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| --- | --- | --- | --- | --- | --- | --- |
| F-Test Two-Sample for Variances | | |  | F-Test Two-Sample for Variances | | |
|  |  |  |  |  |  |  |
|  | *1D* | *1B* |  |  | *1D* | *1B* |
| Mean | -2.37996 | -1.32231 |  | Mean | -2.41118 | -1.31923 |
| Variance | 0.037093 | 0.006893 |  | Variance | 0.11951 | 0.006474 |
| Observations | 30 | 30 |  | Observations | 13 | 13 |
| df | 29 | 29 |  | df | 12 | 12 |
| F | 5.381115 |  |  | F | 18.4589 |  |
| P(F<=f) one-tail | 1E-05 |  |  | P(F<=f) one-tail | 6.8E-06 |  |
| F Critical one-tail | 1.860811 |  |  | F Critical one-tail | 2.686637 |  |
| mean(1D) < mean(1B) AND F > Fcrit | | | | mean(1D) < mean(1B) AND F > Fcrit | | |
| Therefore assume equal variances | | |  | Therefore assume equal variances | | |

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| t-Test: Two-Sample Assuming Equal Variances | | | | t-Test: Two-Sample Assuming Equal Variances | | | |
|  |  |  |  |  |  |  |  |
|  | *1D* | *1B* |  |  | *1D* | *1B* |  |
| Mean | -2.37996 | -1.32231 |  | Mean | -2.35149 | -1.32061 |  |
| Variance | 0.037093 | 0.006893 |  | Variance | 0.135211 | 0.006705 |  |
| Observations | 30 | 30 |  | Observations | 30 | 30 |  |
| Pooled Variance | 0.021993 |  |  | Pooled Variance | 0.070958 |  |  |
| Hypothesized Mean Difference | 0 |  |  | Hypothesized Mean Difference | 0 |  |  |
| df | 58 |  |  | df | 58 |  |  |
| t Stat | -27.6214 |  |  | t Stat | -14.9883 |  |  |
| P(T<=t) one-tail | 2.28E-35 |  |  | P(T<=t) one-tail | 6.59E-22 |  |  |
| t Critical one-tail | 1.671553 |  |  | t Critical one-tail | 1.671553 |  |  |
| P(T<=t) two-tail | 4.55E-35 |  |  | P(T<=t) two-tail | 1.32E-21 |  |  |
| t Critical two-tail | 2.001717 |  |  | t Critical two-tail | 2.001717 |  |  |
| abs(tStat) > abs(t critical two - tail) | | | | abs(tStat) > abs(t critical two - tail) | | | |
| Therefore reject the null hypothesis concluding 1C is a better algorithm | | | | Therefore reject the null hypothesis concluding 1C is a better algorithm | | | |

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| F-Test Two-Sample for Variances | | | | | | | | F-Test Two-Sample for Variances | | | | | | |
|  |  | |  | |  | | |  |  | | |  | | |
|  | *1D* | | *1B* | |  | | |  | *1D* | | | *1B* | | |
| Mean | -4.15867 | | -3.76113 | |  | | | Mean | -4.22648 | | | -3.74108 | | |
| Variance | 0.018605 | | 0.011713 | |  | | | Variance | 0.029633 | | | 0.007588 | | |
| Observations | 30 | | 30 | |  | | | Observations | 13 | | | 13 | | |
| df | 29 | | 29 | |  | | | df | 12 | | | 12 | | |
| F | 1.588412 | |  | |  | | | F | 3.905304 | | |  | | |
| P(F<=f) one-tail | 0.109374 | |  | |  | | | P(F<=f) one-tail | 0.012818 | | |  | | |
| F Critical one-tail | 1.860811 | |  | |  | | | F Critical one-tail | 2.686637 | | |  | | |
| mean(1D) < mean(1B) and F < Fcrit | | | | | | | | mean(1D) < mean(1B) and F > Fcrit | | | | | | |
| Therefore assume unequal variances | | | | | | | | Therefore assume equal variances | | | | | | |
|  |  | |  | |  | | |  |  | | |  | | |
| t-Test: Two-Sample Assuming Unequal Variances | | | | | | | | t-Test: Two-Sample Assuming Equal Variances | | | | | | |
|  |  | |  | |  | | |  |  | | |  | | |
|  | *1D* | | *1B* | |  | | |  | *1D* | | | *1B* | | |
| Mean | -4.15867 | | -3.76113 | |  | | | Mean | -4.1858 | | | -3.76113 | | |
| Variance | 0.018605 | | 0.011713 | |  | | | Variance | 0.032847 | | | 0.011713 | | |
| Observations | 30 | | 30 | |  | | | Observations | 30 | | | 30 | | |
| Hypothesized Mean Difference | 0 | |  | |  | | | Pooled Variance | 0.02228 | | |  | | |
| df | 55 | |  | |  | | | Hypothesized Mean Difference | 0 | | |  | | |
| t Stat | -12.5051 | |  | |  | | | df | 58 | | |  | | |
| P(T<=t) one-tail | 5.16E-18 | |  | |  | | | t Stat | -11.0189 | | |  | | |
| t Critical one-tail | 1.673034 | |  | |  | | | P(T<=t) one-tail | 3.77E-16 | | |  | | |
| P(T<=t) two-tail | 1.03E-17 | |  | |  | | | t Critical one-tail | 1.671553 | | |  | | |
| t Critical two-tail | 2.004045 | |  | |  | | | P(T<=t) two-tail | 7.54E-16 | | |  | | |
| abs(tStat) > abs(t critical two - tail) | | | | | | | | t Critical two-tail | 2.001717 | | |  | | |
| Therefore reject the null hypothesis concluding 1C is a better algorithm | | | | | | | | abs(tStat) > abs(t critical two - tail) | | | | | | |
|  |  | |  | |  | | | Therefore reject the null hypothesis concluding 1C is a better algorithm | | | | | | |
| F-Test Two-Sample for Variances | | | | | | | F-Test Two-Sample for Variances | | | | | | |
|  | |  | |  | |  |  | | |  |  | |  |
|  | | *1D* | | *1B* | |  |  | | | *1D* | *1B* | |  |
| Mean | | -5.16426 | | -5.44815 | |  | Mean | | | -5.14489 | -5.47407 | |  |
| Variance | | 0.00676 | | 0.010461 | |  | Variance | | | 0.007362 | 0.013278 | |  |
| Observations | | 26 | | 26 | |  | Observations | | | 13 | 13 | |  |
| df | | 25 | | 25 | |  | df | | | 12 | 12 | |  |
| F | | 0.646164 | |  | |  | F | | | 0.554422 |  | |  |
| P(F<=f) one-tail | | 0.14081 | |  | |  | P(F<=f) one-tail | | | 0.160205 |  | |  |
| F Critical one-tail | | 0.511392 | |  | |  | F Critical one-tail | | | 0.372213 |  | |  |
| mean(1D) > mean(1B) AND F > Fcrit | | | | | | | mean(1D) > mean(1B) AND F > Fcrit | | | | | | |
| Therefore assume unequal variances | | | | | | | Therefore assume unequal variances | | | | | | |
|  | |  | |  | |  |  | | |  |  | |  |
| t-Test: Two-Sample Assuming Unequal Variances | | | | | | | t-Test: Two-Sample Assuming Unequal Variances | | | | | | |
|  | |  | |  | |  |  | | |  |  | |  |
|  | | *1D* | | *1B* | |  |  | | | *1D* | *1B* | |  |
| Mean | | -5.16426 | | -5.44815 | |  | Mean | | | -5.1838 | -5.4405 | |  |
| Variance | | 0.00676 | | 0.010461 | |  | Variance | | | 0.012093 | 0.010204 | |  |
| Observations | | 26 | | 26 | |  | Observations | | | 26 | 26 | |  |
| Hypothesized Mean Difference | | 0 | |  | |  | Hypothesized Mean Difference | | | 0 |  | |  |
| df | | 48 | |  | |  | df | | | 50 |  | |  |
| t Stat | | 11.031 | |  | |  | t Stat | | | 8.765695 |  | |  |
| P(T<=t) one-tail | | 4.63E-15 | |  | |  | P(T<=t) one-tail | | | 5.57E-12 |  | |  |
| t Critical one-tail | | 1.677224 | |  | |  | t Critical one-tail | | | 1.675905 |  | |  |
| P(T<=t) two-tail | | 9.25E-15 | |  | |  | P(T<=t) two-tail | | | 1.11E-11 |  | |  |
| t Critical two-tail | | 2.010635 | |  | |  | t Critical two-tail | | | 2.008559 |  | |  |
| abs(tStat) > abs(t critical two - tail) | | | | | | | abs(tStat) > abs(t critical two - tail) | | | | | | |
| Therefore reject the null hypothesis concluding 1C is a better algorithm | | | | | | | Therefore reject the null hypothesis concluding 1C is a better algorithm | | | | | | |

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| F-Test Two-Sample for Variances | | | | F-Test Two-Sample for Variances | | |
|  |  |  |  |  |  |  |
|  | *1D* | *1B* |  |  | *1D* | *1B* |
| Mean | -10.0079 | -10.802 |  | Mean | -10.009 | -10.7887 |
| Variance | 0.005882 | 0.00553 |  | Variance | 0.007234 | 0.004789 |
| Observations | 13 | 13 |  | Observations | 13 | 13 |
| df | 12 | 12 |  | df | 12 | 12 |
| F | 1.063568 |  |  | F | 1.51059 |  |
| P(F<=f) one-tail | 0.458371 |  |  | P(F<=f) one-tail | 0.242791 |  |
| F Critical one-tail | 2.686637 |  |  | F Critical one-tail | 2.686637 |  |
| mean(1D) > mean(1B) AND F < Fcrit | | | | mean(1D) > mean(1B) AND F < Fcrit | | |
| Therefore assume unequal variances | | | | Therefore assume unequal variances | | |
|  |  |  |  |  |  |  |
| t-Test: Two-Sample Assuming Unequal Variances | | | | t-Test: Two-Sample Assuming Unequal Variances | | |
|  |  |  |  |  |  |  |
|  | *1D* | *1B* |  |  | *1D* | *1B* |
| Mean | -10.0079 | -10.802 |  | Mean | -10.009 | -10.7887 |
| Variance | 0.005882 | 0.00553 |  | Variance | 0.007234 | 0.004789 |
| Observations | 13 | 13 |  | Observations | 13 | 13 |
| Hypothesized Mean Difference | 0 |  |  | Hypothesized Mean Difference | 0 |  |
| df | 24 |  |  | df | 23 |  |
| t Stat | 26.8034 |  |  | t Stat | 25.64065 |  |
| P(T<=t) one-tail | 1.07E-19 |  |  | P(T<=t) one-tail | 1.01E-18 |  |
| t Critical one-tail | 1.710882 |  |  | t Critical one-tail | 1.713872 |  |
| P(T<=t) two-tail | 2.13E-19 |  |  | P(T<=t) two-tail | 2.02E-18 |  |
| t Critical two-tail | 2.063899 |  |  | t Critical two-tail | 2.068658 |  |
| abs(tStat) > abs(t critical two - tail) | | | | abs(tStat) > abs(t critical two - tail) | | |
| Therefore reject the null hypothesis concluding 1C is a better algorithm | | | | Therefore reject the null hypothesis concluding 1C is a better algorithm | | |

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| F-Test Two-Sample for Variances(Local Average | | | | F-Test Two-Sample for Variances(Local Best) | |
|  |  |  |  |  |  |
|  | *1D* | *1C* |  |  | *1D* |
| Mean | -2.37996 | -0.72362573 |  | Mean | -2.3515 |
| Variance | 0.037093 | 0.062733806 |  | Variance | 0.13521 |
| Observations | 30 | 30 |  | Observations | 30 |
| df | 29 | 29 |  | df | 29 |
| F | 0.591282 |  |  | F | 2.1495 |
| P(F<=f) one-tail | 0.081533 |  |  | P(F<=f) one-tail | 0.02175 |
| F Critical one-tail | 0.5374 |  |  | F Critical one-tail | 1.86081 |
| mean(1D) < mean(1C) AND F > Fcrit | | |  | mean(1D) < mean(1C) AND F > Fcrit | |
| Therefore assume equal variances | | |  | Therefore assume equal variances | |
|  |  |  |  |  |  |
| t-Test: Two-Sample Assuming Equal Variances(Local Average) | | | | t-Test: Two-Sample Assuming Equal Variances(Local Best) | |
|  |  |  |  |  |  |
|  | *1D* | *1C* |  |  | *1D* |
| Mean | -2.37996 | -0.72362573 |  | Mean | -0.7225 |
| Variance | 0.037093 | 0.062733806 |  | Variance | 0.0629 |
| Observations | 30 | 30 |  | Observations | 30 |
| Pooled Variance | 0.049914 |  |  | Pooled Variance | 0.06282 |
| Hypothesized Mean Difference | 0 |  |  | Hypothesized Mean Difference | 0 |
| df | 58 |  |  | df | 58 |
| t Stat | -28.7134 |  |  | t Stat | 0.01687 |
| P(T<=t) one-tail | 2.79E-36 |  |  | P(T<=t) one-tail | 0.4933 |
| t Critical one-tail | 1.671553 |  |  | t Critical one-tail | 1.67155 |
| P(T<=t) two-tail | 5.58E-36 |  |  | P(T<=t) two-tail | 0.9866 |
| t Critical two-tail | 2.001717 |  |  | t Critical two-tail | 2.00172 |
| abs(tStat) > abs(t critical two - tail) | | |  | abs(tStat) < abs(t critical two - tail) | |
| Therefore reject the null hypothesis concluding 1C is a better algorithm | | | | Therefore accept the null hypothesis concluding 1D is a better algorithm | |

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|  | *1D* | *1C* |  |  |  | *1D* | *1C* |
| Mean | -4.15867 | -2.72442 |  |  | Mean | -4.1858 | -2.72065 |
| Variance | 0.018605 | 0.061492 |  |  | Variance | 0.032847 | 0.06142 |
| Observations | 30 | 30 |  |  | Observations | 30 | 30 |
| df | 29 | 29 |  |  | df | 29 | 29 |
| F | 0.302556 |  |  |  | F | 0.534788 |  |
| P(F<=f) one-tail | 0.000955 |  |  |  | P(F<=f) one-tail | 0.048703 |  |
| F Critical one-tail | 0.5374 |  |  |  | F Critical one-tail | 0.5374 |  |
| mean(1D) < mean(1C) AND F < Fcrit | | | |  | mean(1D) < mean(1C) AND F < Fcrit | | |
| Therefore assume unequal variances | | | |  | Therefore assume unequal variances | | |
|  |  |  |  |  |  |  |  |
| t-Test: Two-Sample Assuming Unequal Variances (Local Average) | | | | | t-Test: Two-Sample Assuming Unequal Variances(Local Best) | | |
|  |  |  |  |  |  |  |  |
|  | *1D* | *1C* |  |  |  | *1D* | *1C* |
| Mean | -4.15867 | -2.72442 |  |  | Mean | -4.1858 | -2.72065 |
| Variance | 0.018605 | 0.061492 |  |  | Variance | 0.032847 | 0.06142 |
| Observations | 30 | 30 |  |  | Observations | 30 | 30 |
| Hypothesized Mean Difference | 0 |  |  |  | Hypothesized Mean Difference | 0 |  |
| df | 45 |  |  |  | df | 53 |  |
| t Stat | -27.7574 |  |  |  | t Stat | -26.1376 |  |
| P(T<=t) one-tail | 2.98E-30 |  |  |  | P(T<=t) one-tail | 2.96E-32 |  |
| t Critical one-tail | 1.679427 |  |  |  | t Critical one-tail | 1.674116 |  |
| P(T<=t) two-tail | 5.96E-30 |  |  |  | P(T<=t) two-tail | 5.91E-32 |  |
| t Critical two-tail | 2.014103 |  |  |  | t Critical two-tail | 2.005746 |  |
| abs(tStat) > abs(t critical two - tail) | | | |  | abs(tStat) > abs(t critical two - tail) | | |
| Therefore reject the null hypothesis concluding 1C is a better algorithm | | | | | Therefore reject the null hypothesis concluding 1C is a better algorithm | |  |

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| F-Test Two-Sample for Variances (Local Average) | | | | | F-Test Two-Sample for Variances (Local Best) | | |
|  |  |  |  |  |  |  |  |
|  | *1D* | *1C* |  |  |  | *1D* | *1C* |
| Mean | -5.16426 | -4.41148 |  |  | Mean | -4.406590412 | -4.41148 |
| Variance | 0.00676 | 0.00216 |  |  | Variance | 0.002346827 | 0.00216 |
| Observations | 26 | 26 |  |  | Observations | 26 | 26 |
| df | 25 | 25 |  |  | df | 25 | 25 |
| F | 3.129208 |  |  |  | F | 1.086419886 |  |
| P(F<=f) one-tail | 0.002954 |  |  |  | P(F<=f) one-tail | 0.418735638 |  |
| F Critical one-tail | 1.955447 |  |  |  | F Critical one-tail | 1.955447207 |  |
| mean(1D) < mean(1C) AND f > Fcrit | | | |  | mean(1D) > mean(1C) AND F < Fcrit | | |
| Therefore assume equal variance | | | |  | Therefore assume equal variance | | |
|  |  |  |  |  |  |  |  |
| t-Test: Two-Sample Assuming Equal Variances (Local Average) | | | | | t-Test: Two-Sample Assuming Equal Variances (Local Best) | | |
|  |  |  |  |  |  |  |  |
|  | *1D* | *1C* |  |  |  | *1D* | *1C* |
| Mean | -5.16426 | -4.41148 |  |  | Mean | -5.183804489 | -4.40659 |
| Variance | 0.00676 | 0.00216 |  |  | Variance | 0.012093297 | 0.002347 |
| Observations | 26 | 26 |  |  | Observations | 26 | 26 |
| Pooled Variance | 0.00446 |  |  |  | Pooled Variance | 0.007220062 |  |
| Hypothesized Mean Difference | 0 |  |  |  | Hypothesized Mean Difference | 0 |  |
| df | 50 |  |  |  | df | 50 |  |
| t Stat | -40.6425 |  |  |  | t Stat | -32.97933255 |  |
| P(T<=t) one-tail | 2.86E-40 |  |  |  | P(T<=t) one-tail | 6.80446E-36 |  |
| t Critical one-tail | 1.675905 |  |  |  | t Critical one-tail | 1.675905026 |  |
| P(T<=t) two-tail | 5.73E-40 |  |  |  | P(T<=t) two-tail | 1.36089E-35 |  |
| t Critical two-tail | 2.008559 |  |  |  | t Critical two-tail | 2.008559072 |  |
| abs(tStat) > abs(t critical two - tail) | | | |  | abs(tStat) > abs(t critical two - tail) | | |
| Therefore reject the null hypothesis concluding 1C is a better algorithm | | | | | Therefore reject the null hypothesis concluding 1C is a better algorithm | | |

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| F-Test Two-Sample for Variances (Local Average) | | | F-Test Two-Sample for Variances(Local Best) | | |
|  | *1D* | *1C* |  | *1D* | *1C* |
| Mean | -10.00788256 | -9.38174 | Mean | -10.009 | -9.377153846 |
| Variance | 0.005881789 | 0.004782 | Variance | 0.007234 | 0.004552141 |
| Observations | 13 | 13 | Observations | 13 | 13 |
| df | 12 | 12 | df | 12 | 12 |
| F | 1.229957204 |  | F | 1.589064 |  |
| P(F<=f) one-tail | 0.362865495 |  | P(F<=f) one-tail | 0.217026 |  |
| F Critical one-tail | 2.686637113 |  | F Critical one-tail | 2.686637 |  |
| mean(1D) < mean(1C) AND F < Fcrit | | | mean(1D) < mean(1C) AND F < Fcrit | | |
| Therefore assume unequal variances | | | Therefore assume unequal variances | | |
|  |  |  |  |  |  |
| t-Test: Two-Sample Assuming Unequal Variances | | | t-Test: Two-Sample Assuming Unequal Variances(Local Best) | | |
|  |  |  |  |  |  |
|  | *1D* | *1C* |  | *1D* | *1C* |
| Mean | -10.00788256 | -10.802 | Mean | -10.004 | -9.377153846 |
| Variance | 0.005881789 | 0.00553 | Variance | 0.007542 | 0.004552141 |
| Observations | 13 | 13 | Observations | 12 | 13 |
| Hypothesized Mean Difference | 0 |  | Hypothesized Mean Difference | 0 |  |
| df | 24 |  | df | 21 |  |
| t Stat | 26.803395 |  | t Stat | -20.0384 |  |
| P(T<=t) one-tail | 1.06558E-19 |  | P(T<=t) one-tail | 1.8E-15 |  |
| t Critical one-tail | 1.710882067 |  | t Critical one-tail | 1.720743 |  |
| P(T<=t) two-tail | 2.13116E-19 |  | P(T<=t) two-tail | 3.61E-15 |  |
| t Critical two-tail | 2.063898547 |  | t Critical two-tail | 2.079614 |  |
| abs(tStat) > abs(t critical two - tail) | |  | abs(tStat) > abs(t critical two - tail) | | |
| Therefore reject the null hypothesis concluding 1C is a better algorithm | | | Therefore reject the null hypothesis concluding 1C is a better algorithm | | |