Name: ______________________________

MSA 640 – Homework Assignment #1
Due Friday, March 5, 2010 (100 Points Total/20 Points per Question)

The numerical answers for most of these problems are provided. Consequently, grading will be based almost entirely on the correctness and clarity of the procedure and formulas you use to obtain your answer. You may use a calculator, laptop computer, or any tool you wish, but you must show all your work. You may consult with or discuss these problems with anyone you wish, but your work must be the product of your own personal effort. You may use additional paper if necessary.

#1 Last year at Northern Manufacturing Company, 450 people had colds during the year. There were 320 people who did no exercising and had colds, while all other people with colds were involved in a weekly exercise program. Sixty percent (60%) of the 2,500 employees were involved in some type of exercise.Use the following variables and show all formulas that you use:
E = people who exercised, ~E = people who did not exercise, C = people who got colds
Given: P(C), P(~E and C), P(E and C), P(E)=P(~E)

(a) What is the probability that an employee will have a cold next year? *(0.18)*
(b) Given that an employee is involved in an exercise program, what is the probability that he or she will get a cold next year? *(0.09)*
(c) Given that an employee is not involved in an exercise program, what is the probability that he or she will get a cold next year *(0.32)*
(d) Explain whether exercising and getting a cold are independent events. Prove your answer using the conditional probability equation. Hint: If events are independent, then P(C | E) = P(C)

Given information: P(C) =
P(~E and C) = P(E and C) =
P(E) = P(~E) =

(a) P(C) =	
(b) P(C | E) =	
(c) P(C | ~E) =	
(d) Prove whether C and E are independent events.	

Name: ______________________________

#2 Two parts @ 10 points

(a) Your professor tells you that if you score 95 or greater on your midterm exam, then there is a 85% chance you will get an A for the course. However, you think you have only a 72% chance of scoring 95 or greater. Given this information, what is the probability that you receive an A in the course? *(0.61)*
Show all formulas and use the following variables:
E = exam score of 95 or greater on midterm
A = grade of A in course
Given P(A | E), P(E), find P(A and E)

Given information:
P(A | E) =
P(E) =

P(A and E) =	

(b) Your professor also tells you that if you score 85 or greater on your midterm exam, then there is a 93% chance you will get a B for the course. However, you think you have an 80% chance of scoring 85 or greater. Given this information, what is the probability that you receive a B in the course? *(0.74)*
Show all formulas and use the following variables:
E = exam score of 85 or greater on midterm
B = grade of B in course
Given P(B | E), P(E), find P(B and E)

Given information:
P(B | E) =
P(E) =

P(B and E) =	

#3 The time to complete a construction project is normally distributed with a mean of 60 weeks and a standard deviation of 3.5 weeks. In addition to producing numerical answers, complete drawing and labeling the following normal curves to show approximate solutions for each part of this problem. Show all the formulas you use.

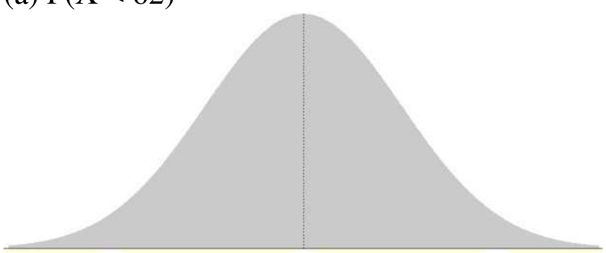
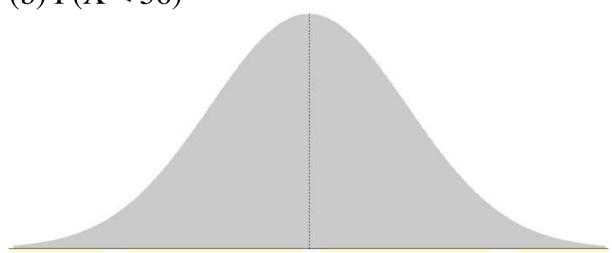
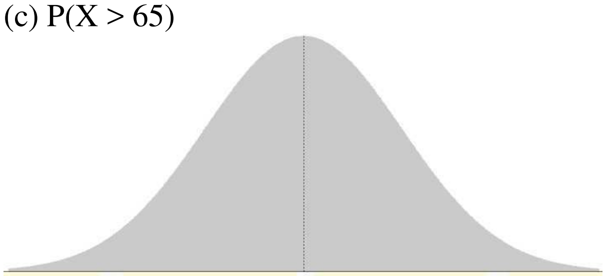
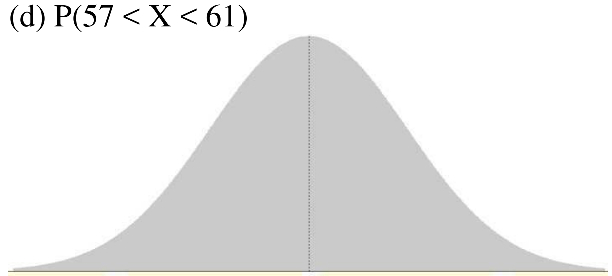
(a) What is the probability the project will be finished in 62 weeks or less? *(0.72)*
(b) What is the probability the project will be finished in 56 weeks or less? *(0.13)*
(c) What is the probability the project will take longer than 65 weeks? *(0.08)*
(d) What is the probability the project will take between 57 and 61 weeks? *(0.42)*

Given information:
μ =
σ =

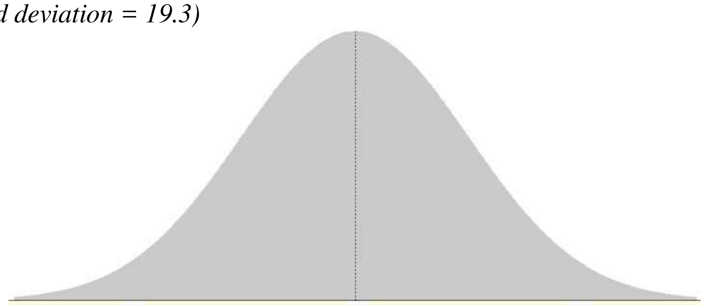
(a) $P(X < 62)$ =	

Name: ______________________________

(b) P(X < 56) =	
(c) P(X > 65) =	
(d) P(57 < X < 61) =	

(a) P(X < 62) 	(b) P(X < 56) 
(c) P(X > 65) 	(d) P(57 < X < 61) 

#4 Armstrong Faber produces a standard number two pencil called Ultra-Lite. Since Chuck Armstrong started Armstrong Faber, sales have grown steadily. With the increase in the price of wood products, however, Chuck has been forced to increase the price of the Ultra-Lite pencils. As a result, the demand for Ulta-Lite has been fairly stable over the past 6 years. On the average, Armstrong Faber has sold 490 thousand pencils each year. Furthermore, 70% of the time sales have been between 470 and 510 thousand pencils. It is expected that the sales follow a normal distribution with a mean of 490 thousand pencils. Given this information, find the standard deviation of this distribution. Complete drawing and labeling the following normal curve to show an approximate solution and show all intermediate work, including formulas. Hint: Start by working backward to find the Z value.
(Z-value = 1.04, standard deviation = 19.3)



Name: ______________________________

Given information:

μ =

70% of the time sales have been between 470 and 510

Z =	
σ =	

#5 Bus and subway ridership in Washington, D.C., during the summer months, is believed to be heavily tied to the number of tourists visiting the city. During the past 12 years, the following data has been obtained:

Tourists (X)	Ridership (Y)
2	1.2
4	1.3
5	1.4
7	1.5
9	1.7
11	2.1
13	2.5
15	2.7
16	2.7
18	3.4
19	3.8
20	4.4

(a) Develop a regression relationship. *(b_0=0.502, b_1=0.163)*
(b) What is the expected ridership if 21 million tourists visit the city? *(3.93)*
(c) What is the expected ridership if 22 million tourists visit the city? *(4.09)*

Don't forget to show all formulas that you use as well as all intermediate work.

Name: ______________________________

X	Y	$(X-\overline{X})$	$(Y-\overline{Y})$	$(X-\overline{X})^2$	$(X-\overline{X})\times(Y-\overline{Y})$
2	1.2				
4	1.3				
5	1.4				
7	1.5				
9	1.7				
11	2.1				
13	2.5				
15	2.7				
16	2.7				
18	3.4				
19	3.8				
20	4.4				
$\sum(X)$	$\sum(Y)$	$\sum(X-\overline{X})$	$\sum(Y-\overline{Y})$	$\sum(X-\overline{X})^2$	$\sum(X-\overline{X})\times(Y-\overline{Y})$

$\overline{X}$ =

$\overline{Y}$ =

b_1 =

b_0 =

Forecast for Year 21 using regression equation:

Forecast for Year 22 using regression equation:

Name: ______________________________

Some Useful Formulas

$$P(A|B) = \frac{P(A\,and\,B)}{P(B)} =$$

$$P(A\,and\,B) = P(A|B) \times P(B) =$$

$$Z = \frac{X-\mu}{\sigma} =$$

$$\sigma = \frac{X-\mu}{Z} =$$

$$X = \mu + (Z \times \sigma) \;=$$

σ =

μ =

$$\overline{X} = \frac{\sum x}{n} =$$

$$\overline{Y} = \frac{\sum y}{n} =$$

$$b_1 = \frac{\sum (X-\overline{X}) \times (Y-\overline{Y})}{\sum (X-\overline{X})^2} =$$

$$b_0 = \overline{Y} - b_1 \overline{X} =$$

$$\hat{Y} = b_0 + b_1 X =$$