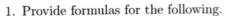
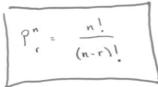
Math 173 Introduction to Probability and Statistics

50 POINTS

Quiz 1



2 (a) The number of ways to choose and arrange r distinct objects from a collection of n distinct objects, i.e. \mathbf{P}_r^n .



2 (b) The number of ways to choose r distinct objects from a collection of n distinct objects, i.e. C_r^n .

$$C_{r}^{n} = \frac{n!}{r!(n-r)!}$$

4 2. How many different ways can a committee of 7 people choose a president, vice-president, and secretary?

$$p_3^7 = \frac{7!}{(7-3)!} = 7.6.5 = 210$$

4 3. How many ways can Noah select 2 elephants and 2 mice from a group of 5 elephants and 7 mice?

2-STAGE EVENT: CHOOSE ELEMANTS THEN CHOOSE MICE

(1)

$$C_{2}^{5} \times C_{2}^{7} = \frac{5!}{2! \cdot 3!} \times \frac{7!}{2! \cdot 5!} = \frac{5 \cdot 4}{2} \times \frac{7 \cdot 6}{2}$$
 $= 10 \times 21 = 210$

- 4. A teacher has given her class a list of 8 problems to study, and a student knows how to answer 6 of these problems. The teacher will randomly select 4 of the 8 problems to make the exam, with each problem being worth the same number of points.
- 4 (a) How many distinct exams can the teacher possibly make?

(b) What is the probability that the student can solve all 4 problems on the exam?

BONUS

(+ 4) (c) What is the probability that the student can solve at least 3 problems on the exam?

$$P(M \text{ LEAST 3}) = P(4) + P(3) = \frac{C_4^6 \cdot C_5^7}{C_4^9} + \frac{C_3^6 \cdot C_5^7}{C_4^9} + \frac{C_3^6 \cdot C_5^7}{C_4^9}$$

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5. An experiment can result in none, one, or both of the events A and B with the probabilities shown in the following table.

$$\begin{array}{c|ccccc} & A & A^c \\ \hline B & .22 & .38 & .6 \\ B^c & .18 & .22 & .4 \\ \hline .4 & .6 & \boxed{1} \end{array}$$

4 (a) (4 points) Find P(A|B).

 \mathbf{u} (b) (4 points) Find P(B|A).

 Ψ (c) (2 points) Are A and B independent events? Explain briefly.

4 (d) (2 points) Are A and B mutually exclusive events? Explain briefly. (ANY OF THESE IS SUFFICIENT

- 6. City crime records show that 15% of all crimes are violent and 85% are nonviolent, involving theft, forgery, and so on. Additionally, 90% of violent crimes are reported versus 60% of nonviolent crimes.
- 4 (a) What is the overall reporting rate for crimes in the city?

LAW OF 161AL PROBABILITY:
$$P(R) = P(V)P(R|V) + P(V^{c})P(R|V^{c})$$

= (.15)(.9) + (.85)(.6)
= .135 + .51 = |.645|

(b) If a crime in progress is reported to the police, what is the probability that the crime is violent?

Bate's Ruce:
$$P(V|R) = \frac{P(V)P(R|V)}{P(R)}$$

$$= \frac{(.15)(.9)}{(.645)} = \boxed{.2093}$$
From PART (a)

7. Suppose a lottery ticket costs \$5 to purchase. 5% of these tickets win \$10, 1% of these tickets win \$100, and the rest of the tickets do not win anything. Fill out the following chart for the probability distribution of the random variable x = expected gain from buying one lottery ticket, and calculate the expected value (i.e. mean value) for x.

$$\mu = E[x] = \sum x \rho(x)$$
= (5)(.05) * (95)(.01) + (-5)(.94)
$$= \left[-3.5 \text{ (DOWARS)} \right]$$