Course name Submitted to: Submitted by: Date:

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#### Task 1

look at 4 sets of relationships and the correlations between the relationships.

1) Create a scatterplot for each set of relationships.



Scatter plot of Percentage Democrats by Percentage with college degree

Figure 1. Scatter plot of Percentage democrats by Percentage with college degree



Figure 2. Scatter plot of Per Capita income by Percentage with a college degree



Figure 3. Scatter plot of Percentage Hispanic by Percentage with college degree



Figure 4. Scatter plot of Percentage Hispanic by Percentage Democrat



Figure 5. Scatter plot of Per Capita income by Percentage Democrat



Figure 6. Scatter plot of Per Capita income by Percentage Hispanic

# 2) Discuss the correlation for these variables and hypothesize what this correlation value tells you about the relationship between these variables.

Table 1. Pearson Correlations between Percentage with College Degree, Percentage Democrat,						
Percentage Hispanic, a	Percentage Hispanic, and Per Capita Income					
Percentage with College DegreePercentage DemocratPercentage HispanicPer Capita Income						
Percentage with College Degree	1					

Percentage Democrat	0.553	1		
Percentage Hispanic	0.136	0.330	1	
Per Capita Income	0.807	0.519	0.119	1

The correlation matrix showcases several notable associations between the variables. The strongest positive correlation observed is between Per Capita Income and Percentage with College Degree (r = 0.807), indicating a robust relationship where higher income tends to be linked with a greater percentage of the population holding a college degree. Additionally, moderate positive correlations exist between the Percentage of Democrat and both Per Capita Income (r = 0.519) and Percentage with College Degree (r = 0.553), implying a tendency for areas with higher Democratic representation to have higher income and educational attainment. Conversely, the Percentage of Hispanic displays relatively weaker correlations with other variables, suggesting a less pronounced relationship with income, education, and political representation in the dataset. These correlation values imply a connection between socioeconomic factors, political affiliation, and educational attainment, suggesting that higher-income areas tend to have a greater percentage of college-educated individuals and, to some extent, a higher representation of Democrats. In contrast, the association with the Hispanic population percentage is comparatively weaker.

**3)** For one value (raw score) in each variable, calculate the Z score and discuss what this Z score tells you.

Table 2. Descriptive Statistics						
	Ν	Minimum	Maximum	Mean	Std. Deviation	
Percent with a college	50	19.60	41.50	29.8060	5.05312	
degree	DISSE	RTATIO	HELP	10		
Percentage Hispanic	50	1.40	48.00	11.5400	10.28079	
Per Capita income	50	24650	45398	31951.10	4448.654	
Percentage Democrat	49	13.30	93.40	42.5939	18.18123	
Valid N (listwise)	49					

#### **Z-scores Interpretation:**

#### 1. Percentage with College Degree (Raw Score: 24.20, Z-score: -1.10941)

The Z-score of -1.10941 for a raw score of 24.20 in Percentage with College Degree suggests that this observation is approximately 1.11 standard deviations below the mean of college degree percentages across the dataset. This implies that the area represented by this observation has a lower percentage of individuals with a college degree than the dataset's average.

#### 2. Percentage Hispanic (Raw Score: 4.00, Z-score: -0.73341)

The Z-score of -0.73341 for a raw score of 4.00 in the Percentage Hispanic indicates that this value is approximately 0.73 standard deviations below the mean Percentage of Hispanic population. This suggests a lower Hispanic population percentage than the dataset's average in this area.

#### 3. Per Capita Income (Raw Score: 27,795, Z-score: -0.93424)

For the raw income score of 27,795, the Z-score of -0.93424 signifies that this value is around 0.93 standard deviations below the mean of per capita income in the dataset. It suggests that the income level in this area or region is relatively lower than the dataset's average income.

# 4. Percentage Democrat (Raw Score: 29.30, Z-score: -0.73119)

With a Z-score of -0.73119 for a raw score of 29.30 in Percentage Democrat, this observation falls around 0.73 standard deviations below the mean of Democrat percentages. It suggests that the representation of Democrats in this area might be slightly lower than the dataset's average.

#### Task 2 Linear Regression

1) Explore the relationship between variables utilizing 4 bivariate linear regressions. Make sure to utilize a scatter plot. Also, include and discuss the equations for each of them.



Figure 7. Scatter plot of Per Capita income by Percentage of College degree

#### **Discussion:**

The regression equation  $(y = 1.08E^4 + 7.12E^2x)$  indicates that for every one percent increase in the population with a college degree or higher, the per capita income is predicted to

increase by 710, given that the intercept (the predicted per capita income when the Percentage of college-educated population is 0%) is \$10,800. The R<sup>2</sup> value of 0.650 suggests that approximately 65% of the variability in per capita income can be explained by the Percentage of the population with a college degree or higher.



Figure 8. Scatter plot of Per Capita income by Percentage Democrats

#### **Discussion:**

The regression equation  $(y = 2.65E^4 + 1.28E^2x)$  suggests that for each one percent increase in the Percentage of Democrats, there is an associated increase of \$128 per capita income, starting from a base of \$26,500 when there are no Democrats. The R<sup>2</sup> value of 0.270 indicates that only 27% of the variance in per capita income is explained by the Percentage of Democrats, which suggests a relatively weak correlation.



Figure 9. Scatter plot of Per Capita income by Percentage Hispanic

#### **Discussion:**

The regression equation ( $y = 3.14E^4 + 51.6 x$ ) implies that per capita income increases by \$51.60 for each one percent increase in the Hispanic population, starting from a baseline of \$31,400. However, with an R<sup>2</sup> value of 0.014, this model suggests that the Percentage of the Hispanic population has a very weak explanatory power for changes in per capita income, accounting for only 1.4% of the variation.



Figure 10. Scatter plot of percentage democrat by Percentage with college degree

# **Discussion:**

The regression equation (y = -16.08 + 1.97x) indicates that for each one percent increase in the population with a college degree, there is an associated 1.97 percent increase in the Percentage of Democrats. The R<sup>2</sup> value of 0.306 suggests that the model explains 30.6% of the variability in the Percentage of Democrats based on the Percentage of the population with a college degree, indicating a moderate positive correlation.

2) Make sure to discuss the following for each of your relationships

a) Descriptives

b) Theory (one or two sentences regarding why you think they are related and the expected direction)

c) Correlations

d) What do the results mean for each of the relationships

e) For the descriptives, correlations, and linear regression, make your charts as provided in the templates

# 1. DV: Per Capita Income, IV: Percentage with College Degree

Table 3. Descriptive Statistics					
	Mean	Std. Deviation	Ν		
Per Capita Income	31951.10	4448.654	50		
Percentage with College Degree	29.8060	5.05312	50		

**Theory:** The theory behind the relationship between Per Capita Income and the Percentage of College Degree is often based on the concept of education's impact on economic prosperity. Higher educational attainment, represented by a higher Percentage with a College Degree, is generally associated with increased skills and knowledge, potentially leading to better job opportunities and higher incomes. Therefore, it's expected that there might be a positive association, indicating that regions or areas with a greater Percentage with College Degree may tend to have higher Per Capita Income levels.

Table 4. Pearson Correlations between Per Capita Income and Percentage with College Degree				
Percentage with College Degree Per Capita Income				
Percentage with College Degree	1			
Per Capita Income 0.807 1				

Table 5: Bivariate Linear Regression Analysis of Per Capita Income		
Percentage with College Degree	710.03***	

	(75.12)		
Constant	10787.89		
	(2270.56)		
Ν	50		
F-Test	89.32***		
***p<0.001, **p< 0.01, *p<0.05, †p<0.10			
Standard Errors in parentheses.			

#### **Results Interpretation:**

The bivariate linear regression analysis between Per Capita Income and Percentage with College Degree revealed a statistically significant relationship (F (1, 48) = 89.32, p < 0.001). The Percentage with a College Degree significantly predicted Per Capita Income ( $\beta$  = 710.03, SE = 75.12, p < 0.001), indicating that for every one-unit increase in the Percentage with a College Degree, Per Capita Income increased by an estimated 710.03 units. This suggests a strong positive linear relationship between these variables, implying that regions with a higher percentage of residents holding college degrees tend to exhibit higher Per Capita Income levels.

# 2. DV: Per Capita Income, IV: Percentage Democrat

	Villenment Annual					
Table 6. Descriptive Statistics						
	Mean	Std. Deviation	Ν			
Per Capita Income	31963.59	4493.869	49			
Percentage Democrats	42.5939	18.18123	49			

**Theory:** The relationship between Per Capita Income and the Percentage of state legislators who are Democrats might suggest a theoretical connection through the political landscape's influence on economic policies. Higher representation of Democratic legislators might imply a focus on policies favoring income equality, social welfare, and public investment, potentially contributing to economic growth and higher Per Capita Income in regions with a higher proportion of Democratic legislators.

Table 7. Pearson Correlations between Per Capita Income and Percentage Democrats				
Percentage Democrats Per Capita Income				
Percentage Democrats	1			
Per Capita Income 0.519 1				

Table 8: Bivariate Linear Regression Analysis of Per Capita Income

Percentage Democrats	128.33***		
	(30.81)		
Constant	26497.30		
	(1424.76)		
Ν	49		
F-Test	17.34***		
***p<0.001, **p< 0.01, *p<0.05, †p<0.10			
Standard Errors in parentheses.			

# **Results Interpretation:**

The bivariate linear regression analysis demonstrated a statistically significant relationship between Per Capita Income and the Percentage of Democrats (F (1, 47) = 17.34, p < 0.001). Percentage of Democrats significantly predicted Per Capita Income ( $\beta$  = 128.33, SE = 30.81, p < 0.001), indicating that for every one-unit increase in the Percentage of Democrats, Per Capita Income increased by an estimated 128.33 units. This suggests a positive linear association, implying that regions with a higher percentage of Democratic representation among state legislators tend to exhibit higher Per Capita Income levels.

# 3. DV: Per Capita Income, IV: Percentage Hispanic

Table 9. Descriptive Statistics					
	Mean	Std. Deviation	Ν		
Per Capita Income	31951.10 A	4448.654	50		
Percentage Hispanic	11.5400	10.28079	50		

**Theory:** The relationship between Per Capita Income and the Percentage of Hispanics might reflect a theoretical association based on socioeconomic factors. A higher percentage of Hispanic areas may indicate diverse communities with varying income levels. A larger Hispanic population might imply certain sectors or regions with lower average income due to potential socioeconomic disparities, thus suggesting a possible negative association between the Percentage of Hispanic and Per Capita Income.

Table 10. Pearson Correlations between Per Capita Income and Percentage Democrats		
Percentage Hispanic Per Capita Inco		Per Capita Income
Percentage Hispanic	1	
Per Capita Income	0.119	1

Table 11: Bivariate Linear Regression Analysis of Per Capita Income		
Percentage Hispanic	51.60	
	(62.01)	
Constant	31355.60	
	(954.15)	
N	50	
F-Test	0.692	
***p<0.001, **p<0.01, *p<0.05, †p<0.10		
Standard Errors in parentheses.		

# **Results Interpretation:**

The bivariate linear regression analysis between Per Capita Income and Percentage of Hispanics did not yield a statistically significant relationship (F (1, 48) = 0.692, p > 0.05). The Percentage Hispanic variable did not significantly predict Per Capita Income ( $\beta$  = 51.60, SE = 62.01, p > 0.05), suggesting that changes in Percentage Hispanic are not reliably associated with changes in Per Capita Income. This lack of statistical significance implies that there might not be a substantial linear relationship between the Percentage of the Hispanic population and Per Capita Income levels in this dataset.

Table 12. Descriptive Statistics			
KINZ	Mean	Std. Deviation	Ν
Percentage Democrat	42.5939	18.18123	49
Percentage with College Degree	29.7980	5.10516	49

**Theory:** The relationship between the Percentage of state legislators who are Democrats and the Percentage with College Degree might indicate an association between educational attainment and political representation. Regions with a higher Percentage of College Degree could potentially foster a populace inclined towards supporting Democratic candidates, as higher education levels often align with progressive ideologies, thereby suggesting a positive correlation between these variables.

Table 13. Pearson Correlations between Percentage Democrat and Percentage with College		
Degree		
	Percentage Democrat	Percentage with College Degree

	Percentage Democrat	Percentage with College Degree
Percentage Democrat	1	

Percentage with College Degree 0.553 1
----------------------------------------

Table 14: Bivariate Linear Regression Analysis of Percentage Democrat		
Percentage with College Degree	1.96***	
	(0.43)	
Constant	-16.08	
	(13.08)	
N	49	
F-Test	20.69***	
***p<0.001, **p< 0.01, *p<0.05, †p<0.10		
Standard Errors in parentheses.		

**Results Interpretation:** The bivariate linear regression analysis exhibited a statistically significant relationship between the Percentage of Democrat and the Percentage with College Degree (F (1, 47) = 20.69, p < 0.001). Percentage with a College Degree significantly predicted the Percentage Democrat ( $\beta$  = 1.96, SE = 0.43, p < 0.001), indicating that for every one-unit increase in Percentage with a College Degree, the Percentage Democrat increased by an estimated 1.96 units. This suggests a positive linear relationship, implying that regions with a higher percentage of residents holding college degrees tend to exhibit a higher percentage of Democratic representation among state legislators.

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