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Rocky Mountain Mapping Center

InstantWorld: Locating an Internet Café in Houston, Texas

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Your Name: _____

Date: _____

Summary: In this lesson, you will use demographic data, roadways, and proximity to schools and universities to locate three Internet Cafes in Houston, Texas.

GIS Skills Involved:

1) Downloading, formatting, and understanding Census TIGER / demographic data.
2) Creating and plotting map layouts.
3) Tabular and spatial sort and query.
4) Joining tables.
5) Geocoding addresses.
6) Solving multiple problems using GIS and spatial analysis.
7) Digitizing Features.
8) Overlay.

This lesson uses ArcView 3.x GIS software from ESRI, Inc., but the spatial concepts can be translated to other GIS packages.

Acquiring and Managing Data

Create a folder on your computer where you will store the data named harriscounty. Make sure this folder does not contain any spaces.
In this lesson, you will download all of the data from the Internet.

Note: You will be downloading just over 9 MB of data. If your instructor has already downloaded the data for you, proceed to question 1 below.

Go to the following web site:

http://www.esri.com/data/download/census2000_tigerline/index.html
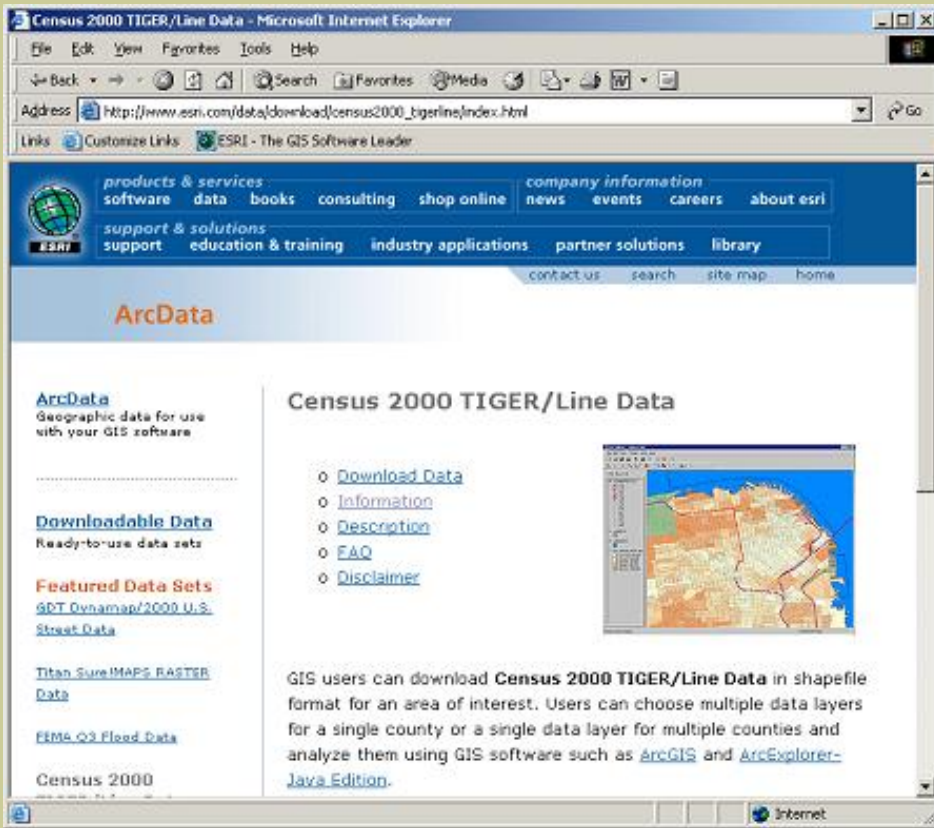
Click on "Download Data" and on the next screen, select Texas on the map or via the list.

On the next screen, select Harris County and press "Submit."   Do not select any layers yet.

On the next screen, click the following 3 boxes, and then press "proceed to download" at the bottom of the list:

Block Groups – 2000
Line Features - Hydrography
Line Features – Roads
Census Block Group Demographics (Under "statewide layers").

Select "Proceed to Download." Next, you will receive a notice that your data file is ready, as follows:

Click **Download File** to retrieve your data to the folder you created at the beginning of this lesson.

Unzip the file with Winzip. Note that there will be three files that are zipped underneath this zip file. In other words, the file you downloaded is a zip containing 4 zipped files and a readme file. These are named:

grp0048201.zip
lkA48201.zip
lkH48201.zip
sf1grp48000.zip
readme.html

Be sure to Unzip each of the files and extract. When you are finished, you should have 11 new files:

tgr48000sf1grp.dbf
tgr48201grp00.dbf
tgr48201grp00.shp
tgr48201grp00.shx
tgr48201lkA.dbf
tgr48201lkA.shp
tgr48201lkA.shx
tgr48201lkH.dbf
tgr48201lkH.shp
tgr48201lkH.shx
readme.html

The Federal Information Processing Standard (FIPS) code for Texas is 48.

1) What do you surmise the FIPS code for Harris county to be?

Read the table that is in the file called readme.html to answer the following questions:

2) In which file are the spatial coordinates for the roads?

The U.S. Census Bureau collects data for statistical areas and political areas. Political areas include Indian Reservations, cities, counties, and states. Statistical areas include Census Tracts, Block Groups, and Blocks. Blocks in a city or town are usually the same as a typical city block, bounded on all sides by streets. Blocks in a rural area may be much larger in area, and may be bounded by roads, streams, or a railroad. Groups of blocks are called Block Groups. Groups of Block Groups are called Census Tracts. Census Tracts nest within counties.

Block groups are analogous to neighborhoods; they are the smallest statistical area for which the more detailed Census data is available. You have just downloaded the Block Groups for Harris County.

3) In which file are the block group boundaries?

4) In which file is the Census data for the Block Groups?

5) In what year was the data collected?

Start ArcView with new project and new view.

Add all of the themes you downloaded above to your view:
Hydrography
Roads
Block Group boundaries

Name your view "Harris County" under View--> Properties.

Under the same menu, set your display units to kilometers.

Save your project ▣ and name it harriscounty.apr (without any spaces), placing it into the same folder as where you stored your data.

Your data sets are now ready to analyze.

Use Theme--> Properties to change the name of your tgr48201lka.shp file to Streets.
Use Theme--> Properties to change the name of your tgr48201lkh.shp file to Hydrography.
6) Make two observations about the pattern of streams in Harris County.

7) What general direction do the rivers flow in Harris County? Why?

Zoom in on downtown Houston and use Theme--> AutoLabel to label the streams (on the field fename).

8) What is the name of the main stream that flows through downtown Houston?

Use Theme--> Remove Labels.

9) Make two observations about the street pattern in Harris County in relationship to downtown. Discuss the effect that downtown has on the layout of the streets.

10) Using the interactive label tool, , what is the name of the inner loop freeway that encircles central Houston?

11) Double click on the roads theme to make a unique value map for streets, symbolizing the roads based on the attribute field **cfcc2**. Zoom in on different areas of your map when you are done, using the "I" identify button to answer the following: What is the code for CFCC2 for the three most major road types in Harris County?

12) What other kinds of attribute information does the streets theme contain?

Go to the Project Window (that shows views, tables, layouts, and so on). You can use the Window pull down menu to select the project window, named harriscounty.

Select: Tables. **Add.**

Add the table containing your Census data for Block Groups. Open this table and examine the data.

13) How many records does the table have?

Open the table the Block Group boundaries layer.

14) How many records does this table have?

15) What geographic extent do you think the longer table covers?

Clear any selected records in both tables.

16) What is the name of the field that these two tables share that contains the same data?

Joining Tables to Analyze Additional Data

To map detailed demographic data, you need to join the 2 tables. It is **very important** to do the join in the correct order. You want to join FROM the table you just added (the tgr46000sf1grp.dbf) TO the table associated with the map (attributes of Tgr46121grp00.shp). Be careful not to click inside the table and inadvertently select any records in the table. If you did this, you'd only join these selected records, rather than the entire table.

First, click on the join field in the tgr46000sf1.grp table.

Second, click on the join field in the table attributes of tgr46121grp00.shp.

Third, click on the "Join Tables" button. (looks like 2 tables with an arrow joining them) ⊞, as shown below:
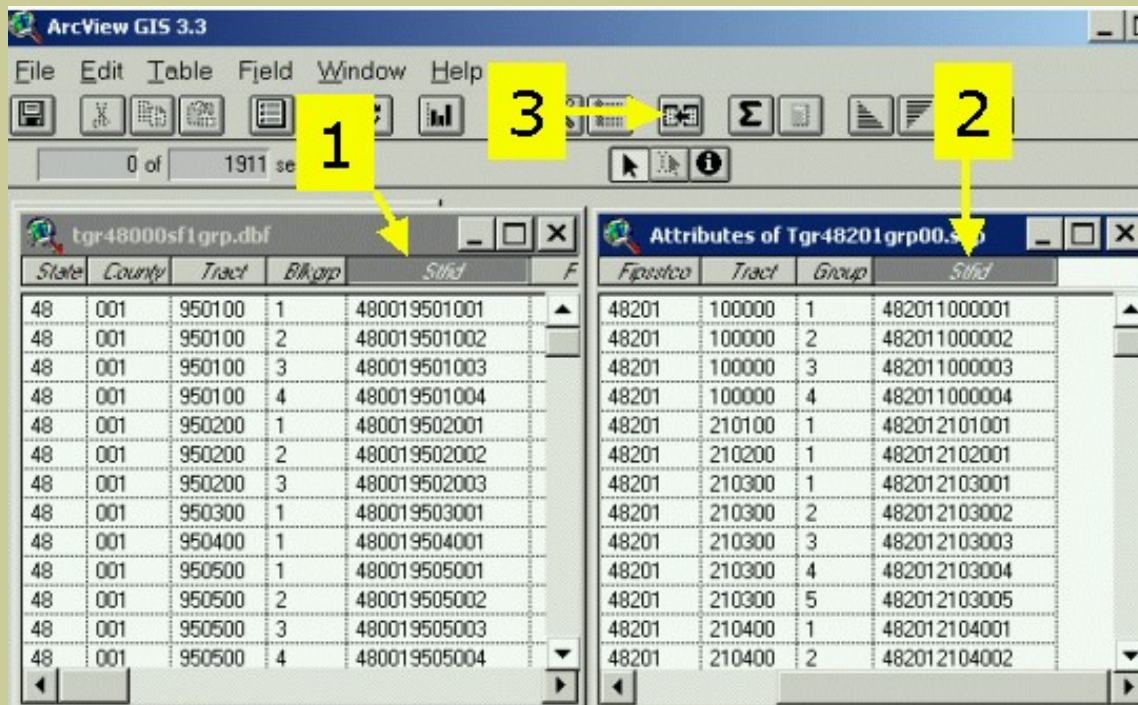
Now, examine your attributes of the block group table.

17) What happened to your tables after you joined them?

18) Look at the columns in your joined table. Is it wider or narrower than before?

19) Why?

20) Examine the number of rows in the table, listed to the upper left of the data. How many block groups exist in Harris County?

Save 🖫 your project.

Siting GIS Clubs for Houston Independent School District: Age

The Houston Independent School District (HISD) is the largest public school system in Texas and the 7th largest in the United States. HISD has contracted with you to determine the best locations to start after-

school GIS Clubs. In the clubs, students will work on community-based issues, do field work, and map social and physical characteristics of the neighborhoods with GIS and GPS.   HISD will start these clubs only in selected areas in the district. Therefore, you need to determine where concentrations of the school-age population reside.
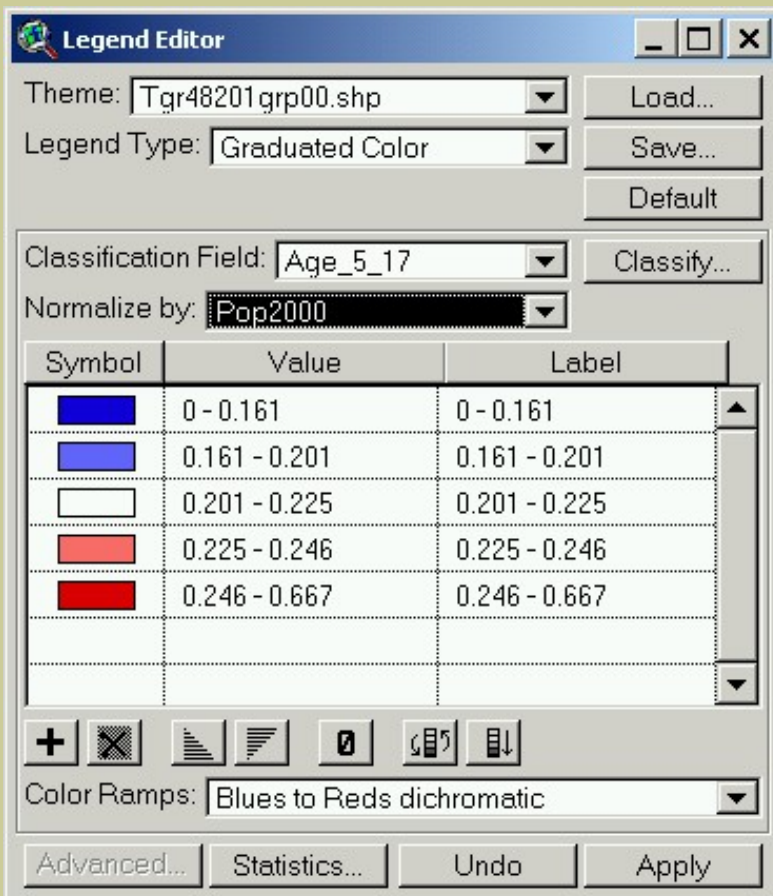
Begin analyzing the school-age population. Double-click the theme legend and make a graduated color thematic map that shows the population of the 5 to 17 year olds, the "school-age" population.

21) Make at least two observations about the pattern of the 5 to 17 year olds in Harris County.

22) Zoom in on downtown Houston. What do you notice about the relative number of school-age population here versus elsewhere in the county?

23) Would you think that there are more schools in the typical downtown neighborhood or more schools in the suburbs? Why?

You have been making maps of total 5-17 year old population. Next, make a map of 5 to 17-year-olds as a **percentage** of the total population. Do this by **normalizing** your data to that of the total 2000 population, as in the screen below. Use the color ramp "blues to reds dichromatic".

Legend Editor

Theme: Tgr48201grp00.shp   Load...
Legend Type: Graduated Color   Save...
                                     Default

Classification Field: Age_5_17   Classify...
Normalize by: Pop2000

Symbol	Value	Label
	0 - 0.161	0 - 0.161
	0.161 - 0.201	0.161 - 0.201
	0.201 - 0.225	0.201 - 0.225
	0.225 - 0.246	0.225 - 0.246
	0.246 - 0.667	0.246 - 0.667

Color Ramps: Blues to Reds dichromatic

Advanced...   Statistics...   Undo   Apply

24) Which three block groups contain the highest percentage of 5 to 17 year olds, and what are their

percentages?

25) Where are these block groups located?

26) In which part(s) of the county are you thinking of recommending the GIS Clubs to the School District?

27) Why?

28) Create a layout using View —> Layout. Create your layout. With the text tool $\boxed{\text{T}}$, add your name, date, and change the title of the map to something that reflects what the map is showing.

Print the layout.

Comparing Classification Schemes

Data can be classified in many ways on a map. Changing how the data is classified may enhance understanding of the phenomenon being mapped. The way data is classified may even distort understanding of a phenomena. All of the maps that you have been making thus far use the classification "natural breaks," in which the software takes the range of data and divides it up on the logical "breaking points" of the data based on Jenks' Optimization Rules.

In the legend editor, click on the "classify" button on the right. Change the map of percentage of 5 to 17 year olds from natural breaks to Quantile and Apply. A quantile classification places the same number of observations (in this case, block groups) in each category. Look at your answer to the above question about how many block groups are in Harris County.

29) You have 5 classes. Therefore, how many block groups are in each of the classes in Harris County?

30) Make 2 observations that compare the quantile map of school age population to the natural breaks map.

Change the classification to Equal Area. This classification places the same geographic area in each of the classes.

31) Make 2 observations that compare the Equal Area map of school age population to the natural breaks map.

Change the classification to Equal Interval. This classification divides the range of data into equal intervals for each class.

32) Make 2 observations that compare the Equal Interval map of school age population to the natural breaks map.

33) What is the range of the percentage of 5 to 17 year olds for each class, using the Equal Interval method?

34) Is the interval the same for each class? Why or why not?

Change the classification to Standard Deviation. ArcView finds the mean value and then places class breaks above and below the mean at intervals of either 1/4, 1/2, or 1 standard deviations until all the data values are contained within the classes.

35) Make 2 observations that compare the Standard Deviation map of school age population to the natural breaks map.

36) In your opinion, which of the five classification methods that you have used above help you to best understand the distribution of school age population in Harris County? Why?

37) Do any of these other classification methods make you change your recommendation on where to start the GIS Clubs?

Leave your classification method as Standard Deviation.

Save your project.

Comparing Map Types

You have been changing the classification methods. In this section, you will change the map type. Change your legend so that you can make a pie chart map. Use the guide below to create pie charts indicating the proportion of 5 to 17 year olds in the total population:
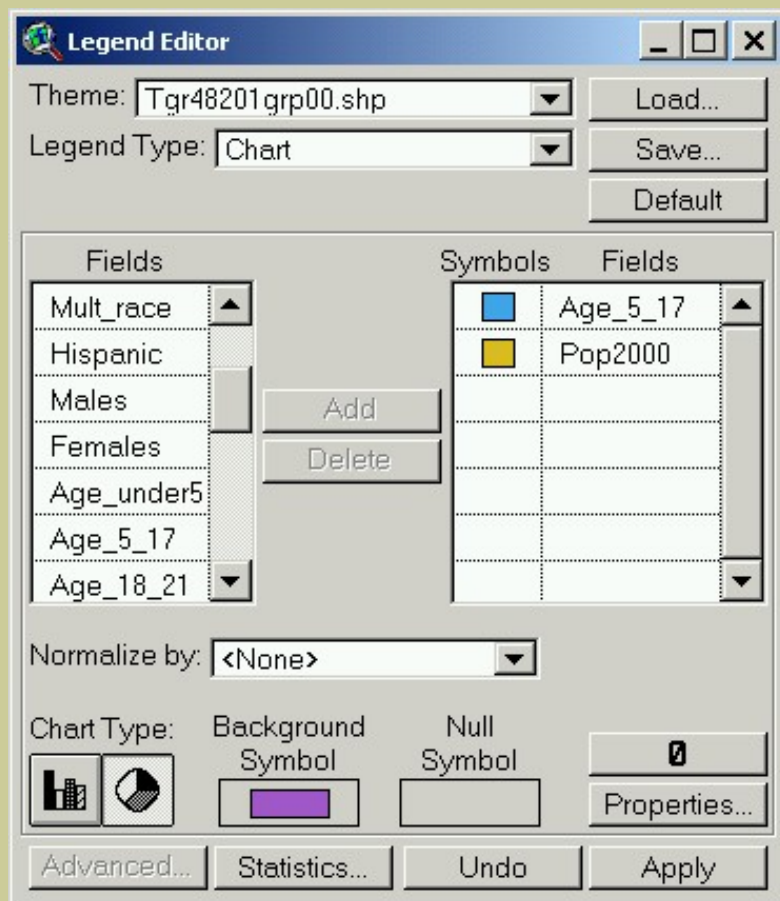
Next, double click on the theme name again to pull up the legend editor. Use the "properties" button in the lower right of the legend editor and make the 2000 population the size field for the pie charts.   Adjust the size range as appropriate so that your map will be legible.

38) What effect did the size property have on the map?

Next, change the legend one more time to make a dot map with 1 dot for every 1 five-to17 year old person. Describe this map.

39) In your opinion, which of the maps—graduated color, pie chart, or dot map—is the easiest to understand?

40) Why?

Save your project.

Siting GIS Clubs for Houston Independent School District: Racial Characteristics

The Houston Independent School District is pleased with your recommendation on where to begin the GIS Clubs. Now, they want you to determine the best location for the clubs that would meet the diversity of the Houston-area population.

Use the graduated color map type, standard deviation classification method, and reds-to-blues dichromatic color ramp throughout this section.

Create a map of the percentage of African Americans (Black normalized by Pop2000).

41) Make two observations about the population distribution of African Americans in Harris County.

Create a map of the percentage of Hispanic Americans (Hispanic normalized by Pop2000).

42) Make two observations about the population distribution of Hispanic Americans in Harris County.

Create a map of the percentage of Asian Americans (Asian normalized by Pop2000).

43) Make two observations about the population distribution of Asian Americans in Harris County.

Create a map of the percentage of Native Americans (Ameri_es normalized by Pop2000).

44) Make two observations about the population distribution of Native Americans in Harris County.

Create a map of the percentage of Multiracial Americans (mult_race normalized by Pop2000).

45) Make two observations about the population distribution of Multiracial Americans in Harris County.

46) Which two racial groups are the most concentrated in Harris County?

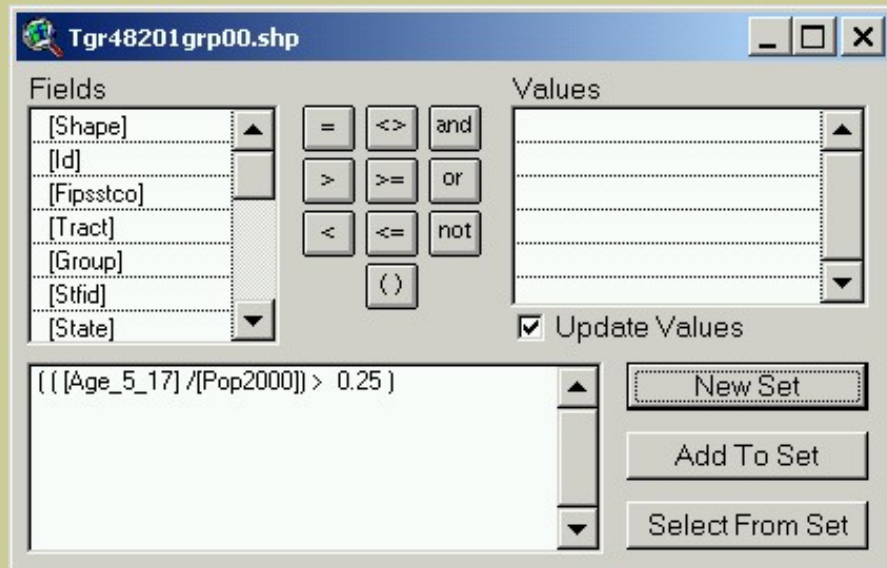47) Which two racial groups are the least concentrated in Harris County?

48) Write in your own words about some of the benefits of racial concentration, and what are some of the challenges that racial concentration brings in a metropolitan area.

A GIS allows you to compare multiple variables at the same time. Say you wanted to begin recommending where the GIS Clubs should be located to best serve Hispanic Americans. You will query your database to select the neighborhoods that have a high percentage of school aged population **and** a high percentage of

Hispanic Americans.

First, change your map to Single Symbol, using any color.

Next, use the Query tool to find the neighborhoods with a high percentage (over 25%) of school aged population. Use the formula as shown and select **New Set** in the box below:
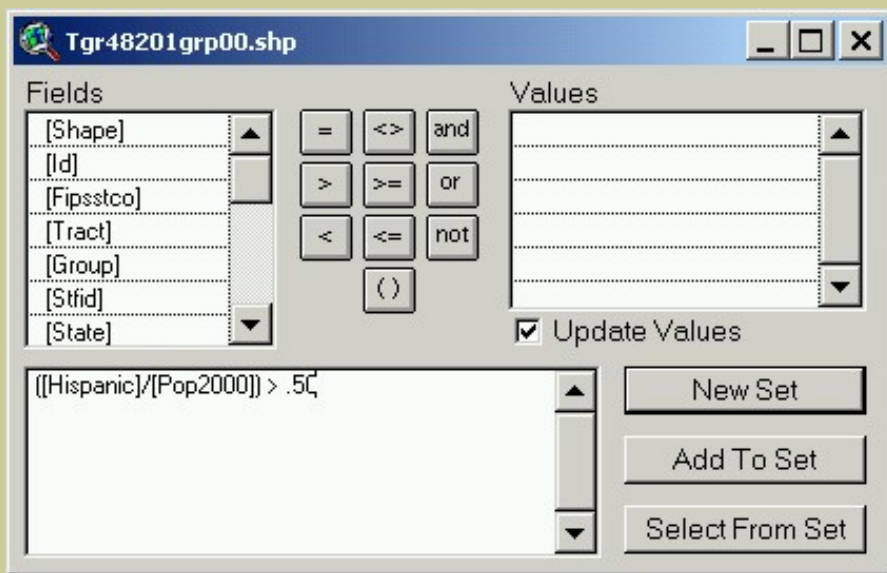

Open the theme table .

49) How many neighborhoods are selected?

50) Examine your map. Where are the neighborhoods containing over 25% school aged population?

Again, use the Query tool to find the neighborhoods with a high percentage (over 50%) of Hispanic population. Use the formula as shown and, because you want to select only those Hispanic neighborhoods with a high percentage of school-aged population, this time select **Select From Set** as shown the box below:

Tgr48201grp00.shp

Fields

[Shape]
[Id]
[Fipsstco]
[Tract]
[Group]
[Stfid]
[State]

`=` `<>` `and`
`>` `>=` `or`
`<` `<=` `not`
`( )`

Values

☑ Update Values

`([Hispanic]/[Pop2000]) > .50`

New Set
Add To Set
Select From Set

Open the theme table 🗔.

51) How many neighborhoods are now selected?

52) Examine your map. Where are the neighborhoods containing over 25% school aged population **and** over 50% Hispanic American population?

53) In which areas of Houston will you recommend GIS Clubs to be started to best address the Hispanic American community?

Clear your selection. 🗔

Repeat the above procedures for the African American community.

54) How many neighborhoods were selected?

55) Examine your map. Where are the neighborhoods containing over 25% school aged population **and** over 50% African American population?

56) In which areas of Houston will you recommend GIS Clubs to be started to best address the African American community?

Clear your selection.

Repeat the above procedures for the Asian American community. Use 20% rather than 50% for the second query; that is, select neighborhoods with over 20% Asian Americans.

57) How many neighborhoods were selected?

58) Examine your map. Where are the neighborhoods containing over 25% school aged population **and** over 20% Asian American population?

59) In which areas of Houston will you recommend GIS Clubs to be started to best address the Asian American community?

60) Why do you suppose you had to lower the concentration percentage for Asian Americans?

Save your project.

Comparing Demographic Characteristics

In this section, you will compare across other variables to see how they are related.

Make a graduated color map of Median Age.

61) Note the area to the east-southeast of downtown with a high median age. Name at least three types of businesses that these neighborhoods would have more of than other areas of the county.

62) Which areas of Harris County have the lowest median age? Name at least three types of businesses that these neighborhoods would have more of than other areas of the county.

63) Make a map of Average Family Size. Compare this to the median age map and explain the relationship between the two maps.

64) What block group had the largest average family size? What was the average family size in that block group? In what part of the county is it located?

Examine your data; then think about and examine the following questions. If you would like to, you can copy one theme, paste it, and change the variable mapped in one of the themes. That way, you can click on and off themes to examine characteristics from both.

65) What is the relationship between median age and average family size? What is the reason that this relationship exists?

66) What is the relationship between the percentage of school aged (5-17 years old) population, median age, and average family size? Name a few reasons why this relationship exists.

Clear your selection. and Save your project.

Determining the Best Location for Internet Cafes in Houston

You have been contacted by *InstantWorld*, an Internet Cafe company that markets to school. The company wants to open three franchises in the Houston area. You need to analyze your data in a GIS environment to recommend the three best locations for the businesses.

In this section, you will use the geocoding feature of ArcView GIS. Any GIS can automatically locate features on a map using street addresses. You need two things: (1) an address list, and (2) a geocodable street theme. You already have the second item.

Zoom in on a few streets in Mission on the map and examine them in the associated table, using the identify feature button.

67) What do you think the fields faddl, taddl, faddr, and taddr mean?

Your streets layer is geocodable; that is, you can use it to locate addresses. To do this, you first need to set it up, as follows:

Access the Theme--> Properties menu for your streets layer. Go to the Geocoding function and set the address style to US Streets, as follows. Select OK and Yes at the prompts.

In the view, select the push-pin symbol (to the left of the query symbol) and type in the address of the Houston Independent School District headquarters: **3830 Richmond Avenue**

68) What happened to your map?

69) In what part of Houston is the school district headquarters?

70) Use the label tool to label some of the streets near the district headquarters. What are the names of the streets that bound the block around the district headquarters?

71) Enter another address. Try entering your own address if you live in Houston. If you do not live in Houston, try **901 Bagby**. Examine the web page: http://www.ci.houston.tx.us/citygovt/mayor/map.html. What building is located at 901 Bagby?

Save your project.

InstantWorld, which seeks to open an Internet Café in Harris County, through a national study, indicates that its Internet Cafes do best in the following neighborhoods:

1) Within 1 km of a high school.

2) Within 2 km of a university or college.

3) In a neighborhood where the percent of 18 to 21 year olds is over 10 % of the total population of the neighborhood, because the Internet Cafes will be designed primarily for this age group.

4) On a busy street (with a CFCC2 code of A1, A2, or A3) to attract customers and to comply with zoning regulations.

Before geocoding, it is a good idea to become more familiar with your geocodable file. In our case, it is the streets shapefile. Access the table for this theme, scroll to the top of the table, and click in the third record that has a TLID of 95999137.   Click in the map and use the zoom to selected tool to zoom to this street segment. . Zoom out a bit to see some of the surrounding streets. Use the identify button to answer the following questions.

72) What is the name of this street?

73) What is the field containing the name of the street called?

74) What is the Starting Address on the left side of the street segment? (FRADDL)

75) What is the Ending Address on the left side of the street segment and what is the field named?

76) What is the Starting Address on the right side of the street segment and what is the field named?

77) What is the Ending Address on the right side of the street segment and what is the field named?

78) Based on what you can determine from this street, which sides of the streets in Houston are even? North and West, North and East, South and West, or South and East?

Clear your selected street. You are ready to geocode addresses.

First, you need to find out where the high schools are located.   You do not need to manually spot them on your map of Houston. Rather, because a listing of these schools exists online with the addresses of the schools, you can use these addresses to geocode the schools to specific locations on the map. This is possible because the TIGER file (the streets) contains address ranges for each street section.

Click here to download the names and addresses of the Houston ISD high schools.

Save this file to the same folder as where your other data is located. The file is named highschools.txt.

Make Streets the active theme.

Select the View--> Geocode Addresses menu. Make Streets the Reference Theme, using Address Style "US Streets", and browse to locate your address table "highschools.txt" in your folder. Make your Geocoded Theme hs_geocoded.shp and store it in your data folder, as follows:
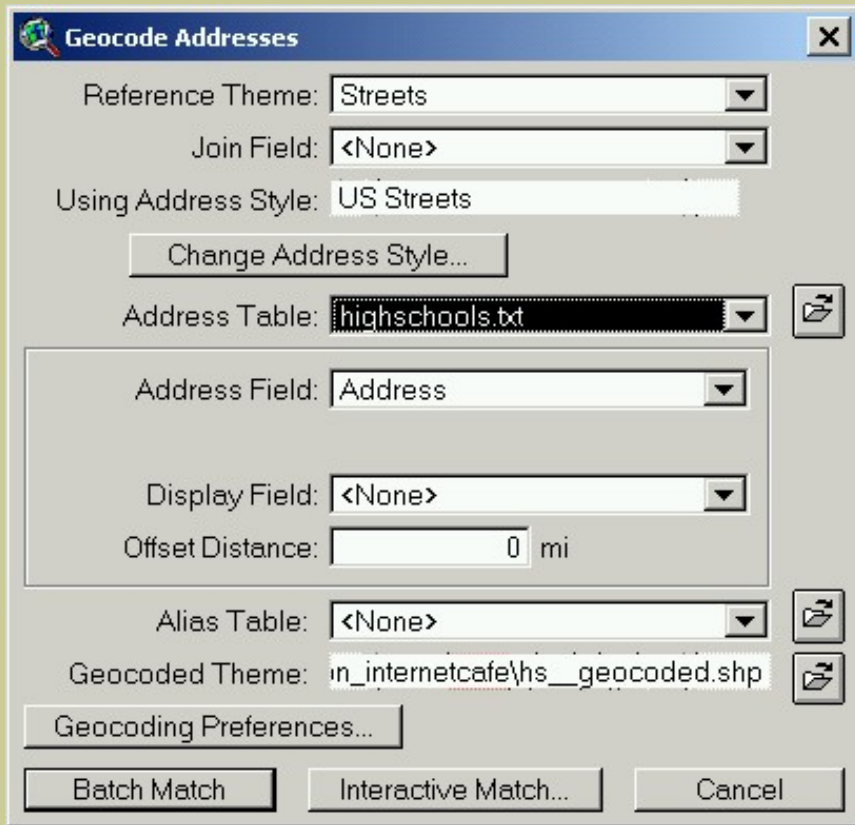
Select **Batch Match** and examine the next screen.

79) How many high schools matched with a "good match"? How many high schools matched with a "partial match"? What is the total of "good match" plus "partial match?"

Notice that you now have a new theme named hs_geocoded. Change the symbol so that high schools will be symbolized with a red flagpole at point size 24. Your map will look similar to the following:
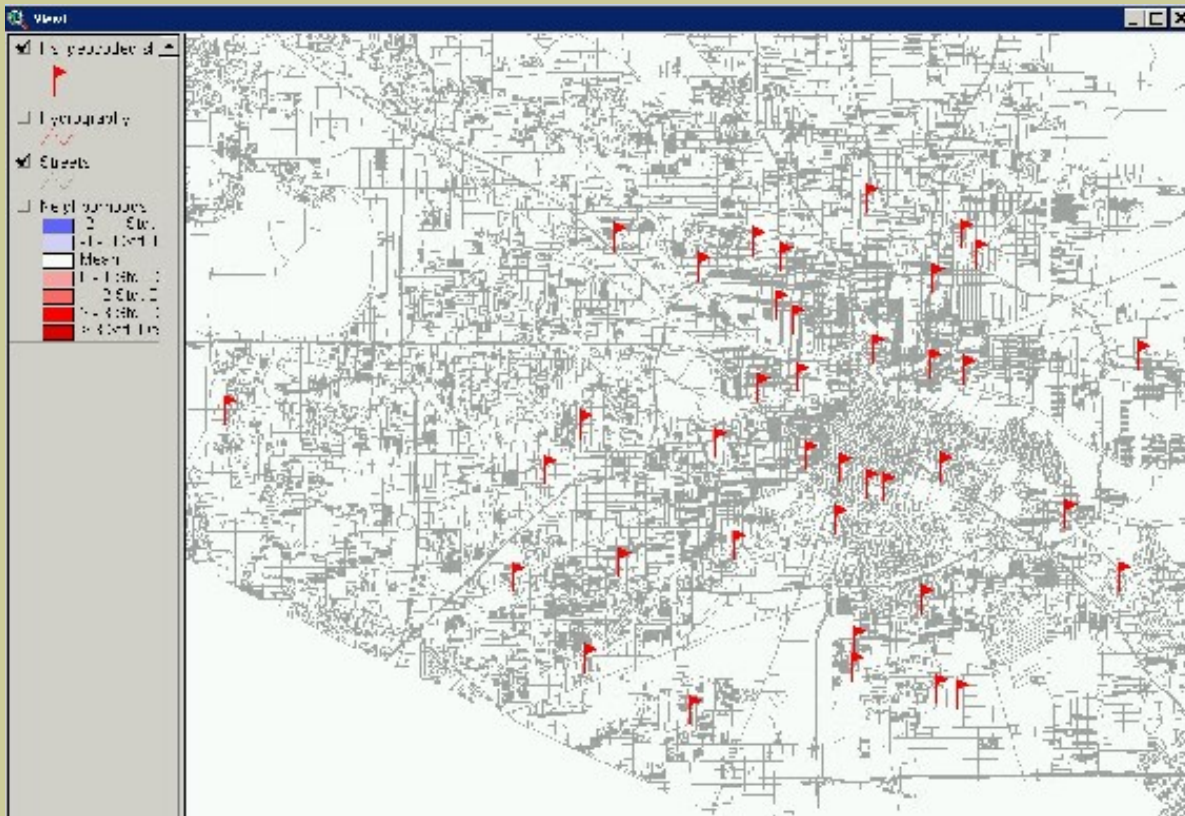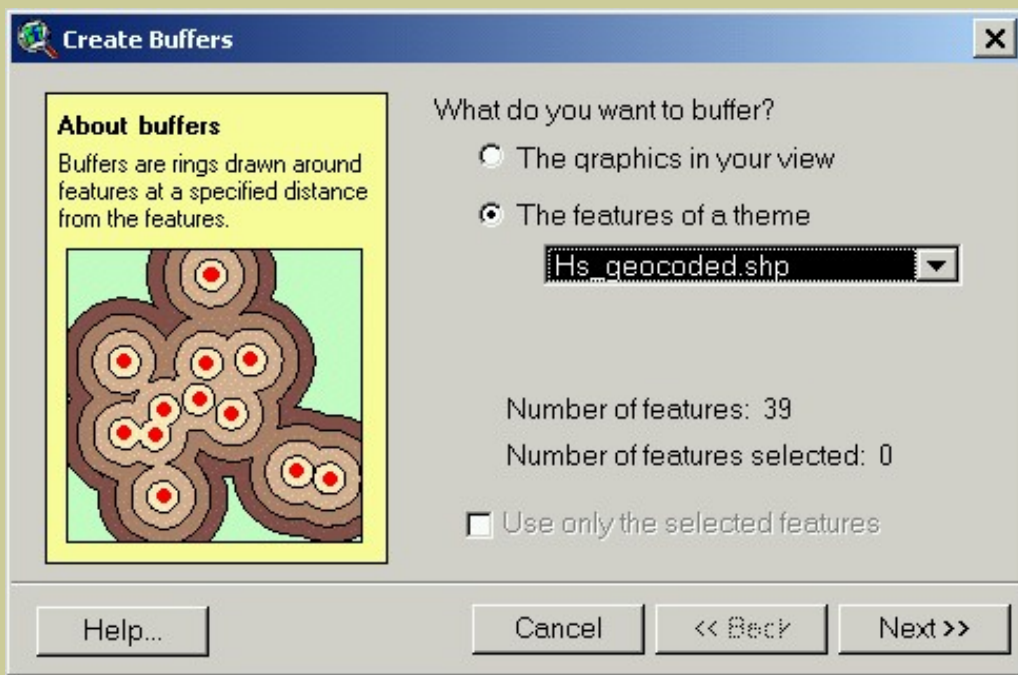
80) Examine the spatial extent of the high schools on your map. Why do you suppose there are no high schools in the Houston Independent School District outside of the central part of Harris County? Hint: Examine the outer school district boundary on the map on: http://dept.houstonisd.org/ab/2002-2003/HS/HighSchools02.htm

Examine the table of your high school geocoded theme.

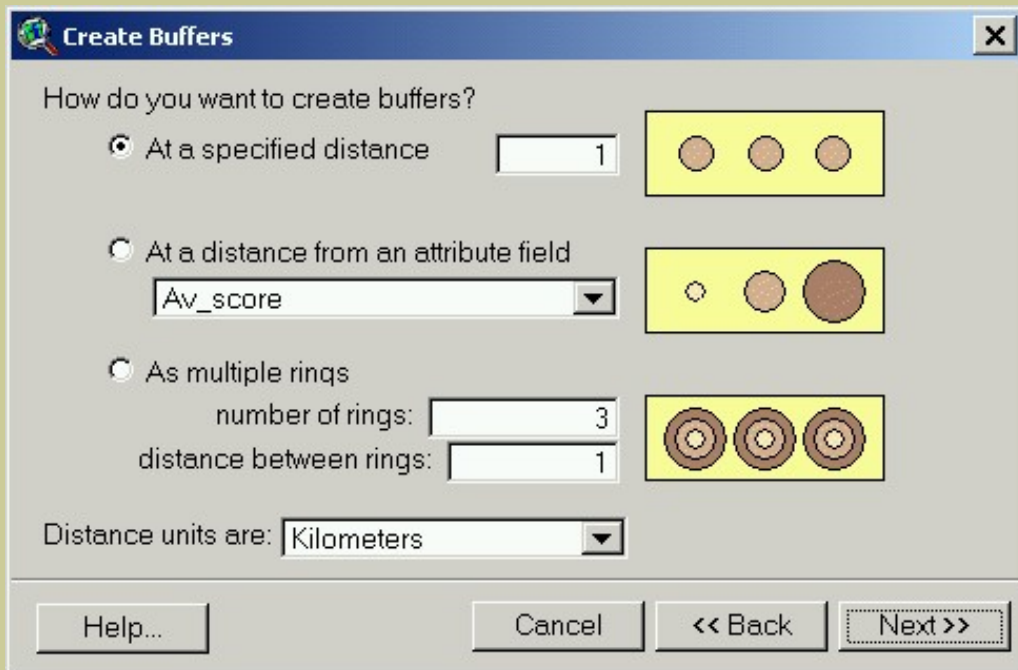81) How many records are in this table? Compare this to your sum of "good" and "partial" matches above and explain the reason for your results.

Recall that the first criteria for your Internet cafes is to locate them within 1 km of high schools. Therefore, you need to *buffer* the high schools to create 1 km areas around them.
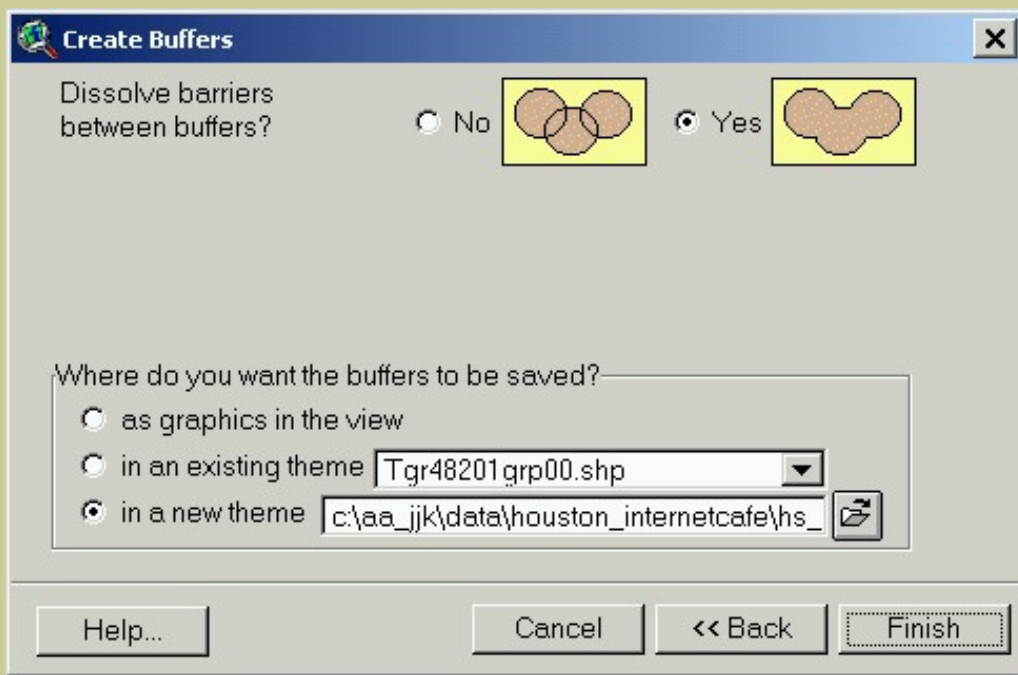
Go to Theme--> Create Buffers. Buffer the features of your theme hs_geocoded.shp, as follows:

Create Buffers ✕

About buffers

Buffers are rings drawn around features at a specified distance from the features.

What do you want to buffer?

○ The graphics in your view

◉ The features of a theme

Hs_geocoded.shp ▼

Number of features: 39

Number of features selected: 0

☐ Use only the selected features

Help...   Cancel   << Back   Next >>

Select **Next.** On the next screen, buffer the high schools at 1 kilometer, as follows:

Create Buffers ✕

How do you want to create buffers?

◉ At a specified distance   1

○ At a distance from an attribute field

Av_score ▼

○ As multiple rings

number of rings: 3

distance between rings: 1

Distance units are: Kilometers ▼

Help...   Cancel   << Back   Next >>

Select **Next.** On the next screen, dissolve buffers and save in a new theme named hs_1km_buffer.

Create Buffers

Dissolve barriers
between buffers? ○ No   ● Yes

Where do you want the buffers to be saved?
○ as graphics in the view
○ in an existing theme Tgr48201grp00.shp
● in a new theme c:\aa_jjk\data\houston_internetcafe\hs_

Help...   Cancel   << Back   Finish

Select **Finish.**

Save your project.

82) Examine your new map of the high school buffers. What shape are they? Why?

Go to the **Edit** menu, and **Select All Graphics.** Then press the **Delete** key on your keyboard.

Save your project.

Next, recall that the second criterion for the Internet Cafés was to locate within 2 km of universities.   You will be adding these universities as dots on the map (digitizing) to develop additional skills, but you could just as easily geocode their addresses as you did the high schools, earlier.

First, go to the View menu and select **New Theme.** Indicate that it will be a point theme and save it in your data folder with the name universities. shp. Notice that it has a dotted line around it, indicating that you are in *edit mode.*

Next, in your View, pull down the "dot" on the right hand side of the toolbar:

Select the dot.

Using the latitude-longitude display in the upper right as your guide, move to the following location: Latitude 29.69, Longitude -95.51. Don't worry about pinpointing the point accurately now; you will have the opportunity to adjust the point in a moment.

Left click on the map to add the point. Because you need to make these points as accurate as possible, to reflect the true location of the universities, after you add the point, right click on the point to access the "Shape Properties" dialog box, as follows:
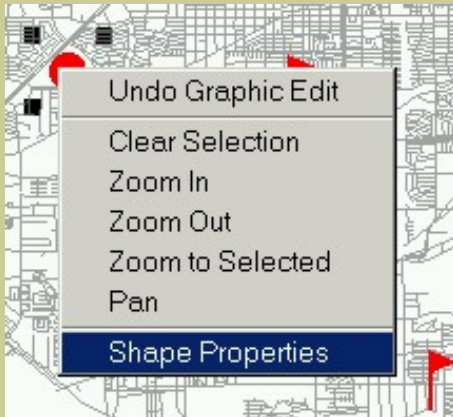
In the following dialogue at lower left, select **Edit.** In the lower right box, type in the coordinates as shown below:
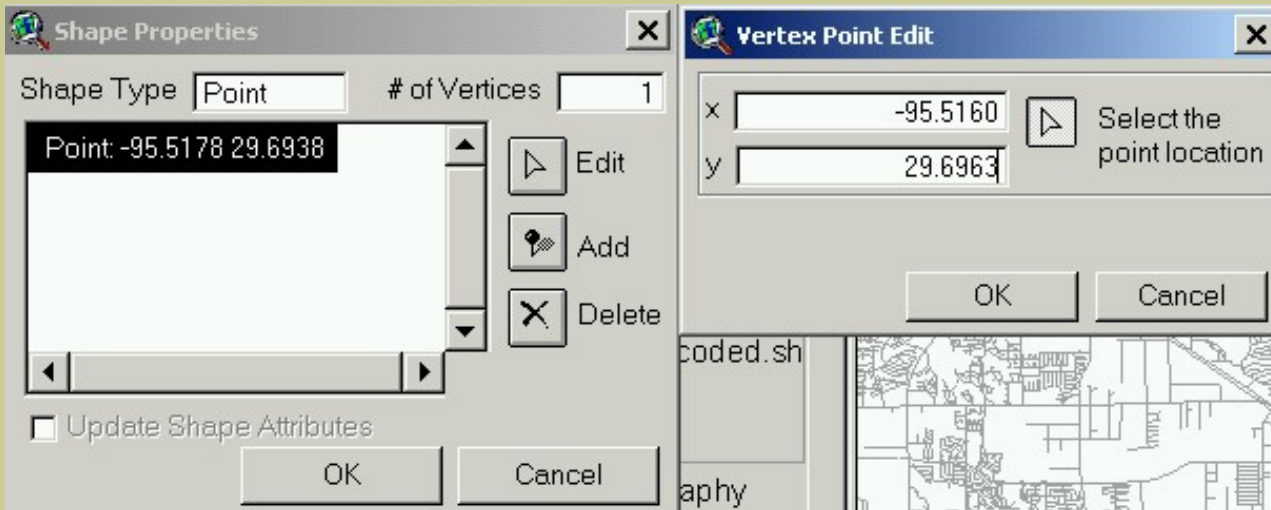
The point is now added. This is the location of Houston Baptist University. There are 5 additional major universities in Houston. Add them as you did the first one. The locations are listed in the table below.

Point	University	Latitude	Longitude
1	Houston Baptist University	29.6963	-95.5160
2	Rice University	29.7169	-95.4019
3	Texas Southern University	29.7247	-95.3628
4	Texas Woman's University	29.7085	-95.3976
5	University of Houston-Clear Lake	29.5776	-95.1073
6	University of Houston-Downtown	29.7649	-95.3588

When you are done, use the Theme--> Stop Editing menu, and **Save Edits**.

83) Why do the longitude numbers have to be negative?

Optional: If you would like to add a field to the table attached to your universities theme, go to Table--> Start Editing, and Edit--> Add Field. Define your new field as text and add the university names as listed above, making sure that you add the correct name to the correct point.

If you have time constraints or have trouble digitizing the universities, and want to download the completed universities file, **click here** to download and save the file, unzip, and add universities as a theme to your view.

Save 🖫 your project.

84) What side of Houston are the major universities located --north, east, south, or west?

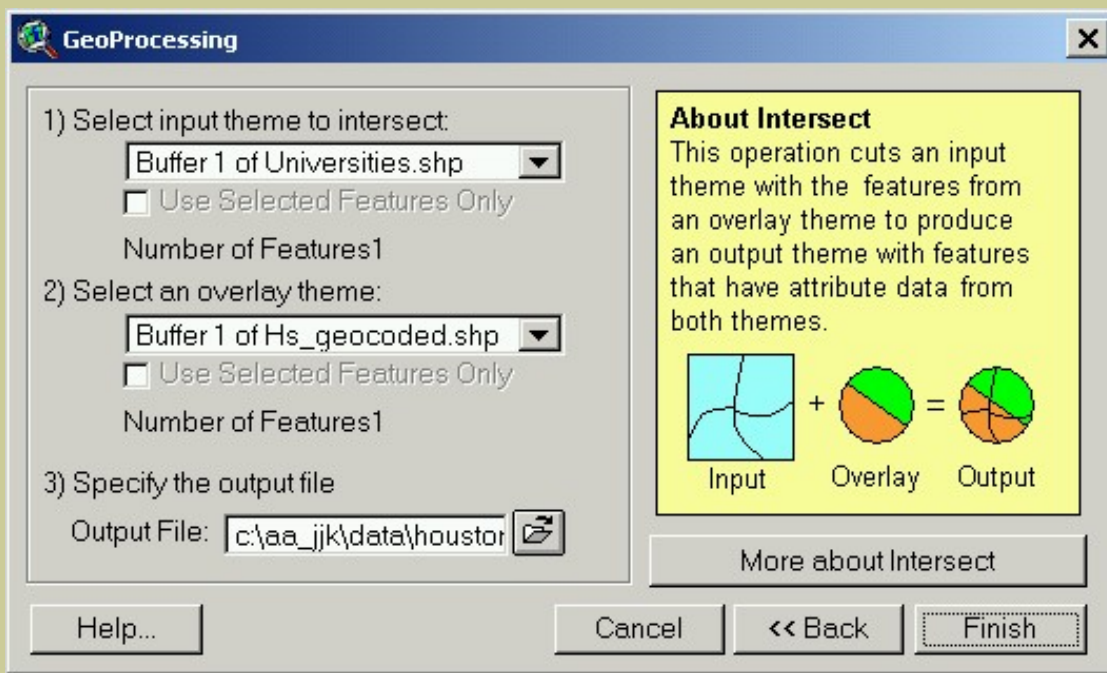85) Examine the table of your universities theme 🖾. How many records exist? Why?

Recall that your Internet Cafes will be located within 2 km of the universities. Buffer the universities to 2km as you did with the high schools, earlier. Name your resulting theme univ_2km_buffer.

86) Name at least two characteristics of the resulting map.

Next, you will combine your high school buffers with your universities buffers to generate a map showing areas near high schools **and** near universities.   To do this, go to the File--> Extensions menu and check on the box to the left of **Geoprocessing.** The geoprocessing extension can now be accessed by selecting the View pull-down menu and then **Geoprocessing Wizard.**

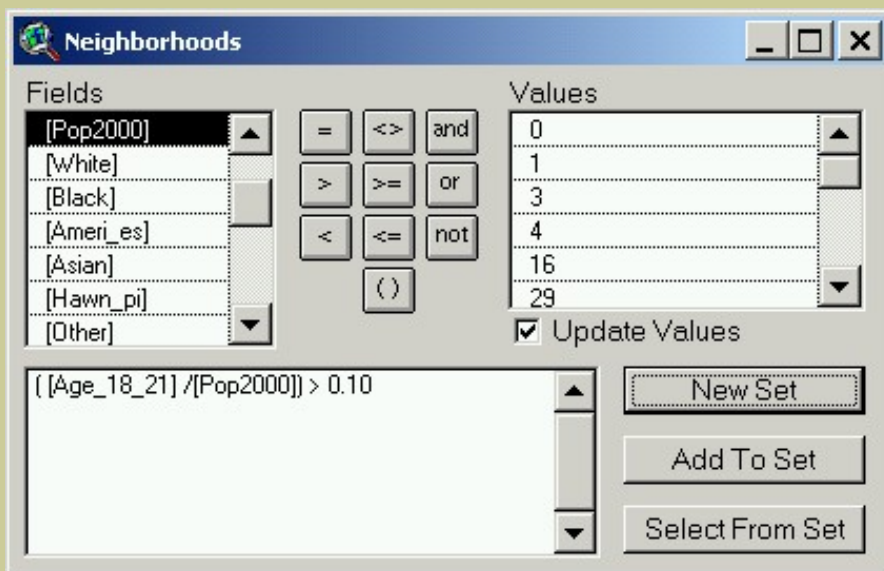In the Geoprocessing Wizard's first screen, select **Intersect** themes.

In the second screen, intersect your universities buffer with your high schools buffer, saving the result in a theme named hs_univ in your data folder, as shown below:

GeoProcessing ☒

1) Select input theme to intersect:

　Buffer 1 of Universities.shp ▼

　☐ Use Selected Features Only

　Number of Features 1

2) Select an overlay theme:

　Buffer 1 of Hs_geocoded.shp ▼

　☐ Use Selected Features Only

　Number of Features 1

3) Specify the output file

　Output File: c:\aa_jjk\data\houstor 📂

About Intersect

This operation cuts an input theme with the features from an overlay theme to produce an output theme with features that have attribute data from both themes.

Input　　Overlay　　Output

More about Intersect

Help...　　　　Cancel　　<< Back　　Finish

87) Turn off your high schools and universities buffers. Examine the new hs_univ theme and name at least two characteristics of the resulting map.

You have completed the first two criteria for the Internet Cafe locations. The third criteria is for a neighborhood where the percent of 18 to 21 year olds is over 10 % of the total population of the

neighborhood.   First, clear any selections 🔲 in your neighborhoods theme and change the legend of the neighborhoods theme to Single Symbol.

Then, use the Query tool 🔨 on your neighborhoods theme to select neighborhoods that meet the age criteria, as follows:

Neighborhoods _ ☐ ✕

Fields

[Pop2000]

[White]

[Black]

[Ameri_es]

[Asian]

[Hawn_pi]

[Other]

=　<>　and

>　>=　or

<　<=　not

( )

Values

0

1

3

4

16

29

☑ Update Values

([Age_18_21] /[Pop2000]) > 0.10

New Set

Add To Set

Select From Set

88) Explain what this formula does.

89) Examine your map. Describe at least two characteristics of the pattern of the neighborhoods with a high percentage of 18 to 21 year olds.

Next, combine the areas near high schools and universities with the neighborhoods with many 18 to 21 year olds, as follows:

First, make hs_univ your active theme by single-clicking on it. Clear ▣ any selected features.

Second, Use the Theme--> Select By Theme menu to select features of hs_univ that intersect the selected features of neighborhoods, as follows:
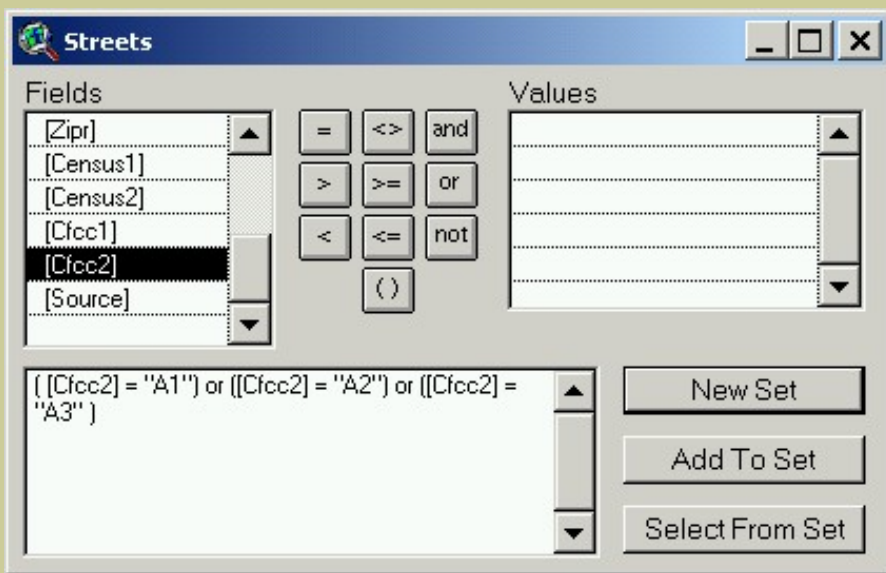

Select **New Set** when completed.

90) Describe at least two characteristics of your resulting map.

The areas selected near high schools and universities are now only those neighborhoods with a high percentage of 18 to 21 year olds.

Now you have 3 of the 4 required criteria. Recall that the final criteria is on a busy street, with a CFCC2 code of A1, A2, or A3. Make the streets theme the active theme and clear ▣ any previously selected streets.

Then, use the Query tool ▨ and enter the formula as follows:

Streets

Fields

[Zipr]
[Census1]
[Census2]
[Cfcc1]
[Cfcc2]
[Source]

=   <>   and

>   >=   or

<   <=   not

( )

Values

([Cfcc2] = "A1") or ([Cfcc2] = "A2") or ([Cfcc2] = "A3")

New Set

Add To Set

Select From Set

Select **New Set.**

91) Examine your table 🔲. How many streets meet this criteria?

Use the "Select By Theme" function as you did above on the hs_univ theme. Select hs_univ polygons that intersect your busy streets.

92) Describe how you accomplished the above.

With your hs_univ the active theme, use Theme--> Convert to shapefile to permanently save your results. Store in your folder and name it internetcafes.

93) How many areas (polygons) are under consideration?

94) Use the measure tool 🔲 to measure the distance from one end of your neighborhoods under consideration to another. How far is it?

95) Which university are most of the neighborhoods under consideration clustered around?

96) Which high schools are most of the neighborhoods under consideration clustered around?

Examine the neighborhoods that are under final consideration. They should look similar in distribution to the following map:
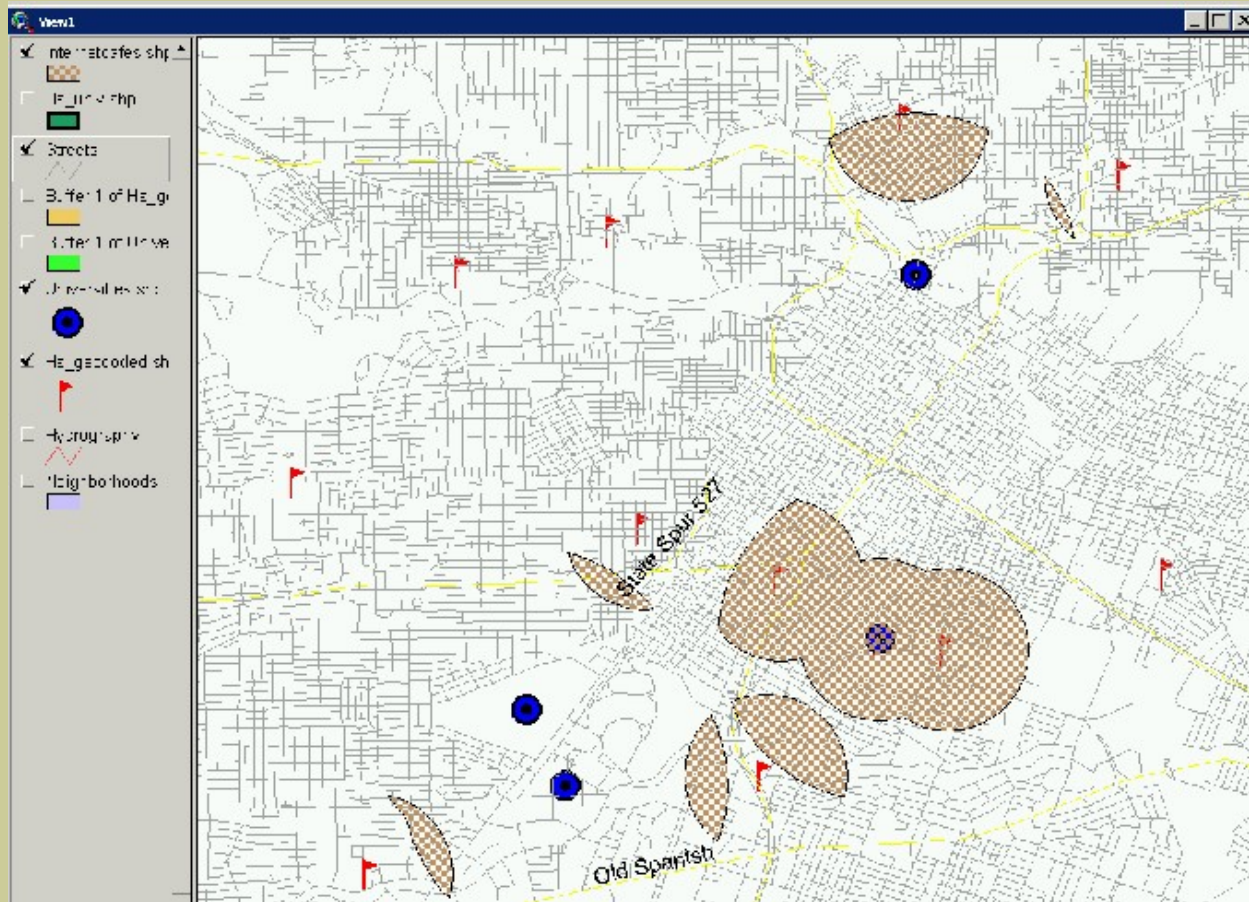
Save 🖫 your project.

97) Write a paragraph describing the locations and the characteristics of the neighborhoods you will recommend as sites for *Instant World.* Select three locations in those neighborhoods, indicating the name of the busy street that these will be located on, and justify why you believe these will be the best three sites for your Internet Cafes.

98) What other considerations would you think that franchises use to locate new businesses? What special considerations should an Internet Cafe have that other businesses do not consider?

99) Create a layout containing your final criteria along with the major roads and any other reference data you think is appropriate. Print it and turn it in with these lab sheets.

100) Summarize in a few sentences what you have learned about locating businesses in this lesson.

101) Summarize in a few sentences what you have learned about site selection in this lesson.

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