

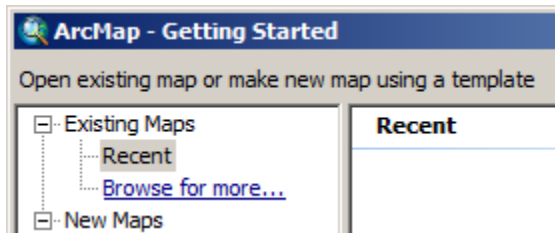
Module 4, Lesson 1

The march of time

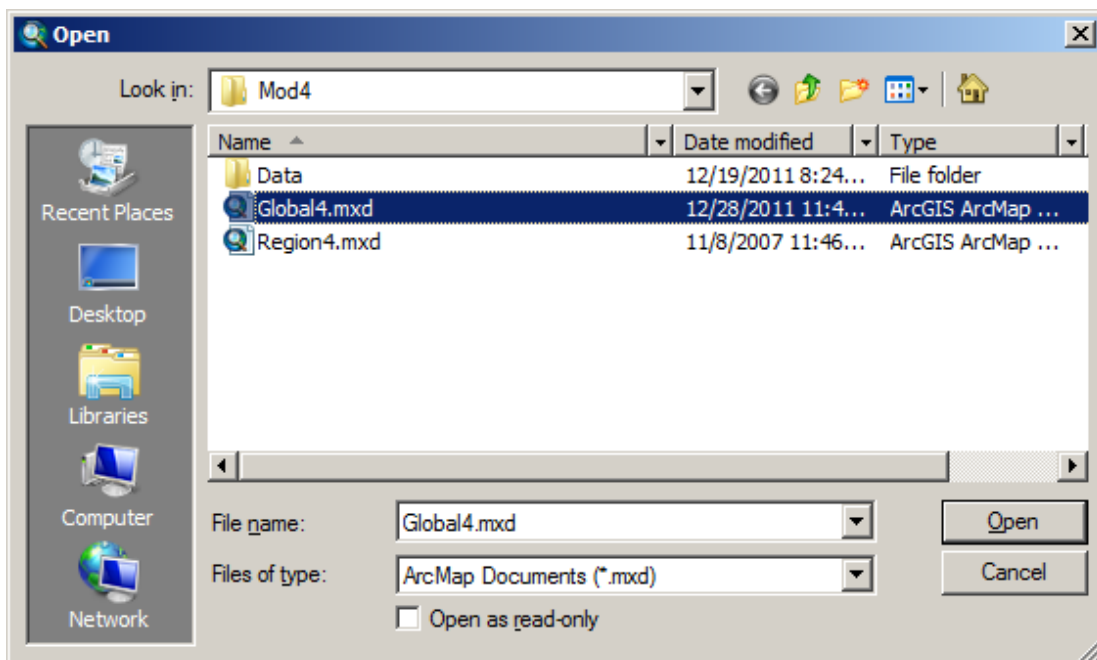
In this activity you will use GIS to identify the world's largest cities at different times during the past 2000 years. You will look for patterns in their locations and speculate on reasons for changes in the patterns.

Step 1: Open a map document

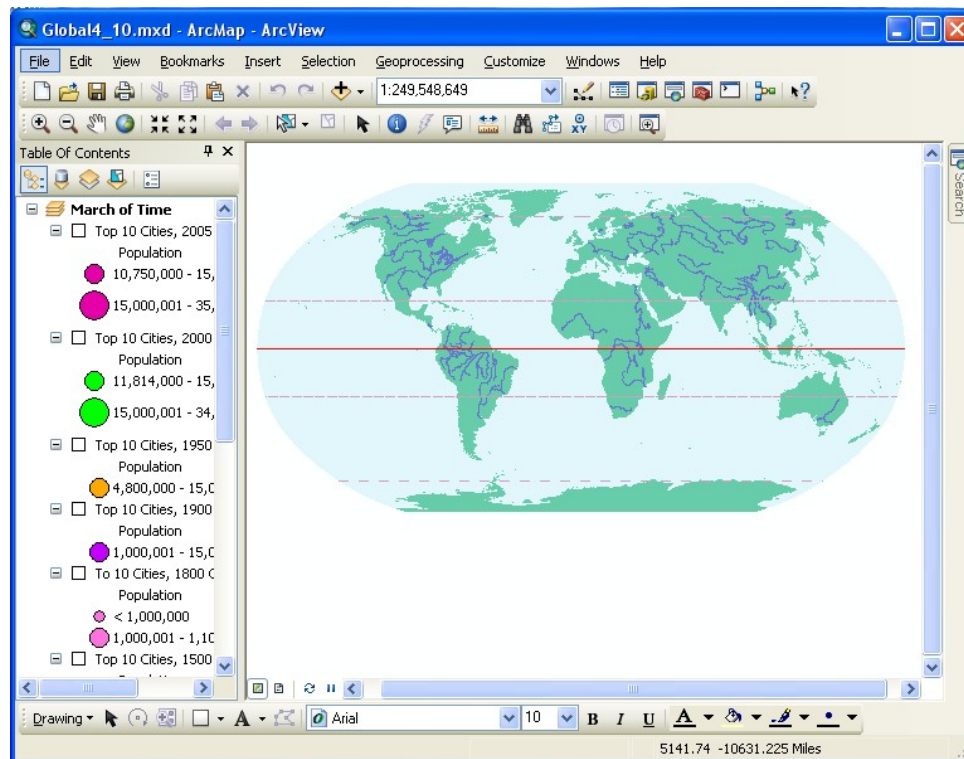
1. Double-click the ArcMap icon on your computer's desktop.
2. When the ArcMap start-up dialog box appears, click Browse for more...



3. Navigate to the Module 4 folder (**OurWorld2Mod4**) and choose **Global4.mxd** (or **Global4**) from the list.



- Click Open. When the map document opens, you see a world map. The Table of Contents has a data frame called March of Time.



Step 2: Look at cities in 100 CE

- Scroll down the Table of Contents on the left side of the ArcMap window until you see the layer called Top 10 Cities, 100 CE (CE stands for Common Era). Click the box to the left of the name to turn on the layer.

Answers to questions in this activity should be recorded on the answer sheet.

- Q1** *Where are the ten largest cities in the world in 100 CE located on the earth's surface?*
- Q2** *Where are they located in relation to each other?*
- Q3** *Where are they located in relation to physical features?*
- Q4** *What are possible explanations for the patterns you see on this map?*

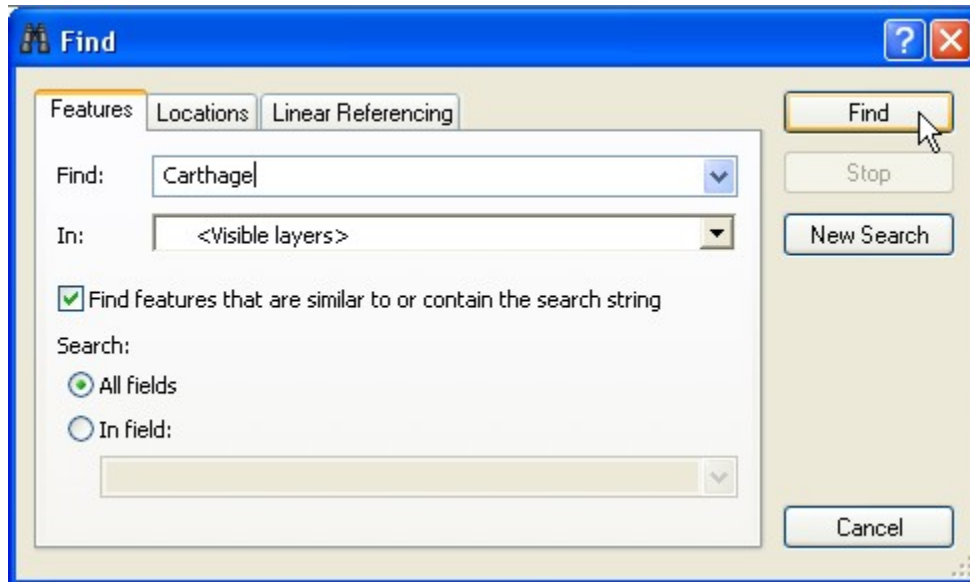
Step 3: Find historic cities and identify modern cities and countries

You will use the Find tool to locate the historic cities on the map.



- Click the Find tool.

2. Type Carthage in the Find dialog box, and then click Find.

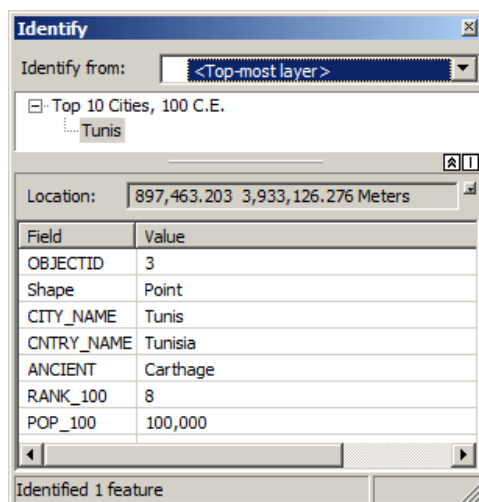


The Find dialog box expands to show a results box. A row for Carthage is listed in the box at the bottom.

3. Move the Find dialog box so you can see all of the cities on your map. Then right click the listed row for Carthage and click Select. The dot that represents Carthage is highlighted blue on the map.

To complete the table in the answer sheet, you need to identify the modern city located in the same place.

4. Right-click the row for Carthage again, and this time click Identify. The information that you need to complete the table on the answer sheet appears in the Identify window.





5. Move the Identify window so it is off the Find dialog box and the map. (To move the window, click its title bar and drag it out of the way.)



Q5 Use the *Find* and *Identify* tools to complete the table on the answer sheet.



6. Close the Identify and Find windows.
7. Click the Clear Selected Features button on the Tools toolbar.

Step 4: Find the largest city of 100 CE and label it

Q6 What's your estimate of how many people lived in the world's largest city in 100 CE?

1. Right-click the Top 10 Cities, 100 CE layer in the Table of Contents, and choose Zoom to Layer. The map zooms to the region of the world where these cities are located.
2. Right-click the Top 10 Cities, 100 CE layer again and choose Open Attribute Table.

	OBJECTID *	Shape *	CITY_NAME	CNTRY_NAME	ANCIENT	RANK_100	POP_100
	1	Point	Rome	Italy	Rome	1	450,000
	2	Point	Izmir	Turkey	Smyrna	10	90,000
	3	Point	Tunis	Tunisia	Carthage	8	100,000
	4	Point	Antioch	Turkey	Antioch	5	150,000
	5	Point	Peshawar	Pakistan	Peshawar	7	120,000
	6	Point	Alexandria	Egypt	Alexandria	4	250,000
	7	Point	Anuradhapura	Sri Lanka	Anuradhapura	6	130,000
	8	Point		Iraq	Seleucia	3	250,000
	9	Point	Suzhou	China	Suzhou	9	-99
	10	Point	Luoyang	China	Luoyang	2	420,000

Each row in this table is associated with one of the city points on the map.

If you see a lot of extra gray area under the last record or to the right of the table, drag the bottom edge of the window up or drag the edge of the window to the left so that the table takes up less space on your screen.

3. Scroll right and locate the field name POP_100. Click the field name to highlight the whole column.
4. Right-click the field name. Choose Sort Descending to list the cities from largest to smallest in terms of population.

ANCIENT	RANK_100	POP_100
Rome	1	450,000
Smyrna	10	90,000
Carthage	8	100,000
Antioch	5	150,000
Peshawar	7	120,000
Alexandria	4	250,000
Anuradhapura	6	130,000
Seleucia	3	250,000
Suzhou	9	-99
Luoyang	2	420,000

In the POP_100 column, the value -99 for Suzhou indicates that no data is available. It does not mean that there was a population of -99 in Suzhou.

Q7 *What was the largest city in 100 CE ?*

Q8 *What was the population of the world's largest city in 100 CE ?*

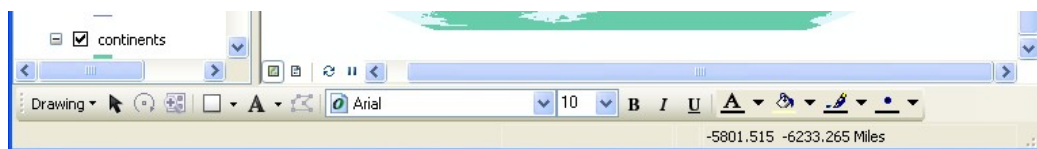
- Click the gray box at the beginning of the row with the largest city. The selected record turns blue in the attribute table, and so does its corresponding dot on the map.

Table

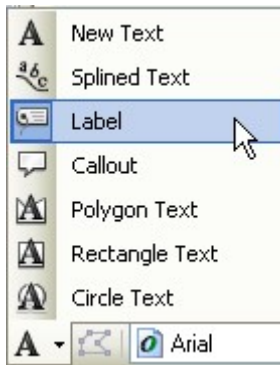
Top 10 Cities, 100 C.E.

	OBJECTID *	Shape *	CITY_NAME
	1	Point	Rome
	10	Point	Luoyang
	6	Point	Alexandria

- Close the Attributes of Top 10 Cities, 100 CE table.
- Make sure the Draw toolbar is displayed. If it is not, right-click in the gray space next to the Help menu, click Draw, and dock the toolbar at the bottom of the ArcMap window.



- Click the drop-down arrow to the right of the New Text tool in the Draw toolbar and select the Label tool.



- Move the Label Tool Options dialog box off the map if necessary. You will accept the default options in the Label Tool Options dialog box.
- Hover your cursor over the selected city. When the Map Tip displays the city name (Rome), click to add the label to the map.



If you accidentally label the wrong feature, click the Undo button and try again. If you want to reposition the label, use the Select Elements tool to drag the text where you want it to go. If you want to change the font, size, or style of the text, use the options on the Draw toolbar.



- Click the Select Elements tool and click anywhere on the map away from the label to remove the selection box around the label. The Label Tool Options dialog box also closes.



- Click the Clear Selected Features button.



- Click the Full Extent button to see the entire world in the map.

Step 5: Look at cities in 1000 CE and label the most populous city

- Turn on the Top 10 Cities, 1000 CE layer.

- ☐ Top 10 Cities, 1500 C.E.
Population
● <1,000,000
- ☒ Top 10 Cities, 1000 C.E.
Population
● <1,000,000
- ☒ Top 10 Cities, 100 C.E.
Population
● <1,000,000

2. Right-click the Top 10 Cities, 1000 CE layer and choose Zoom to Layer.
3. Look for similarities and differences between these points and the cities of 100 CE in the locations and distribution of the world's largest cities.

Q9 *What notable changes can you see from 100 CE to 1000 CE?*

Q10 *What similarities can you see between 100 CE and 1000 CE?*

Now you will look up and label the most populous city of 1000 CE.

Right-click the Top10 Cities, 1000 CE layer and choose Open Attribute Table. This shows you all the attribute data associated with the yellow dots on the map.

4. Locate the POP_1000 field. Click the field name to highlight the column.

Right-click the POP_1000 name and choose Sort Descending to list the cities from largest to smallest in terms of population.

Q11 *What was the largest city in 1000 CE?*

Q12 *What was the population of the world's largest city in 1000 CE?*

Click the gray box at the beginning of the row with the world's largest city in the attribute table. The selected row turns blue in the attribute table, and its corresponding dot on the map turns blue.

5. Close the Attributes of Top 10 Cities, 1000 CE table.
6. Click the Label tool. Click the selected city on the map to label it.
7. Click the Select Elements tool.



8. Reposition the text and use the options on the Draw toolbar to change the font, size, or style of the label text, if desired.
9. Click anywhere in the ocean with the Select Elements tool to unselect the text.



10. Click the Clear Selected Features button to make all the cities in 1000 CE yellow again.



Step 6: Compare other historical periods and formulate a hypothesis



1. Click the Full Extent button.
2. One at a time, turn on each of the remaining six layers representing the years 1500, 1800, 1900, 1950, 2000, and 2005.

Q13 *Complete the table on the answer sheet. Refer back to Q7–Q12 to get information for 100 CE and 1000 CE. (You may need to turn layers on and off or move them up or down in the Table of Contents.)*

Q14 *Using the map document and your answers in Q13, identify historical periods associated with the greatest changes and provide possible explanations for the changes.*

Step 7: Investigate cities in the present time

As a class, before you began the lesson, you made a guess about the top 10 cities in the world today. You will now see if any of your predictions are correct.



1. Zoom to the full extent of the map and leave only the Top 10 Cities, 2005 CE layer on.

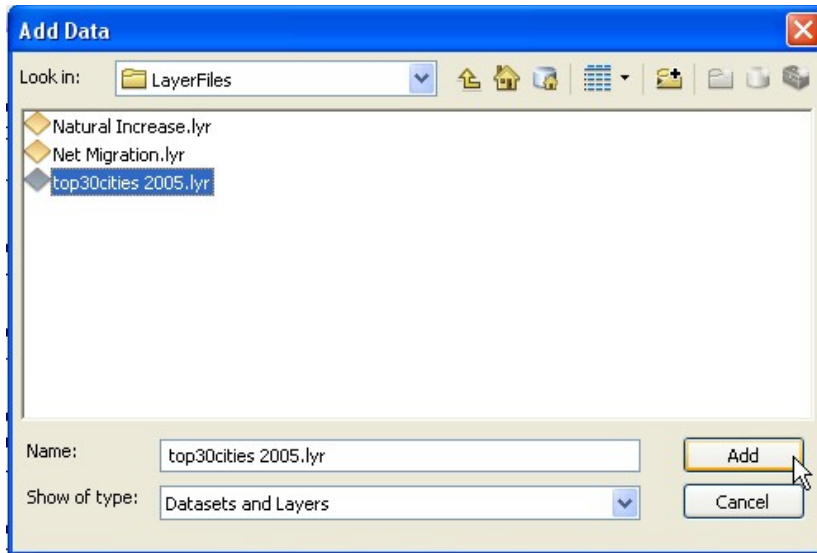
Q15 *How many of your original guesses are among the Top 10 Cities, 2005 CE?*

Q16 *Which cities did you successfully guess?*

Most likely, there are cities on your list that are not in the Top 10 Cities, 2005 CE layer. In order to look at population data for these other cities, you will add a layer with the top 30 cities.

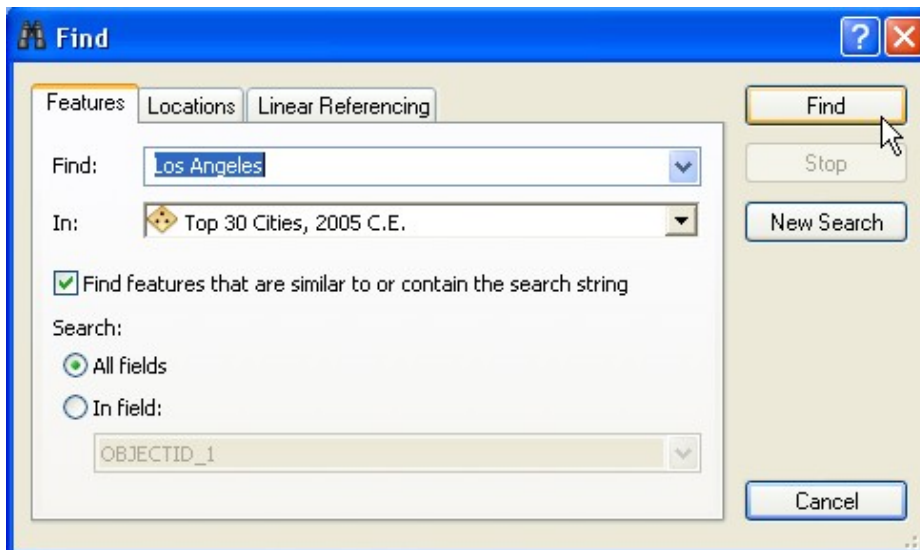


2. Click the Add Data button.
3. Navigate to the module 4 LayerFiles folder (**OurWorld2\Mod4\Data\LayerFiles**). Select **Top 30 Cities 2005.lyr** and click Add.



The Top 30 Cities, 2005 CE layer is added to your map.

4. Use the Find tool to locate one of the other cities that you guessed in the beginning of this activity. Make sure to select Top 30 Cities, 2005 CE as the layer to search, as in the example pictured on the following page.



5. Right-click in the results box on the row for the city you found and choose Identify. The Identify dialog box appears with information for the city you found.

Q17 *In the table on your answer sheet, write the city's name, 2005 population, and rank. You can determine the rank by opening the attribute table and sorting on the POP2005 field. Rank the largest city as 1.*

Q18 *Continue to fill out the table for the other cities in your list or cities that interest you. If you have cities on your list that are not in the top 30, fill in the name, leave the Population column blank, and write >30 in the Rank column.*

6. When you are finished, close the Identify window and the table, if it is open.

Q19 *In general, how far are these other cities from the top 10?*

7. Ask your teacher for instructions on where to save this map document and on how to rename it.
8. If you are not going to save the map document, exit ArcMap by clicking the File menu and clicking Exit. When asked if you want to save changes to **Global4.mxd** (or **Global4**), click No.

In this exercise, you explored population data from 100 CE through the year 2005. You used ArcMap to find, identify, and label the world's most populous cities during different time periods. After analyzing this data, you added data for more large cities and explored populations of your cities of interest.