

module 6

Human Geography III Economic Geography

Economic development, modernization, and trade illustrate the interrelatedness of the global community.



The Wealth of Nations: A global perspective

In this lesson students will be presented with the three modes of economic production—agriculture, industry, and services—as the initial criteria for a country’s developed or developing status. They will select layers of data from a group of economic indicators to determine patterns in developed and developing countries. They will be challenged to draw their own conclusions as to a country’s economic development status and support their conclusions with data.



Share and Share Alike: A regional case study of North America and NAFTA

Students will explore trade in North America focusing on the three trading partners in the North American Free Trade Agreement (NAFTA)—Canada, Mexico, and the United States. They will study export data for the past 10 years from each of the NAFTA countries, then use this information to identify trading trends before and after NAFTA, and to assess its effectiveness. Finally, students will make an ArcMap layout containing a map and charts that support their opinions.



Live, Work, and Play: An advanced investigation

Students will use the Internet to acquire the most recent data on job classifications in California. By exploring this data through a GIS, students will construct a thematic map for California counties that displays population, number of jobs in a given field, and average wage data. They will perform a complex query and create a map that illustrates their results.



The Wealth of Nations

A global perspective

Lesson overview

In this lesson students will be presented with the three modes of economic production—agriculture, industry, and services—as the initial criteria for a country’s developed or developing status. They will select layers of data from a group of economic indicators to determine patterns in developed and developing countries. They will then be asked to draw their own conclusions as to a country’s economic status, and to support those conclusions with data.

Estimated time Two 45-minute class periods

- Materials**
- ✓ Student handouts from this lesson to be copied:
 - GIS Investigation sheets (pages 333 to 342)
 - Student answer sheet (pages 343 to 345)
 - Assessment(s) (pages 346 to 350)

Standards and objectives

National geography standards

GEOGRAPHY STANDARD	MIDDLE SCHOOL	HIGH SCHOOL
1 How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective	The student understands how to make and use maps, globes, graphs, charts, models, and databases to analyze spatial distributions and patterns.	The student understands how to use geographic representations and tools to analyze, explain, and solve geographic problems.
11 The patterns and networks of economic interdependence on Earth’s surface	The student understands ways to classify economic activity.	The student understands the classification, characteristics, and spatial distribution of economic systems.
18 How to apply geography to interpret the present and plan for the future	The student understands how varying points of view about geographic context influence plans for change.	The student understands how to use geographic knowledge, skills, and perspectives to analyze problems and make decisions.



Standards and objectives (continued)

Objectives

The student is able to:

- Define the three economic production criteria traditionally used to determine economic development status.
- Compare and contrast these criteria.
- Evaluate them as suitable measurements for developed or developing status.
- Understand additional economic indicators used to classify a country as developed or developing.
- Develop a definition of developed and developing.
- Predict a country’s or region’s economic status within the next 20 years.

GIS skills and tools



Zoom the layout to view the whole page



Zoom in to a specific area of the map



Activate a data frame in a layout



Find a specific feature on the map and identify it

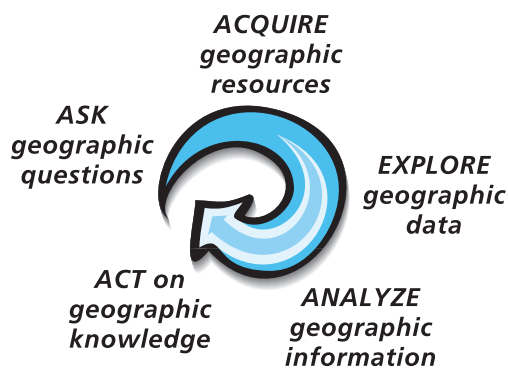


Zoom to the full map extent



Add a layer to the map

- Add a new data frame to a layout
- Symbolize data using graduated colors
- Build a query to exclude specific attribute values from classification
- Display excluded values in a No Data class



For more on geographic inquiry and these steps, see Geographic Inquiry and GIS (pages xxiii to xxv).



Teacher notes

Lesson introduction

Introduce this lesson to your students with a discussion of the three economic production criteria: agriculture, industry, and services. Ask them what they know about these three methods of earning a living. Explain to them that economists generally rate a country's economic status as developing or developed by how much of its workforce is engaged in agriculture, industry, and services. Generally, countries with a high percentage of the workforce in agriculture (whether it be subsistence, commercial, or another type) are placed in the category of "developing."

Have the class begin by using the three production criteria maps of the world to determine whether a country is classified as developed or developing.

Before starting the exercise on the computer, ask the following questions to elicit knowledge, beliefs, or ideas your students may already have about countries around the world:

- Name several countries that have a high percentage of their workforce participating in agriculture.
- Name a country that has a high percentage of its workforce participating in services.
- Which countries do we generally think of as highly industrialized (have high percentages of the workforce participating in industry)?
- Can they think of other factors that might be helpful in determining whether a country is developed or developing?

Student activity



Before completing this lesson with students, we recommend that you complete it as well. Doing so will allow you to modify the activity to accommodate the specific needs of your students.

After the initial discussion, have the students work on the computer component of the lesson individually or in groups of no more than two or three. Distribute the GIS Investigation sheets to the students. Explain to them that they will learn and use GIS skills to enable them to gather data for the assessment worksheet.

In addition to instructions, the handout includes questions to help students focus on key concepts.



Teacher Tip: In order for students to complete the assessment, they must save their project. Be sure to have a suggested naming convention and location on a computer or computer network for your students.

Things to look for while students are working on this activity:

- Are all students in each group participating in the activity, taking turns using the computer and writing information on the chart?
- Are the students using a variety of tools to obtain the information they need?
- Are they experiencing any difficulty symbolizing the economic data layers in step 7?



Conclusion After the students complete the lesson and the assessment, discuss their findings. If you have time, you can have each group share findings on an overhead projector and explain how they came to their conclusions. Students can also take turns presenting the thematic maps they have created, either in printed format or on a computer projection device from the front of the room. Conclude the lesson by asking the students to explain which factors they feel are most important in deciding if a country is developed or developing, and to provide support for their evaluation. Do they feel this two-class system (“developed” and “developing”) is adequate? What alternative or additional classes can they suggest to describe a country’s economic status?

Assessment *Middle school and high school: Highlights skills appropriate to grades 5 through 12*

The middle- and high-school assessments ask students to choose one country they believe is developed and another they believe is developing. Students will use the thematic mapping skills they have learned in this lesson to map additional indicators and draw conclusions about the two countries they have chosen. They will individually write an essay that answers specific questions. The middle- and high-school assessments differ in the types of questions asked.

Extensions

- Ask students to look in local newspaper employment advertisements to classify the jobs in their own community as agriculture, industry, or service. How would they classify the types of employment in their own community?
- Research employment classifications of two different counties, and compare and contrast the percentages of jobs in each category.
- Research the GDP for the top 10 trading partners of the United States, compute the GDP per capita, and map it.
- Have students choose a country and analyze all of the standard of living and economic indicator data, and present their findings orally to the rest of the class.
- Check out the Resources by Module section of this book’s companion Web site (www.esri.com/mappingourworld) for print, media, and Internet resources on the topics of economic indicators, developing countries, and economic production of countries.

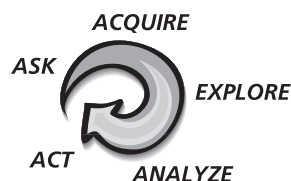


NAME _____

DATE _____

The Wealth of Nations

A GIS investigation



Answer all questions on the student answer sheet handout

Economists generally classify a country's economic status as developing or developed by determining the percentage of its workforce engaged in each of three sectors of the economy—agriculture, industry, and services. In general, a country with a high percentage of its workforce in agriculture is considered to be “developing,” while a country with a high percentage of its workforce in services and industry is considered to be “developed.”

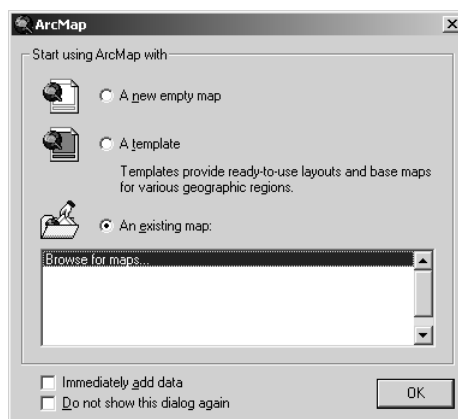
In this GIS Investigation, you will use world maps of the workforce in the three employment sectors to explore patterns of development around the world. You will also examine two other economic indicators—energy use and GDP per capita—and compare the maps of employment sectors to the maps of GDP and energy use. You will evaluate whether or not the employment criteria are good indicators of a country's economic status.

Step 1 Start ArcMap

- a* Double-click the ArcMap icon on your computer's desktop.

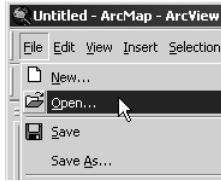


- b* If the ArcMap start-up dialog appears, click **An existing map** and click OK. Then go to step 2b.

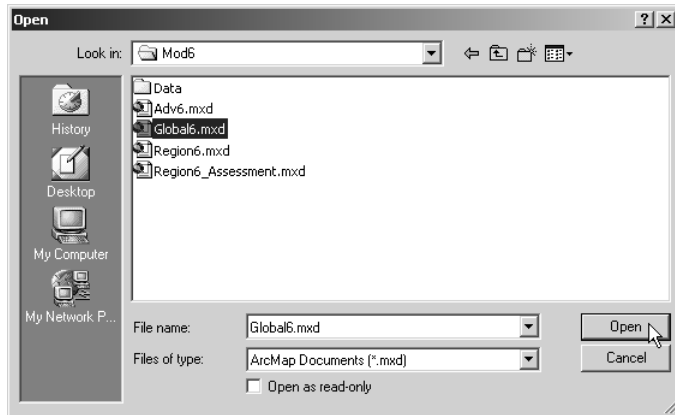


**Step 2 Open the Global6.mxd file**

- a* In this exercise, a map document has been created for you. To open it, go to the File menu and choose **Open**.



- b* Navigate to the module folder (**C:\MapWorld9\Mod6**) and choose **Global6.mxd** (or **Global6**) from the list.



- c* Click **Open**.

When the map document opens, you see a world map of employment in the agricultural sector. The table of contents lists three data frames in all, one for each of the employment sectors.



- d* Click the **Layout View** button below the map.

The layout shows all three data frames side by side on the layout so you can compare them. Also, the **Layout Toolbar** appears or becomes active.



- e* If your **Layout** toolbar is floating, dock it above the table of contents.



- f* Maximize your ArcMap window by clicking the **Maximize** button in the top right corner of the window.



- g* Click the **Zoom Whole Page** button on the **Layout** toolbar to make the layout fill the view.



Step 3 Evaluate the legends and patterns of the maps

a Look at all of the legends in the table of contents.



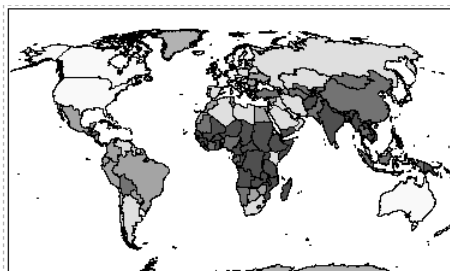
(1) *What do the darkest colors represent?*

(2) *What do the lightest colors represent?*

b Study the Workforce Involved in Agriculture map.

Workforce Involved in Agriculture

- Agriculture
- % Employment
- Very Low
 - Low
 - Moderate
 - High
 - Very High
 - No data



(1) *What does the description “Very High” refer to in this map?*

(2) *Where are the countries with a high percentage of agricultural workers generally located?*



(3) *Where are the countries with a low percentage of agricultural workers generally located?*

c Study the Workforce Involved in Services map.



(1) *Where are the countries with a high percentage of service workers generally located?*



(2) *Where are the countries with a low percentage of service workers generally located?*



(3) *What relationship, if any, do you see between the agriculture and services workforce maps?*

d Study the Workforce Involved in Industry map.



What patterns do you see on the map?



e Using the workforce information in all three maps, in what part or parts of the world do you find the greatest number of developing countries?

Step 4 Analyze data on Bolivia



a Click the Zoom In tool on the Tools toolbar.

b Click and drag a box around South America in the Workforce Involved in Industry map.



c Zoom in to South America on the other two maps.



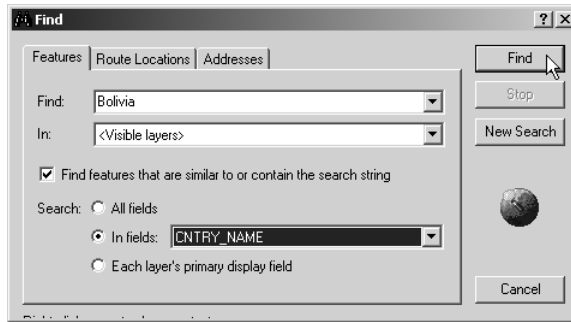
d Click the Select Elements tool and click the Agriculture map to activate the data frame. The data frame is outlined with a colored dashed line with blue squares to indicate it is active.



e Click the Find tool.

f Type **Bolivia** in the Find box on the Features tab.

g Click the circle next to **In fields** in the Search area. Then select CENTRY_NAME from the drop-down list as the field to search.



h Click Find.

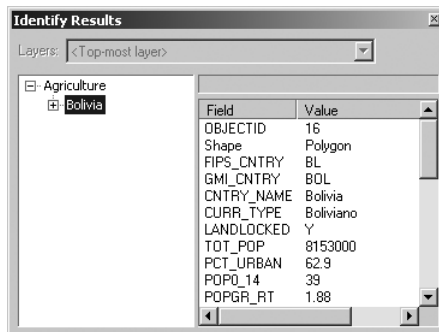
Bolivia is listed in the results box at the bottom of the Find window. Now you will use ArcMap to gather and record data about Bolivia.

i Move the Find window so you can see the Agriculture map.

j Right-click the Bolivia row in the results box and choose Flash feature so that you can pick out Bolivia on the map.

k Right-click Bolivia again, and choose Identify feature(s). Close the Find dialog.

The Identify Results window shows data on Bolivia.



l Scroll down the right side of the window and complete the following questions:



- (1) What percentage of workers in Bolivia are involved in agriculture?
- (2) What percentage of workers in Bolivia are involved in industry?
- (3) What percentage of workers in Bolivia are involved in service?
- (4) Assume that a developing country has a high percentage of its workforce in agriculture and lower percentages of its workforce in industrial-and service-related occupations and analyze the data on Bolivia. Based on these criteria, would you classify Bolivia as a developed or developing country? Explain.



m Close the Identify Results window.



n On your answer sheet, you see a table that has some information completed for Bolivia. Record the classification (developed or developing) you gave Bolivia in the previous question by making a check mark in the appropriate column.

Step 5 Analyze data on other countries

In order to complete the table on your answer sheet, you will need to find each country on the maps, interpret the legends for each map, write your answers in the columns under Agriculture, Industry, and Service, and decide whether each country is developing or developed.



a Click the Find tool and type **India** in the Find text box. Click Find.

Two countries are found that contain the word India in the country name, but only one of them is the one you want.

b Right-click the India row and choose Zoom to feature(s). The map zooms to the country of India.



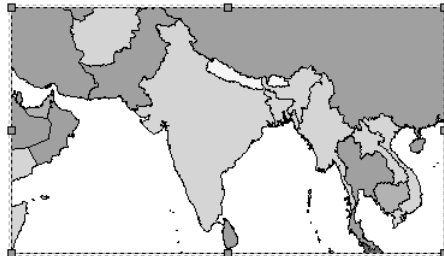
c Write the correct category for the percentage of workers in agriculture in the table on your answer sheet (under step 4n).



d Using the Select Elements tool, activate the Workforce Involved in Industry data frame.

e Click Find in the Find dialog to search the newly active data frame. Then Zoom to India.

The Workforce Involved in Industry data frame zooms to India.



f Interpret the legend and record India's percentage in the table on your answer sheet (under step 4n).



g Activate the Workforce Involved in Service data frame. Click Find to find India and then zoom to it.



h Interpret the legend and record India's percentage in the table on your answer sheet (under step 4n).



i Based on the workforce criteria previously used to determine if a country is developed or developing, write your answer for India in the table on your answer sheet (under step 4n).

j Repeat this process (step 5a–5i) for the other countries listed in the table.

k Close the Find dialog.




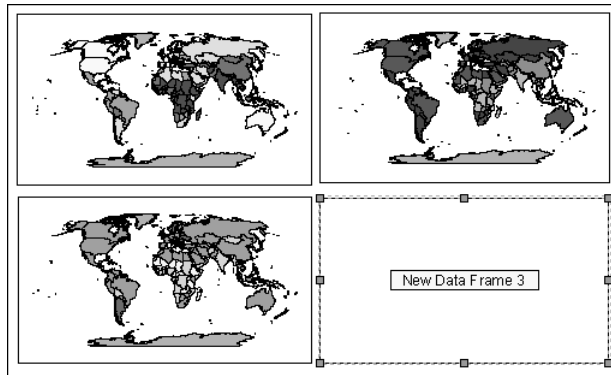
l Use the Select Elements tool and the Full Extent button to activate each data frame and zoom to the entire world in all three maps.


**Step 6 Create a new data frame and add data**

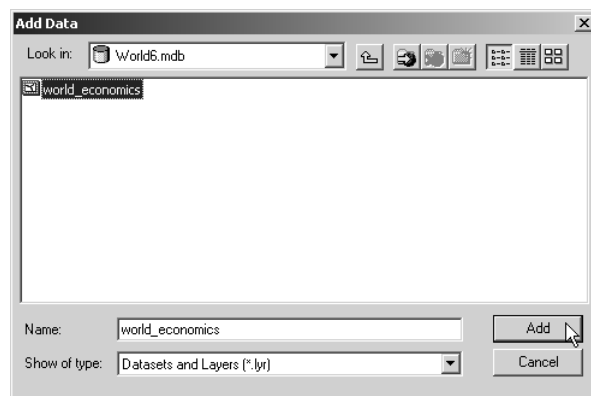
Now you will add economic and energy data and determine whether this data supports your initial conclusions about which countries are developed and which are developing.

Gross Domestic Product (GDP) is the total value of all goods, services, and products produced in a given country. Typically, developing countries have a low GDP. The total amount of energy consumed by a given country is also an indicator of development. If a country has a low level of energy consumption, it tends to be a developing country. Developed countries are high in both GDP and energy use.

- a Click **Insert** on the Main Menu toolbar and choose **Data Frame** to add a new data frame to the map document.
- b  With the **Select Elements** tool, click the new data frame and drag it into the blank space in the bottom right of the layout.
- c Click and drag the blue boxes to resize the data frame to match the others.



- d In the table of contents, click slowly two times on **New Data Frame 3** to activate the text cursor. Name the data frame **Economic Data**.
- e  Click the **Add Data** button.
- f Navigate to the module data folder (**C:\MapWorld9\Mod6\Data**). Open the **World6.mdb** geodatabase and choose **world_economics** from the list. Click **Add**.



- g Add **world_economics** again so there are two copies of it in the data frame.

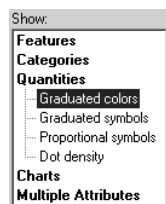
For each new layer, all countries are symbolized with one color. ArcMap randomly assigns the color, so the color on your screen may not match the color on your neighbor's screen.



Step 7 Thematically map GDP per capita and energy use

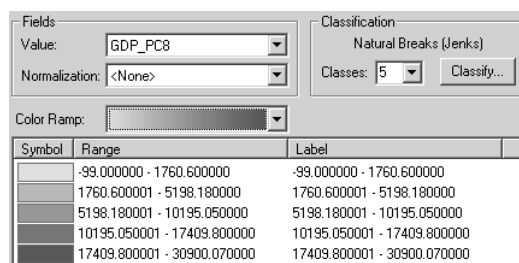
To see the pattern of GDP per capita, you need to change the legend. GDP per capita is the gross domestic product per person in a given year (1998). It is calculated by dividing the GDP of a country by its total population.

- Double-click the first `world_economics` layer name in the table of contents. The Layer Properties dialog is displayed.
- Click the Symbology tab.
- Click Quantities in the Show list on the left side of the dialog. Graduated colors is automatically selected.

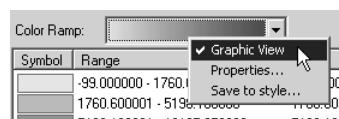


- Click the Value drop-down list, scroll down, and select **GDP_PC8**.

The Symbology tab updates and you see a list of five colored symbols, values, and labels.



- For the Color Ramp choose Brown Light to Dark. (Hint: To choose the color ramps by name instead of colors, right-click the drop-down list and choose Graphic View to toggle the colors off.)



By default, ArcMap has divided the GDP per capita values into five groups, or classes, which are shown in the Range column.

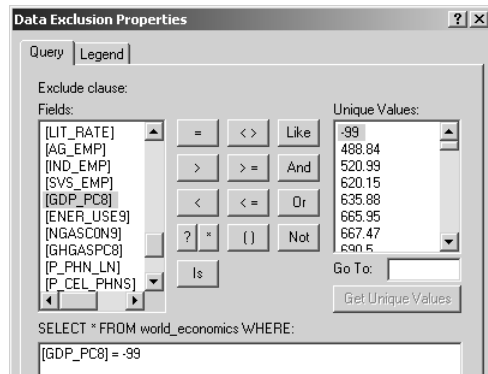
For some countries no data was available for GDP per capita. In this case, the `GDP_PC8` field has a value of `-99`. Because the value of `-99` represents no data, it should not be included in the range of GDP per capita values. You will assign values of `-99` to a No Data class.

- Click the Classify button on the right side of the Symbology tab. Then in the next dialog, click the Exclusion button.
- Click the Query tab in the Data Exclusion dialog.

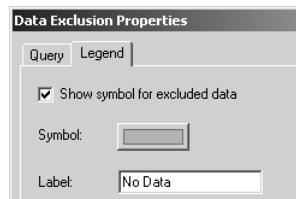
You will build the following query expression: **[GDP_PC8] = -99**



- h* Scroll down the Fields list and find GDP_PC8. Double-click GDP_PC8 to add it to the expression box.
- i* Click the = button.
- j* Click the Get Unique Values button, then double-click -99 to complete the query expression.



- k* Click the Verify button. If you receive a message that the expression was successfully verified, click OK to close the message. If you get a different message, check your work and make sure the query expression matches the one pictured above.
- l* Click the Legend tab. Check the box to Show symbol for excluded data.
- m* Click the Symbol color and change the fill color to Gray 30%. Click OK on the Symbol Selector.
- n* In the Label box, type **No Data**.



- o* Click OK in the Data Exclusion Properties and Classification dialogs.

The ranges in the Symbology tab no longer include the value -99. Next you will change the labels for each symbol to use words instead of numbers.

- p* Click on the top label (488.840000 - 2498.640000). Type **Very Low** and press Enter.

Symbol	Range	Label
	488.840000 - 2498.640000	Very Low
	2498.640001 - 5380.190000	2498.640001 - 5380.190000
	5380.190001 - 10195.050000	5380.190001 - 10195.050000
	10195.050001 - 17409.800000	10195.050001 - 17409.800000
	17409.800001 - 30900.070000	17409.800001 - 30900.070000

- q* Change the next label down to **Low**. Then change the rest of the labels to **Moderate**, **High**, and **Very High**.
- r* Click the General tab in the Layer Properties window. Change the layer name to **GDP per capita**.



s Click OK and look at the updated legend.

- GDP per capita
GDP_PC8
- Very Low
 - Low
 - Moderate
 - High
 - Very High
 - No Data

Next you will map energy use. Energy use is a measure of the total energy consumption from all energy sources as measured by a trillion BTUs (British thermal units). One BTU is the amount of energy needed to heat one pound of water one degree Fahrenheit.

t Turn off GDP per capita.

u Double-click the remaining world_economics layer to open its Layer Properties dialog. Repeat steps 7b–7s using the information below:

- Map the value field ENER_USE9
- Use the Orange Bright color ramp
- Use the query expression **[ENER_USE9 = -99]**
- Change the layer name to **Energy Use**
- Use the same scale (Very Low – Very High) for the labels

Step 8 Analyze GDP per capita and energy use data

Now you will take this new data on GDP per capita and energy use into consideration, and you will reevaluate how you classified countries as developed or developing.

a Turn off Energy Use and turn on GDP per capita.



b Click the Find tool and find Bolivia. Zoom to Bolivia. Answer the following questions.



(1) *What level is the GDP per capita for Bolivia?*



(2) *Based on this new information and the workforce data, should Bolivia be classified as a developing or developed country? Why?*

c Turn off GDP per capita and turn on Energy Use.



(1) *What level is the energy use for Bolivia?*



(2) *Based on this new information and previous data, should Bolivia be classified as a developing or developed country?*



(3) *Why does energy use increase when a country develops?*

Now you will explore the data as it pertains to other countries and you will see if your earlier classification of each country has changed.

d Explore GDP per capita and Energy Use for each of the countries listed on your answer sheet. You may consult your previous classification of these countries by looking at the table from step 4.



(1) *Complete the table on your answer sheet.*



(2) *Name one country from above that you earlier classified as developed and that has GDP and energy use data that indicates it is developing.*



(3) *Based on the data you collected on these six countries, do you feel that the employment criteria are good indicators of a country's economic status? Explain your answer.*



Step 9 Save the map document and exit ArcMap

In this exercise, you used workforce data to determine whether countries should be classified as developed or developing. You added new data, thematically mapped the data, and reevaluated your previous classifications.



a Click the Full Extent button so you can see the entire world in the Economic Data map.

b Choose Save As from the File menu. Ask your teacher for instructions on where to save the map document and how to rename it. You must save this map document because you will need it for the assessment.



c Write the new name you gave the map document and where you saved it in the space on your answer sheet.



d Click the Restore Down button to return the ArcMap window to its original size.

e From the File menu, click Exit.



NAME _____

DATE _____

Student answer sheet

Module 6

Human Geography III: Economic Geography

Global perspective: The Wealth of Nations

Step 3 Evaluate the legends and patterns of the maps

a-1 What do the darkest colors represent?

a-2 What do the lightest colors represent?

b-1 What does the description "Very High" refer to in this map?

b-2 Where are the countries with a high percentage of agricultural workers generally located?

b-3 Where are the countries with a low percentage of agricultural workers generally located?

c-1 Where are the countries with a high percentage of service workers generally located?

c-2 Where are the countries with a low percentage of service workers generally located?

c-3 What relationship, if any, do you see between the agriculture and services workforce maps?

d What patterns do you see on the map?

e Using the workforce information in all three maps, in what part or parts of the world do you find the greatest number of developing countries?



Step 4 Analyze data on Bolivia

- I-1 What percentage of workers in Bolivia are involved in agriculture? _____
- I-2 What percentage of workers in Bolivia are involved in industry? _____
- I-3 What percentage of workers in Bolivia are involved in service? _____
- I-4 Would you classify Bolivia as a developed or developing country? Explain.

n In the table below, record the classification (developed or developing) you gave Bolivia in the previous question. Complete the rest of the table by following the instructions in step 5.

COUNTRY	AGRICULTURE	INDUSTRY	SERVICE	DEVELOPING	DEVELOPED
Bolivia	High	Low	High		
India					
Australia					
South Korea					
Ukraine					
Uruguay					

Step 8 Analyze GDP per capita and energy use data

- b-1 What level is the GDP per capita for Bolivia? _____
- b-2 Based on this new information and the workforce data, should Bolivia be classified as a developing or developed country?

 Why?

- c-1 What level is the energy use for Bolivia? _____
- c-2 Based on this new information and previous data, should Bolivia be classified as a developing or developed country?

- c-3 Why does energy use increase when a country develops?



d-1 Complete the table below.

COUNTRY	GDP PER CAPITA	ENERGY USE	DEVELOPED OR DEVELOPING	IS THIS A CHANGE FROM YOUR EARLIER CLASSIFICATION?
Bolivia				
India				
Australia				
South Korea				
Ukraine				
Uruguay				

d-2 Name one country from above that you earlier classified as developed and that has GDP and energy use data that indicates it's developing.

d-3 Based on the data you collected on these six countries, do you feel that the employment criteria are good indicators of a country's economic status? Explain your answer.

Step 9 Save the map document and exit ArcMap

c Write the new name you gave the map document and where you saved it in the space below.

(Name of map document.
For example: ABC_Global.mxd)

(Navigation path to where map document is saved.
For example: C:\Student\ABC)



NAME _____

DATE _____

The Wealth of Nations

Middle school assessment

- 1** Open your saved version of the Global6 map document (e.g., ABC_Global6). Use the three economic activity maps (agriculture, services, and industry) to select a country you believe is a developed country and one that you believe is a developing country. Write the names of those countries at the top of the sheet provided.
- 2** Activate the Economic Data data frame and add a world_economics layer from the World6 geodatabase. Switch to Data View.
- 3** Thematically map the developing country indicators in the world_economics attribute table. Refer to the attached assessment sheet for guidelines on which data to map (page 350). (Hint: You can copy the world_economics layer and paste it into the data frame for each attribute you map. You may also want to collapse any unneeded data frames table of contents to make your work easier.)
- 4** Record the information you observe from the new maps on the attached sheet. You may use other developing country indicators that are not listed on the sheet. Write those in the blank lines at the end of the table.
- 5** Look at the data in the two columns and decide if your initial prediction is correct.
- 6** Write an essay that includes or answers the following information and questions:
 - Name and description of the three economic production models.
 - Does the data you found about your selected countries support what economists say about economic production as an indicator of developed or developing status?
 - Your own definitions, based on your research, of a developed country and a developing country.

The Wealth of Nations

Assessment rubric

Middle school

STANDARD	EXEMPLARY	MASTERY	INTRODUCTORY	DOES NOT MEET REQUIREMENTS
The student understands how to use maps and databases to analyze spatial distributions and patterns.	Uses GIS to analyze economic data by creating at least seven thematic maps that compare and contrast the different economic indicators for two countries. Uses additional data from outside sources.	Uses GIS to analyze economic data by creating seven thematic maps that compare and contrast the different economic indicators for two countries.	Uses GIS to analyze economic data by creating five or six thematic maps that compare and contrast the economic indicators for two countries.	Uses GIS to create four or fewer thematic maps based on economic data for one or two countries.
The student understands ways to classify economic activity.	Clearly describes the three economic production models and provides an example of each. Creates detailed and accurate original definitions of developed and developing countries. Provides ample evidence for the definition.	Clearly describes the three economic production models and then creates an accurate and original definition of developed and developing countries.	Describes the three economic production models, and attempts to create original definition of developed and developing countries.	Has difficulty describing the three economic production models, and does not attempt to create original definitions for developed and developing countries.
The student understands the spatial organization of human activities and physical systems and is able to make informed decisions.	The student understands how varying points of view about geographic context influence plans for change.	Compares own findings with the predefined economic status of the selected countries. Identifies any inconsistencies in the findings, and either accepts or rejects his/her hypothesis.	Compares and contrasts own findings with the predefined economic status of the selected countries.	Lists own ideas on the economic status of the selected country (or countries), but does not draw any comparisons with predefined economic status.

This is a four-point rubric based on the National Standards for Geographic Education. The “Mastery” level meets the target objective for grades 5–8.





NAME _____

DATE _____

The Wealth of Nations

High school assessment

- 1 Open your saved version of the Global6 map document (e.g., ABC_Global6). Use the three economic activity maps (agriculture, services, and industry) to select a country you believe is a developed country and one that you believe is a developing country. Write the names of those countries at the top of the sheet provided.
- 2 Activate the Economic Data data frame and add a world_economics layer from the World6 geodatabase. Switch to Data View.
- 3 Thematically map the developing country indicators in the world_economics attribute table. Refer to the attached assessment sheet for guidelines on which data to map (page 350). (Hint: You can copy the world_economics layer and paste it into the data frame for each attribute you map. You may also want to collapse any unneeded data frames table of contents to make your work easier.)
- 4 Record the information you observe from the new maps on the attached sheet. You may use other developing country indicators that are not listed on the sheet. Write those in the blank lines at the end of the table.
- 5 Look at the data in the two columns and decide if your initial prediction is correct.
- 6 Write an essay that includes or answers the following information and questions:
 - Name and description of the three economic production models. Give a brief explanation of the relationship between those models. For example: Will a country usually have high percentages or low percentages in all three production areas?
 - Does the data you found about your selected countries support what economists say about economic production as an indicator of developed or developing status?
 - Your own definitions, based on your research, of a developed country and a developing country.
 - Prediction of changes in your countries' economic status by the year 2020, and supporting data.

The Wealth of Nations

Assessment rubric

High school

STANDARD	EXEMPLARY	MASTERY	INTRODUCTORY	DOES NOT MEET REQUIREMENTS
The student understands how to use geographic representations and tools to analyze and explain geographic problems.	Uses GIS to analyze economic data by creating at least seven thematic maps that compare and contrast the different economic indicators for two countries. Uses additional data from outside sources.	Uses GIS to analyze economic data by creating seven thematic maps that compare and contrast the different economic indicators for two countries.	Uses GIS to analyze economic data by creating five or six thematic maps that compare and contrast the economic indicators for two countries.	Uses GIS to create four or fewer thematic maps based on economic data for one or two countries.
The student understands the classification, characteristics, and spatial distribution of economic systems.	Clearly describes the three economic production models, explains the relationship between these models, and then creates original detailed definitions of developed and developing countries. Provides ample evidence and examples for each.	Clearly describes the three economic production models, explains the relationship between these models, and then creates original detailed definitions of developed and developing countries. Provides some evidence and examples for each.	Describes the three economic production models, and attempts to create original definition of developed and developing countries.	Has difficulty describing the three economic production models, and does not attempt to create original definitions for developed and developing countries.
The student understands how to use geographic knowledge, skills, and perspectives to analyze problems and make decisions.	Compares own findings with the predefined economic status of the selected countries. Identifies any inconsistencies in the findings, and either accepts or rejects his/her hypothesis. Refines original hypothesis based on the findings. Predicts future changes for the economic status of the countries giving specific examples.	Compares own findings with the predefined economic status of the selected countries. Identifies any inconsistencies in the findings, and either accepts or rejects his/her hypothesis. Predicts any future changes for the economic status of the countries.	Compares and contrasts own findings with the predefined economic status of the selected countries. Attempts to predict future changes in economic status, but does not provide enough evidence.	Lists own ideas on the economic status of selected country (or countries), but does not draw any comparisons with predefined economic status.

This is a four-point rubric based on the National Standards for Geographic Education. The “Mastery” level meets the target objective for grades 9–12.





DEVELOPING COUNTRY INDICATORS	DEVELOPED COUNTRY _____	DEVELOPING COUNTRY _____
High birth rates		
Moderately high death rates		
High infant mortality rate		
Low life expectancy at birth		
Large percentage of population under 15		
Literacy rates low		
High urban populations		
Low gross domestic product		
Low consumption of energy		
Higher percentage per person communication facilities		
Economic production criteria—write whether they are predominantly agriculture-, industry-, or service-based.		
Other criteria: _____		
Other criteria: _____		
Other criteria: _____		



Share and Share Alike

A regional case study of North America and NAFTA

Lesson overview

Students will explore trade in North America focusing on the three trading partners in the North American Free Trade Agreement (NAFTA)—Canada, Mexico, and the United States. They will study export data for the past 10 years from each of the NAFTA countries, then use this information to identify trading trends before and after NAFTA, and to assess its effectiveness. Finally, students will make a layout containing a map and charts that support their opinions.

Estimated time Two to three 45-minute class periods

- Materials**
- ✓ Student handouts from this lesson to be copied:
 - NAFTA objectives handout (page 356)
 - GIS Investigation sheets (pages 357 to 369)
 - Student answer sheet (pages 371 to 375)
 - Assessment(s) (pages 376 to 379)

Standards and objectives

National geography standards

GEOGRAPHY STANDARD	MIDDLE SCHOOL	HIGH SCHOOL
1 How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective	The student understands how to make and use maps, globes, charts, models, and databases to analyze spatial distributions and patterns.	The student understands how to use geographic representations and tools to analyze, explain, and solve geographic problems.
11 The patterns and networks of economic interdependence on Earth's surface	The student understands the basis for global interdependence.	The student understands the increasing economic interdependence of the world's countries.
13 How the forces of cooperation and conflict among people influence the division and control of Earth's surface	The student understands how cooperation and conflict among people contribute to economic and social divisions of Earth's surface.	The student understands why and how cooperation and conflict are involved in shaping the distribution of social, political, and economic spaces on Earth at different scales.

Objectives

The student is able to:

- Explain the concept of imports and exports related to trade balances of a country.
- Evaluate the effectiveness of NAFTA.
- Create a layout that displays the results of the student's research.



GIS skills and tools



Display attributes for a specific feature



Select a feature on the map



Zoom the layout to view the whole page



Zoom out a fixed amount on the map



Move elements in a layout



Add text to a layout

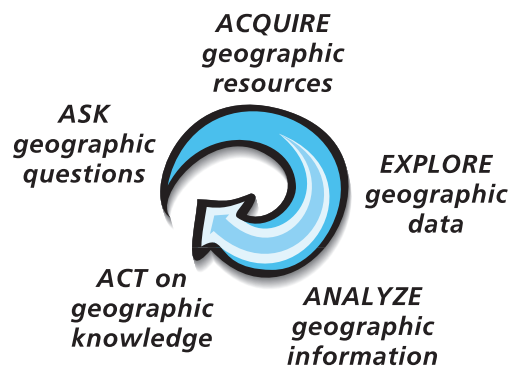


Zoom to the full map extent



Add data to the map

- Open the attribute table for a layer
- Relate a table to a layer attribute table
- Update a relate to reflect a change in selected features
- Clear all selected features
- Open a graph and display data for a specific map feature
- Modify a graph's appearance
- Add graphs to a layout
- Print a layout



For more on geographic inquiry and these steps, see Geographic Inquiry and GIS (pages xxiii to xxv).



Teacher notes

Lesson introduction

This lesson is designed to correspond with a unit on NAFTA. Before you start this lesson, we suggest that you review the history of NAFTA. You may want to visit the following Web sites:

- www.customs.ustras.gov/nafta
Provides links to NAFTA customs and other information from each of the three countries.
- www.dfait-maeci.gc.ca/nafta-alena/menu-e.asp
Presents clear and concise information on the history of NAFTA and continuing NAFTA issues.
- www.sice.oas.org/indexe.asp
Contains excellent information on NAFTA as well as on foreign trade in general.



Note: Due to the dynamic nature of the Internet, the URLs listed above may have changed. If the URLs do not work, refer to this book's Web site for an updated link: www.esri.com/mappingourworld.

Additional resources on NAFTA are listed on this book's Web site (www.esri.com/mappingourworld).

Your students should have a working knowledge of basic economics in addition to background information on NAFTA. Make sure they are familiar with the terms trade, imports, exports, trade balance, and tariffs. Basic graph-reading skills will also be essential.

Begin the lesson with a discussion of the North American Free Trade Agreement (NAFTA) as spelled out in the NAFTA objectives handout included with this lesson. Ask your students to explain the objectives of NAFTA in their own words. This exercise could be done as a class activity on the board or in groups with several sets of goals being developed. Note: You may want to save the results so students can refer to them when they evaluate NAFTA in step 8.

When you are satisfied that your students have a handle on NAFTA, discuss the flow of goods into and out of a country and the concept of trade balance. Introduce the following formula for trade balance:

EXPORTS – IMPORTS = TRADE BALANCE (trade surplus or deficit)

When exports are more than imports, you have a trade surplus.

When imports are more than exports, you have a trade deficit.

Ask the students to predict the trade balance between each of the NAFTA countries.

Student activity



Before completing this lesson with students, we recommend that you work through it yourself. Doing so will allow you to modify the activity to accommodate the specific needs of your students.

Student work on the computer component of the lesson follows the initial discussion. Ideally each student should be at an individual computer, but the lesson can be modified to accommodate a variety of instructional settings.

On the first day, distribute the GIS Investigation sheets to the students. Explain that in this activity they will create graphs and maps to explore and report on the patterns of trade over the past 10 years between the NAFTA countries. In addition, they will use the graphs to identify whether NAFTA achieved its goals as outlined in the objectives discussed in class.



*Student activity
(continued)*

The worksheets will provide students with detailed instructions for their investigations. As they navigate through the lesson, they will be asked questions that will help keep them focused on key concepts. Some questions will have specific answers while others will require creative thought.

Things to look for while the students are working on this activity:

- Are students using a variety of tools?
- Are they answering the questions as they work through the procedure?
- Do they need help with the lesson's vocabulary?



Teacher Tip: Step 7 of this GIS Investigation contains instructions for students to stop and save their work. This is a good spot to stop the class for the day and to pick up the investigation the next day. Be sure your students know how to rename their project and where to save it. We recommend that you spend two class periods doing the GIS Investigation and allow one period for work on the assessment.

Conclusion

At the completion of the lesson, have the students present to the class their trading history layouts and answers to their initial predictions. Ask them to describe the trade balances between each of the countries and also whether they think NAFTA has succeeded in achieving its goals. Finally, the students should evaluate whether or not NAFTA should remain in place. Tally up the results and report to the class what their combined opinion suggests.

Assessment

Middle school: Highlights skills appropriate to grades 5 through 8

Students will create and present layouts that illustrate the history of trade between Mexico and the United States, using maps they have made, graphs, text, and graphics. Presenters will describe the trade balance between the countries, and indicate whether they think NAFTA has achieved its goals. Presentations will conclude with students offering opinions about whether NAFTA should remain in place, using information from their layout to support those opinions.

High school: Highlights skills appropriate to grades 9 through 12

Students will create and present layouts that illustrate the history of trade between Mexico and the United States, using maps they have made, charts, text, and graphics. Presenters will describe the trade balance between the countries, and indicate whether they think NAFTA has achieved its goals. Presentations will conclude with students offering opinions about whether NAFTA should remain in place, using information from their layout to support those opinions. Finally, students will write a paragraph describing how they would change the NAFTA agreement to improve or enhance future trading for all three countries.

Extensions

- Have the students research the history of NAFTA.
- Have students acquire similar data for the European Union, OPEC, and the Organization of American States, and compare and contrast the outcomes of NAFTA and the European Union.
- Have students map the movements of commodities from the NAFTA countries in which they were produced, to countries where they are bought and used.
- Go to Statistics Canada, U.S. Census Bureau, and INEGI sites to obtain total international export information and map that information.



- NAFTA affects other aspects of each nation's economy, such as employment rates. Have students research employment trends since the advent of NAFTA. Have the NAFTA countries experienced increased employment or unemployment since 1994?
- Ask the students to do research on the employment/unemployment figures in the United States, Canada, and Mexico since NAFTA was initiated in 1994, and to report if there was a substantial change in employment/unemployment figures since January 1, 1994.
- Check out the Resources by Module section of this book's companion Web site (www.esri.com/mappingourworld) for print, media, and Internet resources on the topics of economics, trade, and NAFTA.



NAFTA objectives handout

The North American Free Trade Agreement (NAFTA) came into effect on January 1, 1994. This agreement created the world's largest free trade area. Among the agreement's main objectives are the liberalization of trade between Canada, Mexico, and the United States, stimulation of economic growth in all three countries, and equal access to each other's markets.

NAFTA Articles 101 and 102

Article 101: Establishment of the Free Trade Area

The Parties to this Agreement, consistent with Article XXIV of the General Agreement on Tariffs and Trade, hereby establish a free trade area.

Article 102: Objectives

- 1** The objectives of this Agreement, as elaborated more specifically through its principles and rules, including national treatment, most-favored-nation treatment and transparency are to:
 - (a) eliminate barriers to trade in, and facilitate the cross border movement of, goods and services between the territories of the Parties;
 - (b) promote conditions of fair competition in the free trade area;
 - (c) increase substantially investment opportunities in the territories of the Parties;
 - (d) provide adequate and effective protection and enforcement of intellectual property rights in each Party's territory;
 - (e) create effective procedures for the implementation and application of this Agreement, for its joint administration and the resolution of disputes; and
 - (f) establish a framework for further trilateral, regional and multilateral cooperation to expand and enhance the benefits of this Agreement.
- 2** The Parties shall interpret and apply the provisions of this Agreement in the light of its objectives set out in paragraph 1 and in accordance with applicable rules of international law.

From the North American Free Trade Agreement between the Government of Canada, the Government of the United Mexican States, and the Government of the United States of America, published January 1, 1994, as written in the U.S. Customs Department Web site (www.customs.gov/impoexpo/nafta_newf.htm).

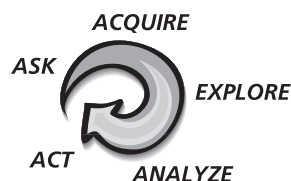


NAME _____

DATE _____

Share and Share Alike

A GIS investigation



Answer all questions on the student answer sheet handout

On January 1, 1994, the North American Free Trade Agreement (NAFTA) was enacted to enhance trade and increase access to the total trade market available to businesses in North America. Tariffs and quotas were eliminated to increase the competitiveness of goods produced by all North Americans. Now, a decade after NAFTA's inception, your task will be to evaluate whether these objectives have been accomplished for all three countries involved. In this lesson you will create and analyze graphs of exports and trade balances for the NAFTA trading partners. As you are doing these exercises, ask yourself the following questions:

- Have there been any changes in exports or trade balance since the inception of NAFTA?
- Is there a larger market available for business in North America?
- Is there greater competition forcing businesses to provide the best products and best prices for their goods?
- Has NAFTA been equally beneficial for all countries involved?
- Does the trade balance of a country tell the whole story of how effective NAFTA is?

Ultimately, you will have to decide if you think NAFTA is effective!

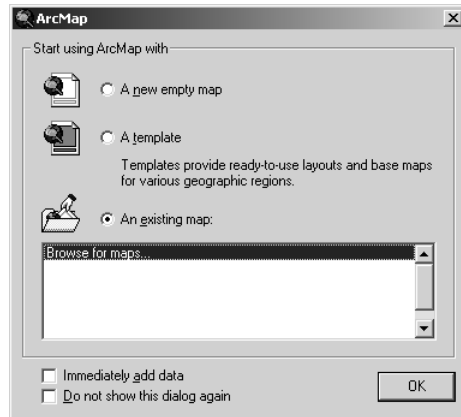
Step 1 Start ArcMap

- Double-click the ArcMap icon on your computer's desktop.



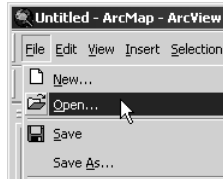


- b** If the ArcMap start-up dialog appears, click **An existing map** and click OK. Then go to step 2b.

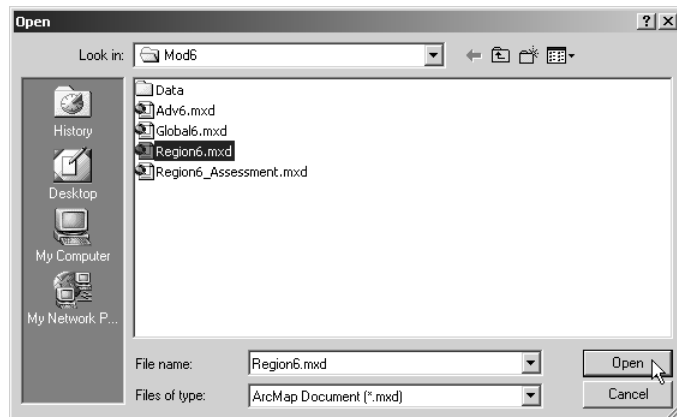


Step 2 Open the Region6.mxd file

- a** In this exercise, a map document has been created for you. To open it, go to the File menu and choose **Open**.

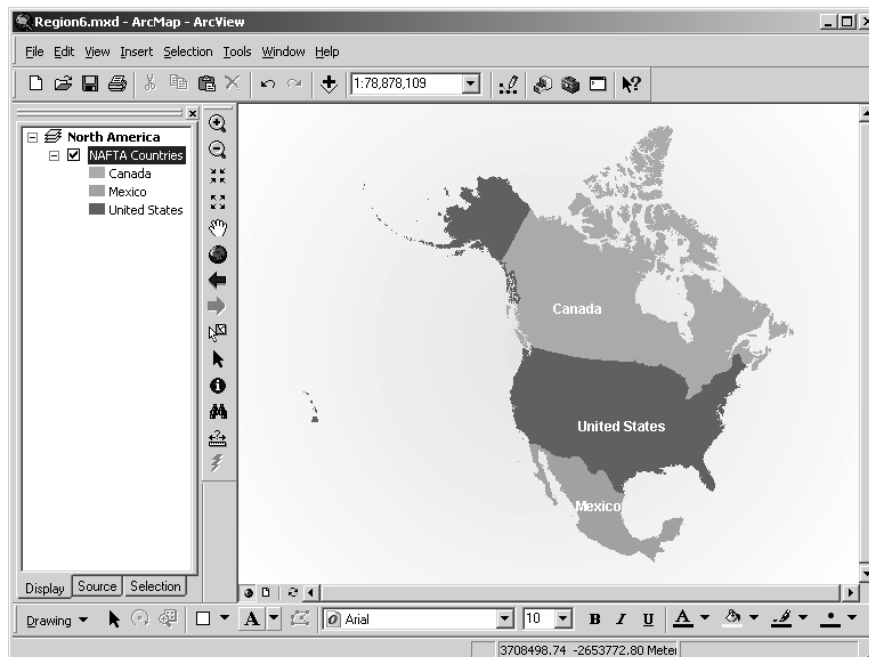


- b** Navigate to the module folder (**C:\MapWorld9\Mod6**) and choose **Region6.mxd** (or **Region6**) from the list.



- c** Click Open.

When the map document opens, you see a map of North America showing the three countries participating in NAFTA.



Step 3 Examine the map and attribute table



- Click the Identify tool, then click Canada on the map.
- Look at the attribute names in the Field column of the Identify Results window.

Field	Value
OBJECTID	3
Shape	Polygon
CNTRY_NAME	Canada
FIPS_CNTRY	CA
1991 to US	91064
1991 TB US	5914
1991 to MEX	509
1991 TB MEX	-1743
1991 to CAN	0
1991 TB CAN	0
1992 to US	98630
1992 TB US	8036
1992 to MEX	673
1992 TB MEX	-1622
1992 to CAN	0

- Scroll down the list and answer the following questions.



- Which years does the layer contain data for?
- How many attributes are there for each year?

Field names with the word “to” in them represent the value of goods and services exported from one country to another. For example, the attribute **1991 to US** represents the value of goods and services that a country exported **to the United States** in the year 1991. Field names with the abbreviation “TB” represent a country’s trade balance.

The values are expressed in millions of U.S. dollars. That means you have to multiply the number you see by 1,000,000 to get the actual dollar value.



- What was the value of goods and services exported from Canada to the United States in 1991?




- d Close the Identify Results window.
- e Right-click NAFTA Countries in the table of contents and choose Open Attribute Table.
- (1) What is the name of the table?
- (2) How many rows are there for each country on the map?
- f Click the gray box at the beginning of the United States row in the table.

OBJECTID*	Shape*	CNTRY_NAME	FIPS_CNTRY	1991 to US
1	Polygon	Mexico	MX	31130
2	Polygon	United States	US	0
3	Polygon	Canada	CA	91064

Step 4 Relate another table to the layer table

In this step you will open a second table that contains the trade data organized differently. You will relate the two tables together and then view the trading statistics in the tables and on a series of graphs.

- a Click the Source tab at the bottom of the table of contents. (Hint: If the Source tab is covered by the Attributes of NAFTA_Countries table, click the table's title bar and drag the table out of the way.)
- b Right-click NAFTA_Trading_Statistics in the table of contents and choose Open.
-  **Note: The NAFTA_Trading_Statistics table is not listed on the Display tab because it is not a map layer. It is only listed on the Source tab.**
- c Make each table window smaller. Make sure that you can see all of the rows in the table as well as the Options button at the bottom. Arrange your windows so that you can see the map and both of the tables at the same time (Hint: Your ArcMap window can be small for this investigation.)
- d Examine the NAFTA_Trading_Statistics table pictured below and answer the questions.

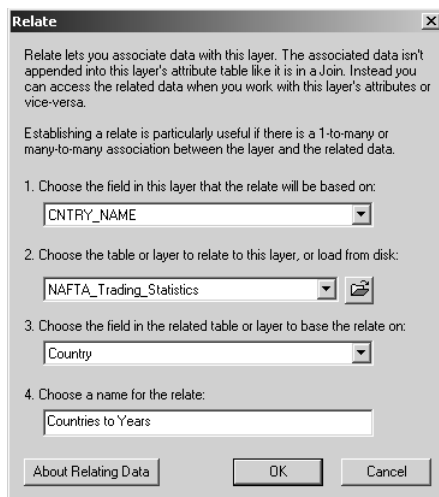
Country	Item	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Canada	Total Exports to United States	91064	98630	111216	128406	144370	155893	167234	173256	198711	230838
Canada	Trade Balance with the United States	5914	8036	10772	13967	17144	21682	15468	16653	32111	51897
Canada	Total Exports to Mexico	509	673	640	793	846	923	923	989	1085	1371
Canada	Trade Balance with Mexico	-1743	-1622	-2236	-2520	-3054	-3503	-4149	-4191	-5335	-6753
Mexico	Total Exports to United States	31130	35211	39917	49494	62101	74297	85938	94629	109721	135926
Mexico	Trade Balance with the United States	-2147	-5381	-1664	-1350	15809	17505	14550	15856	22812	24577
Mexico	Total Exports to Canada	2252	2295	2876	3313	3899	4426	5072	5180	6420	8125
Mexico	Trade Balance with Canada	1743	1622	2236	2520	3053	3503	4149	4191	5335	6754
United States	Total Exports to Canada	85150	90594	100444	114439	127226	134210	151767	156604	166600	178941
United States	Trade Balance with the Canada	-5914	-8036	-10772	-13967	-17144	-21683	-15467	-16652	-32111	-51897
United States	Total Exports to Mexico	33277	40592	41581	50844	46292	56792	71388	78773	86909	111349
United States	Trade Balance with Mexico	2147	5381	1664	1350	-15809	-17505	-14550	-15856	-22812	-24577

- (1) How many rows are there for each country?
- (2) What information is collected under the field titled "Item" for Canada?
- (3) Describe in general terms the information collected in the field titled "Item."
- (4) How many years of data are represented in the table?



In the next steps, you will relate the two tables by using common information to both tables (country names).

- e Right-click NAFTA Countries in the table of contents, point to Joins and Relates, and click Relate.
- f In the first drop-down list in the Relate dialog, scroll down and choose CENTRY_NAME. Keep the default selections for steps 2 and 3. In step 4, replace the default name with **Countries to Years**. Click OK.



- g Click the Options button in the Attributes of NAFTA Countries table and choose Related Tables, Countries to Years: NAFTA_Trading_Statistics.



What happens in the NAFTA Trading Statistics table?



- h Use the Select Features tool to click Canada on the map.



What happens in the two tables and the map?

- i Update the related rows by clicking the Options button in the Attributes of NAFTA Countries table and choosing Related Tables, Countries to Years: NAFTA_Trading_Statistics.

Next, you'll see what happens when you make a selection in the related table.

- j Select a row for Mexico in the Attributes of NAFTA_Trading_Statistics table.



What happens in the two tables and the map?

- k Now click the Options button in the related table—the Attributes of NAFTA_Trading_Statistics table—and choose Related Tables, Countries to Years: NAFTA_countries.



What have you observed about the way the NAFTA Trading Statistics table is tied to the NAFTA Countries attribute table and map layer?

- l Click Selection in the Main menu in the ArcMap window and choose Clear Selected Features. All of the selections are cleared.

**Step 5 Examine export graphs**

Now you will examine a graph of exports to Canada.

- a* Click the Tools menu, point to Graphs, and choose Exports to Canada.

The graph window actually contains three small graphs, one for each country.

- b* Enlarge the graph window slightly so you can read it more easily.



(1) Which country exported more goods and services to Canada—Mexico or the United States?



(2) Why is the graph empty in the space for Canada?

- c* Drag the graph window completely off the map and table windows.



- d* Using the Select Features tool, click Mexico on the map. Mexico is outlined in blue.



What happened to the graph?

Because the graph is created from the data in the attribute table, it is tied to the map through the table. When you select a country on the map, only the data for that associated row in the table is displayed in the graph.

- e* Answer the questions below using the graph and tables.



(1) How many years of data are represented on the graph?



(2) What year does the first bar on the left represent?



(3) Compare the numbers on the y-axis with those in the two tables. Are the numbers on the graph in thousands, millions, or billions of dollars? (Hint: Remember that the Attributes of NAFTA Countries table values are in millions of dollars.)



(4) Looking at the graph, how would you describe the trend of Mexican exports to Canada over the 10-year period?



(5) What was the approximate value of Mexican exports to Canada in 1991? In 2000?



(6) Approximately how many times greater is the 2000 export figure than the 1991 export figure?

- f* Close the Exports to Canada graph.

- g* Click the Tools menu and open the graph entitled Exports to U.S.



(1) How would you describe the trend of Mexican exports to the United States over the 10-year period?



(2) Approximately how many times greater is the 2000 export figure than the 1991 export figure?







Note: Carefully observe the y-axis values of the graphs in this investigation. The height of a column may be the same on two different graphs, but it may represent very different dollar values.




Step 6 Examine a trade balance graph



- a Click the Tools menu and open the graph entitled Trade Balance with U.S.
- b This graph may cover up the first graph. Drag it below the first one so you can see both graphs at the same time.

 **Remember: Trade balance compares how much a country exports to a trading partner with how much it imports from the same partner.**

- c Use the Trade Balance with U.S. graph to answer the questions below.
 -  (1) Did Mexico have a trade surplus or deficit with the United States for 1992?
 -  (2) What was the approximate value of the trade balance for 1992? (Remember, the y-axis is in millions of dollars.)
 -  (3) What was the first year that Mexico exported more to the United States than it imported from the United States?
 -  (4) Describe the trend of Mexico's trade balance with the United States over the 10-year period.



- d Click Canada on the map. Look at the Trade Balance graph again.
 -  Did Canada have a deficit trade balance with the United States anytime during the 10-year period?

- e Click the map away from any country (anywhere in the yellow area) to clear the selection. Compare Mexico and Canada on the graph.
 -  (1) In 1998, was Canada's trade balance with the United States greater, smaller, or about the same as Mexico's?
 -  (2) In 2000, was Canada's trade balance with the United States greater, smaller, or about the same as Mexico's?

- f Select Canada on the map, then click the Options menu in the Attributes of NAFTA Countries table and update the relate.



Referring to the Attributes of NAFTA_Trading_Statistics table, what was the exact value of Canada's trade balance with the United States in 2000?

- g Click the Selection menu in the ArcMap window and click Clear Selected Features.

Step 7 Change the look of a trade balance graph

- a Close the table windows and the Exports to U.S. graph. (Keep open the Trade Balance with U.S. graph.)
- b Click the Tools menu and open the graph entitled TB Mex.

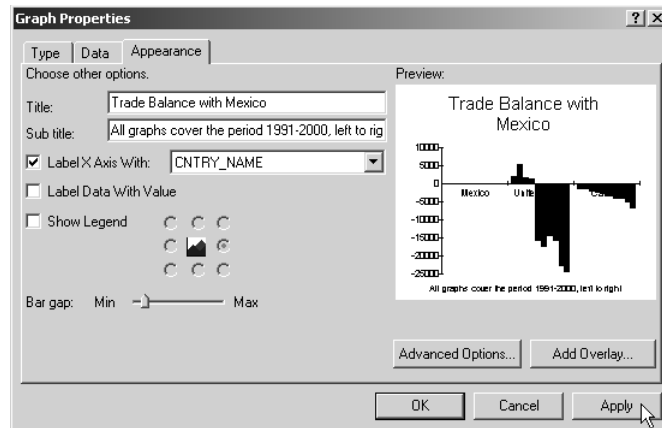
TB Mex is a basic graph showing the Mexican trade balance data. In the next steps you will change the properties of this graph to give it the same appearance as the other trade balance graphs.

- c Right-click the title bar of the TB Mex graph window and choose Properties.
- d Arrange your windows so you can see the Graph Properties dialog and both of the graphs.

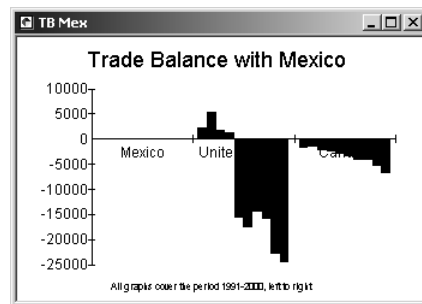


You will begin by changing the graph title, adding a subtitle, and removing the graph legend.

- e In the Appearance tab, make the following changes:
- Delete the existing title and type **Trade Balance with Mexico**.
 - In the Sub title box, type **All graphs cover the period 1991-2000, left to right**.
 - Check the box to Label X Axis With. CENTRY_NAME should be the label field.
 - Uncheck the Show Legend box.



- f Click Apply. The TB Mex graph is updated.

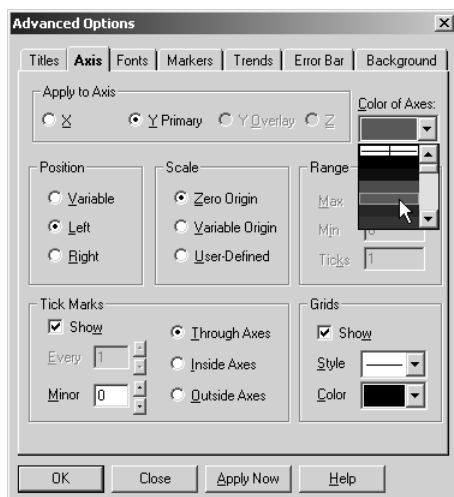


Next you will add the grid lines and change the color of the title, subtitle, and background.

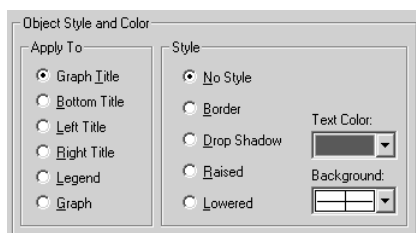
- g Click the Advanced Options button on the Appearance tab of the Graph Properties dialog.



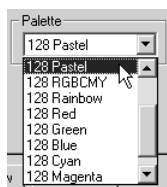
- h** Click the **Axis** tab in the **Advanced Options** dialog. Choose the following settings, and then make sure your dialog looks like the one pictured below:
- **Color of Axes** = teal blue (the fourth color listed)
 - **Position** = **Left**
 - **Check to Show grids**
 - **Grid color** = **black**



- i** Click the **Background** tab.
- j** Make sure that **Graph Title** is selected in the **Apply To** list. Then click the **Text Color** drop-down list and choose teal blue.

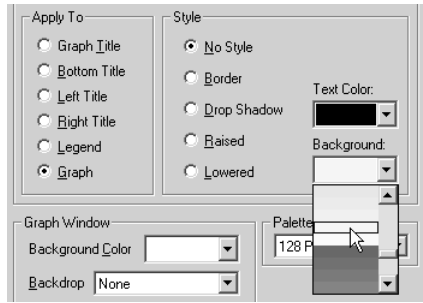


- k** Click **Bottom Title** in the **Apply To** list. Choose the teal blue text color again.
- l** Click **Graph** in the **Apply To** list and make the text color black.
- m** Click the **Palette** drop-down list. Scroll up and choose **128 Pastel**.





- n* Locate the Background list just above the Palette list (NOT the Background Color list to the left). Select light cyan blue by scrolling down about two-thirds of the way until you see a set of cyan blues and then bright pinks. Choose the second light cyan color above the bright pink. (This is the color that is used in the Trade Balance with U.S. graph.)



- o* Click OK in both open dialog windows.

The Trade Balance with Mexico graph now looks like the other trade balance graphs. You will use this graph later in step 8.

- p* Close the two graph windows.



- q* Ask your teacher if you should stop here and save this ArcMap map document. Follow your teacher's instructions on how to rename the map document and where to save it. For example, you could rename it **ABC_Region6** where ABC are your initials. To help you remember, write the new name you gave the project and where you saved it on the answer sheet.

If you do not need to save the project, proceed to step 8.

Step 8 Evaluate the effectiveness of NAFTA

In this lesson, you are looking at the level of trade among the NAFTA trading partners—Canada, Mexico, and the United States. You are also looking at changes in the level of trade among the three countries over time.

Remember, it is nearly impossible for any country to produce everything it needs to support its people. Countries must import (purchase) goods from other countries. One country's imports are the other country's exports. In this map document, you have no graphs for imports because you can figure out that information by looking at the export graphs.

For example, to find the United States' imports from Canada, you switch the question in your mind and look for Canada's exports to the United States. You would find this information on the graph entitled Exports to United States.

To decide whether or not NAFTA is meeting its goals, you will need to further explore the data in the graphs and tables in the ArcMap map document. In this step, you will gather the information that you need to decide if you think NAFTA is effective. You may want to refer to the NAFTA objectives handout or the list of NAFTA goals you developed with your teacher at the beginning of the lesson. Remember these formulas as you examine the charts and answer the questions that follow:

$$\text{Exports} - \text{Imports} = \text{Trade Balance}$$

Trade Balance:

$$\text{Exports} > \text{Imports} = \text{Trade Surplus}$$

$$\text{Imports} > \text{Exports} = \text{Trade Deficit}$$




- a* Go to the Tools menu and open the three export graphs. Arrange them so they are not overlapping and you can compare them.
- ? *b* Use the graphs to find the value of exports between each set of countries for the year 2000. Write the information in the table on your answer sheet.
- ? *c* Add the export values together for each pair of countries (for example, United States to Mexico plus Mexico to United States) and write that number in the Total Volume Between Partners column.
- ? *d* Rank the trading partners by the overall volume of trade between the two countries. Use 1 for the partners trading the most and 3 for the partners trading the least.
 - ? (1) *Do you think that NAFTA had a positive (+), negative (-), or neutral (n) effect on trade volume between each set of partner countries?*
 - ? (2) *Do you think that any one of these three countries benefited more than the other two by NAFTA? If so, which country? Explain your answer.*
- e* Close the three graph windows.
- f* Go to the Tools menu and open the three Trade Balance graphs. Arrange them so you can compare them.

Remember that most countries prefer to export a higher volume and dollar value of goods than they import, but either a large trade surplus or large trade deficit may negatively affect a country's overall economic health.
- g* Look at the Trade Balance with Canada graph.
 - ? (1) *What country has a healthier trade balance with Canada—Mexico or the United States?*
 - ? (2) *On what graph do you find a set of bars that looks like a mirror image of those for the U.S. trade balance with Canada?*
- h* Compare the trade balance graphs.
 - ? (1) *What country had the most dramatic change for the better after NAFTA came into being? (Remember, NAFTA went into effect in 1994.)*
 - ? (2) *Estimate the U.S. trade deficit with Canada and Mexico for 1999 and 2000. Express the values in billions of dollars, using round numbers that you estimate from the graphs. Write the answers in the space provided.*
 - ? (3) *Did the U.S. combined trade balance get better or worse between 1999 and 2000? By how much?*
- i* Close the three graph windows.

Step 9 Create and print a layout

In this step you will create a layout that presents the information about the U.S. trade balance and exports to Canada. The layout will include the NAFTA countries map and two graphs: Exports to Canada and Trade Balance with Canada. Later, in the assessment, you will use the techniques you learn to create a layout showing the results of your evaluation of NAFTA.

-  *a* Click the Layout View button.
- b* Maximize your ArcMap window so that it fills your screen. If your Layout toolbar is floating, dock it above the view or in your preferred location.



- c** Click the Zoom Whole Page button on the Layout toolbar to make the layout fill the view.

The layout looks like a piece of paper. The layout already has a map, title, north arrow, legend, and scale bar. Before adding the graphs, you will make space for them by slightly reducing the size of the map.

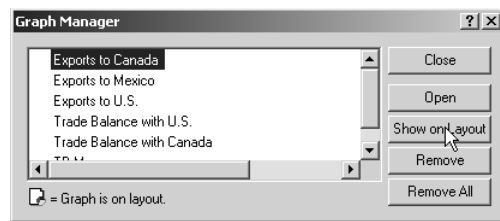


- d** Click the Fixed Zoom Out button on the Tools toolbar once to reduce the size of North America.

Next you will add the two graphs.

- e** Click the Tools menu, point to Graphs, and then click Manage to display the Graph Manager.

- f** Select Exports to Canada in the list and then click the Show on Layout button.



The graph is added to the middle of the layout.

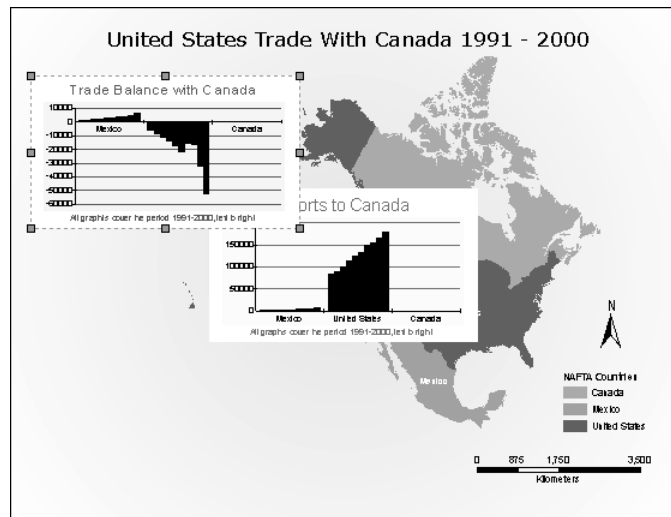
- g** Repeat the procedure to show the Trade Balance with Canada graph on the layout.

- h** Click Close to close the Graph Manager.

You will arrange the two graphs on the left side of the layout. You will also make the map a little smaller so that it better fits the space on the right.



- i** Click the Trade Balance with Canada graph using the Select Elements tool. Drag the graph to the upper left of the layout, under the title.



- j** Click the Exports to Canada graph to activate it. Then click and drag it to a position below the first graph.



- k* Use the Pan tool on the Tools toolbar to move North America slightly to the right—center it between the graphs and the legend.

When you are satisfied with the look of your layout, go on to the next step. You will add your name and the date to the layout.



- l* Click the New Text tool in the Draw toolbar. Click in the yellow space underneath the graphs to insert a piece of text.

- m* Type your name, a comma, and today's date, and then press the Enter key on your keyboard.

Amy B. Changalee, September 21, 2004

- n* Drag the text down to the lower left corner of the layout, just inside the map neat line. When you are finished, click anywhere in the white space outside the layout to unselect the text.

Finally, you need to focus the graphs on the United States to reflect U.S. trade with Canada.



- o* Click the Select Features tool and click the United States on the map.

The graphs change to focus on U.S. data.

- p* From the File menu, select Print.

- q* Check with your teacher to be sure the correct printer is selected. Click OK to print your layout.

Step 10 Exit ArcMap

In this exercise, you used ArcMap tables, graphs, and a map to explore trade data for the three North American countries. After analyzing this data, you created a layout to present some of the information.

- a* Ask your teacher for instructions on where to save this map document and on how to rename it. Save it according to your teacher's instructions.

- b* If you are not going to save the map document, exit ArcMap by choosing Exit from the File menu. When asked if you want to save changes to the map document, click No.



NAME _____

DATE _____

Student answer sheet

Module 6

Human Geography III: Economic Geography

Regional case study: Share and Share Alike

Step 3 Examine the map and attribute table

c-1 Which years does the layer contain data for? _____ to _____

c-2 How many attributes are there for each year? _____

c-3 What was the value of goods and services exported from Canada to the United States in 1991?
\$ _____

e-1 What is the name of the table? _____

e-2 How many rows are there for each country on the map? _____

Step 4 Relate another table to the layer table

d-1 How many rows are there for each country? _____

d-2 What information is collected under the field title "Item" for Canada?

d-3 Describe in general terms the information collected in the field titled "item."

d-4 How many years of data are represented in the table? _____

g What happens in the NAFTA_Trading Statistics table?

h What happens in the two tables and the map?

j What happens in the two tables and the map?



k What have you observed about the way the NAFTA Trading Statistics table is tied to the NAFTA Countries attribute table and map layer?

Step 5 Examine export graphs

b-1 Which country exported more goods and services to Canada—Mexico or the United States?

b-2 Why is the graph empty in the space for Canada?

d What happened to the graph?

e-1 How many years of data are represented on the graph? _____

e-2 What year does the first bar on the left represent? _____

e-3 Compare the numbers on the y-axis with those in the two tables. Are the numbers on the graph in thousands, millions, or billions of dollars?

e-4 Looking at the graph, how would you describe the trend of Mexican exports to Canada over the 10-year period?

e-5 What was the approximate value of Mexican exports to Canada in 1991?

In 2000? _____

e-6 Approximately how many times greater is the 2000 export figure than the 1991 export figure?

g-1 How would you describe the trend of Mexican exports to the United States over the 10-year period?

g-2 Approximately how many times greater is the 2000 export figure than the 1991 export figure?

**Step 6 Examine a trade balance graph**

c-1 Did Mexico have a trade surplus or deficit with the United States for 1992? _____

c-2 What was the approximate value of the trade balance for 1992? (Remember, the y-axis is in millions of dollars.)

c-3 What was the first year that Mexico exported more to the United States than it imported from the United States?

c-4 Describe the trend of Mexico's trade balance with the United States over the 10-year period.

d Did Canada have a deficit trade balance with the United States anytime during the 10-year period?

e-1 In 1998, was Canada's trade balance with the United States greater, smaller, or about the same as Mexico's?

e-2 In 2000, was Canada's trade balance with the United States greater, smaller, or about the same as Mexico's?

f Referring to the Attributes of NAFTA_Trading_Statistics table, what was the exact value of Canada's trade balance with the United States in 2000?

Step 7 Change the look of a trade balance graph

q Write the new name you gave the map document and where you saved it.

(Name of map document.
For example: ABC_Region6.mxd)

(Navigation path to where map document is saved.
For example: C:\Student\ABC)

**Step 8 Evaluate the effectiveness of NAFTA**

- b Use the graphs to find the value of exports between each set of countries for the year 2000. Write the information in the table below.

DIRECTION OF EXPORT FLOW	VALUE OF EXPORTS (MILLION \$)	TOTAL VOLUME BETWEEN PARTNERS (MILLION \$)
United States to Mexico		
Mexico to United States		
United States to Canada		
Canada to United States		
Canada to Mexico		
Mexico to Canada		

- c Add the export values together for each pair of countries (for example, United States to Mexico plus Mexico to United States) and write that number in the Total Volume Between Partners column.
- d Rank the trading partners by the overall volume of trade between the two countries. Use 1 for the partners trading the most and 3 for the partners trading the least.
- United States–Mexico: _____
- United States–Canada: _____
- Canada–Mexico: _____
- d-1 Do you think that NAFTA had a positive (+), negative (–), or neutral (n) effect on trade volume between each set of partner countries?
- United States–Mexico: _____
- United States–Canada: _____
- Canada–Mexico: _____
- d-2 Do you think that any one of these three countries benefited more than the other two by NAFTA? If so, which country? Explain your answer.
- _____
- _____
- _____
- g-1 What country has a healthier trade balance with Canada—Mexico or the United States?
- _____
- g-2 On what graph do you find a set of bars that looks like a mirror image of those for the U.S. trade balance with Canada?
- _____
- h-1 What country had the most dramatic change for the better after NAFTA came into being? (Remember, NAFTA went into effect in 1994.)
- _____



h-2 Estimate the U.S. trade deficit with Canada and Mexico for 1999 and 2000. Express the values in billions of dollars, using round numbers that you estimate from the graphs.

	1999 (\$ BILLION)	2000 (\$ BILLION)
U.S. trade balance with Mexico		
U.S. trade balance with Canada		
Combined deficit (total)		

h-3 Did the U.S. combined trade balance get better or worse between 1999 and 2000? _____
By how much? _____



NAME _____

DATE _____

Share and Share Alike

Middle school assessment

- 1 Using the 10 years of export and trade balance data you have for the NAFTA trading partners, Canada, Mexico, and the United States, make a determination if you think that NAFTA has been effective, marginally effective, or ineffective and whether you think NAFTA should continue or not.

Remember that there are several factors that you can use in drawing your conclusions. You have looked at several of those factors during this lesson. For instance, you can compare the exports of each country as well as look at each country's trade balances. Refer back to the NAFTA Objectives handout to remind yourself of the original intent of NAFTA.

- 2 To display your findings, create a layout in ArcMap that graphically displays your conclusion. Use the layout in the Region6_Assessment map document that has already been started for you. You may rearrange and resize the existing layout components and add your own. Your final layout should include the following components:
 - (a) Title
 - (b) Map
 - (c) Map legend
 - (d) Orientation (north arrow or compass rose)
 - (e) At least two charts
 - (f) Text labels or descriptions
 - (g) Author (your name)
 - (h) Today's date
- 3 Present your layout to the class as evidence for your conclusion on NAFTA's effectiveness.

Share and Share Alike

Assessment rubric

Middle school

STANDARD	EXEMPLARY	MASTERY	INTRODUCTORY	DOES NOT MEET REQUIREMENTS
The student knows and understands how to make and use maps, globes, graphs, charts, models, and databases to analyze spatial distributions and patterns.	Creates a layout using GIS with eight or more components including several maps and charts that illustrate the effectiveness of NAFTA.	Creates a layout using GIS with eight components including a map and minimum of two charts.	Creates a layout using GIS with most of the eight specified components including a map and at least one chart.	Creates a layout using GIS with some of the eight specified components including a map.
The student knows and understands the basis for global interdependence.	Layout shows a clear understanding of the concepts of balance of trade for NAFTA trading partners through multiple charts and maps.	Layout includes charts and maps showing an understanding of the concept of balance of trade for NAFTA trading partners.	Layout includes charts and maps showing some understanding of the concept of balance of trade for NAFTA trading partners.	Layout includes chart and or map showing trade partners, but does not illustrate an understanding of balance of trade.
The student knows and understands how cooperation and conflict among people contribute to economic and social divisions of Earth's surface.	Presents a logical argument to his/her conclusions on the effectiveness of NAFTA using a variety of resources to support his/her findings including, but not limited to, data and maps.	Presents a logical argument to his/her conclusions on the effectiveness of NAFTA using data and maps to support his/her ideas.	Describes conclusions on the effectiveness of NAFTA and provides data and maps, but cannot provide ample argument or evidence.	Identifies NAFTA participants and trading partners, but does not present any personal conclusions as to its effectiveness.

This is a four-point rubric based on the National Standards for Geographic Education. The "Mastery" level meets the target objective for grades 5–8.





NAME _____

DATE _____

Share and Share Alike

High school assessment

- 1 Using the 10 years of export and trade balance data you have for the NAFTA trading partners, Canada, Mexico, and the United States, make a determination if you think that NAFTA has been effective, marginally effective, or ineffective and whether you think NAFTA should continue or not.

Remember that there are several factors that you can use in drawing your conclusions. You have looked at several of those factors during this lesson. For instance, you can compare the exports of each country as well as look at each country's trade balances. Refer back to the NAFTA objectives handout to remind yourself of the original intent of NAFTA.

- 2 To display your findings, create a layout in ArcMap that graphically displays your conclusion. Use the layout in the Region6_Assessment map document that has already been started for you. You may rearrange and resize the existing layout components and add your own. Your final layout should include the following components:
 - (a) Title
 - (b) Map
 - (c) Map legend
 - (d) Orientation (north arrow or compass rose)
 - (e) At least two charts
 - (f) Text labels or descriptions
 - (g) Author (your name)
 - (h) Today's date
- 3 Present your layout to the class as evidence for your conclusion on NAFTA's effectiveness.
- 4 Compose a paragraph describing how you would change the NAFTA agreement to improve or enhance future trading results for all three countries. Include specific reasons why you believe your changes to NAFTA would be effective.

Share and Share Alike

Assessment rubric

High school

STANDARD	EXEMPLARY	MASTERY	INTRODUCTORY	DOES NOT MEET REQUIREMENTS
The student knows and understands how to use geographic representations and tools to analyze, explain, and solve geographic problems.	Creates a layout using GIS with eight or more components including several maps and charts that illustrate the effectiveness of NAFTA.	Creates a layout using GIS with eight components including a map and minimum of two charts that illustrates the effectiveness of NAFTA.	Creates a layout using GIS with most of the eight specified components including a map and at least one chart that illustrate the effectiveness of NAFTA.	Creates a layout using GIS with some of the eight specified components including a map that illustrates the effectiveness of NAFTA.
The student knows and understands the increasing economic interdependence of the world's countries.	Composes a brief essay that defines specific improvements to the NAFTA agreement that will benefit future trading for all three countries. Provides examples to illustrate these ideas.	Composes a paragraph that defines specific improvements to the NAFTA agreement that will benefit future trading for all three countries.	Composes a paragraph that lists ideas for improvement to the NAFTA agreement, but the improvements may not benefit all parties.	Lists ideas for improvement to the NAFTA agreement, but does not define how these improvements will enhance future trading.
The student knows and understands why and how cooperation and conflict are involved in shaping the distribution of social, political, and economic spaces on Earth at different scales.	Presents a logical argument to his/her conclusions on the effectiveness of NAFTA at a local, regional, and global level using a variety of resources to support his/her findings including, but not limited to, data and maps.	Presents a logical argument to his/her conclusions on the effectiveness of NAFTA at a local, regional, and global level using data and maps to support his/her ideas.	Describes conclusions on the effectiveness of NAFTA at a local, regional, and global level, but cannot provide ample argument or evidence.	Identifies NAFTA participants and trading partners, but does not present any personal conclusions as to its effectiveness.

This is a four-point rubric based on the National Standards for Geographic Education. The "Mastery" level meets the target objective for grades 9–12.





Live, Work, and Play

An advanced investigation

Lesson overview

Students will use the Internet to acquire the most recent data on employment in California. By exploring this data through a GIS, they will construct a thematic map for California counties that displays population, number of jobs in the finance field, and average wage data, then perform a complex query and create a map that illustrates their results. Students will be learning how to examine data to choose a place to live that satisfies a set of criteria.

Estimated time Two to three 45-minute class periods

- Materials** ✓ Student handouts from this lesson to be copied:
- Live, Work, and Play worksheet (page 384)
 - GIS Investigation sheets (pages 385 to 394)

Standards and objectives *National geography standards*

GEOGRAPHY STANDARD	MIDDLE SCHOOL	HIGH SCHOOL
1 How to use maps and other geographic representations, tools, and technologies to acquire, process, and report information from a spatial perspective	The student understands how to make and use maps, globes, graphs, charts, models, and databases to analyze spatial distributions and patterns.	The student understands how to use geographic representations and tools to analyze, explain, and solve geographic problems.
12 The processes, patterns, and functions of human settlement	The student understands the causes and consequences of urbanization.	The student understands the evolving forms of present-day urban areas.
18 How to apply geography to interpret the present and plan for the future	The student understands how varying points of view on geographic context influence plans for change.	The student understands how to use geographic knowledge, skills, and perspectives to analyze problems and make decisions.

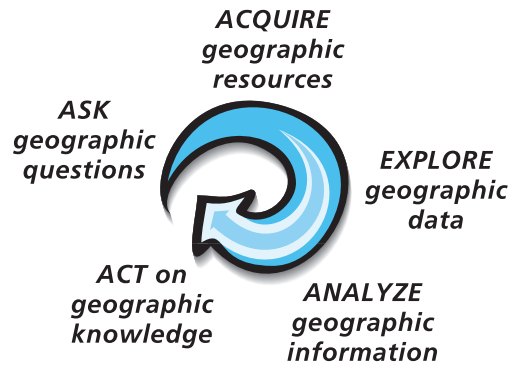
Objectives

The student is able to:

- Use the Internet to locate data for recent economic activity.
- Use a GIS to map data acquired from the Internet.
- Thematically map various data to select an appropriate place to live.

**GIS skills and tools**

- Locate data on the Internet and prepare it in a comma-delimited file
- Add tables to a map document
- Join tables
- Select features by multiple attributes
- Select a county according to a number of criteria
- Create a layout
- Print a presentation-style map



For more on geographic inquiry and these steps, see Geographic Inquiry and GIS (pages xxiii to xxv).

Teacher notes**Lesson introduction**

Open a class discussion with the following prompts:

- Business owners frequently use GIS to select a suitable site for a new business location.
- Individuals can also use GIS to decide where they would like to live, work, and spend their leisure time by looking for areas that have various characteristics, such as affordable housing, employment opportunities, and recreational areas.
- What criteria are important to students when they think about where they would like to live after they graduate from high school or college and enter adulthood?

Explain to your students that they will use the Internet to find data on recent economic activity. They will use a GIS to map economic data they find and will analyze the data to locate the best place to live, work, and play. This GIS Investigation will require students to work independently, with little guidance.



Student activity



Before completing this lesson with students, we recommend that you complete it as well. Doing so will allow you to modify the activity to accommodate the specific needs of your students.

Distribute this lesson's GIS Investigation sheets and the Live, Work, and Play Worksheet. Students should fill out the worksheet, identifying the criteria they consider the most important in choosing a place to live, then follow the guidelines to retrieve county economic data from the Internet. They will edit the data, add the data to ArcMap, and export the data to a geodatabase table. Then students will use the data to create thematic maps that display concentrations of jobs and wages, and analyze the maps to find areas with desirable characteristics (as listed on the worksheet).



Teacher Tip: In this activity, students will download and edit data. They will export the edited data to a geodatabase table. This action results in permanent changes to the data. In order for this to work properly, each student must have their own copy of the Mod6 folder.

Conclusion

Engage students in a discussion of the patterns they discovered as they mapped different economic criteria. Were they able to find a place to live that satisfied *all* of the criteria they had? Could they add more criteria? Could they use this same method to download data for other states and broaden the search area (e.g., including Washington and Oregon)? How might site analysis be useful for businesses?

Assessment

The last step of the GIS Investigation asks students to perform their own multiple-attribute query on where to live, and create a layout of their results. In addition to the map, you may wish to ask students to submit a written report that summarizes the process they went through in selecting an optimal living site and explains their query of the data. A written report could answer any or all of the following questions:

- What steps were involved in the query process each student went through to make their site selection?
- Were they surprised at the results they got when they mapped the various criteria? Why or why not?
- Was there an alternate site that might have been as acceptable as the first site chosen? Why or why not?



Note: Due to the independent nature of this lesson, there is no supplied assessment rubric. You are free to design assessment rubrics that meet the needs of your specific adaptation.

Extensions

- Ask students to broaden their search area to other states. Download economic data for other states from the Bureau of Economic Analysis Web site and perform the same analysis. Students should note any changes they see.
- Have students query more fields in the CA counties table to narrow their search. They can explore, for example, median rent, median house values, and the percentage of residents who are married.
- Have students download employment data for an industry that interests them and perform a query based on their individual priorities.
- Check out the Resources by Module section of this book's companion Web site (www.esri.com/mappingourworld) for print, media, and Internet resources on the topics of employment data and demographics.



NAME _____

DATE _____

Live, Work, and Play worksheet

Imagine: You have just graduated from college with a degree in finance. You want to move to California, but you don't know which county would be best for you. You need to find a good job in the finance industry (banking, investments, insurance, or real estate). You know that salary is important (after all, you would like to start paying off your student loans as soon as possible), but you also know there are many other things to consider when deciding where to live and work. For example, you might want to consider the cost of housing, the length of your commute, and what you'll do in your free time (do you want to be near the beach, the mountains, a city with good nightlife?).

To start your investigation of good, better, and best places to live, complete the table below. For each category, designate it as a Very Important, Average, or Not Important criterion for determining where you want to live.

LAYERS AVAILABLE	VERY IMPORTANT	AVERAGE	NOT IMPORTANT
Percentage of people ages 18–29			
Number of finance jobs available			
Average wage			




NAME _____

DATE _____

Live, Work, and Play

An advanced investigation

 **Note:** Due to the dynamic nature of the Internet, the URLs listed in this lesson may have changed, and the graphics shown below may be out of date. If the URLs do not work, refer to this book's Web site for an updated link: www.esri.com/mappingourworld.



Answer all questions on the student answer sheet handout

Now that you have rated the importance of different criteria in determining where you want to live, you will download employment data from the Internet and use ArcMap to find places that meet your criteria. (Make sure that you have completed the Live, Work, and Play worksheet provided by your teacher before beginning this part of the activity.)

Step 1 Locate economic data on the World Wide Web

The World Wide Web is a great source to find geographic data. In this step, you will go to the Bureau of Economic Analysis (BEA) Web site to find economic data.

- a Open your Web browser to the BEA U.S. Economic Accounts page at **www.bea.doc.gov**.
- b Under Regional, click **State and Local Personal Income**.
- c Under Local area annual estimates, click the link titled **Interactive tables - view or download specific data**.
- d Under Step 1, choose **Detailed income and employment tables by NAICS industry, 2001-2002 (CA05 and CA25)**.

Step 1. Select a series. This will change options below.
<input type="radio"/> Personal income and population summary estimates (CA1-3)
<input checked="" type="radio"/> Detailed income and employment tables by NAICS industry, 2001-2002 (CA05 and CA25)
<input type="radio"/> Detailed income and employment tables by SIC industry, 1969-2000 (CA05 and CA25)
<input type="radio"/> Detailed tables of regional profiles, personal current transfers, farm income, 1969-2002 (CA30-CA45)
<input type="radio"/> Wage and salary summary estimates (CA34)
<input type="radio"/> Single line of data for all counties (3183 rows returned; please limit years selected to speed process)

- e Under Step 2, click **CA25N - Total full-time and part-time employment by industry**.



- f Under Step 3, click **California** for the state, then click the arrow button. -->

Detailed NAICS series 2001-2002
Step 2. Select one table from this box. (help)

CA05N - Personal income by major source and earnings by industry
CA25N - Total full-time and part-time employment by industry

Step 3. Select one major area from the left box, then select one minor area from the right box. (help)

California	06000 - California
Colorado	06001 - Alameda
Connecticut	06003 - Alpine
Delaware	06005 - Amador
District of Columbia	06007 - Butte
Florida	06009 - Calaveras
Georgia	06011 - Colusa
Hawaii	06013 - Contra Costa
Idaho	06015 - Del Norte
Illinois	06017 - El Dorado

- g Click the Display button to see a report for all of California.
- h Scroll down the industry classifications and click the code **1000**. A table displays showing the number of people employed in finance and insurance jobs per county or metropolitan area (MSA) in California.

Step 2 Download data and prepare it for ArcGIS

Before you can see a map of this data in ArcMap, you need to save it to your computer and modify it so that ArcGIS can understand it. The modifications are done in a text editor program.

- a Click the Download Data button.
The file is in comma separated values format (.csv). Choose to save the file.
- b Save the file in your module 6 data folder (**C:\MapWorld9\Mod6\Data**) and rename it **ABC_finance.csv**, where **ABC** are your initials.
- c Open a text editor such as WordPad or Notepad. Open the ABC_finance.csv file you just saved. (Hint: Select All Files in the Files of type drop-down list to see the .csv file.) The data appears in your new document.

For example:


```

ABC_finance.csv - Notepad
File Edit Format Help
["Finance and insurance","FIPS","AreaName","2001","2002"]
1000,"06000","California",874291,899433
1000,"06001","Alameda",28920,30388
1000,"06003","Alpine","(D)","(D)"
1000,"06005","Amador",486,503
1000,"06007","Butte",3752,4125
1000,"06009","Calaveras",460,465
1000,"06011","Colusa",179,190
1000,"06013","Contra Costa",33630,35326
1000,"06015","Del Norte",128,137
1000,"06017","El Dorado",3435,4562
1000,"06019","Fresno",15921,16026
1000,"06021","Glenn",206,205
1000,"06023","Humboldt",2062,2136
1000,"06025","Imperial",1323,1225
1000,"06027","Inyo",179,192
1000,"06029","Kern",8334,8643
1000,"06031","Kings",908,927
1000,"06033","Lake",498,508
1000,"06035","Lassen",219,222
1000,"06037","Los Angeles",245424,250397
1000,"06039","Madera",1026,1077
1000,"06041","Marin",12517,12740
1000,"06043","Mariposa",97,107
1000,"06045","Mendocino",1131,1152
1000,"06047","Merced",1692,1761
1000,"06049","Modoc",64,54
1000,"06051","Mono",110,110
1000,"06053","Monterey",7031,7092
1000,"06055","Napa",2625,2858
1000,"06057","Nevada",2362,2476
1000,"06059","Orange",113990,118827
1000,"06061","Placer",7266,8338
1000,"06063","Plumas",258,315
1000,"06065","Riverside",20522,21879
1000,"06067","Sacramento",43105,44148
1000,"06069","San Benito",494,572
1000,"06071","San Bernardino",22505,23795
1000,"06073","San Diego",74115,77125
1000,"06075","San Francisco",69374,64971
1000,"06077","San Joaquin",9473,9953
1000,"06079","San Luis Obispo",4366,4734
1000,"06081","San

```

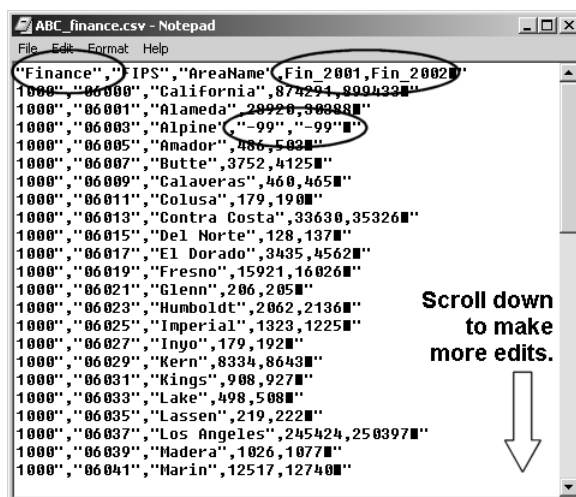


- d Make the following changes in the first line of text:
- Replace "Finance and insurance" with "**Finance**". (Keep the quotation marks.)
 - Change "2001" to **Fin_2001** and change "2002" to **Fin_2002**. (Omit the quotation marks.)

 **Note:** Fields with quotation marks will be defined as text. Fields without quotation marks will be defined as numeric. Ignore the end-of-line symbols and quotation marks at the end of each line.

- e Narrow the table window until most lines have data for a single county. (Click and drag the right edge of the window.)
- f Use the Find and Replace function to find all "(D)" and replace them with "-99".

Consult the graphic below to make sure you made all the necessary changes.



```

ABC_finance.csv - Notepad
File Edit Format Help
"Finance","IPS","AreaName","Fin_2001,Fin_2002"
1000,"06000","California",874294,899432
1000,"06001","Alameda",28928,30888
1000,"06003","Alpine","-99","-99"
1000,"06005","Amador",486,502
1000,"06007","Butte",3752,4125
1000,"06009","Calaveras",460,465
1000,"06011","Colusa",179,190
1000,"06013","Contra Costa",33630,35326
1000,"06015","Del Norte",128,137
1000,"06017","El Dorado",3435,4562
1000,"06019","Fresno",15921,16026
1000,"06021","Glenn",206,205
1000,"06023","Humboldt",2062,2136
1000,"06025","Imperial",1323,1225
1000,"06027","Inyo",179,192
1000,"06029","Kern",8334,8643
1000,"06031","Kings",908,927
1000,"06033","Lake",498,508
1000,"06035","Lassen",219,222
1000,"06037","Los Angeles",245424,250397
1000,"06039","Madera",1026,1077
1000,"06041","Marin",12517,12740
  
```

The data you saved includes statistics for counties and metropolitan areas, but you need only the county statistics.

- g Delete all the data after Yuba County; it occurs approximately halfway through the file. (This is metro area data that you do not need.) The last line in your file now should read "1000", "06115", "Yuba",431,432". See example below:

```

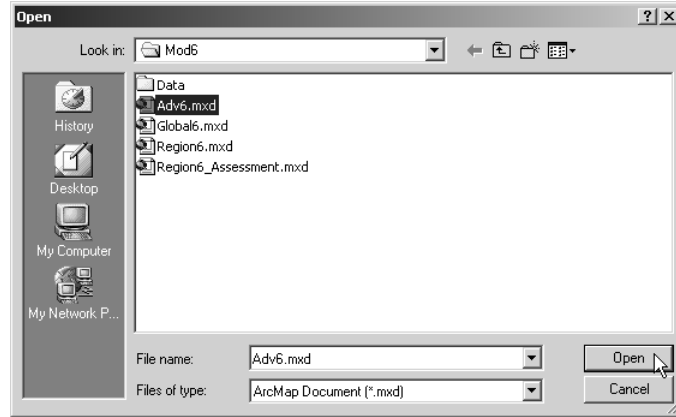
1000,"06095","Solano",4764,4942
1000,"06097","Sonoma",11845,12078
1000,"06099","Stanislaus",6060,6261
1000,"06101","Sutter",1264,1207
1000,"06103","Tehama",707,768
1000,"06105","Trinity",101,111
1000,"06107","Tulare",5141,5686
1000,"06109","Tuolumne",623,588
1000,"06111","Ventura",23494,25757
1000,"06113","Yolo",2572,2572
1000,"06115","Yuba",431,432
  
```

- h Save the file.
- i Minimize the text editor program and your Web browser. You will use them later to download additional data in step 5.

Now that your data is in a format that ArcGIS can read, you will bring the data into ArcMap and map it.

**Step 3 Start ArcMap and add your data**

- a Start ArcMap.
- b Open the **Adv6.mxd** (or **Adv6**) map document from your module folder (**C:\MapWorld9\Mod6\Adv6.mxd**).



When the map document opens, you see a map with two layers turned on (Population Age 18 - 29 and CA Counties).

- c Click the Add Data button and navigate to the location of **ABC_finance.csv**, select it, and click Add.
- d Open the table from the Source tab and check it to make sure the fields and rows look correct and contain data.

Finance	FIPS	AreaName	Fin_2001	Fin_2002
1000	06000	California	874291	899433
1000	06001	Alameda	28920	30388
1000	06003	Alpine	-99	-99
1000	06005	Amador	486	503
1000	06007	Butte	3752	4125
1000	06009	Calaveras	460	465
1000	06011	Colusa	179	190
1000	06013	Contra Costa	33630	35326
1000	06015	Del Norte	128	137
1000	06017	El Dorado	3435	4562
1000	06019	Fresno	15921	16026

- e Close the table.
- Next, you will export the table to the California.mdb geodatabase.
- f Right-click ABC_finance.csv in the table of contents, point to Data, and click Export.
 - g Click the Output table Browse button. Select Personal Geodatabase tables in the Save as type drop-down list. Type **finance** for the table name. Then navigate to the California geodatabase (**C:\MapWorld9\Mod6\Data\California.mdb**).






- h* Click Save. Then click OK in the Export Data dialog. Click Yes to add the new table your map document.
- i* Right-click the ABC_finance.csv table and click Remove. You won't be using this version of the table.

You will join the new geodatabase table to the attribute table of the CA Counties layer so that you can map the finance data.

- j* Right-click the CA Counties layer, point to Joins and Relates, and click Join.
- k* In the Join Data dialog, choose to Join attributes from a table. Choose FIPS as the field to base the join on. The next two boxes should be filled in automatically with finance and FIPS.
- l* Click OK. Click Yes if you receive a message about indexing the table.
- m* Open the CA Counties layer attribute table.
- n* Scroll to the right and notice that the finance fields appear at the end of the table. (These are Finance, FIPS, AreaName, Fin_2001, and Fin_2002.) Close the table.

In the next step, you will classify the CA Counties layer so you can thematically map the finance employment data you retrieved from the Internet.

Step 4 Thematically map finance employment data

- a* Click the Display tab in the table of contents. Turn off the Population Age 18 - 29 layer.
-  *b* Right-click CA Counties and choose Copy. Click the Paste button to paste a copy of the CA Counties layer.
- c* Open the Properties dialog for the copied layer. Click the General tab and name the layer **Number of Finance Jobs**.
- d* In the Symbology tab, choose Quantities, Graduated colors. For Value field, scroll to the end of the list and click finance.Fin_2002. Choose an orange or brown color ramp.

The value field (Fin_2002) represents the number of finance jobs for each county in California in 2002. By default, ArcMap has divided the number of finance jobs into five groups.



Some counties have no data available. In such cases, the `Fin_2002` field has a value of `-99`. Because this number is a code and not a measurement of the number of jobs, counties with a value of `-99` need to be excluded from the categories you just created.

- e* Click the **Classify** button. In the next dialog, click the **Exclusion** button.
- f* In the **Query** tab of the **Data Exclusion Properties** dialog, create the following expression to define the counties you want to exclude: **[finance.Fin_2002] = -99**.
- g* Click the **Legend** tab and check **Show symbol for excluded data**. Choose a 30% gray symbol and label the class **No Data**. Click **OK**.
- h* Look at the histogram (graph) in the **Classification** dialog.

The histogram shows the number of jobs on the x-axis (bottom) and the number of counties on the y-axis (side). The gray bars show how many counties have a particular number of jobs. The blue vertical lines show where the data is broken into classes.

- i* Change the classification method to **Quantile** and notice how the class breaks in the histogram change.

The “Quantile” method groups the counties so that each class has approximately the same number of counties. California has 58 counties in total with no data values for two of them, leaving 56 counties with employment data for 2002. Therefore, each of the five classes has approximately 11 counties.

- j* Click **OK** in the **Classification** dialog.

The **Symbology** tab updates the list of five colored symbols, ranges, and labels.

- k* Change the labels for the five classes to the following phrases:

Symbol	Range	Label
	54 - 465	Very Low
	466 - 1225	Low
	1226 - 4942	Medium
	4943 - 21879	High
	21880 - 250397	Very High

- l* Click **OK** to update the map.
- m* Save your map document according to your teacher’s instructions. We recommend that you save it in your **Mod6** folder and rename it **ABC_Adv6** where **ABC** are your initials.
- n* Look at the **Finance jobs** map. Where are the counties with a high number of finance jobs? You will refer back to this map after you’ve downloaded average wage data for the California counties.



Step 5 Download average wage data for California counties

Now you will go back to the BEA Web site and retrieve data on average wages for California counties. Then you will add the data to ArcMap and the California geodatabase.

- a Restore your Web browser and go to the BEA economic accounts page at www.bea.doc.gov.
- b Under Regional, click **State and Local Personal Income**.
- c Under Local area annual estimates, click the link titled **Interactive tables - view or download specific data**.
- d Under Step 1, choose **Wage and salary summary estimates (CA34)**.
- e Under Step 2, click **Average wage per job**. Then choose **California** for the state and leave **2002** and **2001** for the years.

CA34 – wage and salary summary estimates
 Step 2. Select one estimate, one area, and one or more years. (help)

Wage and salary disbursements	
Wage and salary employment	
Average wage per job	

United States and regions	2002
Metropolitan Statistical Areas*	2001
BEA Economic Areas	2000
State Metro/Nonmetro Portions**	1999
Alabama	1998
Alaska	1997
Arizona	1996
Arkansas	1995
California	1994
Colorado	1993

- f Click the Display button to see a report for all of California.
- g Click the Download Data button. Save the file as a comma separated values file (.csv) and rename it **ABC_wage.csv**, where **ABC** are your initials. Save it in a folder your teacher specifies.

Step 6 Prepare average wage data for ArcGIS

- a Make the following edits to the file you just saved:
 - Replace the long title "Average wage per job ¹" in the first line of the file with the word "**Wage**". (Keep the quotes.)
 - Replace the double quotes and the years "2001" and "2002" with **AvWage2001** and **AvWage2002**. (Omit the quotes here.)
 - Replace any "(D)" with "**-99**". (Note: Your data may not have any "(D)" values.)



- b Delete everything after the Yuba County data.
- c Save the file and exit the text editor program.

**Step 7 Add average wage data to ArcMap**

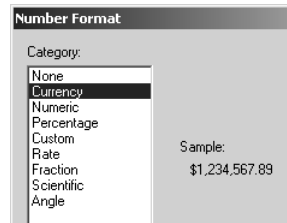
- a Repeat steps 3c–3i above to add the new **ABC_wage.csv** table to your map document and export it to the California geodatabase. Name the new table **wage**.
- b Repeat steps 3j–3l above to join the wage table to the CA Counties table. (Note: You will need to use **ca_counties.FIPS** as the first join field, **wage** as the table, and **FIPS** as the second join field.)
- c Click the Display tab in the table of contents. Then copy and paste the CA Counties layer.

Step 8 Thematically map California average wage data

- a Double-click the new CA Counties layer to open the Layer Properties dialog. Rename the layer **Average Wages** in the General tab.
- b Click the Symbology tab. Symbolize the layer with graduated colors using **wage.AvWage2002** for the value field. Choose a color ramp that is different from the ones used for the other layers.
- c Classify the data using the Defined Interval method. Type **10000** for the Interval Size and click OK in the Classification dialog.

This places the class breaks at even intervals of ten thousand (30,000, 40,000, etc.). Because the values represent dollars, you will format the labels as currency.

- d Right-click anywhere in the white space in the symbol box and choose Format Labels. Choose the Currency format and click OK.



- e Click OK in the Layer Properties dialog.



- f Save your map document.

Step 9 Query the data

With population data, number of finance jobs data, and average wage data, you will perform a query to narrow down the counties where you could live in California. For the purpose of this exercise, you will perform an example query with detailed instructions. In step 10, you will perform your own query, using the preferences you made on your worksheet.

- a Look at the different layers by turning them on and off. Try to visually identify a couple of counties that appear to meet the criteria you identified earlier.

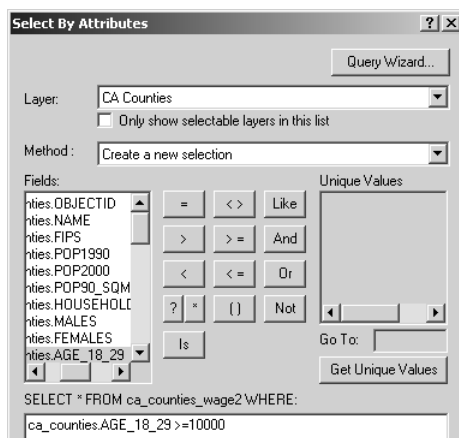
Now you will perform a query. For this example query, assume that the number of people aged 18–29 years old is an important criterion, followed by number of finance jobs, and then average wage. Because this is countywide data, it's important to take that into consideration when you develop the query.



- b* Turn off all layers except CA Counties.
- c* Click Selection on the Main menu and choose Select by Attributes.
- d* Choose CA Counties from the Layer list at the top of the Select by Attributes dialog. Choose “Create a new selection” for the method.
- e* For Fields, scroll down and to the right and double-click **ca_counties.AGE_18_29**.

The 18- to 29-year-old population in California ranges from 203 in one county to 1,988,668 in another. Because you want to eliminate counties with a low population in this age group, you are going to query for counties with an 18- to 29-year-old population size of 10,000 or more.

- f* Click the greater than or equal to button, and then type **10000** in the query box.



- g* Verify your query and then click Apply. Move the Select By Attributes dialog so you can see all the counties in California with an 18- to 29-year-old population of 10,000 or more.
- h* Click the Selection tab below the table of contents. Take note of how many counties are selected (38).

Now you will search for counties with many finance jobs as well as many people aged 18–29. This might narrow the list of places you would consider living, because some of the counties selected in your first query might have few finance jobs. You are going to query for counties with 5,000 or more finance jobs.

- i* In the Select By Attributes dialog, change Method to “Select from current selection.”
- j* Click the Clear button.
- k* Create the following new query statement: **finance.Fin_2002 >= 5000**. Verify the query statement and then click Apply.

The number of selected counties has decreased. There are now 22 selected counties that have a population aged 18–29 years of 10,000 or greater and more than 5,000 finance jobs available. Now you will add average wage data to your search. These numbers reflect annual salary in dollars. In this example, you will query for counties with an average salary of \$35,000 or more.

- l* Clear the current query statement and make a new one where **AvWage2002** is greater than or equal to 35000. Select these features from the current selection.




The number of selected counties has decreased significantly.

- m* Close the Select by Attributes dialog.
- n* Click the Display tab. Open the CA Counties layer attribute table and click the Selected button at the bottom of the table.

The 13 counties that meet all the criteria you used are highlighted in blue.


- o* Look at the map and ask yourself the following questions: Are the selected counties the ones you identified in step 9a? Do you know anything else about those counties that would make them an attractive place to live?


Step 10 Perform your own query and map your observations

- a* Use the instructions in step 9 and the worksheet you completed at the beginning of the GIS Investigation to create your own query of CA counties. Be sure to record the criteria you used for your query. You will need to include that information in your layout.
- b* After you've performed your query, prepare your map to look the way you want it to look in a layout.
-  *c* Create a layout and title it **Live, Work and Play - Your Name**. For example, *Live, Work and Play - Joanna Smith* would be an appropriate title for a map.

Include the following items in your layout:

- Title
- Legend
- List of criteria used for query
- The Attributes of CA Counties table, displaying the results of your query
- Map scale
- North arrow
- Author of map
- Date of map creation

 **Hint:** Add layout elements such as the title from the Insert menu. Add the table to the layout by opening it and then choosing Add Table to Layout from the Options button. If you experience difficulty creating the layout, refer to ArcGIS Desktop Help. Look at the topics under ArcMap, Laying out and printing maps.

- d* Print your map.
-  *e* Save your final map document.