



# Solutions

## 10

### 10.1 Correlation and Regression

1. (ii)  $r = 0.982$   
 (iv)  $y = 3.8234x + 23.044$   
 (v) €80,000
2. (ii)  $r = -0.933$   
 (iv)  $y = -3.9546x + 91.619$   
 (v) 75.8  
 (vi) 12.5
3. (ii)  $r = .9499$   
 (v)  $y = 63.837x - 339.845$   
 (vi) €1575

### 10.2 Confidence Intervals

1.  $362.53 \leq \mu \leq 387.47$
2.  $23.92 \leq \mu \leq 26.08$
3.  $38.32 \leq \mu \leq 41.68$
4.  $3.2 \leq \mu \leq 4.8$
5.  $14518 \leq \mu \leq 19065$
6.  $.306 \leq p \leq .354$
7.  $.223 \leq p \leq .277$
8.  $.514 \leq p \leq .654$
9.  $.354 \leq p \leq .396$
10.  $.3082 \leq p \leq .3918$
11.  $.262 \leq p \leq .318$

### 10.3 Hypothesis Testing

1.  $H_0 : p = .3$ [claim]  
 $H_a : p \neq .3$   
 $.322 \leq p \leq .458$   
 Reject  $H_0$ , reject the radio station's claim.
2.  $H_0 : p = .78$ [claim]  
 $H_a : p \neq .78$   
 $.723 \leq p \leq .757$   
 Reject  $H_0$ , reject the claim made by the drug company.
3.  $H_0 : p = .9$ [claim]  
 $H_a : p \neq .9$   
 $.85 \leq p \leq .91$   
 Do not reject  $H_0$ , do not reject the CEO's claim.
4.  $H_0 : p = .4$   
 $H_a : p \neq .4$ [claim]  
 $.46 \leq p \leq .5$   
 Reject  $H_0$ , support the magazine's claim.
5.  $H_0 : p = .167$   
 $H_a : p \neq .167$ [claim]  
 $.165 \leq p \leq .335$   
 Do not reject  $H_0$ , do not support the claim that die is biased.
6.  $H_0 : p = .222$   
 $H_a : p \neq .222$ [claim]  
 $.422 \leq p \leq .698$   
 Reject  $H_0$ , support the managers claim that the player is somehow cheating.
7.  $H_0 : \mu = 65$ [claim]  
 $H_a : \mu \neq 65$   
 $58.53 \leq \mu \leq 65.47$   
 $z = -1.69$   
 $p = .091$   
 Do not reject  $H_0$ , do not reject claim by travel company.





8.  $H_0 : \mu = 12.50$ [claim]  
 $H_a : \mu \neq 12.50$   
 $9.87 \leq \mu \leq 11.13$   
 $z = -6.26$   
 $p = 0$   
Reject  $H_0$ , reject director's claim.
9.  $H_0 : \mu = 20000$ [claim]  
 $H_a : \mu \neq 20000$   
 $14518 \leq \mu \leq 19065$   
 $z = -2.77$   
 $p = .0056$   
Reject  $H_0$ , reject reporter's claim.
10.  $H_0 : \mu = 70000$ [claim]  
 $H_a : \mu \neq 70000$   
 $60615 \leq \mu \leq 65385$   
 $z = -5.75$   
 $p = 0$   
Reject  $H_0$ , reject tyre manufacturer's claim.
11.  $H_0 : \mu = 65$ [claim]  
 $H_a : \mu \neq 65$   
 $57.29 \leq \mu \leq 67.58$   
 $z = -.98$   
 $p = .327$   
Do not reject  $H_0$ , do not reject casino owner's claim.
12.  $H_0 : \mu = 60$ [claim]  
 $H_a : \mu \neq 60$   
 $37.28 \leq \mu \leq 42.72$   
 $z = -14.39$   
 $p = 0$   
Reject  $H_0$ , reject politician's claim.
13.  $H_0 : \mu = 7.1$   
 $H_a : \mu \neq 7.1$ [claim]  
 $7.14 \leq \mu \leq 7.86$   
 $z = 2.18$   
 $p = .0292$   
Reject  $H_0$ , support the doctor's claim that average weight has increased.
14.  $H_0 : \mu = 800$ [claim]  
 $H_a : \mu \neq 800$   
 $733.64 \leq \mu \leq 806.36$   
 $z = -1.62$   
 $p = .105$   
Do not reject  $H_0$ , do not reject psychologist's claim.





15.  $H_0 : \mu = 100$   
 $H_a : \mu \neq 100$ [claim]  
 $103.4 \leq \mu \leq 116.62$   
 $z = 2.96$   
 $p = .003$   
Reject  $H_0$ , support principal's claim.

## 10.4 Exam Questions

1. (a) i. 5.6%  
ii. €22,862  
iii. Reject  $H_0$ , the mean annual income has changed.  
(b)  $€22,472 \leq \mu \leq €27,476$   
(c) Central Limit Theorem - The distribution of sample means will be normally distributed.  
(d)  $n = 494$
2. (a)  $86.39 \leq \mu \leq 94.51$   
(b)  $H_0 : \mu = 94$ [claim]  
 $H_a : \mu \neq 94$   
Do Not Reject  $H_0$ , do not reject supermarket's claim.  
(c)  $z = -1.71$   
 $p = .0872$
3. (a) Pensioners, students  
(b) 1847800, 151500  
(c) i. 50.4%, 10.1%, 39.5%  
ii. 39.6%, 8.0%, 52.4%  
iii. I agree (There are more people on the dole which increases the social welfare expenditure; as fewer people are in the labour force, there is less income tax available to the Government.)  
(d) i. No  
ii. I found Liam's chart more useful. I can see very clearly on this chart the large fall in males at work from 2009.  
iii. 51.2%
4. (a) Drug A is not more successful than the generic drug,  $P \leq 0.51$ . Conclusion: we can say with 95% confidence that the percentage success of Drug A is between 54.73% and 66.67%. Therefore the null hypothesis is rejected. The company's claims are true.  
(b) 277
5. (a) i. The population is divided into different subgroups which have common characteristics. Random samples are drawn from each sub group according to their proportion of the population.





- ii. Long Haul economy class passengers. Long haul business class passengers.  
Long haul executive class passengers. Short haul passengers.
  - (b) i. 0.231, 0.238
  - ii. No, these are not independent events- a delayed flight would influence your satisfaction with the overall service.
  - (c) i. .
  - ii. Most people would keep their baggage under 20 kg so they would not have to pay extra charges.
  - (d) i. .
  - ii. The distribution is skewed right. This is because the median is less than the mean.
  - (e) i. Null hypothesis: satisfaction level is unchanged,  $P = 0.7$ , reject the null hypothesis.
  - ii. No, margin of error = 0.02236
  - (f) i. .
  - ii.  $r = 0.8822$
  - iii. Strong positive correlation: Older people spend more.
6. Null hypothesis:  $P(\text{Property is in negative equity}) = 0.31$ . Reject the null hypothesis and accept the alternative hypothesis that the proportion of properties in negative equity has changed.
7. (a) 0.03
- (b) No
8. (a) i. Histograms: run, cycle, swim
- ii. Mean  $\approx$  median  $\approx$  25 minutes.
- iii. 3.16 minutes
- iv. There was probably no discrete mode result as all the times were different. Therefore there is no modal time. There is a modal class alright but no modal time.
- (b) Cycle vs. Swim: moderately positive correlation; Run vs. Swim: Moderately strong positive correlation; Run vs. Cycle: strong positive correlation.
- (c) 22.972 minutes
- (d) 67.5 minutes, 108.7 minutes
- (e) 196
- (f) 4.6%

