Instructions: There are 10 questions of equal value. Round all probability and proportion final answers to 4 decimal places. Be sure to justify using z, t or chi-square distributions. Give appropriate units when units are involved. Three pages of formulas and three pages of tables are also provided. Please ensure that your examination package is complete.

Q1.   Each year, just before graduation, university students living in dormatories throw out lots of trash. The amount of trash from a random sample of 18 students is given below.

Ranked Data in kg								
158	178	181	188	199	211	219	224	231
234	256	265	307	308	315	337	345	429

a)   Construct a histogram based on five convenient classes. You choose the classes.

b)   Use the Empirical Rule to determine if the sample is approximately normally distributed.

c)   Construct a 95 % confidence interval estimate for the average amount of trash university students living in dormatories throw out just before graduation.

Q2.   The police force in a large city consists of 80 % men. Thirty-five percent of the men get promoted, but only fifteen percent of the women get promoted. What is the probability that the next officer promoted will be a woman?

Q3.   The age x years and the selling price y in thousands of dollars for a random sample of used Honda Accords is listed in this table.

a)   Find the equation of the line of best fit.

b)   What selling price do you predict for a Honda Accord that is 6 years old? Round off to the nearest dollar.

c)   What percentage of the total variation in selling prices is explained by the age of the car?

x	y
3	24.9
7	9.0
5	17.8
4	29.2
7	13.6
3	24.9
2	25.7
7	11.9
5	18.8
2	25.9
2	26.9
4	23.8
5	19.3
4	21.9

The following sums may be useful.

$x = 60$

$x^2 = 300$

$y = 293.6$

$y^2 = 6643.96$

$x\, y = 1127$

Q4. The life of a certain brand of light bulb is a random variable with probability density function defined by

$$f(x) = \frac{1}{58\sqrt{x}} \quad \text{for } 1 \le x \le 900 \text{ hours, and zero elsewhere.}$$

Calculate the standard deviation of x. Round off to the nearest hour.

Q5. Melanoma is the most serious form of skin cancer and is increasing at a very fast rate. However, the survival rate is 90% when it is diagnosed in its early stage. What is the probability that 220 or more of 250 early-stage patients will survive melanoma. Use the normal approximation to the binomial, if appropriate.

Q6. You can now buy a quartz wrist watch for under 25$, and many people claim that they are just as accurate as the much more expensive quartz watches that are accurate within 19.8 seconds per month. The standard deviation for all quartz watches is 9.1 seconds per month. A random sample of 36 cheap (under 25$) quartz watches had a mean error of 22.7 seconds per month. Use the .

Q10. Twenty laboratory mice were randomly divided into two groups of 10. Each group was fed according to a prescribed diet. At the end of 3 weeks, the weight gained by each animal was recorded. Do the data in the table justify the conclusion that the mean weight gained on diet B is greater than the mean weight gained on diet A? Use 5% level of significance in your test. Do not assume that population variances are equal.

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Answers

1. a) Lots of possible classes. Class width about 60 is convenient.

   b) $\bar{x} = 254.72222$, $s = 71.93$, within 1 st. dev. there are 66.7%, within 2 st. dev. there are 94.4% and within 3 st. dev. there are 100% of the data. These percentages are close to those in the Empirical Rule, namely, 68%, 95% and 99.7%. The sample is approx. normal.

   c) 95% C.I.E. for   : $218.9 <$ < 290.5 kg

2. $P(\text{Woman}\,|\,\text{Promoted}) = 0.0968$

3. a) $= 34.1 - 3.063x$ thous. \$ b) $15\,720$ \$ c) 82.64%

4. $= 267$ h

5. $P(x > 219.5) = 0.8770$,   Must verify Rule of Five.

6. H_o: 19.8 s,   p-value $= 0.0281$,   Reject H_o. At 5% level of significance, the mean monthly error is more than 19.8 s.

7.   90% C.I.E.: $-0.0049 <$ $_1$ $_2 < 0.0849$,   Must verify Rule of Five.

8. H_o: Type of irritation is independent of age group. $^2 = 7.389$,   Reject H_o. At 5% level of significance, the type of irritation depends on the age group.

9. H_o: The proportions are as stated. $^2 = 2.667$,   Fail to reject H_o. At 5% level of significance, the stated proportions are correct.

10. H_o: $_B$ $_A$, $t = 1.978$, We must assume that weight gains on both diets are approx. normally