# Sec.11-1 (p.599)

|  |
| --- |
| 6. A medical researcher wishes to see if hospital patients in a large hospital have the same blood type distribution as those in the general population. The distribution for the general population is as follows: type A, 20%; type B, 28%; type O, 36%; and type AB = 16%. He selects a random sample of 50 patients and finds the following: 12 have type A blood, 8 have type B, 24 have type O, and 6 have type AB blood. At α = 0.10, can it be concluded that the distribution is the same as that of the general population? |

medical researcher 醫學研究人員; hospital patients 住院患者; general population 普通人群;

1. 假設

The distribution of the blood type of the patients were as follow:

20% were type A, 28% were type B, 36% were type O, and 16% were type AB (claim)

The distribution is not the same as stated in the null hypothesis

1. 拒絕域
2. 檢定統計量

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **A** | **B** | **O** | **AB** |
| **Observed** | 12 | 8 | 24 | 6 |
| **Expected** |  |  |  |  |

1. 決策

不拒絕

1. 結論

There is not enough evidence to reject the claim at α = 0.10.

給定顯著水準為0.10下，我們沒有足夠的證據拒絕宣稱

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 10. In a recent year, the most popular colors for light trucks were white, 31%; black, 19%; silver 11%; red 11%; gray 10%; blue 8%; and other 10%. A survey of randomly selected light truck owners in a particular area revealed the following. At α = 0.05, do the proportions differ from those stated?   |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | | **White** | **Black** | **Sliver** | **Red** | **Gray** | **Blue** | **Other** | | 45 | 32 | 30 | 30 | 22 | 15 | 6 | |

light trucks 輕型卡車;

1. 假設

The proportions of the most popular colors for light trucks is as follow:

31% were white, 19% were black, 11% were silver, 11% were red, 10% were gray, 8% were blue, and 10% were other

The proportions is not the same as stated in the null hypothesis (claim)

1. 拒絕域
2. 檢定統計量

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Category** | **White** | **Black** | **Sliver** | **Red** | **Gray** | **Blue** | **Other** |
| **Observed** | 45 | 32 | 30 | 30 | 22 | 15 | 6 |
| **Expected** | 55.8 | 34.2 | 19.8 | 19.8 | 18 | 14.4 | 18 |

1. 決策

拒絕

1. 結論

There is enough evidence to support the claim at α = 0.05.

給定顯著水準為0.05下，我們有足夠的證據支持宣稱

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 16. In a recent year U.S. retail automobile sales were categorized as listed below.   |  |  |  |  | | --- | --- | --- | --- | | luxury 16.0% | large 4.6% | midsize 39.8% | small 39.6% |   A random sample of 150 recent purchases indicated the following results: 25 were luxury models, 12 were large cars, 60 were midsize, and 53 were small. At the 0.10 level of significance, is there sufficient evidence to conclude that the proportions of each type of car purchased differed from the report? |

automobile汽車;

1. 假設

The proportions of each type of car purchased is as follow:

16.0% were luxury, 4.6% were large, 39.8% were midsize, and 39.6% were small

The proportions is not the same as stated in the null hypothesis (claim)

1. 拒絕域
2. 檢定統計量

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category** | **luxury** | **large** | **midsize** | **small** |
| **Observed** | 25 | 12 | 60 | 53 |
| **Expected** | 24 | 6.9 | 59.7 | 59.4 |

1. 決策

不拒絕

1. 結論

There is not enough evidence to support the claim at α = 0.1.

給定顯著水準為0.1下，我們沒有足夠的證據支持宣稱

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 18. A researcher wishes to see if the number of randomly selected adults who do not have health insurance is equally distributed among three categories (less than 12 years of education, 12 years of education, more than 12 years of education). A sample of 60 adults who do not have health insurance is selected, and the results are shown. At α = 0.05, can it be concluded that the frequencies are not equal ? Use the P-value method. If the null hypothesis is rejected, give a possible reason for this.   |  |  |  |  | | --- | --- | --- | --- | | **Category** | < 12 years | 12 years | > 12 years | | **Frequency** | 29 | 20 | 11 | |

insurance保險;

1. 假設

The number of randomly selected adults who do not have health insurance is equally distributed over

the three education level

The number of randomly selected adults who do not have health insurance is not equally distributed

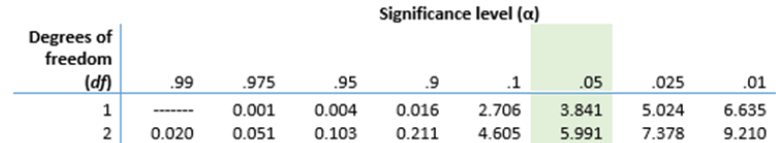
over the three education level. (claim)

1. 檢定統計量

equally distributed

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **< 12 years** | **12 years** | **> 12 years** |
| **Observed** | 29 | 20 | 11 |
| **Expected** | 20 | 20 | 20 |

1. p-value



1. 決策

拒絕

1. 結論

There is enough evidence to support the claim at α = 0.05.

給定顯著水準為0.05下，我們有足夠的證據支持宣稱

# Sec. 11-2 (p.613)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8. Are movie admissions related to ethnicity? A 2014 study indicated the following numbers of admissions (in thousands) for two different years. At the 0.05 level of significance, can it be concluded that movie attendance by year was dependent upon ethnicity?   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | **Caucasian** | **Hispanic** | **African American** | **Other** | | **2013** | 724 | 335 | 174 | 107 | | **2014** | 370 | 292 | 152 | 140 | |

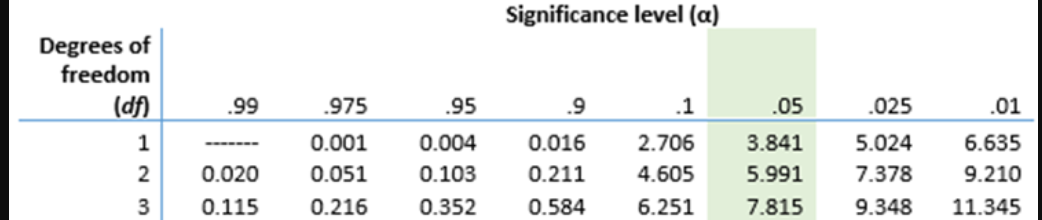
movie admissions 電影入場; ethnicity 種族

1. 假設

The movie attendance by year was independent upon ethnicity.

The movie attendance by year was dependent upon ethnicity. (claim)

1. 拒絕域



1. 檢定統計量

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Observed** | **Caucasian** | **Hispanic** | **African American** | **Other** | **Total** |
| **2013** | 724 | 335 | 174 | 107 | 1340 |
| **2014** | 370 | 292 | 152 | 140 | 954 |
| **Total** | 1094 | 627 | 326 | 247 | 2294 |

, etc.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Expected** | **Caucasian** | **Hispanic** | **African American** | **Other** |
| **2013** | 639.041 | 366.251 | 190.427 | 144.281 |
| **2014** | 454.959 | 260.749 | 135.573 | 102.719 |

1. 決策

拒絕

1. 結論

There is enough evidence to support the claim at α = 0.05.

給定顯著水準為0.05下，我們有足夠的證據支持宣稱

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16. Listed is information regarding organ transplantation for three different years. Based on these data, is there sufficient evidence at α = 0.01 to conclude that a relationship exists between year and type of transplant?   |  |  |  |  | | --- | --- | --- | --- | | **Year** | **Heart** | **Kidney** | **Lung** | | **2003** | 2056 | 870 | 1085 | | **2004** | 2016 | 880 | 1173 | | **2005** | 2127 | 903 | 1408 | |

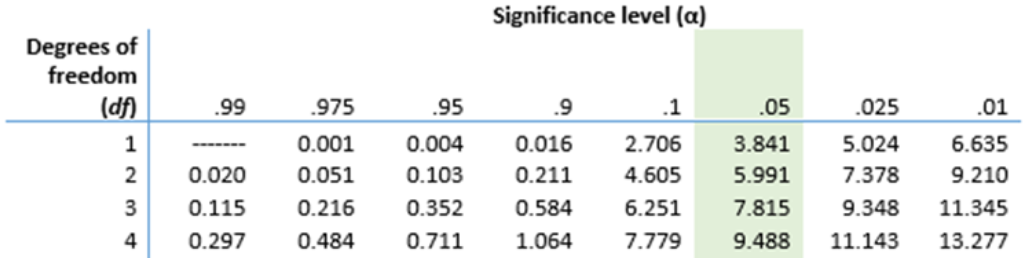
organ transplantation 器官移植;

1. 假設

The type of transplant is independent of the year in which the transplant was received.

The type of transplant is dependent of the year in which the transplant was received. (claim)

1. 拒絕域



1. 檢定統計量

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Observed** | **Heart** | **Kidney** | **Lung** | **Total** |
| **2003** | 2056 | 870 | 1085 | 4011 |
| **2004** | 2016 | 880 | 1173 | 4069 |
| **2005** | 2127 | 903 | 1408 | 4438 |
| **Total** | 6199 | 2653 | 3666 | 12518 |

|  |  |  |  |
| --- | --- | --- | --- |
| **Expected** | **Heart** | **Kidney** | **Lung** |
| **2003** | 1986.275 | 850.071 | 1174.655 |
| **2004** | 2014.997 | 862.363 | 1191.640 |
| **2005** | 2197.728 | 940.567 | 1299.705 |

1. 決策

拒絕

1. 結論

There is enough evidence to support the claim at α = 0.01.

給定顯著水準為0.01下，我們有足夠的證據支持宣稱

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20. . To test the effectiveness of a new drug, a researcher gives one group of randomly selected individuals the new drug and another group of randomly selected individuals a placebo. The results of the study are shown here. At α = 0.10, can the researcher conclude that the drug results differ from those of the placebo? Use the P-value method.   |  |  |  | | --- | --- | --- | | **Medication** | **Effective** | **Not effective** | | **Drug** | 32 | 9 | | **Placebo** | 12 | 18 | |

1. 假設

The drug results is independent of medication.

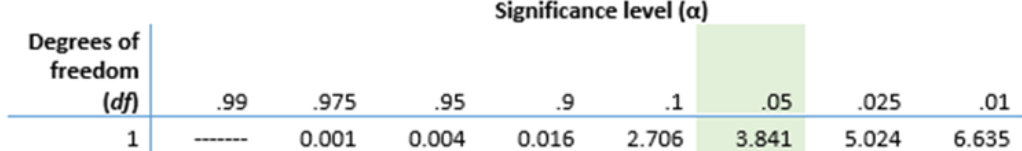
The drug results is dependent of medication. (claim)

1. 檢定統計量

|  |  |  |  |
| --- | --- | --- | --- |
| **Observed** | **Effective** | **Not effective** | **Total** |
| **Drug** | 32 | 9 | 41 |
| **Placebo** | 12 | 18 | 30 |
| **Total** | 44 | 27 | 71 |

|  |  |  |
| --- | --- | --- |
| **Expected** | **Heart** | **Lung** |
| **2003** | 25.408 | 15.592 |
| **2005** | 18.592 | 11.408 |

1. p-value



1. 決策

拒絕

1. 結論

There is enough evidence to support the claim at α = 0.1.

給定顯著水準為0.1下，我們有足夠的證據支持宣稱

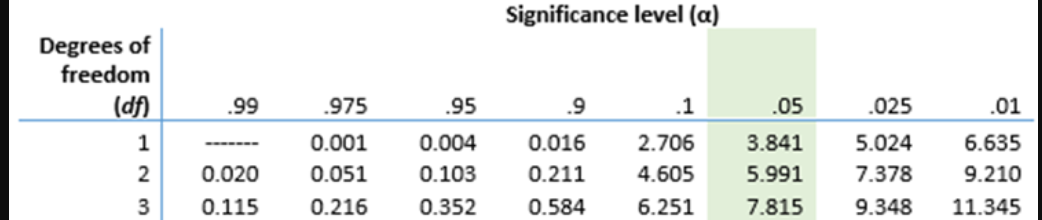
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 28. On average, 79% of American fathers are in the delivery room when their children are born. A physician's assistant surveyed 300 randomly selected first-time fathers to determine if they had been in the delivery room when their children were born. The results are shown here. At α = 0.05, is there enough evidence to reject the claim that the proportions of those who were in the delivery room at the time of birth are the same?   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | **Hospital A** | **Hospital B** | **Hospital C** | **Hospital D** | | **Present** | 66 | 60 | 57 | 56 | | **Not present** | 9 | 15 | 18 | 19 | | **Total** | 75 | 75 | 75 | 75 | |

delivery room 產房; physician's assistant 醫師助理;

1. 假設

At least one proportion is different

1. 拒絕域



1. 檢定統計量

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Observed** | **Hospital A** | **Hospital B** | **Hospital C** | **Hospital D** | **Total** |
| **Present** | 66 | 60 | 57 | 56 | 239 |
| **Not present** | 9 | 15 | 18 | 19 | 61 |
| **Total** | 75 | 75 | 75 | 75 | 300 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Expected** | **Hospital A** | **Hospital B** | **Hospital C** | **Hospital D** |
| **2003** | 59.75 | 59.75 | 59.75 | 59.75 |
| **2005** | 15.250 | 15.250 | 15.250 | 15.250 |

1. 決策

不拒絕

1. 結論

There is not enough evidence to reject the claim at α = 0.05.

給定顯著水準為0.05下，我們沒有足夠的證據拒絕宣稱

# Sec. 11-3 (p.627)

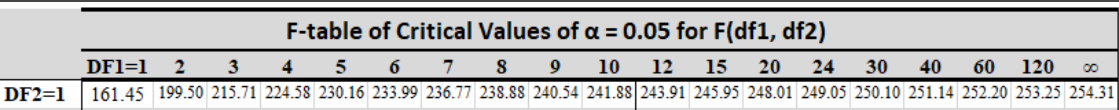
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 8. The amount of sodium (in milligrams) in one serving for a random sample of three different kinds of foods is listed. At the 0.05 level of significance, is there sufficient evidence to conclude that a difference in mean sodium amounts exists among condiments, cereals, and desseets.   |  |  |  | | --- | --- | --- | | **Condiments** | **Cereals** | **Desserts** | | 270 | 260 | 100 | | 130 | 220 | 180 | | 230 | 290 | 250 | | 180 | 290 | 250 | | 80 | 200 | 300 | | 70 | 320 | 360 | | 200 | 140 | 300 | |  |  | 160 | |

sodium鈉; condiments 調味品; cereals 穀物;

1. 假設

At least one mean is different. (claim)

1. 拒絕域



1. 檢定統計量
2. 計算每組的樣本平均()和變異數()

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Condiments** | **Cereals** | **Desserts** |
| Mean | 165.714 | 245.714 | 237.5 |
| Var | 5695.238 | 3928.571 | 7335.714 |

1. 計算總平均
2. 計算組間變異
3. 計算組內變異
4. 計算檢定統計量
5. 決策

不拒絕

1. 結論

There is not enough evidence to support the claim at α = 0.05.

給定顯著水準為0.05下，我們沒有足夠的證據支持宣稱

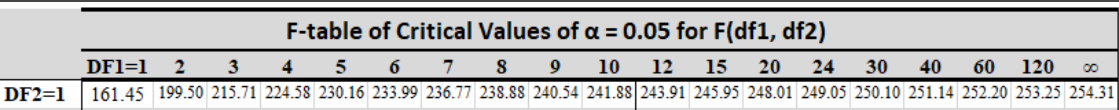
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 11. The data shown are the weekly admissions (入場人數), in millions, of people attending movie theaters over three different time periods. At α = 0.05 , is there a difference in the means for the weekly attendance for these time periods?   |  |  |  | | --- | --- | --- | | **1950-1974** | **1975-1990** | **1991-2000** | | 58.0 | 17.1 | 23.3 | | 39.0 | 19.9 | 26.6 | | 25.1 | 19.6 | 27.7 | | 19.8 | 20.3 | 26.5 | | 17.7 | 22.9 | 25.8 | |

admissions 入場人數;

1. 假設

At least one mean is different. (claim)

1. 拒絕域



1. 檢定統計量
2. 計算每組的樣本平均()和變異數()

|  |  |  |  |
| --- | --- | --- | --- |
|  | **1950-1974** | **1975-1990** | **1991-2000** |
| Mean | 31.92 | 19.96 | 25.98 |
| Var | 281.477 | 4.268 | 2.707 |

1. 計算總平均
2. 計算組間變異
3. 計算組內變異
4. 計算檢定統計量
5. 決策

不拒絕

1. 結論

There is not enough evidence to support the claim at α = 0.05.

給定顯著水準為0.05下，我們沒有足夠的證據支持宣稱

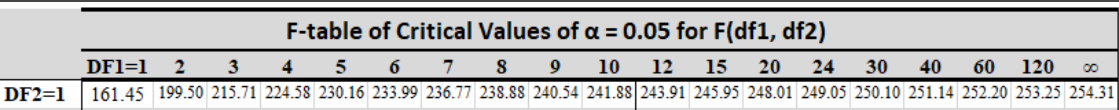
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 16. Annual child care costs for infants are considerably higher than for older children. At α = 0.05, can you conclude a difference in mean infant day care costs for different regions of the United States? (Annual costs per infant are given in dollars.)   |  |  |  | | --- | --- | --- | | **New England** | **Midwest** | **Southwest** | | 10390 | 9449 | 7644 | | 7592 | 6985 | 9691 | | 8755 | 6677 | 5996 | | 9464 | 5400 | 5386 | | 7328 | 8372 |  | |

child care costs 托兒費用; infants 嬰幼兒;

1. 假設

At least one mean is different. (claim)

1. 拒絕域



1. 檢定統計量
2. 計算每組的樣本平均()和變異數()

|  |  |  |  |
| --- | --- | --- | --- |
|  | **New England** | **Midwest** | **Southwest** |
| Mean | 8705.8 | 7376.6 | 7179.25 |
| Var | 1638175.2 | 2458850.3 | 3713568.917 |

1. 計算總平均
2. 計算組間變異
3. 計算組內變異
4. 計算檢定統計量
5. 決策

不拒絕

1. 結論

There is not enough evidence to support the claim at α = 0.05.

給定顯著水準為0.05下，我們沒有足夠的證據支持宣稱

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 17. A research organization tested microwave ovens. At α = 0.10, is there a significant difference in the average prices of the three types of oven? A computer printout for this exercise is shown. Use the P-value method and the information in this printout to test the claim.   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Watts | | | | | | | 1000 | | 900 | | 800 | | | 270 | | 240 | | 180 | | | 245 | | 135 | | 155 | | | 190 | | 160 | | 200 | | | 215 | | 230 | | 120 | | | 250 | | 250 | | 140 | | | 230 | | 200 | | 180 | | |  | | 200 | | 140 | | |  | | 210 | | 130 | | | **ANOVA SOURCE TABLE** | | | | | | | **Source** | **df** | **SS** | **MS** | **F** | **p-value** | | **Between group** | 2 | 21729.735 | 10864.867 | 10.118 | 0.00102 | | **Within group** | 19 | 20402.083 | 1073.794 |  |  | | **Total** | 21 | 42131.818 |  |  |  | | **DESCRIPTIVE STATISTICS** | | | | | | | **Condit** | **N** | **Means** | **St Dev** |  |  | | **1000** | 6 | 233.333 | 28.23 |  |  | | **900** | 8 | 203.125 | 39.36 |  |  | | **800** | 8 | 155.625 | 28.21 |  |  | |

1. 假設

At least one mean is different. (claim)

1. 檢定統計量
2. p-value
3. 決策

拒絕

1. 結論

There is enough evidence to support the claim at α = 0.1.

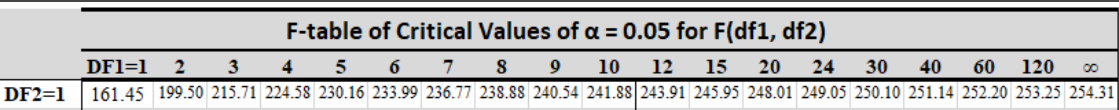
給定顯著水準為0.1下，我們有足夠的證據支持宣稱

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 20. Kiplinger's listed the top 100 public colleges based on many factors. From that list, here is the average debt at graduation for various schools in four selected states. At α = 0.05, can it be concluded that the average debt at graduation differs for these four states?   |  |  |  |  | | --- | --- | --- | --- | | **New York** | **Virginia** | **California** | **Pennsylvania** | | 14734 | 14254 | 13171 | 18105 | | 16000 | 15176 | 14431 | 17051 | | 14347 | 12665 | 14689 | 16103 | | 14392 | 12591 | 13788 | 22400 | | 12500 | 18385 | 15297 | 17976 | |

1. 假設

At least one mean is different. (claim)

1. 拒絕域



1. 檢定統計量
2. 計算每組的樣本平均()和變異數()

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **New York** | **Virginia** | **California** | **Pennsylvania** |
| Mean | 14394.6 | 14614.2 | 14275.2 | 18327 |
| Var | 1571070.8 | 5639253.7 | 674050.2 | 5834041.5 |

1. 計算總平均
2. 計算組間變異
3. 計算組內變異
4. 計算檢定統計量
5. 決策

拒絕

1. 結論

There is enough evidence to support the claim at α = 0.05.

給定顯著水準為0.05下，我們有足夠的證據支持宣稱