	6-5	sum > 10
1-6	2-6	3-6	4-6	5-6	6-6	

$P = \frac{12}{36}$

④



muffin or coffee = 62% or .62

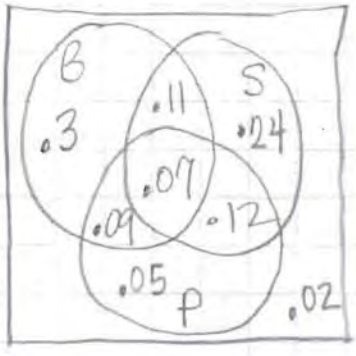
⑤ a) $E = \{10, 20\} \rightarrow P = 2/25$

b) $E = \{2, 4, 5, 6, 8, 10, 12, 14, 15, 16, 18, 20, 22, 24, 25\}$ $P = 15/25$

c) $E = \{3, 9, 15, 21\}$ $P = 4/25$

⑥ $52/52$

⑦



a) $P(B) = .57$

b) $P(B \cap S) = .18$

c) $P(B \cup P) = .74$

d) $P(B \cap (S \cap P)^c) = .5$

e) $P(B \cap S^c) = .39$

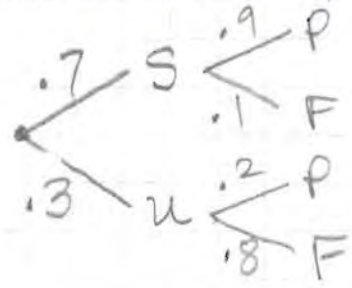
f) $P((B \cap S) \cup (B \cap P) \cup (P \cap S)) = .39$

⑧ $\frac{P(E)}{P(E^c)} = \frac{P(E)}{1 - P(E)} = \frac{.55}{1 - .55} = \frac{.55}{.45} = \frac{11}{9} \Rightarrow$ 11 : 9 odds, 11 to 9 odds

6 : 11 $\rightarrow P(F) = \frac{6}{6+11} = \frac{6}{17}$

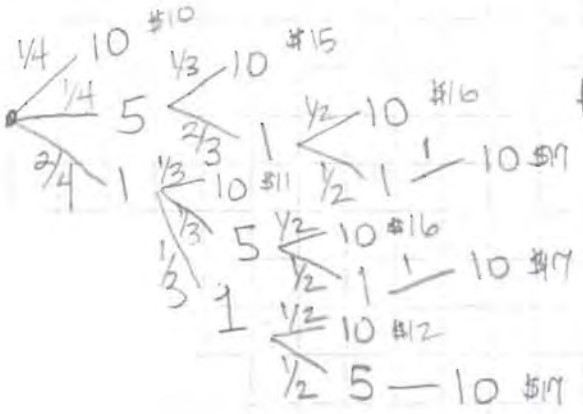
EXAM 1 REVIEW
Conditional Probability

Math 166
Fall 2011

1. 

a) $P(S|P) = \frac{P(S \cap P)}{P(P)} = \frac{(.7)(.9)}{(.7)(.9)+(.3)(.2)}$
$= 21/23 \ (\approx .91)$

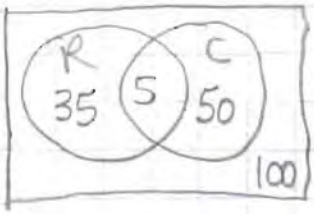
b) $P(U|F) = \frac{P(U \cap F)}{P(F)} = \frac{(.3)(.8)}{(.7)(.1)+(.3)(.8)}$
$= 24/31 \ (\approx .77)$

2. 

$P(\$16) = (1/4)(2/3)(1/2) + (2/4)(1/3)(1/2) = 1/6$

$P(\$17) = (1/4)(2/3)(1/2) + (2/4)(1/3)(1/2) + (2/4)(1/3)(1/2) = 1/4$

$P(2 \text{ draws}) = (1/4)(1/3) + (2/4)(1/3) = 1/4$

3. 

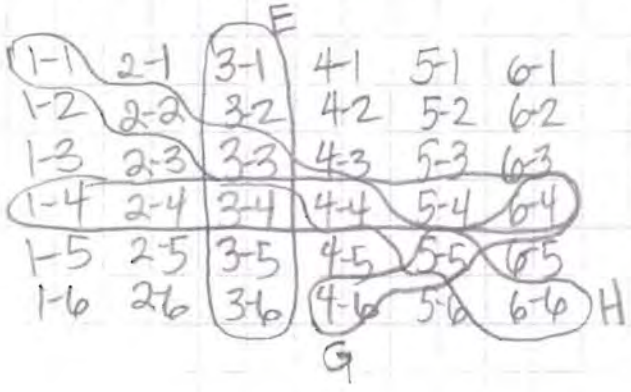
a) $P(R|C) = \frac{n(R \cap C)}{P(C)} = \frac{5}{55} = \frac{1}{11}$

b) NOT ME as $R \cap C \neq \emptyset$
$P(R) \cdot P(C) = (.4)(.55) = .22 \neq .05 = P(R \cap C)$
$\Rightarrow$ NOT IND.

4.

	Ret	FIC	NF	TOT
HB	5	0	2	7
PB	0	10	5	15
TOT	5	10	7	22

$P(PB|NF) = \frac{n(PB \cap NF)}{n(NF)} = \frac{5}{7}$

5. 

a) Yes $P(E) \cdot P(F) = 1/6 \cdot 1/6 = 1/36 = P(E \cap F)$

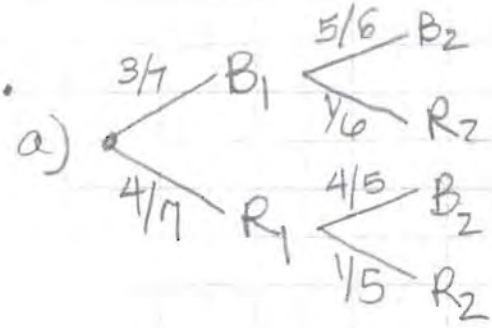
b) No. $P(F) \cdot P(G) = 1/6 \cdot 3/36 \neq 1/36 = P(F \cap G)$

c) Yes $E \cap G = \emptyset$

d) $P(G|E) = n(E \cap G)/n(E) = 0$

e) $P(G|H) = \frac{n(G \cap H)}{n(H)} = \frac{1}{6}$

6. a)



b) $P(B_1|B_2) = \frac{P(B_1 \cap B_2)}{P(B_2)} = \frac{(3/7)(5/6)}{(3/7)(5/6)+(4/7)(4/5)}$

$= 25/57$

START: | 3B 4R | BOX1 | 4B 1R | BOX2 | 2B 7R | BOX3 |

PICK B_1: | 5B 1R | BOX2 | 2B 7R | BOX3 |

PICK R_1 | 4B 1R | BOX2 | 2B 8R | BOX3 |

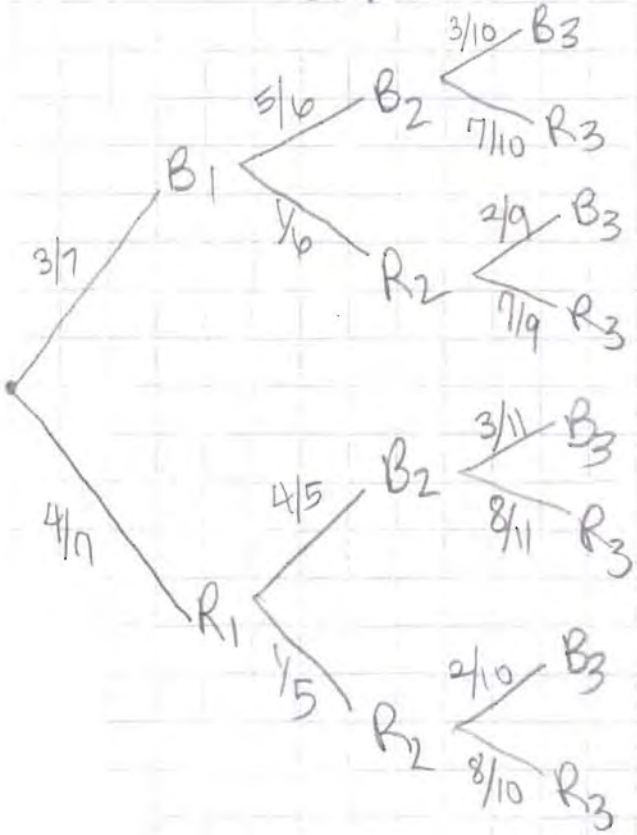
PICK B_1, B_2 | 3B 7R | BOX3 |

PICK $R_1 B_2$ | 3B 8R | BOX3 |

PICK B_1, R_2 | 2B 7R | BOX3 |

PICK $R_1 R_2$ | 2B 8R | BOX3 |

c)



d) $P(B_3) = (3/7)(5/6)(3/10) + (3/7)(1/6)(2/9) + (4/7)(4/5)(3/11) + (4/7)(1/5)(2/10)$

≈ 0.2705