Finite Math Exam #2
Friday, March 14, 2008

Name Key

You must show all your work.

1. In how many ways can five boys and six girls be seated in a row if (5 points each)

   a. Boys and girls are seated alternately?

   $\frac{6}{G}\cdot\frac{5}{B}\cdot\frac{5}{G}\cdot\frac{4}{B}\cdot\frac{4}{G}\cdot\frac{3}{B}\cdot\frac{3}{G}\cdot\frac{2}{B}\cdot\frac{2}{G}\cdot\frac{1}{B}\cdot\frac{1}{G} = \boxed{86,400}$

   b. Boys sit together and girls sit together?

   $\frac{5}{B}\cdot\frac{4}{B}\cdot\frac{3}{B}\cdot\frac{2}{B}\cdot\frac{1}{B}\cdot\frac{6}{G}\cdot\frac{5}{G}\cdot\frac{4}{G}\cdot\frac{3}{G}\cdot\frac{2}{G}\cdot\frac{1}{G} = 86400$

   OR $\frac{6}{G}\cdot\frac{5}{G}\cdot\frac{4}{G}\cdot\frac{3}{G}\cdot\frac{2}{G}\cdot\frac{1}{G}\cdot\frac{5}{B}\cdot\frac{4}{B}\cdot\frac{3}{B}\cdot\frac{2}{B}\cdot\frac{1}{B} = 86400$ $\Big\} = \boxed{172,800}$

2. There are eight people on the board of directors of the Acme Corporation. (4 points each)

   a. In how many ways can a president, a vice president, and a treasurer be elected from the members?

   $8\cdot 7\cdot 6 = \boxed{336}$

   b. In how many ways can they elect a three- person committee to study future expansion if there are no restrictions on which members of the board may serve on the committee?

   $_8C_3 = \boxed{56}$

3. In how many ways can a five-card hand be drawn, without replacement, from a standard deck of 52 cards if at least three are to be hearts? (7 points)

   3 hearts & 2 not or 4 hearts & 1 not or 5 hearts

   $_{13}C_3\cdot{}_{39}C_2 + {}_{13}C_4\cdot{}_{39}C_1 + {}_{13}C_5 = \boxed{241,098}$

4. An experiment consists of tossing a coin and then rolling a standard six-sided die. What is the probability that the coin lands heads **and** the number on the die is even? (7 points)

   H2, H4, H6

   $P(E) = \frac{3}{12} = \boxed{\frac{1}{4}}$

5. A five-card hand is to be dealt from a standard deck of 52 cards. What is the probability that exactly two of the five cards are not hearts? (6 points)

   $\frac{{}_{39}C_2\cdot{}_{13}C_3}{{}_{52}C_5} \approx \boxed{.0815}$

6. From a lot of ten ladies' blouses, four are known to have a flaw. An ordered sample of three blouses is to be randomly selected, without replacement, from these ten blouses. What is the probability that the first one selected will have a flaw and the second two will not have a flaw? (7 points)

   $\frac{4}{10}\cdot\frac{6}{10}\cdot\frac{5}{9} = \boxed{\frac{2}{15}}$

   flaw · not flaw · not flaw

7. $A = \{a,d,e\}$, $B = \{b,c,d\}$, $C = \{a,e,f\}$, $U = \{a,b,c,d,e,f,g\}$ (4 points each)

a. $A \cup B' =$ $\{a, d, e, f, g\}$

$B' = \{a,e,f,g\}$

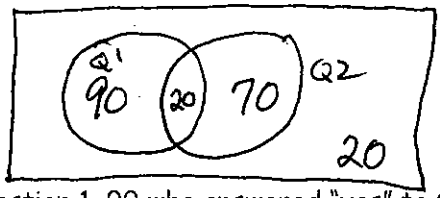
b. $A - U =$ $\emptyset$ or $\{\}$

c. $A \cap (B \cup C)' =$ $\emptyset$

$B \cup C = \{a,b,c,d,e,f\} \rightarrow (B \cup C)' = \{g\}$

8. There were ~~150~~ 200 respondents to a survey about ownership of radios and color TV sets. They were asked these questions: (4 points each)

Q1: Do you own a color TV set?
Q2: Do you own at least two radios?



There were 110 people who answered "yes" to Question 1, 90 who answered "yes" to Question 2, and 20 who answered "yes" to both questions.

a. How many answered "yes" to at least one of the questions? 180

b. How many answered "no" to both questions? 20

c. How many peopled answered "yes" to exactly one of the questions? 160

9. Tammy's son will enter college 14 years from now. At that time, she would like to have $20,000 available for college expenses. For this purpose, her bank will set up an account that pays 7% compounded quarterly. If she makes payments into the account at the end of each quarter, what must her payments be to achieve her goal? (8 points)

$$P = \frac{20{,}000\left(\frac{.07}{4}\right)}{\left[\left(1+\frac{.07}{4}\right)^{4(14)}-1\right]} \approx \$213.16$$

10. Sally gets financing for 90% of the $105,000 purchase price of a house at the rate of 8% on the monthly unpaid balance. (6 points each)

$105{,}000(.90) = \$94{,}500$

a. Find the amount of the monthly payments to repay the loan if the loan is repaid in 30 years?

$$P = \frac{\left(\frac{.08}{12}\right)(94{,}500)}{1-\left(1+\frac{.08}{12}\right)^{-12(30)}} \approx \$693.41$$

b. Find the total amount of interest paid to the finance company.

$(\$693.41)(12)(30) - 94500 = \$155{,}127.60$

c. Assuming timely payments of the amount in part (a), what is the unpaid balance after 20 years?

10 years left

$$P = 693.41\left[\frac{1-\left(1+\frac{.08}{12}\right)^{-12(10)}}{.08/12}\right] \approx \$57{,}151.88$$

11. Convert 16% compounded monthly to the APR. (5 points)

$$APR = \left(1+\frac{.16}{12}\right)^{12} - 1 \approx .1723 \text{ or } 17.23\%$$