

Math 107  
Dusty Wilson

Ch. 15 Group Project

Names: KEY

Show any work required to answer each question. Do your work on this sheet.

- 10 1. An envelope contains 16 colored blocks, eight red and eight yellow, and all the same size and shape. One block is drawn and the color recorded. The block is then replaced and a second block is drawn and the color recorded. The second block is then replaced and a third block is drawn and its color recorded.

w/ replacement  
a) List the sample space for this experiment.  
 $S = \{RRR, RRY, RYR, YRR, YYR, YRY, RYY, YYY\}$   
 8.7.6, 8.7.8, 8.8.7, 8.8.7, 8.7.8, 8.8.7, 8.8.7, 8.7.6

3R  $\frac{8 \cdot 8 \cdot 8}{16 \cdot 16 \cdot 16} = \frac{1}{8}$   
 2R  $\frac{3 \cdot 8 \cdot 8}{16^3} = \frac{3}{8}$   
 1R  $\frac{3 \cdot 8 \cdot 8}{16^3} = \frac{3}{8}$   
 0R  $\frac{8 \cdot 8 \cdot 8}{16^3} = \frac{1}{8}$   
 b) List the probability for each possible number of red blocks (use the sample space).  
 3 Red:  $\frac{8 \cdot 7 \cdot 6}{16 \cdot 15 \cdot 14}$       2 Red:  $\frac{3 \cdot 8 \cdot 8 \cdot 7}{16 \cdot 15 \cdot 14}$       1 Red: same as 2 Red      0 Red:  $\frac{8 \cdot 7 \cdot 6}{16 \cdot 15 \cdot 14}$   
 $P_n(3 \text{ red}) = .1$        $P_n(2 \text{ red}) = .4$        $P_n(1 \text{ red}) = .4$        $P_n(0 \text{ red}) = .1$

c) What is the probability of drawing exactly two yellow blocks?  
 $\frac{3}{8} .4$  (Same as  $P_n(1 \text{ Red})$ )

d) What is the probability of not drawing exactly two yellow blocks?  
 $\frac{5}{8} .6$  (Same as  $1 - P_n(1 \text{ red})$ )

- 10 2. Your club consists of 8 members. One will be chosen to be president, one vice-president and one secretary-treasurer. How many different possibilities are there to fill these three offices?

$8 \cdot 7 \cdot 6 = 336$

- 10 3. California license plates

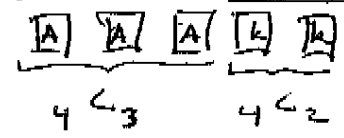
a) How many possible combinations (1 letter followed by 3 numbers followed by 3 letters) are there for California state license plates? (digits)

$26 \cdot 10 \cdot 10 \cdot 10 \cdot 26 \cdot 26 \cdot 26 = 45,697,600$  plates

b) How many possible combinations are there if no letter or number is repeated on the CA license plate?

$26 \cdot 10 \cdot 9 \cdot 8 \cdot 25 \cdot 24 \cdot 23 = 2,583,360$  plates

- 10 4. What is the probability of getting an "Aces full of Kings" full-house in 5-card stud poker? (3 aces and 2 kings) (Give your answer as a reduced fraction and a decimal rounded to 8 places.)



$P_n(\text{Full House}) = \frac{(4C_3)(4C_2)}{52C_5} = 0.00144058$

Total hands  $\frac{4C_3 \cdot 4C_2}{52C_5}$   
 $P_n(AAAkk) = 0.00000923$

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5. Alex, Beth, Charlene, and Dusty are nearing the end of a rousing game of Settlers of Catan (and play in alphabetical order). One of them will win in this last round – but the victor depends upon the outcome of the dice where on each turn the player rolls two dice and considers the sum. The goal is to determine the probability that each one will win, but we will do so in stages: *express answers as decimals*

- Alex will win if he rolls an 8 or a 9
- Beth will win if she rolls an 8 (but Alex did not win on his turn)
- Charlene will win if she rolls a 6 or less and Beth did not roll a 7 (and Alex and Beth did not win)
- Dusty will win if he gets a turn

a.) Find  $\Pr(\text{Alex wins})$ .  $= \frac{5+4}{36} = .25$

b.) Find  $\Pr(\text{Beth wins})$ . Hint: What is the probability that Alex did not win?

$$= \frac{27}{36} \cdot \frac{5}{36} = .104$$

c.) Find  $\Pr(\text{Charlene wins})$ .

i.) First find the probability that Alex and Beth do not win, but Charlene has a winning roll.

$$= \frac{27}{36} \cdot \frac{31}{36} \cdot \frac{15}{36} = .269$$

ii.) Then find the probability that Alex does not win, Beth rolls a seven, and Charlene has a winning roll.

$$= \frac{27}{36} \cdot \frac{6}{36} \cdot \frac{15}{36} = .052$$

iii.) Finally, find the probability that Charlene wins.

$$(i.) - (ii.) = .217$$

d.) Find  $\Pr(\text{Dusty wins})$ .

$$1 - (a.) - (b.) - (c.) = .429$$

e.) ~~who is most~~ Rank players by likelihood to win from greatest to least.  
Dusty, Charlene, Alex, and Beth.