Assignment # 5
Test of Hypotheses for two parameters

1] A sample of 40 observations is selected from one population with a population standard deviation of 5. The sample mean is 102. A sample of 50 observations is selected from a second population with a population standard deviation of 6. The sample mean is 99.
(a) Test the hypothesis that $\mu_1 = \mu_2$ against the alternative that $\mu_1 \neq \mu_2$. Use $\alpha = 0.04$

(b) What is the *p*-value?

2] Mary Jo Fitzpatrick is the vice president for Nursing Services at St. Luke's Memorial Hospital. Recently she noticed in the job postings for nurses that those who are unionized seem to offer higher wages. She decided to investigate and gathered the following information.

Group	Sample size:	Sample Mean Wage	Population Standard deviation:
Union	**40**	**$20.75**	**$2.25**
Nonunion	**45**	**$19.80**	**$1.90**

Would it be reasonable for her to conclude that union nurses earn more? Use the 0.02 significance level. What is the p-value?

3] The Tampa Bay (Florida) Area Chamber of Commerce wanted to know whether the mean weekly salary of nurses was larger than that of school teachers. To investigate, they collected the following information on the amounts earned last week by a sample of school teachers and a sample of nurses.

School Teachers ($)	1095	1076	1077	1125	1034	1059	1052	1070
	1080	1092	1082	1079				
Nurses ($)	1091	1140	1071	1021	1100	1109	1075	1079

Is it reasonable to conclude that the mean weekly salary of nurses is higher? Use the 0.1 significance level.

4] A random sample of 15 items from the first population showed a mean of 50 and a standard deviation of 5. A sample of 12 items for the second population showed a mean of 46 and a standard deviation of 15.
Test the hypothesis that $\mu_1 = \mu_2$ against the alternative that $\mu_1 \neq \mu_2$. Use $\alpha = 0.1$

5] A recent survey compared the costs of adoption through public and private agencies. For a

sample of 16 adoptions through a public agency, the mean cost was $21045, with a standard deviation of $835. For a sample of 18 adoptions through a private agency, the mean cost was $22840, with a standard deviation of $1545.
Test the hypothesis that $\mu_1 = \mu_2$ against the alternative that $\mu_1 \neq \mu_2$. Use α = 0.1

6] Suppose you are an expert on the fashion industry and wish to gather information to compare the amount earned per month by models featuring Liz Claiborne attire with those of Calvin Klein. The following table gives the amount ($000) earned per month by a sample of 15 Claiborne models and a sample of 12 Klein models.

Claiborne models:	$5.0	$4.5	$3.4	$3.4	$6.0	$3.3	$4.5	$4.6
	$3.5	$5.2	$4.8	$4.4	$4.6	$3.6	$5.0	
Klein models.	$3.1	$3.8	$4.0	$3.6	$3.7	$3.8	$3.6	$3.6
	$4.9	$5.9	$2.3	$4.0				

Is it reasonable to conclude that Claiborne models earn more? Use the 0.1 significance Level.

7] A firm has been experimenting with two different physical arrangements of its assembly line. It has been determined that both arrangements yield approximately the same average number of finished units per day. To obtain an arrangement that produces greater process control, you suggest that the arrangement with the smaller variance in the number of finished units produced per day be permanently adopted. Two independent random samples yield the results shown in Table (1).

(a) Test the hypothesis that $\sigma_1^2 = \sigma_2^2$ against the alternative that $\sigma_1^2 \neq \sigma_2^2$ where, σ_1^2 ***and*** σ_2^2 are the variances of the number of finished units for the two assembly line arrangements respectively. Use α = 0.1

(b) Based on the result, in part **(a)** which of the two arrangements would you recommend?

(c) Test the hypothesis that $\mu_1 = \mu_2$ against the alternative that $\mu_1 \neq \mu_2$ where, μ_1 ***and*** μ_2 are the means of the number of finished units for the two-assembly line arrangements respectively. Use α = 0.1

Line 1	448	523	506	500	533	447	524	469	470	494	536	481	492
	567	492	457	497	483	533	408	453					
Line 2	372	446	537	592	536	487	592	605	550	489	461	500	430
	543	459	429	494	538	540	481	484	374	495	503	547	

Table (1): Number of Finished Units Produced per Day by Two Assembly Lines

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8] Hippo grazing patterns in Kenya. In Kenya, human-induced land-use changes and excessive resource extraction has threatened the jungle ecosystem by reducing animal grazing areas and disrupting access to water sources. In Landscape & Ecology Engineering (Jan. 2013), researchers compared hippopotamus grazing patterns in two Kenyan areas — a national reserve and a community pastoral ranch. Each area was subdivided into plots of land. The plots were sampled (406 plots in the national reserve and 230 plots in the pastoral ranch) and the number of hippo trails from a water source was determined for each plot. Sample statistics are provided in the following table.

(a) Can the researchers reliably conclude that the variability in number of hippo trails from a water source in the national reserve differs from the variability in number of hippo trails from a water source in the pastoral ranch? Use $\alpha = 0.1$. Use

$f_{0.05}(405, 229) = 1$ & $f_{0.05}(229, 405) = 1$

(b) The researchers concluded that the mean number of hippo trails was higher in the national reserve than in the pastoral ranch. Do you agree? Use $\alpha = 0.1$

	National Reserve	Pastoral Ranch
Sample size:	**406**	**230**
Mean number of trails:	**0.31**	**0.13**
Standard deviation:	**0.4**	**0.3**

9] Two different weight loss programs are being compared to determine their effectiveness. Ten men were assigned to each program, so $n_1 = n_2 = 10$, and their weight losses are recorded below.

(a) Test the hypothesis that $\sigma_1^2 = \sigma_2^2$ against the alternative that $\sigma_1^2 \neq \sigma_2^2$. Use $\alpha = 0.1$

(b) Test the hypothesis that $\mu_1 = \mu_2$ against the alternative that $\mu_1 \neq \mu_2$. Use $\alpha = 0.1$.

Diet 1	**3.4**	**10.9**	**2.8**	**7.8**	**0.9**	**5.2**	**2.5**	**10.5**	**7.1**	**7.5**
Diet 2	**11.9**	**13.1**	**11.6**	**6.8**	**6.8**	**8.8**	**12.5**	**8.6**	**17.5**	**10.3**

10] A study published in Chemosphere reported the levels of the dioxin TCDD of 20 Massachusetts Vietnam veterans who were possibly exposed to Agent Orange. The amount of TCDD levels in plasma and in fat tissue were as follows:

Veteran	*TCDD levels In plasma*	*TCDD levels In fat tissue*
1	2.5	*4.9*
2	*3.1*	*5.9*
3	*2.1*	*4.4*
4	*3.5*	*6.9*
5	*3.1*	*7.0*
6	*1.8*	*4.2*
7	*6.0*	*10.0*
8	*3.0*	*5.5*
9	*36.0*	*41.0*
10	*4.7*	*4.4*
11	*6.9*	*7.0*
12	*3.3*	*2.9*
13	*4.6*	*4.6*
14	*1.6*	*1.4*
15	*7.2*	*7.7*
16	*1.8*	*1.1*
17	*20.0*	*11.0*
18	*2.0*	*2.5*
19	*2.5*	*2.3*
20	*4.1*	*2.5*

Test the hypothesis that $\mu_1 = \mu_2$ against the alternative that $\mu_1 \neq \mu_2$. where, μ_1 *and* μ_2 represent the true mean TCDD in plasma and in fat tissue, respectively. Assume the distribution of the differences to be approximately normal. Use $\alpha = 0.05$.
