Math 214 Statistics Fall 13 Midterm 1a

/6

Name: Solutions

- Do any 8 of the following 10 questions.
- You may use a calculator, but no notes.

1	10	
2	10	
3	10	
4	10	
5	10	
6	10	
7	10	
8	10	
9	10	
10	10	
	80	

Midterm 1	
Overall	

(1) (10 points) Data were collected from 1200 randomly selected students who graduated between 2006 and 2009 from the University of Florida. Some of the variables that were collected are listed below:

Gender of the student.
School/college from which the student graduated.
Annual salary of the first job after graduation.
Graduation date in terms of semester (e.g., Fall 2006, Spring 2007, etc.).

(a) What is an experimental unit in the study?

(b) What is the sample size?

(c) What were the statistics collected?

a) student

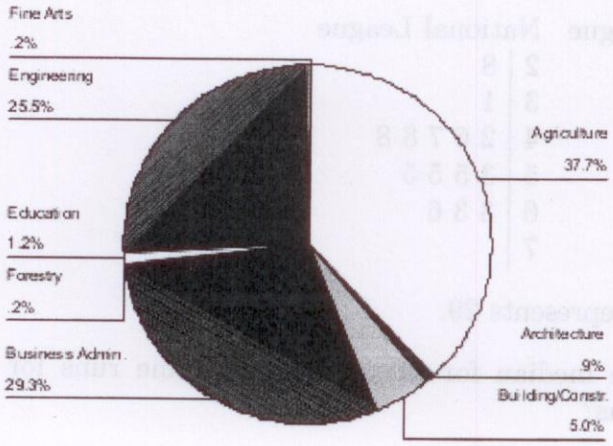
b) 1200

c) gender, school, annual salary, graduation date

(2) (10 points) Refer to the previous question.

(a) Which statistics were categorical and which were numerical?

(b) A pie chart of the departments in the school/college from which the 1200 sampled students graduated is shown below:



Based on the graph, (approximately) how many of the sampled students graduated with a degree in Fine Arts or Engineering?

b) $1200 \times \frac{25.7}{100} \approx 308$

a) categorical : gender, school } graduation date
numerical : salary } could be either

(3) (10 points) During the early part of the 1994 baseball season, many sports fans and baseball players noticed that the number of home runs being hit seemed to be unusually large. Below are separate stemplots for the number of home runs by American League and National League teams based on the team-by-team statistics on home runs hit through Friday, June 3, 1994 (from the Columbus Dispatch sports section, Sunday, June 5, 1994).

American League		National League	
2		2	8
3	6	3	1
4	0 3 9	4	2 6 7 8 8
5	1 4 7 8 8	5	3 5 5 5
6	4 8 8	6	3 3 6
7	5 8	7	

Legend: 2 | 9 represents 29.

(a) What is the median for the number of home runs for the American League teams?

(b) True/False: The American League plot is reasonably symmetric.

(c) True/False: The National League plot is bimodal.

(d) What is the maximum number of home runs from a National League team?

a) $\frac{57+58}{2} \approx 57.5$

b) True

c) False

d) 66

(4) (10 points) Refer to the previous question.

(a) True/False: The median number of home runs hit by National League teams for this time period was higher than the median for the American League teams.

(b) True/False: The lowest number of home runs hit by any team for this time period is 28.

(c) What is the mean for the number of home runs for the National League teams?

a) $\frac{48+53}{2} \simeq 50.5$ False

b) True

c) $(28 + 31 + 42 + 46 + 47 + 48\times2 + 53 + 55\times3 + 63\times2 + 66)/14$

$\simeq 50$

(5) (10 points) The following numbers are a sample of the monthly rental prices for apartments in New York.

```
> rent
[1] 3000 2000 3000 5000 500 5000 3000 1500
```

(a) What is the median rent?

(b) What are the Q1 and Q3 rents?

(c) What is the interquartile range?

(d) Sketch the boxplot for the rents.

500 1500 2000 3000 | 3000 3000 5000 5000

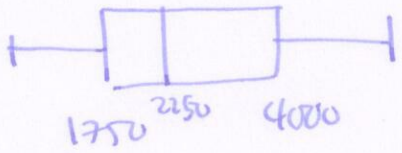
a) 3000

b) $Q1 = \frac{1500+2000}{2} = 1750$

$Q3 = \frac{3000+5000}{2} = 4000$

c) $Q3 - Q1 = 4000 - 1750 = 2250$.

d)



(6) (10 points) The following numbers are a sample of the monthly rental prices for apartments in New York.

```
> rent
 [1] 4000 3000 4000 6000 2500 6000 4000 2500
```

(a) What is the mean rent?

(b) What is the standard deviation of the rents?

a) $(2500 + 2500 + 3000 + 4000 \times 3 + 6000 \times 2)/8 = 4000$

b) $\sqrt{((2500-4000)^2 \times 2 + (3000-4000)^2 + (4000-4000)^2 \times 3 + (6000-4000)^2 \times 2)/8}$

≈ 1588.7 or $1299.038\ldots$

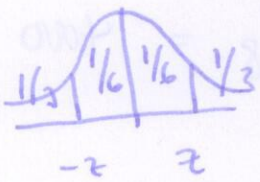
(17) (18)

(7) (10 points) Let Z be a normally distributed random variable with mean $\mu = 0$ and standard deviation $\sigma = 1$.

(a) Find $P(Z < -0.75)$.

(b) For what value of Z is one-third of the distribution contained in the interval $[-Z, Z]$?

a) 22.6602

b) 

$z = 0.43$

(8) (10 points) If you draw an M&M candy at random from a bag of the candies, the candy you draw will have one of six colors. The probability of drawing each color depends on the proportion of each color among all candies made. Assume the table below gives the probabilities for the color of a randomly chosen M&M:

Color	Brown	Red	Yellow	Green	Orange	Blue
Probability	0.2	0.2	?	0.1	0.1	0.1

(a) What is the probability of drawing a yellow candy?

(b) What is the probability of not drawing a red candy?

(c) What is the probability that you draw neither a brown nor a green candy?

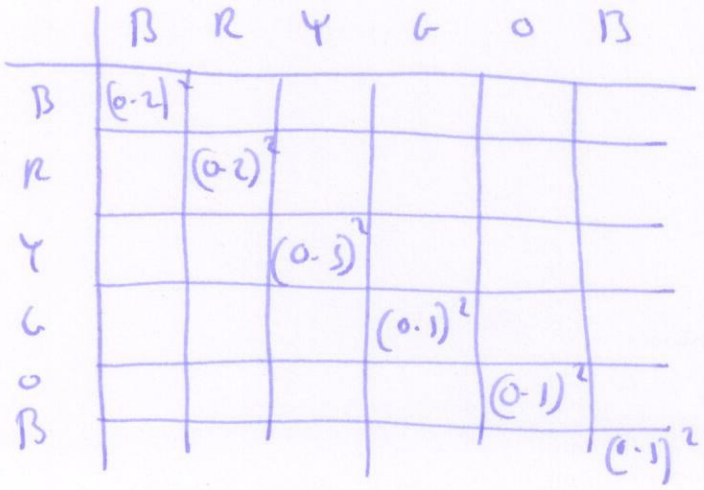
(d) If you select two M&Ms and the colors are independent, then what is the probability that both are the same color?

a) $1 - \underbrace{(0.2+0.2+0.1+0.1+0.1)}_{0.7} = 0.3.$

b) $1 - 0.2 = 0.8$

c) $1 - (0.2+0.1) = 0.7$

d) $(0.2)^2 + (0.2)^2 + (0.3)^2 + (0.1)^2 + (0.1)^2 + (0.1)^2 = 0.2$



(9) (10 points) It has been established that the length of gestation until birth for pregnant women is a random variable that is well modeled by the Normal distribution with a mean $\mu = 282$ days and standard deviation $\sigma = 11$ days.

(a) Find the probability that the birth occurs between 271 days and 293 days.

(b) By what day have 80% of women given birth?

(c) Births with gestation time of 258 days or less are considered to be premature births. What is the probability that a randomly selected pregnant woman will give birth to a premature baby?

(10) A box contains three balls, labelled 1, 2 and 3. You choose a ball from the box and record its label, and then without replacing it, choose another ball from the box and record its label. The random variable X is given by the product of the two labels.

(a) Write down the sample space, and associated probabilities.

(b) What is the probability that the second ball is labelled 3?

(c) What is the expected value of X?

a)

first ball	second ball	pair	prob	X
1	2	(1,2)	1/6	2
	3	(1,3)	1/6	3
2	1	(2,1)	1/6	2
	3	(2,3)	1/6	6
3	1	(3,1)	1/6	3
	2	(3,2)	1/6	6

b) $\frac{1}{3}$

c) $\frac{1}{6} \times 2 \times 2 + \frac{1}{6} \times 3 \times 2 + \frac{1}{6} \times 6 \times 2 = \frac{2}{3} + 1 + 2 = \frac{11}{3}$