***Chapter 4***

**9.2** An electrical firm manufactures light bulbs that have a length of life that is approximately normally distributed with a standard deviation of **40** hours. If

a sample of **30** bulbs has an average life of **780** hours, find a 96% confidence interval for the population mean of all bulbs produced by this firm.

***Population normal and ”known ” ,***

**is:**

**>>**

**(**

**9.6** How large a sample is needed in Exercise 9.2 if we wish to be 96% confident that our sample mean will be within **10** hours of the true mean?

**“we always rounded the number up”**

**9.4** The heights of a random sample of **50** college students showed a mean of **174.5** centimeters and a standard deviation of **6.9** centimeters.

(a) Construct a 98% confidence interval for the mean height of all college students.

(b) What can we assert with 98% confidence about the possible size of our error if we estimate the mean height of all college students to be **174.5** centimeters?

1. **is:**

**>>**

1. The error will not exceed

**H.W 9.5** A random sample of **100** automobile owners in the state of Virginia shows that an automobile is driven on average **23,500** kilometers per year with a standard deviation of **3900** kilometers. Assume the distribution of measurements to be approximately normal.

1. Construct a 99% confidence interval for the average number of kilometers an automobile is driven annually in Virginia.
2. What can we assert with **99%** confidence about the possible size of our error if we estimate the average number of kilometers driven by car owners in Virginia to be **23,500** kilometers per year?
3. **is:**

**>>**

1. The error will not exceed

Q. A group of **10** college students were asked to report the number of hours that they spent doing their homework during the previous weekend and the following results were obtained: 7.25, 8.5, 5.0, 6.75, 8.0, 5.25, 10.5, 8.5, 6.75, 9.25

It is assumed that this sample is a random sample from a normal distribution with unknown variance σ2. Let μ be the mean of the number of hours that the college student spend doing his/her homework during the weekend.

1. Find the sample mean and the sample variance.

1. Find a point estimate for μ
2. Construct a 80% confidence interval for μ.

for is:

>> (error=e=0.754)

(6.821, 8.329)

**9.35** A random sample of size **n1 = 25**, taken from a normal population with a standard deviation **σ1 = 5**, has a mean . A second random sample of size **n2 = 36**, taken from a different normal population with a standard deviation **σ2 = 3**, has a mean .

Find a 94% confidence interval for μ1 − μ2.

**:**

**(error=e=2.1019)**

**(2.8981, 7.1019)**

**9.38** Two catalysts in a batch chemical process, are being compared for their effect on the output of the process reaction. A sample of **12** batches was prepared using catalyst **1**, and a sample of **10** batches was prepared using catalyst **2**. The **12** batches for which catalyst **1** was used in the reaction gave an average yield of **85** with a sample standard deviation of **4**, and the **10** batches for which catalyst **2** was used gave an average yield of **81** and a sample standard deviation of **5**.

Find a 90% confidence interval for the difference between the population means, assuming that the populations are approximately normally distributed with equal variances.

**but equal**

**:**

**(0.693, 7.307)**

**H.W 9.41** The following data represent the length of time, in days, to recovery for patients randomly treated with one of two medications to clear up severe bladder infections:

|  |  |
| --- | --- |
| **Medication 1** | **Medication 2** |
|  |  |
|  |  |
|  |  |

Find a 99% confidence interval for the difference

**but equal**

**:**

**(0.65, 3.35)**

**9.44** A taxi company is trying to decide whether to purchase brand "A" or brand "B" tires for its fleet of taxis. Find a 99% confidence interval for ***μ*1 *− μ*2** if tires of the two brands are assigned at random to the left and right rear wheels of **8** taxis and the following distances, in kilometers, are recorded:

|  |  |  |
| --- | --- | --- |
| **Taxi** | **Brand A** | **Brand B** |
| 1 | 34,400 | 36,700 |
| 2 | 45,500 | 46,800 |
| 3 | 36,700 | 37,700 |
| 4 | 32,000 | 31,100 |
| 5 | 48,400 | 47,800 |
| 6 | 32,800 | 36,400 |
| 7 | 38,100 | 38,900 |
| 8 | 30,100 | 31,500 |

Assume that the differences of the distances are approximately normally distributed.

**.**

**From the table, we calculate :**

**:**

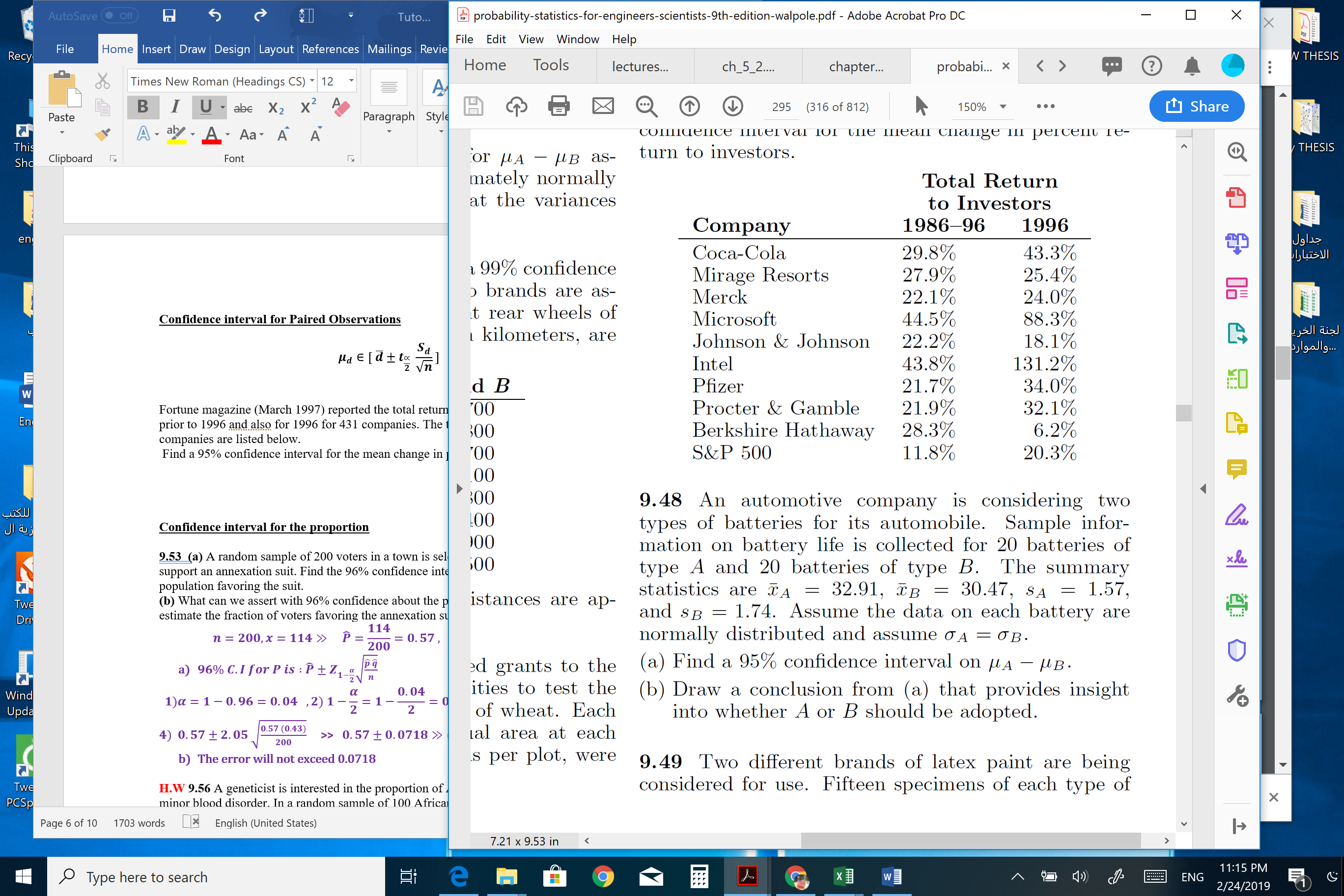
**( -10589.0873 ,** **8364.0873 )**

|  |  |
| --- | --- |
| **Values of Z** | |
|  | **1.285** |
|  | **1.645** |
|  | **1.885** |
|  | **1.96** |
|  | **2.055** |
|  | **2.325** |
|  | **2.575** |

**Confidence interval for Paired Observations**

**9.47** Fortune magazine (March 1997) reported the total returns to investors for the 10 years prior to 1996 and also for 1996 for 431 companies. The total returns for 10 of the companies are listed below.

Find a 95% confidence interval for the mean change in percent return to investors.



**Confidence interval for the proportion**

**9.53 (a)** A random sample of 200 voters in a town is selected, and 114 are found to support an annexation suit. Find the 96% confidence interval for the fraction of the voting population favoring the suit.

**(b)** What can we assert with 96% confidence about the possible size of our error if we estimate the fraction of voters favoring the annexation suit to be 0.57?



**>>**

1. **The error will not exceed 0.0718**

**H.W 9.56** A geneticist is interested in the proportion of African males who have a certain minor blood disorder. In a random sample of 100 African males, 24 are

found to be afflicted.

(a) Compute a 99% confidence interval for the proportion of African males who have this blood disorder.

(b) What can we assert with 99% confidence about the possible size of our error if we estimate the proportion of African males with this blood disorder to be 0.24?



**>>**

1. **The error will not exceed 0.0427**

**9.67** A clinical trial was conducted to determine if a certain type of inoculation has an effect on the incidence of a certain disease. A sample of **1000** rats was kept in a controlled environment for a period of **1** year, and **500** of the rats were given the inoculation. In the group not inoculated, there were **120** incidences of the disease, while **98** of the rats in the inoculated group contracted it. If ***p*1** is the probability of incidence of

the disease in uninoculated rats and ***p*2** the probability of incidence in inoculated rats, compute a **90%** confidence interval for ***p*1 *− p*2**.

**Confidence interval for Variance**

**9.72** A random sample of 20 students yielded a and a variance of for scores on a college placement test in mathematics. Assuming the scores to be normally distributed, construct a 98% confidence interval for .

98% C.I for is:

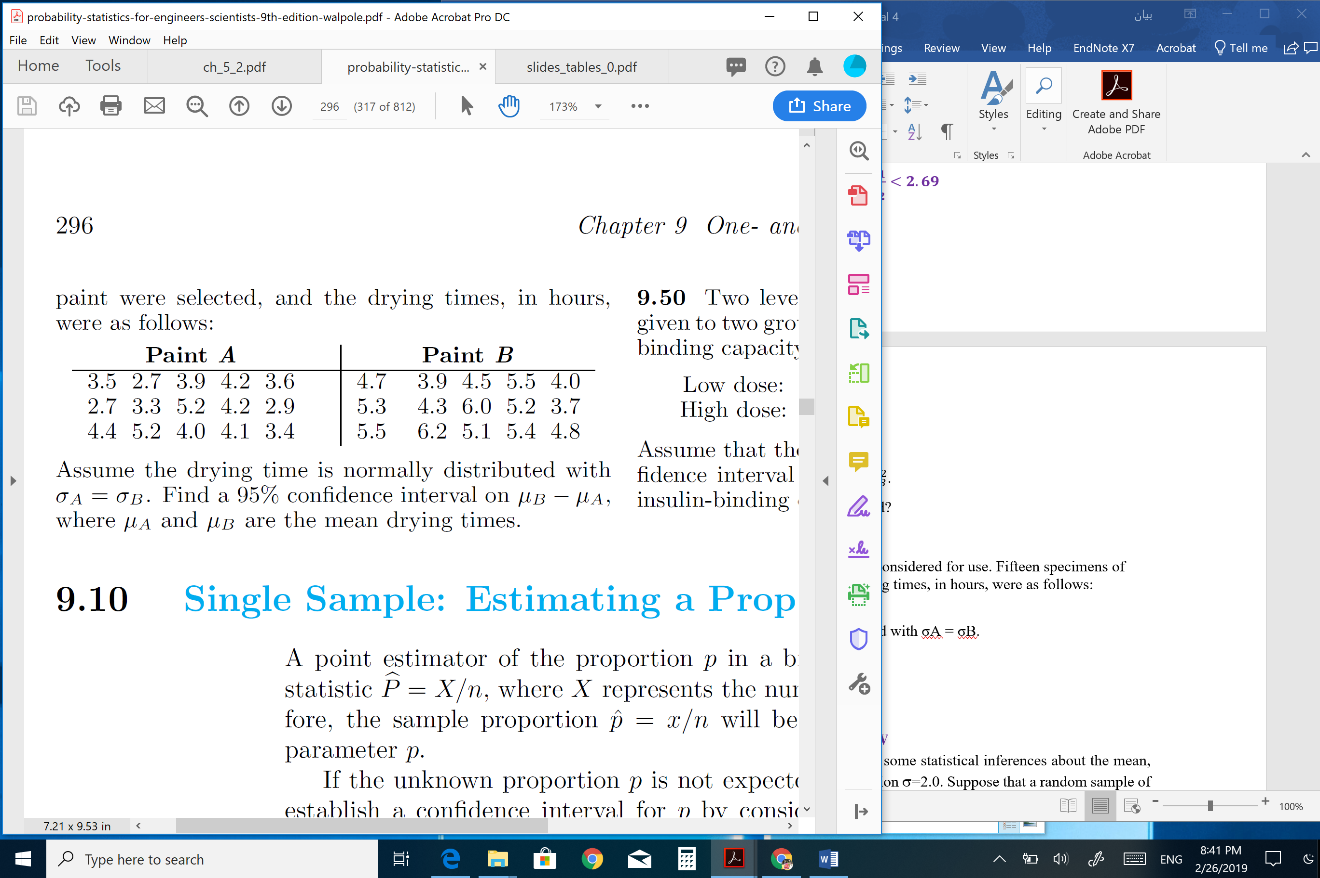
;

Thus,

**H.W 9.77** An experiment reported in Popular Science compared fuel economies for two types of similarly equipped diesel mini-trucks. Let us suppose that 12 Volkswagen and 10 Toyota trucks were tested in 90- kilometer-per-hour steady-paced trials. If the 12 Volkswagen trucks averaged 16 kilometers per liter with a standard deviation of 1.0 kilometer per liter and the 10 Toyota trucks averaged 11 kilometers per liter with a standard deviation of 0.8 kilometer per liter, **Construct a 98% confidence interval for , where and are, respectively, the standard deviations for the distances traveled per liter of fuel by the Volkswagen and Toyota mini-trucks.**

98% C.I for is :

Thus,

**9.80** Two different brands of latex paint are being considered for use. Fifteen specimens of each type of paint were selected, and the drying times, in hours, were as follows:

Assume the drying time is normally distributed with

* Construct a 95% confidence interval for .
* Construct a 95% confidence interval for  **.**
* Should the equal-varianceassumption be used?

95% C.I for is :

Thus,

No need for the assumption of equality of variances.

**H.W**

Q2. Suppose that we are interested in making some statistical inferences about the mean, μ, of a normal population with standard deviation σ=2.0. Suppose that a random sample of size *n*=49 from this population gave a sample mean =4.5.

|  |
| --- |
| (1) The distribution of  is . |
| (2) A good point estimate of μ is = |
| (3) The standard error of  is = **0.2875** |
| (4) A 95% confidence interval for μ is |
| (5) If the upper confidence limit of a confidence interval is **5.2**, then the lower confidence limit is  **>> = 5.2 >> = 0.7** |
| (6) The confidence level of the confidence interval (3.88, 5.12) is |
| **Then, the confidence level**  **Note: we will get the same result if use**  (7) If we use  to estimate μ, then we are 95% confident that our estimation error will not exceed. |
| (8) If we want to be 95% confident that the estimation error will not exceed e=0.1 when we use  to estimate μ, then the sample size *n* must be equal to |

Q1. A survey of 500 students from a college of science shows that 275 students own computers. In another independent survey of 400 students from a college of engineering shows that 240 students own computers.

1. a 99% confidence interval for the true proportion of college of science's student who own computers is

(A) 0.59p1 0.71 (B) 0.49p1 0.61

(C) 2.49p16.61 (D) 0.3p10.7

(29) a 95% confidence interval for the difference between the proportions of students owning computers in the two colleges is

(A) 0.015p1p20.215 (B) 0.515p1p20.215

(C) 0.450 p1 p2 0.015 (D) 0.115 p1 p2 0.015