In this activity, you will learn about the geographic tools used by cartographers (map makers) to gather, process and report information about people, places and environments. Cartographers decide which information to include and how it is displayed.

**Key Terms**

- Cartographer
- Globe
- Spatial Knowledge
- Aerial Photograph
- Yangtze River
- Geographic Tools
- Geographic Information System
- Digital Satellite Image
- Demography

One day your teacher reveals that during her summer recess, she traveled to Asia. While there, she became friends with a teacher. She tells the class that since you will be learning about Asia this year, she will contact her new friend and have her students compile an information packet about the city in which they live.

A few weeks later, your teacher enters your classroom with a box of materials from her friend’s students. She tells your class that her friend’s students have gathered information about the people, places and environment of the city in which they live. Your teacher says that after examining the contents of the box, you will share your findings with the other sixth-grade classes. Inside the box are several folders. With a sense of excitement, your teacher begins taking out the first folder from the box.
Dear Students of Ohio,

We have sent your class several maps to examine. Rather than tell you where we are located, we thought it might be more fun for your class to figure out where we live after examining these maps. — Students of Ms. Chang’s Class

The next item in the box is a globe with a small red flag on it.

A globe is a three-dimensional map showing the Earth’s surface. While a flat, two-dimensional map has to make some distortions to cover the entire surface of the Earth, a globe is more accurate. By placing string on a globe, you can see the shortest distance between two points on Earth’s surface. It becomes clear that you would have to fly north, for example, to travel from Ohio to Asia.
The next map that your teacher takes out is a map of Asia with latitude and longitude lines drawn on the map.

**CHECKING YOUR UNDERSTANDING**

After examining these maps, answer the following questions:

- In what hemisphere is this city located? ________________
- In what continent is this city located? ________________
- In what country is this city located? ________________
- The city’s absolute location is: Latitude: __________ Longitude: __________
- What is the name of the city? ________________
- How does a globe differ from a two-dimensional map? ________________
THE SECOND FOLDER: AERAL PHOTOGRAPHS

Here are two aerial photographs of our city, taken 26 years apart. In case you do not know what aerial photographs are, we have also included information about them.

Soon after the discovery of photography, photographers began to turn their attention to aerial views. An aerial photograph is a picture taken from high above the Earth. The first aerial photographs were taken of a French village by a French photographer in a balloon over Paris in 1858.

Today, aerial photographs are far more advanced. Usually they are taken with highly accurate cameras from airplanes. They are often used by geographers because aerial photographs can show the surface features of a large area, similar to a map.

This aerial photograph of our city was taken in 1987. Notice the area across the river, known as Pudong.
Both of these are aerial photographs of our city, which has become an international city that draws visitors from all over the world. We are emerging as one of the world’s most influential economic, financial, cultural, science and technology centers.

The waterway that you see in both photographs of our city is the Yangtze River. It is one of the world’s busiest waterways. Traffic along this river has helped to make our city a major commercial center, transporting goods such as coal and manufactured goods.

**CHECKING YOUR UNDERSTANDING**

What additional information can be learned about this city from these two aerial photographs?

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The Third Folder: Digital Satellite Images

We thought you might find these satellite images of our city interesting. In case you are not sure what a digital satellite image is, we have included a description of these kinds of images.

Digital satellite images are a special type of “aerial photography.” They are photographs of Earth taken by satellites. Satellite images are used by cartographers to see what an area looks like from high above Earth’s surface. The first satellite pictures were taken by an American space satellite in 1958, flying 65 miles above Earth.

Satellite images provided an important breakthrough for mapmakers. Satellite images have proved to be highly useful for creating more accurate maps. A satellite image typically covers a large ground area, showing mountains, rivers, and roads. Satellite imagery can even detect light frequencies beyond what the human eye can see.

The satellite images below show our city at night. The image on the left was taken from space in 1992, while the one on the right was taken from space in 2009. These images show electric lights in our city. As you can see, the bright area is much larger in 2009 than 17 years earlier. These images tell a great deal about what has happened to our city’s size, wealth, and population growth.
CHECKING YOUR UNDERSTANDING

These satellite images at night suggest that dramatic changes took place between 1992 and 2009. What do these images tell us about those changes?

_____________________________________________________________________
_____________________________________________________________________
_____________________________________________________________________

THE FOURTH FOLDER: HISTORICAL MAPS

We are studying historical maps of our city in class. We thought that you might find these interesting, so we have included them along with the other material.

These historical maps show the growth of our city. Our city is actually many centuries old. Our city grew in importance when it was opened to foreign trade following the British victory over China in 1842.

This map to the right shows how our city looked in 1855. That is more than 160 years ago. As you can see, the city center was where a tributary (a smaller body of water joining a larger one) emptied into the Yangtze River.
This second map shows how our city looked in 1932. On this map, you can still see where the same tributary empties into the Yangtze River. As you can see, by then our city had expanded to the south and west.

This next map shows how our city looked in 1973.

Notice that the lighter gray areas show urban areas of our city, where people lived. These areas tended to be located near the Yangtze River.

The darker gray areas on the map show rural land. These areas on the map were quite thinly settled. Again, notice that the areas of urban settlement have expanded further in all directions since 1932.
The last map in this folder shows our city today.

As you can see from this map, there are almost no rural areas left as in the other maps. As the map shows, our city has expanded further in every direction, so that its rural areas have almost totally disappeared!

**OUR CITY IN 2013**

Urban area

Rural area

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**CHECKING YOUR UNDERSTANDING**

- What conclusions can you draw from these maps about how our city has changed over time?

- The first four folders above provided information displayed **spatially** — maps, aerial photographs, digital satellite images, and historical maps. How does this spatial representation of information differ from showing information in other ways?
Computers now make **Geographic Information Systems**, or GIS, possible. Computers store information at each location on a map. By clicking on the location, a person can find information that applies to that specific location. These systems use information from satellites and land-based sources, including data from satellite photography, land-based maps, statistics, and other sources.

Geographic Information Systems are especially useful for handling natural disasters. In the event of an earthquake, fire, or flood, officials can easily obtain detailed information about landforms, water bodies, pipelines, power lines, sewer systems, buildings, roads, flood zones, and weather predictions for each location. Officials can quickly pinpoint potential hazards and can rapidly notify people and even evacuate areas.

### CHECKING YOUR UNDERSTANDING

- Why is displaying information spatially — either on maps or in Geographic Information Systems — often very useful?

- Maps are created for many different purposes. Select one of the maps you have learned about in this activity and describe the purpose for which that map was created.
Here is some information about our country’s climate and our city’s annual rainfall. We would love to have you come and visit us one day with your family.

Our city has a subtropical maritime monsoon climate. It is generally mild and humid in the city. Although located in the southern part of China, we enjoy four separate seasons.

Our spring time is warm and our cool autumn is quite comfortable. Summers, from June through September, are generally the hottest and rainiest time of the year.

In general, our winters are chilly and damp. Winter days are overcast and cold and usually are not pleasant.

Surprisingly, winters are the driest season of the year. Cold winds from Siberia in the north can lead nighttime temperatures to drop below freezing. Despite this, our city rarely experiences more than one or two days of snowfall during most years.
THE SIXTH FOLDER: OUR PEOPLE

We saved some of the most interesting information about our city for last. This is an article describing the people of our city. This type of information is known as demography. It describes the characteristics and vital statistics of our people.

Our country, China, has one-fifth of the world’s population. Our nation is also the third largest country in the world in area, just behind Russia and Canada.

Our city boasts the largest population in China. The overwhelming majority of our residents are Han Chinese. Only 1.2% of our residents belong to minority groups.

The life expectancy of our residents has now reached 82.1 years — 79.8 for men and 84.4 for women. This is the highest life expectancy for any city in mainland China and is significantly higher than most other countries in the world, including the United States.

<table>
<thead>
<tr>
<th>Year</th>
<th>Population</th>
<th>±%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1953</td>
<td>6,204,400</td>
<td>—</td>
</tr>
<tr>
<td>1964</td>
<td>10,816,500</td>
<td>+74.3%</td>
</tr>
<tr>
<td>1982</td>
<td>11,859,700</td>
<td>+9.6%</td>
</tr>
<tr>
<td>1990</td>
<td>13,341,900</td>
<td>+12.5%</td>
</tr>
<tr>
<td>2000</td>
<td>16,407,700</td>
<td>+23.0%</td>
</tr>
<tr>
<td>2010</td>
<td>23,019,200</td>
<td>+40.3%</td>
</tr>
<tr>
<td>2012</td>
<td>23,710,000</td>
<td>+3.0%</td>
</tr>
<tr>
<td>2013</td>
<td>23,900,000</td>
<td>+0.8%</td>
</tr>
</tbody>
</table>
Our infant mortality rate has been dropping. It is now less than 6 infant deaths per 1,000 people. With such a high life expectancy and a low mortality rate, the aging of our population is becoming a serious problem for the future. In 2009, 8% of our population was under the age of 14, while more than 22% of our residents were over 60 years of age.

More than 200,000 foreigners live in our city. This makes up about 1% of our population. We have over 214 nationalities living in our city: the top three are from Taiwan, Japan, and the United States.

Our city’s residents are among of the most educated people in the world. According to a recent survey, 99.99% of our children attended our nine-year obligatory education. About 97% of our middle school graduates have gone on to senior high schools. About 84% of our senior high school graduates enroll in college.

As China’s largest and wealthiest city, we are often looked at as a leading trendsetter in fashion, design, and the arts. With our futuristic skyscrapers, upscale restaurants, and classy malls, our city competes with Hong Kong, Tokyo, Bangkok, and Singapore as Asia’s best city to live in.

**CHECKING YOUR UNDERSTANDING**

What did you learn about the people and demography of this city?

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____________________________________________________________________________________
We have sent your class an English-language newspaper article dealing with environmental issues in our city.

Environmental conditions in our city have improved over the past year due to increased spending on “green” development and tighter control of pollution. The amount of dust in our air has declined. Our rivers are cleaner. The power department recently announced no blackouts were needed this past winter. These measures have been used in the past to cope with our shortages of electricity.

The spilling of sulfur dioxide and the discharge of industrial wastes into our environment are our two major environmental problems. These emissions and discharges have seriously polluted our city’s environment. In the past, many businesses in our city have discharged their waste directly into the air and the waterways. This had led some of our waterways to become so cloaked with industrial waste that the flow of water stopped.

The Environmental Bureau recently reported that such improvements were the result of record spending on improving our environment and efforts to improve life in the city. Thirty-six construction projects that had brought billions of yuan (China’s currency) worth of investment to our city were suspended because of the pollution they caused. In addition, 70,000 vehicles have been removed from our roads because of the pollution they caused.
The port of Huangpu is the source of most of the city’s water supply. It is a huge port that provides a water transportation system and serves as a sink for many of the city’s industrial discharges. Groundwater is generally only a couple of feet below the surface. With the exception of the Yangtze estuary, where water quality is high, most water bodies in the city are moderately to severely polluted. Sixty percent of the Huangpu basin is seriously contaminated by cyanide, mercury, arsenic and other dangerous pollutants.

Our Environmental Bureau now evaluates all new construction projects according to their possible impact on our city’s environment. Any project that fails to account for how it will deal with the waste and pollution it produces during construction will not receive a license from the city. In the past two years, ten percent of the projects applying for permits have been rejected because of pollution concerns.

From this article, describe some of the environmental challenges faced by residents of the city and tell what is being done to improve the environment.
In this activity, you examined a variety of different data about a city in China. It’s now time to put this information together to make a brochure or advertisement to attract foreign visitors to this city. You might make a printed brochure or even consider creating a web page advertising this city.

In the space below, use your understanding of this data to write a brief report about the people, places and environment of this city. By this time, you have probably figured out that the mystery city is Shanghai!

**Introduction:** Welcome: Come visit our city. You will find many things of interest here. To prepare for your visit to our city, you should know something about it.

**Location:**

**Landforms:**
Activity 1B: How Well Can You Interpret Geographic Tools?

Climate/Weather:

Recent Growth:

Population/Demography:

Chief Economic Activities:

Problems Facing the Future:

Closing:

Now that you have completed your report, your teacher will assign you to a group to make a brochure or web page advertising Shanghai to visitors.
MAKING CONNECTIONS

INVESTIGATING YOUR COMMUNITY

Let’s be good neighbors. You and your classmates should gather similar data about where you live to send to these students in Shanghai. To complete this *Making Connection* exercise, your teacher will divide the class into four groups. Each group will need to create a packet of information about the city where you live.

WHERE IS YOUR CITY?

Create a set of maps to show where in the world your city is located. Your set of maps should contain:

1. a map showing in which **hemisphere** your city is located;
2. a map of the United States showing which **state** your city is in;
3. a written description showing the **relative location** of your city; and
4. a map of your state indicating the **absolute location** of your community by giving its precise coordinates (latitude and longitude).

AERIAL VIEW OF YOUR HOME/CITY

Since the students in this activity sent you an aerial view of their city, it would be nice to do the same for them. The simplest way for you to obtain an aerial view of your community is to use your computer.

To obtain a satellite image of your area, you can use Google Earth. **Google Earth** is a free geographical information program available on your personal computer. With Google Earth, you can find a very realistic view of your city and community. Its maps allow you to view the terrain, buildings, and much more of your city in a three-dimensional image.
This program can be used for a snapshot of your home and its surrounding areas. To obtain this image you will need to take a screen shot from your computer’s desktop.

- If you have a personal computer (PC), you can get a screen shot by pressing the Print Screen key, located near the upper right corner of your keyboard.
- If you use an Apple computer, you can press Command + Shift + 3 Key near the upper left corner of your keyboard.

**DRAW A MAP OF YOUR COMMUNITY**

Now you are ready to draw an accurate map of your community from this aerial view.

- First, find a central point around which to organize your map — like your house or school.
- Then, draw a map extending a few blocks in each direction from that central location.
- On your map, create at least three different symbols for a legend to show where things in your community are located, such as parks, stores, schools and highways. For example, you might draw a square with dollar signs ($$$) inside it to symbolize a bank.
- The map of your community should also include a scale of miles and cardinal directions.
- Be sure your map has a grid showing the absolute location of your city (*its latitude and longitude*). You can add additional details as needed.

**THE DEMOGRAPHY OF YOUR CITY**

You might use your computer to search the U.S. Bureau of the Census. This federal government agency conducts a census every ten years and produces data about the American people and economy. You can search their website (www.censu.gov) for data about your state and city. You might also look for additional data about some of the demographic facts about your city in an almanac — a special kind of reference book that contains facts and numbers on a wide range of topics. A new edition is published every year.
TOPOGRAPHY AND CLIMATE OF YOUR CITY
You can use an atlas to find information about the topography (land forms) and climate of your town or city. An atlas is a type of reference book that contains many different maps. A world atlas usually has a map of all nations, while an atlas of the United States will have maps of all 50 states. An atlas with state maps will indicate the major land features of your town or city, such as mountains, rivers and other bodies of water. Some atlases contain specialized maps showing rainfall, population distribution, food production, religions, or other information.

CONNECTING TO THE INTERNET

GOOGLE EARTH
www.google.com/earth/explore/showcase/historical.html
This website allows you to travel back in time with historical imagery in Google Earth. You can view your neighborhood, home town, and other familiar places to see how the places where you live changed over time.

MAPPING PERCEPTIONS
http://asiasociety.org/education/resources-schools/elementary-lesson-plans/mapping-perceptions
You know that what you write often reveals your biases and prejudices. This fact is also true for people who make maps. This website, from the Asia Society, deals with what maps can tell us about how mapmakers see the world.

NATIONAL ATLAS MAP MAKER TOOL
http://www.nationalatlas.gov/mapmaker
This U.S. government site allows you to assemble, view and print maps. You can choose from numerous layers of geographic information and display map layers individually or mixed with others.

NATIONAL GEOGRAPHIC SOCIETY
This site provides students with an interactive museum. Visit Gallery 1: The World in Spatial Terms to use the Globe Projector, Mental Mapper and World Viewer.
### STUDY CARDS

**Aerial Photography**
- What is a aerial photography?

- How is it useful to mapmakers?

**Digital Satellite Images**
- What is a digital satellite imagery?

- How is it useful to mapmakers?

**Geographic Information Systems**
- What is GIS?

- What kind of information does GIS provide?

**Shanghai, China**
- What are some of the unique characteristics of this city?
Directions: Explain the role each of these geographic tools play in helping a cartographer perform his or her job.

Globes:

Historic Maps:

Aerial Photography:

Digital Satellite Imagery:

Climate Maps:

Geographic Information Systems:
A special purpose map is one that has specific information. Such maps might provide information about climate, soil, waterways, population or religion. When creating a special purpose map, cartographers have to balance several factors to fairly represent the data. Mapmakers must also be mindful of the audience that will be using the map.

In this activity, you played the role of an “amateur cartographer.” You provided different data about your community. What other kinds of data would provide a better understanding of your city to people who are unfamiliar with it?