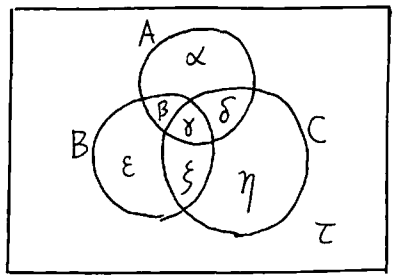
TEST THREE NO. A , MA 114, DR. JING'S SECTION
NOVEMBER 9, 2006

Print Your Name: **Row:** **Seat number:**

Please turn in this page with your work sheets and place at appropriate pile.

PLEASE SHOW YOUR WORK FOR PARTIAL CREDITS.

1. (15 pts) In the Venn diagram that follows, find all the elements in each of the three sets:
(a) $A \cup B$
(b) $A \cup (B \cap C^c)$
(c) $[A \cup (B \cap C^c)]^c$
(d) $A^c \cup (B \cap C)$



2. (15 pt) Suppose that $P(A) = 0.3$, $P(B) = 0.7$ and $P(A \cup B) = 0.8$. Compute
(a) $P(A \cap B)$
(b) $P(A^c)$
(c) $P(B \cup A^c)$

3. (15 pt) Ann has 8 long-sleeve shirts, 4 short-sleeve shirts, and 6 pairs of pants,
(a) how many different ways can she dress (assuming she is going to wear a shirt and pants)?
(b) If she is going on a trip and plans to take 4 shirts and 2 pairs of pants, how many possibilities are there for she to choose?
(c) Same as the previous question to ask how many possibilities are there for she to choose, except she decides that the shirts she takes should all be long sleeve?
(d) Same as in question (b) to ask how many possibilities are there for she to choose, except she decides to take at most two short sleeve shirts?

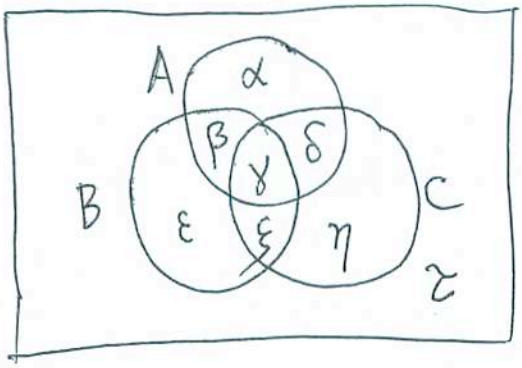
4. (20 pts) A class of 72 students are offered three subjects: math, business and history. There are 50 students taking math, 37 taking business, 25 taking hostory, 20 taking math and business. 16 taking math and history, 18 taking business and history, and 12 students taking all three subjects.
(a) How many students don't take any of the courses?
(b) How many students take exactly one course?
(c) How many students take at most two course?
(d) How many students take at least one course?

5. (15 pts) There are 3 digits in the area codes and 7 seven digits in the local telephone in North America.
(a) How many possible area codes are there?
(b) Assuming that no area codes contain repetition of digits, how many possible area codes are there?
(c) If a neighborhood has a population of eleven million, is one area code enough for the region?
(d) In reality one is not allowed to use up all possible first three digits in the 7 digit local numbers. Suppose that the first three digits has only 50 choices, how many area codes does one need for a city of one million people?

6. (15 pts) There are 12 points on a circle.
(a) How many ways are there to draw inscribed triangles using the 12 points as vertices and no vertices can be used in two triangles?
(b) How many different pentagons could possibly be formed having all its vertices chosen from among the 12 points and no point is used simultaneously in two pentagons?

Test 3A, MA114 Nov 2006

1.



(a) $A \cup B = \{\alpha, \beta, \gamma, \delta, \varepsilon, \xi\}$

(b) $A \cup (B \cap C^c) = \{\alpha, \beta, \gamma, \delta, \varepsilon\}$

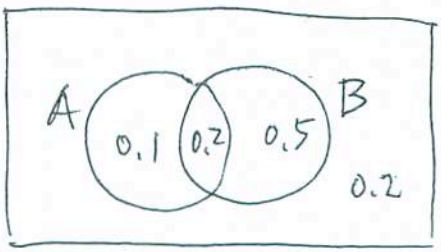
(c) $[\ \downarrow\ ]^c = \{\xi, \eta, \tau\}$

(d) $A^c \cup (B \cap C) = \{\gamma, \xi, \varepsilon, \eta, \tau\}$.

2. (a) $P(A \cap B) = 0.3 + 0.7 - 0.8 = 0.2$

(b) $P(A^c) = 1 - p(A) = 0.7$

(c) $P(B \cup A^c) = 0.5 + 0.2 = 0.7$



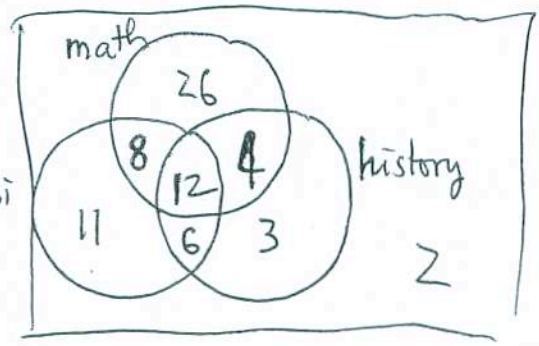
3. (a) $C(12,1) \cdot C(6,1) = 12 \times 6 = 72$

(b) $C(12,4) \cdot C(6,2)$

(c) $C(8,4) \cdot C(6,2)$

(d) $[C(8,4)C(4,0) + C(8,3)C(4,1) + C(8,2)C(4,2)] \cdot C(6,2)$

4



$50 + 11 + 6 + 3 = 70$

(a) 2

(b) $8 + 4 + 6 = 18$

(c) $72 - 12 = 60$

(d) $72 - 2 = 70$.

5. (a) 10^7

(b) $P(10,3)$

(c) $10^7 = 10{,}000{,}000$ not enough

(d) $50 \times 10^4 = 500{,}000$ Need 2 area code

6. (a) $C(12,3)$

(b) $C(12,5)$

TEST THREE NO. B, MA 114, DR. JING'S SECTION
NOVEMBER 9, 2006. 11:45–1:00

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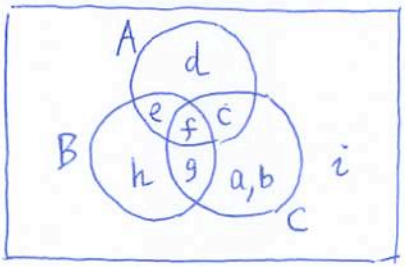
PLEASE SHOW YOUR WORK FOR PARTIAL CREDITS.

1. (15 pts) In the Venn diagram that follows, find all the elements in each of the three sets:
(a) $A \cap B$
(b) $A \cap (B \cup C^c)$
(c) $[A \cap (B \cup C^c)]^c$
(d) $A^c \cap (B \cup C)$



2. (20 pts) A class of 80 students are offered three subjects: math, business and history. There are 50 students taking math, 40 taking business, 25 taking history, 18 taking math and business, 15 taking math and history, 12 taking business and history, and 8 students taking all three subjects.
(a) How many students take exactly one course?
(b) How many students don't take any of the courses?
(c) How many students take at least one course?
(d) How many students take at most two course?

3. (15 pts) There are 4 symbols chosen from the Arabic numbers $\{0, 1, \ldots, 9\}$ and Latin letters on a state's car plates.
(a) How many possible plates are there?
(b) If the first symbol must be A, B or C, how many possible plates are there?
(c) If no repetitions allowed how many possible plates are there which contain the letter A?

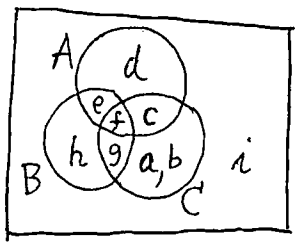
4. (15 pts) Suppose $p(A) = 0.7$, $p(B) = 0.6$ and $p(A \cap B) = 0.35$. Compute
(a) $p(A \cup B)$
(b) $p(A \cap B^c)$
(c) $p(B^c \cap A^c)$

5. (15 pts) A class has 34 girls and 26 boys and an election is held to select two members to represent the class at the school.
(a) How many different ways are there to choose these two representatives?
(b) If the selection requires that one girl and one boy are chosen, how many possibly different results are there?
(c) If at least one girl must be chosen, how many different results are there?

6. (15 pt) How many different ways are there for one to rearrange the letters in the word "MISSISSIPPI"?

Solution to Test 3B

1.



(a) $A \cap B = \{e, f\}$

(b) $A \cap (B \cup C^c) = \{c, d, e, f\} \cap (B \cup C^c)$

$= \{c, d, e, f\} \cap (\{e, f, g, h\} \cup \{d, e, h, i\})$

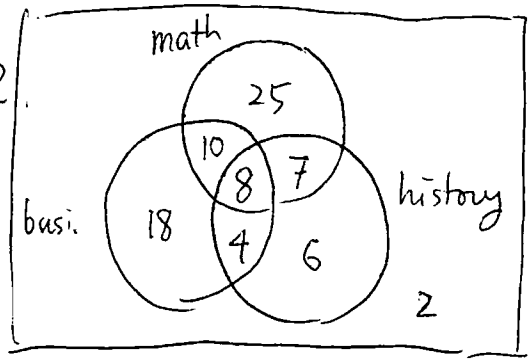
$= \{d, e, f\}$

(c) $[A \cap (B \cup C^c)]^c = \{a, b, c, g, h, i\}$

(d) $A^c \cap (B \cup C) = \{h, g, a, b, i\} \cap \{a, b, c, e, f, h, g\}$

$= \{h, g, a, b\}$

2.



(a) Exactly 1 course : $4 + 7 + 10 = 21$

(b) Don't take any course : 2

(c) $80 - 2 = 78$

(d) $80 - 8 = 72$

3. (a) $10 + 26 = 36$ $\square\square\square\square$ $\boxed{36^4}$

(b) $3 \times 36 \times 36 \times 36$ $\boxed{3 \cdot 36^3}$

(c) All possible plate numbers : $P(36, 4) = 36 \times 35 \times 34 \times 33$.

Containing 1 A : $A\square\square\square$ or $\square A\square\square$ or $\square\square A\square$, $\square\square\square A$

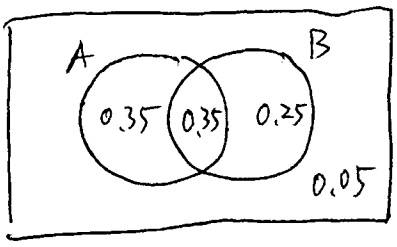
$4 \cdot P(35, 3) = 4 \times 35 \times 34 \times 33$

(b) ~~Containing 2A : $C(4,2) \cdot P(3$~~ So $36 \times 35 \times 34 \times 33 - 4 \times 35 \times 34 \times 33$

$= \boxed{35 \times 34 \times 33 \times 32}$

4 (c)

4



(a) $P(A\cup B)=P(A)+P(B)-P(A\cap B)$
$= 0.7+0.6-0.35=0.95$

(b) $P(A\cap B^c)=0.35$

(c) $P(B^c\cap A^c)=P((A\cup B)^c)=1-P(A\cup B)=0.05$

5. (a) $C(60,2)=\frac{60!}{2!\,58!}$

(b) $C(34,1)\cdot C(26,1)=34\times 26$

(c) 1 girl : 34×26
2 girls : $C(34,2)=\frac{34\times 33}{2}=17\times 33$
$\#=34\times 26+17\times 33$
$=17(54+33)=\boxed{17\times 87}$

6. $\frac{11!}{4!\,4!\,2!}$