Q1-3 on pg 40, Q16,17 on pg 46 A180

Check you understand! Q31, Q34 to Q37

10Qs = about 30mins

1. Which one of the following statements is **false**?

T (1) A statistically significant result is not always practically significant.

T (2) A non-significant hypothesis test does not mean that the null hypothesis is true.

T (3) Large positive *t*-test statistics lead to small *P-values* for two-tailed tests.

T (4) A small *P-value* from a hypothesis test may result from a very large sample, and the results may be of no practical significance.

F (5) A ~~one~~ two-tailed *t*-test should be used when the idea for doing the test came about as a result of looking at the data.

2. Which **one** of the following statements is **false**?

T (1) In hypothesis testing, statistical significance does not imply practical significance.

F (2) In a hypothesis test for no difference between two means, a very small *P-value* indicates a ~~very large~~ probable difference in the means.

T (3) In hypothesis testing, a non-significant test result does not imply that H_0 is true.

T (4) In hypothesis testing, large samples can lead to small *P-values* without the results having any practical significance.

T (5) In a hypothesis test for no difference between two means, a two-sided test should be used when the idea of doing the test has been triggered as a result of looking at the data.

3. Which one of the following statements is **false**?

T (1) Tests of hypotheses can only deal with random errors and sampling variation. They are ineffective when confronted with data that has systematic bias

T (2) The larger the *P-value,* the weaker the evidence against H_0.

T (3) A two-sided test of H_0: *parameter = hypothesised value* has *P-value* greater than 0.05 if the *hypothesised value* lies within a 95% confidence interval for the *parameter*.

F (4) An extremely small *P-value* means that the ~~actual~~ effect differs ~~markedly~~ from that claimed in the null hypothesis. Size → CI!

(5) The larger the test statistic, $|t_0|$, for a two-sided test, the smaller the *P-value* will be.

Questions 4 to 9 **refer to the following situation:**

The weight gain of women during pregnancy has an important effect on the birth weight of their children. In a study conducted in three countries, weight gains (in kg) of women during the last three months of pregnancy were measured. The results are summarised in the following table.

Country	n	$\bar{x}$	s_x
Egypt (E)	11	4.55	1.83
Kenya (K)	11	3.29	0.851
Mexico (M)	11	2.9	1.8

CI! mean!

4. We wish to determine the size of the difference in average weight gain between Egyptian and Kenyan women. Given that the data shows no non-Normal features when plotted, the most appropriate procedure to use here is (select **one** only):

→ quantify size of $\mu_E - \mu_K$

(1) a confidence interval based on the paired t-test.

(2) a two-independent sample proportion t-test.

(3) a confidence interval based on the two-independent sample t-test.

(4) a confidence interval based on the F-test.

(5) a confidence interval based on the Chi-square test.

5. Suppose a two-independent sample t-test is appropriate here for testing H_0: $\mu_E - \mu_K = 0$, against H_1: $\mu_E - \mu_K \neq 0$. Then the value of the degrees of freedom, df, is (select **one** only):

(1) 21 (4) 20

(2) 10 (5) 22

(3) 11

$$df = \min(n_1 - 1, n_2 - 1) = \min(11-1, 11-1) = \min(10,10) = 10!$$

6. Suppose the P-$value$ for the test in Question 5 is 0.1654 (it is not). Which **one** of the following statements is **correct**?

no ev. against H_0!

(1) The data provides no evidence against H_0.

(2) The data provides strong evidence that H_0 is true.

(3) The data provides evidence that H_0 is true.

(4) The data provides evidence in favour of H_1.

(5) The data provides strong evidence that H_1 is true.

7. When calculating a 95% confidence interval for $\mu_E - \mu_K$, the value of the t-multiplier obtained from a *Student's t*-table is 2.2281. The standard error, $se(\bar{x}_E - \bar{x}_K)$ = 0.6085, then the **margin of error** for the 95% confidence interval is:

est $\pm \underbrace{t \times se(\text{est})}_{\text{MOE!}}$

(1) $(4.55 - 3.29) \pm 2.2281 \times \dfrac{0.6085}{\sqrt{11}}$

(2) $\pm 2.2281 \times \dfrac{0.6085}{\sqrt{11}}$

→ (3) $(3.29 - 4.55) \pm 2.2281 \times 0.6085$

$\pm t \times se(\bar{x}_E - \bar{x}_K)$

(4) $(3.29 - 4.55) \pm 2.2281 \times \dfrac{0.6085}{\sqrt{11}}$

(5) $\pm 2.2281 \times 0.6085$

→ $\pm 2.2281 \times .6085$

8. We wish to ~~determine~~ if there are differences in average weight gain in any of the three countries. The most appropriate procedure to use here is (select **one** only):

mean!

3 groups!

(1) a confidence interval for the highest-lowest average weight gain: $\mu_{high} - \mu_{low}$.

(2) an F-test for H_0: $\mu_E = \mu_K = \mu_M$.

(3) a paired t-test for H_0: $\mu_{diff} = 0$, where $\mu_{diff} = \mu_{high} - \mu_{low}$.

(4) three paired t-tests.

(5) a Tukey interval for the highest-lowest average weight gain: $\mu_{high} - \mu_{low}$.

9. We wish to perform an F-test for the weight gain data. The appropriate degrees of freedom are (select **one** only):

(1) $df_1 = 2$ and $df_2 = 30$

$df_1 = 3 - 1 = 2$

(2) $df_1 = 3$ and $df_2 = 33$

$df_2 = 33 - 3 = 30$

(3) $df_1 = 33$ and $df_2 = 3$

(4) $df_1 = 30$ and $df_2 = 2$

(5) $df_1 = 2$ and $df_2 = 33$

Questions 10 to **13** refer to the following information.

HDL cholesterol is known as the "good cholesterol" as it is associated with lower risks of problems like heart disease. The following data were collected on men working in New Zealand companies. How exactly?

The men were divided into exercise groups by the amount of exercise they reported. Levels of exercise were classified as lowest, medium, and most. Sixty men were randomly sampled from each exercise group, and their HDL cholesterol level was measured.

cate, ord, 3 levels

Box plots and some SPSS output analysing the data follow.

indep!

num, cont response var

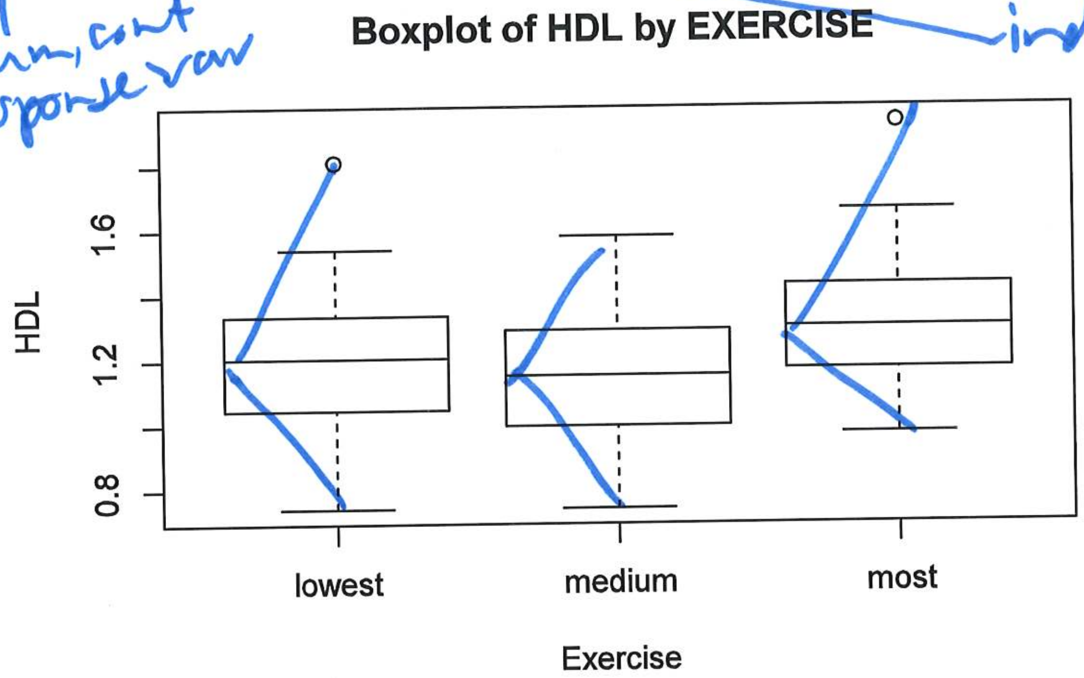


Figure 3: Box plot of HDL by exercise level.

Descriptives

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean Lower Bound	95% Confidence Interval for Mean Upper Bound	Minimum	Maximum
lowest	60	1.1998	.1926					
medium	60	1.1497	.2301					
most	60	1.2998	.1906					
Total	180							

$\frac{.2301}{.1926} = 1.2 < 2$

$df_1 = 3 - 1 = 2$

ANOVA

p-val

st. ev. against Ho

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	.7013	*	.3507	*	.000
Within Groups	6.7632	*	.0382		
Total	7.4645	179			

Table 3: SPSS output for the cholesterol data.

$f_0 = \frac{.3507}{.0382} = 9.181$

$df_2 = 180 - 3 = 177$

10. Which one of the following statements about the F–test shown in Table 3 is **false**?

(1) The outside values in the lowest and most groups show that the Normality assumption of the F–test is violated. $n_{tot} = 180$!

(2) The alternative hypothesis states that at least one of the exercise groups has a different underlying mean HDL level from another.

(3) The differences in the sample standard deviations of the lowest, medium and most exercise groups do not affect the validity of the F–test in practice. ✓ $1.2 < 2$

(4) The box plots in Figure 3 give us no information on the independence of the exercise groups.

(5) The null hypothesis states that the underlying mean HDL level is the same for each exercise group.

11. The values for the degrees of freedom, df_1 and df_2, at the top of Table 3 are:

$n_{tot} - k = 180 - 3 = 177$

$k - 1 = 3 - 1 = 2$

(1) df_1=2, df_2=177

(2) df_1=2, df_2=178

(3) df_1=2, df_2=59

(4) df_1=3, df_2=177

(5) df_1=3, df_2=176

12. The value of the F–test statistic, f_0, at the top of Table 3 is nearest to:

$\frac{.3507}{.0382} = 9.181$ (3dp)

(1) 9.643

(2) 10.643

(3) 9.181

(4) 0.104

(5) 0.109

13. Which one of the following statements is the **best** interpretation of the P-*value* in the analysis of variance for HDL shown in Table 3?

(1) There is no evidence that all of the exercise groups have different underlying mean HDL cholesterol levels.

(2) There is extremely strong evidence that at least one of the exercise groups has a different underlying mean HDL cholesterol level from another. Good

(3) There is no evidence that any of the exercise groups have different underlying mean HDL cholesterol levels.

(4) There is extremely strong evidence that all of the exercise groups have different underlying mean HDL cholesterol levels. too far!

(5) There is some evidence that at least one of the exercise groups has a different underlying mean HDL cholesterol level from another.

Question 14 refers to the following additional information.

A medical study was carried out to test the effectiveness of a new sleeping drug. It was hoped that the drug would be suitable for the New Zealand market. Ten people who had recently been diagnosed with having a particular type of sleeping disorder were used as subjects in the study. They were all given the drug on one night and then, on the next night, they were all given a placebo. The subjects could not tell beforehand, and nor were they told, which was the drug and which was the placebo. On each of the two nights, each subject was measured for the number of hours of sleep. The results are shown below.

Patient	Hours of Sleep: Drug	Hours of Sleep: Placebo	Difference
1	6.1	5.2	0.9
2	7.0	7.9	-0.9
3	8.2	3.9	4.3
4	7.6	4.7	2.9
5	6.5	5.3	1.2
6	8.4	4.1	3.0
7	6.9	4.2	2.7
8	6.7	6.1	0.6
9	7.4	3.8	3.6
10	5.8	6.3	-0.5

paired data ⇓ analyse differences!

Patient	Drug	Placebo	Difference
Sample Mean	7.06	5.28	1.78
Sample Std. Dev.	0.85	1.26	1.77

To determine the efficacy of the drug, the researcher wanted to see if there was a difference between the average number of hours of sleep when the drug is taken and the average number of hours of sleep when the placebo is taken.

14. An appropriate test to perform is a:

(1) Paired t-test on the differences.

(2) Two sample t-test if plots of the two samples are **not** severely non-Normal.

(3) t-test on the differences if a plot of the differences displays severe non-Normality. → use non-parametric test instead

(4) Two sample t-test on the two samples if plots of the two samples are severely non-Normal.

(5) F-test on the differences.

15. Which one of the following statements about paired data is **false**?

T (1) For paired data, we analyse the differences.

T (2) Pairing is beneficial when the variability within pairs is small compared with the variability between pairs.

T (3) The one sample *t*-test can be used to analyse the differences in paired data.

F (4) Pairing ca~~nnot~~ be used in observational studies.

T (5) The carryover effect occurs when the first treatment alters the effect of the second treatment.

Questions 16 and **17** refer to the following information.

Printed on every packet of "Yummo" corn chips is a weight of 150g. A consumer collects 48 (n) packets of "Yummo" corn chips and finds a mean weight of 148.5g $\bar{x}$ and a standard deviation of 2.1g. s

16. The customer wishes to test H_0: $\mu = 150$ versus H_1: $\mu \neq 150$. The standard error, se($\bar{x}$), is 0.3031. The value of the *t*-test statistic, t_0, and the degrees of freedom *df*, to be used are given by:

(1) $t_0 = -4.95$, $df = 47$

~~(2)~~ $t_0 = 4.95$, $df = 47$

~~(3)~~ $t_0 = -4.95$, ~~$df = 48$~~

~~(4)~~ $t_0 = -4.95$, ~~$df = 49$~~

~~(5)~~ $t_0 = 4.95$, ~~$df = 48$~~

$df = n-1 = 48-1 = 47$

$$t_0 = \frac{\text{est} - \text{hyp val}}{\text{std err}} = \frac{\bar{x} - \mu_0}{se(\bar{x})} = \frac{(148.5 - 150)}{.3031} = -4.9489 \text{ (4dp)}$$

17. Suppose the customer finds that the *p-value* for the above test = 0.07 (it is not). The **best** interpretation of this test would be:

weak ev. against H_0!

F ~~(1)~~ With a *p-value* of 0.07 there is some evidence against the null hypothesis.

T (2) With a *p-value* of 0.07 there is weak evidence against the null hypothesis.

T (3) With a *p-value* of 0.07 there is weak evidence against the null hypothesis that the mean weight of Yummo chips is 150g. best

F ~~(4)~~ With a *p-value* of 0.07 there is some evidence against the null hypothesis that the mean weight of Yummo chips is 150g.

F (5) With a *p-value* of .07% there is weak evidence against the null hypothesis that the mean weight of Yummo chips is 150g.

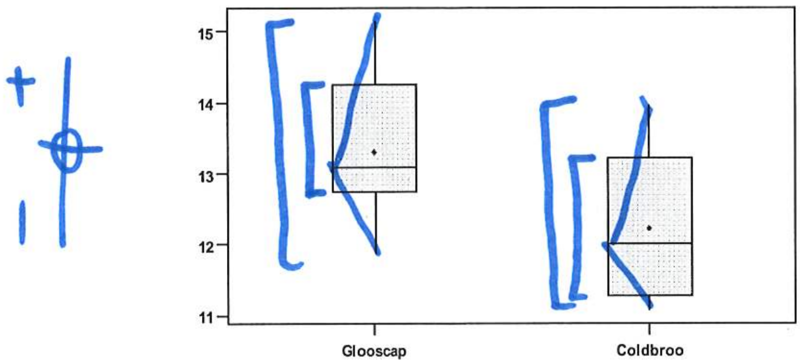
%!

Questions 18 to 21 refer to the following information.

As part of a study to compare the physical education programs at two Canadian schools, running times (in seconds) over a set distance were recorded for two independent samples of sixth grade students taken from each school. (Data source courtesy of Chance Encounters).

Boxplots of Glooscap and Coldbroo

(means are indicated by solid circles)



Group Statistics

	schcode	N	Mean	Std. Deviation	Std. Error Mean
runtime	Glooscap	12 n_1	13.3125 $\bar{x}_1$	.99133 s_1	.28617
	Coldbrook	13 n_2	12.2285 $\bar{x}_2$	.99018 s_2	.27463

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
runtime	~~Equal variances assumed~~	~~.008~~	~~.930~~	~~2.733~~	~~23~~	~~.012~~	~~1.08404~~	~~.39661~~	~~.26359~~	~~1.90449~~
	Equal variances not assumed			2.733	df 22.836	p-val .012	$\bar{x}_1-\bar{x}_2$ 1.08404	.39663	(.26322	, 1.90485)

$t_0 = 1.08404/.39663$ $se(\bar{x}_1-\bar{x}_2)$ 95% CI for $\mu_1-\mu_2$

18. To test for a difference in the physical education programs of the two schools the null and alternative hypotheses would be:

~~(1)~~ $H_0: \mu_1 - \mu_2 = 0$ versus $H_1: \mu_1 - \mu_2 > 0$

~~(2)~~ $H_0: \cancel{p_1 - p_2} = 0$ versus $H_1: \cancel{p_1 - p_2} \neq 0$

(3) $H_0: \mu_1 - \mu_2 = 0$ versus $H_1: \mu_1 - \mu_2 \neq 0$

~~(4)~~ $H_0: \bar{x}_1 - \bar{x}_2 = 0$ versus $H_1: \bar{x}_1 - \bar{x}_2 \neq 0$

~~(5)~~ $H_0: \cancel{p_D - p_S} > 0$ versus $H_1: \cancel{p_D - p_S} = 0$

19. Which one of the following is false?

T (1) There are no gross outliers in the data.

T (2) The running times for Glooscap are on average, greater than the running times for Coldbrook.

T (3) Two-sample t-tests are, in general, more robust to non-Normal features than the one sample t-test. $n_1 + n_2 = 12 + 13 = 25$

F (4) The data taken from Glooscap and Coldbrook show ~~severely~~ slightly non-normal features.

T (5) The range of running times for Glooscap is slightly more than the range of running times for Coldbrook.

20. The best interpretation for this test is: p-val = .012 = 1.2%

(1) With a *p-value* of ~~0.12~~ there is ~~no~~ evidence against the null hypothesis.

(2) With a *p-value* of 0.012 there is ~~no~~ evidence against the null hypothesis that there is a difference in the mean running times.

(3) With a *p-value* of 1.2% there is ~~no~~ evidence against the null hypothesis that there is no difference in the mean running times.

(4) With a *p-value* of 0.012 there is strong evidence against the null hypothesis that there is no difference in the mean running times.

(5) With a *p-value* of 0.012 there is ~~weak~~ evidence against the null hypothesis that there is no difference in the mean running times

21. The 95% confidence interval for the difference between the true mean running times is given ~~in the~~ SPSS output above. Which one of the following interpretations is true? 95% CI: [.26, 1.90]

F (1) With a probability of 0.95, the true difference of means $\mu_1 - \mu_2$ lies between 0.26 and 1.91.

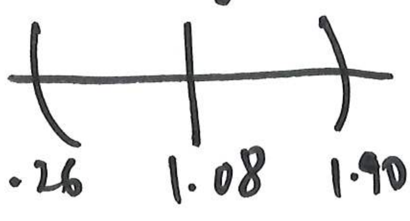
won't get same CI!

F (2) In repeated sampling the 95% confidence interval ~~[0.26, 1.90]~~ will contain the true difference in means in 95% of the samples taken.

F (3) With 95% confidence, we estimate that the true proportion p_1 will be somewhere between 0.26 ~~larger~~ and 1.90 ~~smaller~~ larger than p_2 not p's!

T (4) With 95% confidence, we estimate that the true mean running time from Glooscap μ_1 is somewhere between 0.26 and 1.90 larger than the true mean running time from Coldbrook μ_2.

F (5) With 95% confidence the true mean from Glooscap μ_1 is ~~1.05~~ 1.08 larger than the true mean from Coldbrook μ_2. with a margin of error of .82.



width = 1.90 − .26
= 1.64

48

moe = 1.64/2 = .82

Questions 22 and 23 refer to the following information.

Factor V is a protein involved in the forming of blood clots. The higher the level of factor V, the faster the blood clots. The Auckland Blood Transfusion Service is interested in the effects of sterilisation of blood plasma because factor V is known to be unstable and may break down during sterilisation. The table below gives measured levels of factor V in blood samples from 16 blood donors. Both pre- and post-sterilisation measurements are given for each blood sample.

Donor Number	**Pre-Sterilisation**	**Post-Sterilisation**
1	1073	916
2	1064	1030
3	967	923
4	849	892
5	810	628
6	855	759
7	1047	828
8	1008	784
9	957	809
10	829	773
11	821	786
12	1257	1106
13	1095	832
14	1098	863
15	932	783
16	1440	869

Factor V and Blood Sterilisation

n=16

diffs

analyse as a single sample!

	Sample mean	Standard deviation	Sample size
~~Pre - Sterilisation~~	~~1006.37~~	~~170.899~~	~~16~~
~~Post - Sterilisation~~	~~848.812~~	~~112.195~~	~~16~~
Difference (Pre-Post)	$\bar{x}_{diff}$=157.562	s_{diff}=140.132	n_{diff}=16

Summary Statistics

22. Which **one** of the following statements gives the **correct** hypotheses for this test?

F-test (1) H_0: all of the μ's are equal
H_1: none of the μ's are equal ✗

t-test for 2 indep. samples (2) H_0: $\mu_1 - \mu_2 = 0$
H_1: $\mu_1 - \mu_2 \neq 0$ ✗

(3) H_0: $\mu_{diff1} - \mu_{diff2} = 0$
H_1: $\mu_{diff1} - \mu_{diff2} \neq 0$ ✗

(4) H_0: $\mu_{diff} = 0$
H_1: $\mu_{diff} \neq 0$ ✓

t-test for single proportion (5) H_0: $p = 0$
H_1: $p \neq 0$ ✗

data is paired ∴ need a dot plot of differences

weird combination of 2 indep samples & paired!

23. The t-test statistic for testing whether there is any evidence of an effect of sterilisation is given by:

(1) $\dfrac{\overline{x}_{\text{diff}}}{se\left(\overline{x}_{\text{diff}}\right)}$

(2) $\dfrac{\overline{x}_{\text{diff}}}{se\left(\overline{x}_{\text{Post}} - \overline{x}_{\text{Pre}}\right)}$

(3) $\dfrac{\overline{x}_{\text{Post}} - \overline{x}_{\text{Pre}}}{se\left(\overline{x}_{\text{Post}} - \overline{x}_{\text{Pre}}\right)}$

(4) $\dfrac{\overline{x}_{\text{Post}} - \overline{x}_{\text{Pre}}}{se\left(\overline{x}_{\text{Post}} + \overline{x}_{\text{Pre}}\right)}$

(5) $\dfrac{\overline{x}_{\text{Post}}}{se\left(\overline{x}_{\text{Post}}\right)} - \dfrac{\overline{x}_{\text{Pre}}}{se\left(\overline{x}_{\text{Pre}}\right)}$

$t_0 = \dfrac{\text{est} - \text{hyp val}}{\text{std err}} = \dfrac{\overline{x}_{\text{diff}} - 0}{se(\overline{x}_{\text{diff}})}$

24 For an F-test to be valid, which of the assumptions listed below are **required**?

I ✓ The samples are independent.
II ✗ The underlying means (i.e. the population means) are equal. H_0!
III ✓ The underlying level of variability is the same for each of the groups.
IV ✗ The sample sizes are equal.
V ✓ The underlying distribution of each group is Normal.

(1) II, III and V
(2) I, III and V
(3) II, III and IV
(4) I, II and V
(5) I, IV and V

25 Which **one** of the following statements gives the **correct** hypotheses for an F-test?

~~(1)~~ H_0: all of the μ's are equal
H_1: none of the μ's are equal too far!

~~(2)~~ H_0: not all of the μ's are equal
H_1: all of the μ's are equal

(3) H_0: all of the μ's are equal
H_1: at least one of the μ's is different

~~(4)~~ H_0: ~~none~~ all of the μ's are equal
H_1: some of the μ's are ~~equal~~ diff

(5) H_0: ~~some~~ all of the μ's are equal
H_1: not all of the μ's are equal

n

Questions 26 to 28 refer to the following information.

A certain drug was claimed to have a side effect of increasing the heart beat rate. An experiment was performed on 8 rats. The number of heartbeats was recorded over a fixed time period immediately before and immediately after each rat received the drug. The data is given below. paired data! analyse diffs...

26. It would be **inappropriate** to use a two independent sample t-test to test the hypothesis that $\mu_{\text{after}} - \mu_{\text{before}} = 0$ mainly because the:

- ~~(1)~~ Population standard deviations are unknown.
- ~~(2)~~ Sample sizes are small.
- (3) Data are related.
- ~~(4)~~ Samples are independent.
- ~~(5)~~ Population means are unknown.

$$t_0 = \frac{\text{est} - \text{hyp val}}{\text{std err}} = \frac{\bar{x}_{\text{diff}} - 0}{se(\bar{x}_{\text{diff}})}$$

27. The value of the t-test statistic, t_0, to test the hypothesis that $\mu_{\text{diff}} = 0$, is:

(1) $\dfrac{\bar{x}_{\text{after}}}{se(\bar{x}_{\text{after}})} - \dfrac{\bar{x}_{\text{before}}}{se(\bar{x}_{\text{before}})}$

(2) $\dfrac{\bar{x}_{\text{diff}}}{se(\bar{x}_{\text{after}} - \bar{x}_{\text{before}})}$

(3) $\dfrac{\bar{x}_{\text{after}} - \bar{x}_{\text{before}}}{se(\bar{x}_{\text{after}} - \bar{x}_{\text{before}})}$

(4) $\dfrac{\bar{x}_{\text{after}} - \bar{x}_{\text{before}}}{se(\bar{x}_{\text{after}} + \bar{x}_{\text{before}})}$

(5) $\dfrac{\bar{x}_{\text{diff}}}{se(\bar{x}_{\text{diff}})}$

$$t_0 = \frac{-69.25}{5.16}$$

diff $\quad s_{\text{diff}}$

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	95% Confidence Interval of the Difference Upper			
Pair 1	after - before	-69.25	14.60	5.16	-81.46	-57.04	-13.42	7	.000

$\bar{x}_{\text{diff}}$ $\quad se(\bar{x}_{\text{diff}})$ $\quad$ p-val $\quad df = n-1$

28. The best description for the paired test on the heartbeats of the rats would be:

- ~~(1)~~ With 95% confidence we estimate that on average the heartbeats of the rats is 69.25 beats
- (2) With 95% confidence we estimate that on average the heartbeat of the rats before taking the drug was between 57.04 and 81.46 beats lower than the heartbeat of the rats after taking the drug.
- (3) With 95% confidence we estimate that on average the heartbeat of the rats before taking the drug was between 57.04 and 81.46 beats higher than the heartbeat of the rats after taking the drug.
- ~~(4)~~ With 95% confidence we estimate that the difference in the rats was between 57.04 and 81.46 heartbeats.
- (5) With 95% confidence we estimate that on average the heartbeat of the rats after taking the drug was between 57.04 and 81.46 beats higher than the heartbeat of the rats before taking the drug.

same!

Questions 29 and **30** refer to the following information.
It has already been established that increased reproduction decreases longevity of female fruitflies. Therefore, an experiment was designed to test whether increased reproduction also reduces longevity for male fruitflies. Longevity is the life span (i.e. how long they live). Each male fruitfly was randomly assigned to one of five groups. There were **twenty-five** male fruitflies in each group. This is the variable GP.

The five groups are:

GP1:	Male forced to live alone
GP2	Male lives with one receptive female, i.e. the female is willing to mate.
GP3	Male lives with one non-receptive female.
GP4	Male lives with 8 non-receptive females.
GP5	Male lives with 8 receptive females.

ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11939.28	*	2984.82	*	.000
Within Groups	26313.52	*	219.28		
Total	38252.80	*			

29. The degrees of freedom for the test statistic, f_0, for this F-test are:

    (1) ~~$df_1 = 5$, $df_2 = 125$~~
    (2) $df_1 = 4$, $df_2 = 120$
    (3) ~~$df_1 = 120$, $df_2 = 4$~~
    (4) $df_1 = 4$, ~~$df_2 = 124$~~
    (5) ~~$df_1 = 125$, $df_2 = 5$~~

$df_1 = 5 - 1 = 4$

$df_2 = 125 - 5 = 120$

30. The value of the test statistic, f_0, for this F-test is:

    (1) 79.20
    (2) 654,500
    (3) 13.61
    (4) 0.073S5
    (5) 0.4537

$$f_0 = \frac{2984.82}{219.28}$$