**PAPER 1 Solution**

**Question 1**

= 0

 < 0

Rejection region: 

P-value = .0320. There is enough evidence to infer that ABS is better.

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| --- | --- | --- |
| t-Test: Paired Two Sample for Means | |  |
|  |  |  |
|  | *ABS* | *non-ABS* |
| Mean | 5.4625 | 5.6375 |
| Variance | 1.51125 | 1.95410714 |
| Observations | 8 | 8 |
| Pearson Correlation | 0.993511614 |  |
| Hypothesized Mean Difference | 0 |  |
| df | 7 |  |
| t Stat | -2.19795039 |  |
| P(T<=t) one-tail | 0.031962061 |  |
| t Critical one-tail | 1.894578605 |  |
| P(T<=t) two-tail | 0.063924123 |  |
| t Critical two-tail | 2.364624252 |  |

**Excel: Xr12-03 CLO Mapped: CLO2**

**Question 2**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| The test statistic is F = 4.06 and the p-value = .0139. There is enough statistical evidence to infer that there are differences between some of the bumpers. The question is now, Which bumpers differ?  Anova: Single Factor | |  |  |  |  |  |
|  |  |  |  |  |  |  |
| SUMMARY |  |  |  |  |  |  |
| *Groups* | *Count* | *Sum* | *Average* | *Variance* |  |  |
| Bumper 1 | 10 | 3800 | 380 | 16924.2222 |  |  |
| Bumper 2 | 10 | 4859 | 485.9 | 8197.43333 |  |  |
| Bumper 3 | 10 | 4838 | 483.8 | 10426.1778 |  |  |
| Bumper 4 | 10 | 3482 | 348.2 | 14048.6222 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
| Between Groups | 150883.875 | 3 | 50294.625 | 4.05630801 | 0.013947 | 2.866266 |
| Within Groups | 446368.1 | 36 | 12399.11389 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 597251.975 | 39 |  |  |  |  |
| Bumper 4 | 10 | 3482 | 348.2 | 14048.6222 |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |
| *Source of Variation* | *SS* | *df* | *MS* | *F* | *P-value* | *F crit* |
| Rows | 77460.3 | 9 | 8606.7 | 0.71527191 | 0.68899 | 2.456281 |
| Columns | 124510.2 | 2 | 62255.1 | 5.17379766 | 0.016781 | 3.554557 |
| Error | 216589.8 | 18 | 12032.76667 |  |  |  |
|  |  |  |  |  |  |  |
| Total | 418560.3 | 29 |  |  |  |  |

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| --- | --- | --- |
| t-Test: Two-Sample Assuming Equal Variances | |  |
|  |  |  |
|  | *Bumper 1* | *Bumper 2* |
| Mean | 380 | 485.9 |
| Variance | 16924.22222 | 8197.433333 |
| Observations | 10 | 10 |
| Pooled Variance | 12560.82778 |  |
| Hypothesized Mean Difference | 0 |  |
| df | 18 |  |
| t Stat | -2.112865403 |  |
| P(T<=t) one-tail | 0.024421145 |  |
| t Critical one-tail | 1.734063607 |  |
| P(T<=t) two-tail | 0.048842289 |  |
| t Critical two-tail | 2.10092204 |  |
|  |  |  |
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|  |  |  |
|  |  |  |
| t-Test: Two-Sample Assuming Equal Variances | |  |
|  |  |  |
|  | *Bumper 1* | *Bumper 3* |
| Mean | 380 | 483.8 |
| Variance | 16924.22222 | 10426.17778 |
| Observations | 10 | 10 |
| Pooled Variance | 13675.2 |  |
| Hypothesized Mean Difference | 0 |  |
| df | 18 |  |
| t Stat | -1.984794338 |  |
| P(T<=t) one-tail | 0.031311612 |  |
| t Critical one-tail | 1.734063607 |  |
| P(T<=t) two-tail | 0.062623223 |  |
| t Critical two-tail | 2.10092204 |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| t-Test: Two-Sample Assuming Equal Variances | |  |
|  |  |  |
|  | *Bumper 1* | *Bumper 4* |
| Mean | 380 | 348.2 |
| Variance | 16924.22222 | 14048.62222 |
| Observations | 10 | 10 |
| Pooled Variance | 15486.42222 |  |
| Hypothesized Mean Difference | 0 |  |
| df | 18 |  |
| t Stat | 0.571395182 |  |
| P(T<=t) one-tail | 0.287398955 |  |
| t Critical one-tail | 1.734063607 |  |
| P(T<=t) two-tail | 0.574797909 |  |
| t Critical two-tail | 2.10092204 |  |
|  |  |  |
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| --- | --- | --- |
| t-Test: Two-Sample Assuming Equal Variances | |  |
|  |  |  |
|  | *Bumper 2* | *Bumper 3* |
| Mean | 485.9 | 483.8 |
| Variance | 8197.433333 | 10426.17778 |
| Observations | 10 | 10 |
| Pooled Variance | 9311.805556 |  |
| Hypothesized Mean Difference | 0 |  |
| df | 18 |  |
| t Stat | 0.048661708 |  |
| P(T<=t) one-tail | 0.480862388 |  |
| t Critical one-tail | 1.734063607 |  |
| P(T<=t) two-tail | 0.961724775 |  |
| t Critical two-tail | 2.10092204 |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
| t-Test: Two-Sample Assuming Equal Variances | |  |
|  |  |  |
|  | *Bumper 2* | *Bumper 4* |
| Mean | 485.9 | 348.2 |
| Variance | 8197.433333 | 14048.62222 |
| Observations | 10 | 10 |
| Pooled Variance | 11123.02778 |  |
| Hypothesized Mean Difference | 0 |  |
| df | 18 |  |
| t Stat | 2.919492955 |  |
| P(T<=t) one-tail | 0.0045758 |  |
| t Critical one-tail | 1.734063607 |  |
| P(T<=t) two-tail | 0.0091516 |  |
| t Critical two-tail | 2.10092204 |  |

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| --- | --- | --- | --- |
| t-Test: Two-Sample Assuming Equal Variances | | |  |
|  |  |  |  |
|  | *Bumper 3* | *Bumper 4* |  |
| Mean | 483.8 | 348.2 |  |
| Variance | 10426.17778 | 14048.62222 |  |
| Observations | 10 | 10 |  |
| Pooled Variance | 12237.4 |  |  |
| Hypothesized Mean Difference | 0 |  |  |
| df | 18 |  |  |
| t Stat | 2.740943692 |  |  |
| P(T<=t) one-tail | 0.006714615 |  |  |
| t Critical one-tail | 1.734063607 |  |  |
| P(T<=t) two-tail | 0.013429229 |  |  |
| t Critical two-tail | 2.10092204 |  |  |
| There is enough evidence to show that difference exist between Bumper 3 and 4, Bumper 2 and 4, and Bumper 1 and 2. |  |  |  |

**Excel: Xm14-02 CLO Mapped: CLO2**

**Question 3**

a)



b)     

42 18 1,764 324 756

34 6 1,156 36 204

25 0 625 0 0

35 –1 1,225 1 –35

37 13 1,369 169 481

38 14 1,444 196 532

31 7 961 49 217

33 7 1,089 49 231

19 –9 361 81 –171

29 8 841 64 232

38 8 1,444 64 304

28 5 784 25 140

29 3 841 9 87

36 14 1,296 196 504

18 –7 324 49 –126

Total 472 86 15,524 1,312 3,356

= 472 ****= 86 ****= 15,524 ****= 3,356

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= 5.73 – (.9675)(31.47) = –24.72

The sample regression line is

 = –24.72 + .9675x

The slope coefficient indicates that for each additional hour of television weight increases on average by .9675 pounds. The y-intercept is the point at which the regression line hits the y–axis; it has no practical meaning.

c) = 

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Rejection region: or 

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= (Excel: t = 6.55, p–value = 0.) There is enough evidence to conclude that there is a linear relationship between hours of television viewing and how overweight the child is.

d) 

Prediction interval: (where 

=

Lower prediction limit = –2.702, Upper prediction limit = 11.31 (Excel: –2.692, 11.32)

e) Confidence interval estimate: 



LCL = 2.514, UCL = 6.096 (Excel: 2.524, 6.105)

**EXCEL SOLUTION:**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SUMMARY OUTPUT | |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| *Regression Statistics* | |  |  |  |  |  |  |  |
| Multiple R | 0.876196547 |  |  |  |  |  |  |  |
| R Square | 0.767720389 |  |  |  |  |  |  |  |
| Adjusted R Square | 0.749852726 |  |  |  |  |  |  |  |
| Standard Error | 3.825235201 |  |  |  |  |  |  |  |
| Observations | 15 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| ANOVA |  |  |  |  |  |  |  |  |
|  | *df* | *SS* | *MS* | *F* | *Significance F* |  |  |  |
| Regression | 1 | 628.7118169 | 628.7118 | 42.96703 | 1.84E-05 |  |  |  |
| Residual | 13 | 190.2215165 | 14.63242 |  |  |  |  |  |
| Total | 14 | 818.9333333 |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  | *Coefficients* | *Standard Error* | *t Stat* | *P-value* | *Lower 95%* | *Upper 95%* | *Lower 95.0%* | *Upper 95.0%* |
| Intercept | -24.70901151 | 4.748056533 | -5.20403 | 0.00017 | -34.9666 | -14.4515 | -34.9666 | -14.4515 |
| Television | 0.9674474 | 0.147590938 | 6.554924 | 1.84E-05 | 0.648597 | 1.286298 | 0.648597 | 1.286298 |

**Excel: Xm16-02 CLO Mapped: CLO3**

**Question 4**

1. P(excellent) = .27 + .22 = .49
2. P(excellent | man) = 
3. P(man | excellent) =
4. No, since P(excellent)  P(excellent | man) **CLO Mapped: CLO1**