Stat 1040 Recitation 6 Solutions

- 1. (10 points) I buy 24 eggs from a local store. Unknown to me, 6 of the 24 eggs contain salmonella. If I choose 4 eggs at random from the 24 to make a quiche:
 - (a) What is the chance that none of the 4 eggs contains salmonella?

$$(\frac{18}{24}) \cdot (\frac{17}{23}) \cdot (\frac{16}{22}) \cdot (\frac{15}{21}) = .288$$

by the multiplication rule

(b) What is the chance that at least one of the 4 eggs contains salmonella?

1- chance that none contain salmonella = 1- answer from (a) = $\left(1-\frac{18}{24}, \frac{17}{23}, \frac{16}{22}, \frac{15}{21}\right) = .712$

(c) What is the chance that all of the 4 eggs contain salmonella?

 $\binom{6}{24}\binom{5}{23}\binom{4}{22}\binom{3}{21} = .0014$

(d) What is the chance the second egg I choose contains salmonella?

It's the same as the chance the first egg contains scelmonella, so it's 6 24

2. (5 points) Refer to question 1. Suppose that 25% of all the farms eggs realty do contain salmonella. Are we more likely to get more than 30% eggs with salmonella in a sample of 100 or 1000? Explain.

We are looking for a large % error

A large % error is more likely with 100 than 1000.

- 3. (10 points) A child opens a bag of M&M's and gets 24 candies: 7 red, 3 orange, 5 yellow, 1 brown, 1 green, 2 blue and 5 purple. The child chooses 2 M&M's, at random (without replacement), and gives these 2 M&M's to his sister.
 - (a) What is the chance that his sister gets two purple M&M's?

$$\frac{5}{24}$$
, $\frac{4}{23}$ = .036

(b) What is the chance that his sister gets no purple M&M's?

$$\frac{19}{24} \cdot \frac{18}{23} = .62$$

(c) What is the chance that his sister gets at least one purple M&M?

(d) What is the chance that his sister gets two M&M's that are both purple or two that are both orange?

both orange?

Fur purple or two orange (and these are mutually exclusive)

$$\left(\frac{5}{24}, \frac{4}{23}\right) + \left(\frac{3}{24}, \frac{2}{23}\right) = .047$$

- 4. (10 points) Research shows that there is about a 50% chance that a baby is a girl. Assume that the gender s of children in the same family are independent. In a family of four children:
 - (a) What is the chance that all the children are girls?

(b) What is the chance that not all the children are girls?

(c) What is the chance that at least one of the children is a boy?

(d) What is the chance that none of the children are girls?

(e) What is the chance that all the children are boys?

(f) What is the chance of getting 2 boys followed by 2 girls?

(g) What is the chance of getting all the same gender?

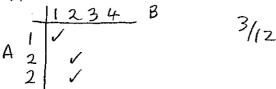
5. a)
$$(\frac{1}{6})^3$$

$$(6) 1 - (\frac{6}{1})^3$$

c)
$$\left(\frac{5}{6}\right)^3$$

d)
$$1-\left(\frac{5}{6}\right)^3$$

- 6. (5 points) There are two boxes of tickets one box has tickets with the numbers 1, 2, 2 written on them. (Yes, there are two tickets with a "2" on). The other box has tickets marked 1,2,3,4. One ticket is drawn at random from each box.
 - (a) Find the chance that the nuber from box A is the same as the number from box B.



(b) Find the chance that the nuber from box A is greater than the number from box B.

- 7. (10 points) An elementary school in Logan employs 15 teachers; 11 are women and 4 are men. Two teachers are selected at random to meet the governor and attend a reception in SLC. Answer each part separately.
 - (a) What is the probability that both are women?

$$\frac{11}{15} \cdot \frac{10}{14} = \frac{11}{21}$$

(b) What is the probability that at least one is a woman?

1-chance both are men =
$$1 - \left(\frac{4}{15}, \frac{3}{14}\right)$$

(c) What is the probability that both are the same gender?

MM or WW cand they are mutually exclusive

$$\left(\frac{11}{15}, \frac{10}{14}\right) + \left(\frac{4}{15}, \frac{3}{14}\right) = .581$$

- 8. (10 points) I have 20 lightbulbs a large box. Unknown to me, 4 of these 20 bulbs are broken. I select 6 bulbs at random from these 20 bulbs to put in a chandelier. Answer each of the following questions separately.
 - (a) What is the chance that the first bulb works?

$$\frac{16}{20} = .8$$

(b) What is the chance that the second bulb works?

(c) What is the chance that all 6 of the bulbs work?

- 9. A pet store has 16 fish in a tank: 7 males and 9 females. I buy 2 of the fish, selected at random.
 - (a) What is the chance that both of my fish are males?

(b) What is the chance that both of my fish are females?

(c) What is the chance that one of my fish is male and the other is female?

MF or FM
$$\left(\frac{7}{16}\right)\left(\frac{9}{15}\right) + \left(\frac{9}{16}\right)\left(\frac{7}{15}\right)$$

(d) What is the chance that neither of my fish are male?

(e) What is the chance that at least one of my fish is male?

1- chance neither is male = 1-
$$\left(\frac{9}{16}\right)\left(\frac{8}{15}\right)$$