BUSINESS DATA ANALYSIS, A15, TEST 2

Name: _____ Student number_____

Instructions:

- Please show all of your work on the test paper. Partial marks will be awarded in the event of an incorrect answer. Conversely, if the incorrect method has been implemented, or no work is shown, then no marks will be awarded even though the answer is correct.

- Round all decimals to two digits after the decimal point.

- All unauthorized materials must be put away such as cell phones, listening devices, etc. Programmable calculators and formula sheets are not allowed.

- **Cheating is a serious academic offense. Anyone caught cheating or aiding in the act of cheating will be given a mark of zero for this assessment, and a note will be placed in his or her file.**

Formulas:

$p(A \text{ or } B) = p(A) + p(B) - p(A \text{ and } B), \quad p(A \text{ and } B) = p(A)p(B|A)$

$p(A_i|B) = \frac{p(B|A_i)p(A_i)}{\sum_j p(B|A_j)p(A_j)}$

$E(X) = \sum xp(x), \qquad \sigma^2 = \sum(x - E(X))^2 p(x)$

$p(x) = q^{x-1}p, \quad \mu = \frac{1}{p}, \quad \sigma = \sqrt{\frac{q}{p^2}}$

$p(x) =_n C_x \; p^x q^{n-x}, \quad {}_nC_x = \frac{n!}{x!(n-x)!}, \quad \mu = np, \quad \sigma = \sqrt{npq}$

$z = \frac{X-\mu}{\sigma}, \qquad X = \mu + z\sigma$

(1) (3 marks) Upon examination of the claims records of thousands of policy holders, an insurance company makes an empirical determination of the probability distribution of the random variable X = claim amount (in thousands of dollars).

X	$p(x)$
0	0.30
1	0.10
2	0.15
5	0.20
10	0.25

(a) Calculate the expected claim amount for a randomly selected policy holder.
(b) Calculate the standard deviation.

(2) (3.5 marks) A survey is organized to find out if online shoppers are concerned with the security of business transactions on the Web. Of the 65 individuals who respond, 25 are concerned and 40 are not concerned. 12 of those who are concerned are female and 18 of those not concerned are female. If a respondent is selected at random determine the probabilities that:

(a) The respondent is male and concerned.
(b) The respondent is male or concerned.
(c) A male respondent is concerned.
(d) Is concern for Web security independent of gender? Base your conclusion on a numerical comparison.

(3) (3.5 marks) One in every 200 people is infected by a virus. A test is used to determine whether a person is infected. If a person is infected, the test is positive 90% of the time, and if the person is not infected the test is still positive 5% of the time.

(a) Display the information in a tree diagram and clearly label the events and their probabilities.
(b) What is the probability that a randomly selected person will test positve?
(c) What is the probability that a person who tested positive is actually infected?

(4) (3.5 marks) A used car salesman makes a sale on 10% of his presentations. On a busy Friday the salesman makes a sales pitch to 20 customers.
   (a) What is the probability that the first sale for the day will be with the 5th customer?
   (b) What is the expected number of customers until the first sale and what is the standard devuation?
   (c) What is the probability the salesman will have 4 sales on the day?
   (d) What is the probability the salesman will have no sales on the day?
   (e) What is the expected number of sales for this Friday and what is the standard deviation?

(5) (3.5 marks) US high school students who intend to go to college take a SAT test. SAT scores are known to follow a normal ditribution with a mean of 1020 and standard deviation of 153.
   (a) What is the probability that a randomly selected student has a SAT score above 1200?
   (b) What is the probabilty that a randomly selected student has a SAT score between 800 and 1000?
   (c) What SAT score corresponds to the top 5% of SAT scores?

(6) (3 marks) According to a study by the nonpartisan group Public Agenda, 34% of teachers in the US have considered quitting their jobs due to lack of discipline in their schools. Estimate the probability that in a random sample of 400 US teachers more than 150 have considered quitting their jobs due to lack of discipline.