

Math 107 Sec. 2  
 Montgomery  
 October 12, 2007

Exam 2

Answers

1. (20 pts.)  $U$  is the set of all 26 letters in the alphabet.

$A = \{a, e, i, o, u\}$ ,  $B = \{a, b, c, \dots, o\}$ ,  $C = \{\text{truman}\}$

a)  $(A' \cup C)' = A \cap C'$

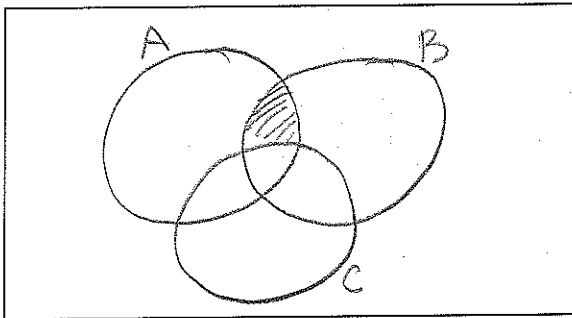
$=$  vowels not in "truman"  
 $= \{e, i, o\}$

b)  $B' \cap (A \cup C)$

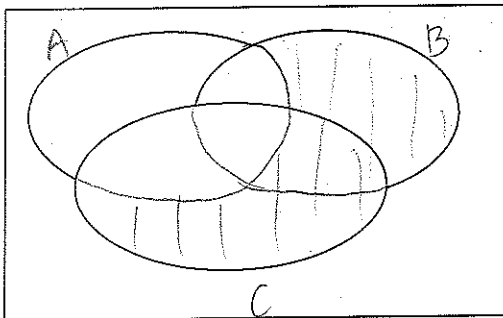
not a-o  $\cap \{a, e, i, o, u, t, r, m, n\} = \{r, t, u\}$

2. (10 pts) In a survey, students were asked if they liked apples, if they liked bananas, and if they liked cherries.

a. Draw a Venn diagram that could be used to represent the results of the survey, and shade the area that would represent the students who liked apples and bananas, but not cherries.



b. What people are represented by the shaded area below. Represent the set in symbols.

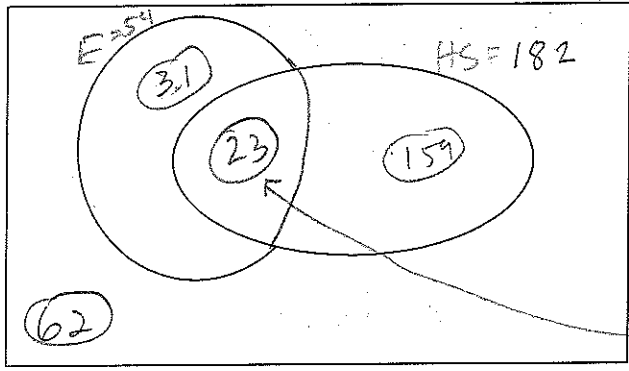


$(B \cup C) \cap A'$   
 Those who don't like apples  
 but do like bananas or cherries.

3. (15 pts) 275 employed US citizens over 40 years of age were randomly chosen. 54 of them were upper level executives. 182 of the 275 people played on high school teams in some sport. 62 of the 275 were not upper level executives and did not play on high school teams.

a. How many upper level executives played HS sports? 23

b. How many are either executives or played sports? 213



$$275 - 62 = n(E \cup HS)$$

$$213 = n(E \cup HS)$$

$$\begin{array}{r} 182 \\ + 54 \\ \hline 236 \\ - 213 \\ \hline 23 \end{array}$$

Bonus: Does this data set support the contention that someone who plays HS sports does better in business? (Brief answer--compare two proportions.)

Proportion of executives in general population =  $54/275 = 20\%$   
 Proportion of executives in the HS population =  $23/182 = 13\%$   
 } NO

4. (15 pts) The days of the year are numbered from 1 to 365. (Disregard leap years) 7 people are chosen at random and their birthdays recorded. (Do not compute the answers below.)

a. How many outcomes are possible?  
 $365 \times 365 \times 365 \times 365 \times 365 \times 365 \times 365$

b. How many outcomes are possible if all the birthdays are different?  
 $365 \times 364 \times 363 \times 362 \times 361 \times 360 \times 359$

c. How many outcomes have at least two people with the same birthday? (i.e., the birthdays are not all different.)

Answer in (a) - Answer in (b).

5. (20 pts) Show factors, cancel and compute:

a.  ${}_{25}C_4 = \frac{25 \cancel{24} \cancel{23} \cancel{22}}{\cancel{4} \cancel{3} \cancel{2} \cancel{1}} = 25 \times 23 \times 22 = 12450$

b.  ${}_{11}P_4 = 11 \times 10 \times 9 \times 8 = 990 \times 8 = 7920$

c.  ${}_{13}C_{10} \times {}_8C_3 = \frac{13 \times 12 \times 11 \times 10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4}{10 \times 9 \times 8 \times 7 \times 6 \times 5 \times 4} \times \frac{8 \times 7 \times 6}{3 \times 2 \times 1} = 13 \times 2 \times 11 \times 8 \times 7 = 16016$

6. (20 pts) Andrea owns an automobile dealership and needs to reduce her inventory. She needs to sell 24 of her 187 cars very quickly by reducing the price.

a. She needs to decide which of the cars will have the price reductions. In how many ways can she do this? (Don't compute the answer.)

${}_{187}C_{24}$

b. She has 47 SUV's and 11 convertibles on the lot; the rest are sedans. She has decided that 10 SUV's, 4 convertibles, and 10 sedans will go on sale. In how many ways can she choose the cars to go on sale? (Don't compute the answer.)

$\frac{47C_{10}}{\text{SUV}} \quad \frac{11C_4}{\text{Conv}} \quad \frac{129C_{10}}{\text{sedan}} \quad 47+11=58, \frac{187-58}{129} \text{ sedans}$

c. 5 of the 24 cars on sale must be chosen to go on display. One will be in the showroom near the entrance, one will be in the middle of the showroom, and one in the back. Another will be at the entrance to the parking lot, and the last will be near the street in front of the office. In how many ways can these cars be chosen and arranged in this way? (Don't compute the answer.)

${}_{24}P_5 = 24 \times 23 \times 22 \times 21 \times 20$