Name: Key

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Due: Wednesday, 2/20/13 in 1st half of class
Lab #3 – M200 Sp13

Instructions: *Use notation P(event) = formula =work (in fractions) = fraction = decimal, to answer each of the questions involving probability. Fractions need to be in lowest terms and decimals need to be rounded to 3 digits if they were in scientific notation.*

1. Based on the following 2 way table, answer the questions. The data represents the results from a survey of 171 students at Foothill College who expressed their comfort level in the desks on the college campuses. The results are from a survey conducted by Professor Butterworth's students during the Fall 2012 term. The data has been grouped for those whose ages are termed as One, Two and Three – just ways of classifying into 3 groups and not disclosing what age groups the classifications refer.

Prob Notation + ½
Fraction, Work + ½ & Notation

	Ages			
Comfort Level	One	Two	Three	Total
Comfortable	50	38	5	93
Not Comfortable	35	37	6	78
Total	85	75	11	171

$171 - 93 = 78$; $35 + 37 = 72$; $78 - 72 = 6$

$85 + 75 + 11 = 171$

-¼ for incorrect answer but attempted w/ honest effort (in ball park)

a) Complete the table. Show your work here for finding the box for Age Group Two ∩ Comfortable +1

$93 - 50 - 5 = 38$ (-¼)

Fractional Answer +½

b) What is the probability that a randomly chosen respondent is from Age Group One? +1

$$P(\text{One}) = \frac{85}{171} \doteq 0.497076 \approx 0.497$$

Decimal Answer +½
Round decimal correctly +½

c) What is the probability that a randomly chosen respondent is from Age Group Two and Not Comfortable in the desks? +1

Box of overlap ÷ grand total

$$P(\text{Two} \cap \text{NC}) = \frac{37}{171} \doteq 0.216374 \approx 0.216$$

d) Of those that are in Age Group Two, what is the probability that a randomly chosen respondent is Not Comfortable? +1

Box of overlap ÷ condition total

$$P(\text{NC} \mid \text{Two}) = \frac{37}{75} = 0.49\overline{3} \approx 0.493$$

e) What is the probability that a randomly chosen respondent is Comfortable or in Age Group One? +1

$$P(\text{C} \cup \text{One}) = P(\text{C}) + P(\text{One}) - P(\text{C} \cap \text{One})$$
$$= \frac{93}{171} + \frac{85}{171} - \frac{50}{171} = \frac{128}{171} \doteq 0.748538 \approx 0.749$$

f) For sampling without replacement, what is the probability that 3 randomly chosen respondents are in Age Group Three? +1

$$P(\text{Three}_1 \cap \text{Three}_2 \cap \text{Three}_3) = P(\text{Three}_1) \cdot P(\text{Three}_2 \mid \text{Three}_1) \cdot P(\text{Three}_3 \mid \text{Th}_1 \cap \text{Th}_2)$$
$$= \frac{11}{171} \cdot \frac{10}{170} \cdot \frac{9}{169} = \frac{990}{4912830} \doteq 2.0151 \times 10^{-4} \approx 0.000202$$

-¼ for wrong answers on base -½ for off base answers +8½

+1

g) For sampling with replacement, what is the probability that 3 randomly chosen respondents are in Age Group Three?

$P(Th_1 \cap Th_2 \cap Th_3) = P(Th_1) \cdot P(Th_2) \cdot P(Th_3) = \left(\frac{11}{171}\right)^3 = 2.6619 \times 10^{-4}$

All the same w/ replacement ≈ 0.000266

h) If we were to choose 3 respondents to ask, how would sampling actually be done – with or without replacement?

+1 In the "real world" sampling would be done without replacement because you wouldn't want the same answer

i) As a follow-up to part h), how should the sampling be done to be truly random?

+1 Sampling must be done with replacement twice to be truly random.

j) Are the probabilities in parts f) & g) different? Why?

+1 The probabilities are different, although only by 64/1,000,000 (64 millionths). The difference is in the changing probability in sampling w/out replacement.

2. Our combination door lock is a three-digit code, where the first digit is a letter from the first 7 letters of the alphabet, and the second one of the 10 digits and the third is one of the last 5 letters of the alphabet. What is the probability that you open our lock with a single randomly chosen three-digit code? Show your work.

+1

$\frac{7}{\#\text{ of ways to get 1st}} \cdot \frac{10}{\#\text{ of ways to get second digit}} \cdot \frac{5}{\#\text{ of ways to get third digit}} = 350$ codes & 1 is correct

so $P(\text{correct}) = \frac{1}{350} \approx 0.00286$

3. An auditor for a company randomly chooses 7 months' account records from the last two years to audit, how many ways are there to choose the 7 months to audit? Show your work. Hint: Does order matter? Does Jan12, June12 and Aug11 result in the same audit as Aug11, Jan12 & June12.

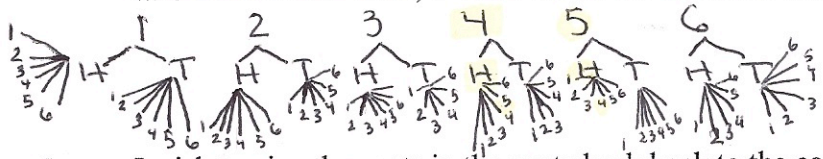
+1

Order doesn't matter

$_{24}C_7 = \frac{24!}{7!\,24-7!} = 346104$

4. If you toss a coin 1 time and a die twice, how many different XXX sequences will result where there are 1 head, a 4 and a 5 on the die? Hint: This can be done by drawing a tree.

+1



4H5 or 5H4

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5. I wish to give the coats in the coat check back to the correct people. If there are 7 coats, how many ways are there for me to get the wrong coat back to at least one person if I just randomly give them back? *Hint: How many ways can I give the coats back and how many ways are correct? The complement of the number of correct ways the number of incorrect ways to give the coats back.*

+1

B/C correct people must get their coats, order matters.

$_7P_7 = \frac{7!}{7-7!} = 5040$ ways to give the coats back

All but 1 is the wrong order, so

5039

Y. Butterworth

+8