Lesson 3—Map Elements

Understanding the Elements of a Quality Map

One class period or about 50 minutes of instruction

This lesson goes into detail about the *important elements of a map*. Students learn about *direction*, *scale*, *symbols*, *labels*, *key* or *legend*, and *grid* and *index*. Through a jigsaw activity groups of students create posters showing details of each element. Students then try to create a better version of a map using those elements. They peer review a partner's map using the map elements rubric.

The next day's lesson introduces students to analyzing spatial relationships.

Teaching Tip
You may decide to have students finish the map for homework. If this is the case, students will require time in the next class to peer review the maps.

Materials Needed

- **Individual Map Elements** handout
- **Map Element Poster Directions**
- **Simple Map Task**
- **Simple Map Task Rubric**
- **Map Design Exit Ticket**

Copy instructions
Print at least *six copies* of the **Map Elements** handout and **Map Elements Poster Directions** (one per group). Print a class set of the **Simple Map Task** and **Map Design Exit Ticket**. Print at least one **Map Task Rubric** per pair of students.

National Standards

NGS 1A—Recognize characteristics and applications of maps, globes, aerial and other images.

NGS 1B—Make and use different globes, graphs, charts, databases, and models.

Learning Objectives

1. Understand and design important elements of maps. (Key/Legend, Symbols and Labels, Grid and Index, Scale, and Direction)

Evidence of Learning

Students apply elements to a practice map.

Handout
- Simple Map Task

Lesson Sequence

1. Think/Pair/Share

What are the important parts of maps?

2. Jigsaw

Students are split into 6 different groups. Each group reads about a specific element, discusses, and then designs a poster about the element to present (see poster directions).

Handouts
- Individual Map Elements handout
- Map Elements Poster Directions

3. Poster Presentations

Groups present their posters to the class.

Handout
- Simple Map Task

4. Simple Map Task

Students are given a basic and blank map to apply all of the elements to.

Handout
- Map Task Rubric

5. Map Task Rubric Peer Review

Students pair up to share and critique the maps they created, based on the rubric.

6. Share (if time)

Share some of the map work that students did that their partner thought was high quality.

Handout
- Map Design Exit Ticket

7. Reflection

Have students turn in exit ticket on their way out of the class.

Simple Map Task Directions—Assessing Application of Map Elements

The purpose of this assignment is to see that students can clearly use each of the map elements: *direction*, *scale*, *legend or key*, *symbols and labels*, *grid*, and *index*.

The following is provided to help you give directions for the **Simple Map Task**.

Teacher's Decision

Since the main purpose of this assignment is for students to practice placing and using map elements, the actual purpose or content of this map does not matter. Use your judgement to allow students to come up with their own idea for a map, provide them with some options below, or require each student to follow along below to make a map of cities, freeways, and rivers.

Optional Map Ideas

- Create a map of the cities and rivers you can remember
- Create a map of the places you have visited (use different symbols for family, amusement, etc.)
- Create a map of famous sports teams or stadiums (use different symbols for different sports
- Create a map of famous historical sites

Mapping Cities, Freeways, and Rivers

Students create their own map of the US and show the following **cities**:

- Boston
- Los Angeles
- Houston
- Seattle
- Jacksonville

Students add these **highways** to the map:

- I-90
- I-10
- I-5
- I-95

Students add these **rivers** to the map:

- Missouri River
- Mississippi River

Teaching Tip
Provide students with either the locator map, atlases, or Internet access.

Teaching Tip
The locator map shows information, but purposely does not use distinct symbols. Be sure to point out to students the limitations of this map and that it would score very low on the rubric. Their task is to make a better version.

Formative Rubric for Lesson 3—Map Elements

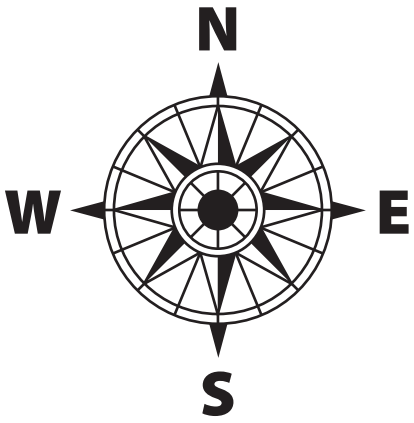
	1	2	3	4
Legend or Key	Legend or key is unable to be read or missing.	Legend or key is messy or distracting from the rest of the map.	Legend or key is easy to find and clear to read. Doesn't distract from the rest of the map. Not so small that it is hard to read.	Legend or key is clear and creative as well. The style of the legend matches the overall style of the map.
Symbols and Labels	Symbols and labels are unable to be read or missing.	Symbols and labels are messy or distracting from the rest of the map.	Symbols and labels are easy to spot and clear to understand.	Symbols and labels are not just clear, but creative as well. The style of the symbols matches the style of the map.
Direction—Compass Rose	Compass rose is unable to be read or missing.	Compass rose is messy, inaccurate, or distracting from the rest of the map.	Compass rose is easy to find and clear to read. It is also accurate.	Compass rose is not just clear, but is creative as well. The style of the compass rose matches the style of the map.
Scale	Scale is unable to be read or missing.	Scale is messy, inaccurate, or distracting from the rest of the map.	Scale is easy to find and clear to read. It is also accurate.	Scale is not just clear, but creative as well. The style of the scale matches the overall style of the map.
Map Grid	Map grid is unable to be read or missing.	Map grid is messy or distracting from the rest of the map.	Grid is easy to understand and clear to read. It isn't so large that it distracts from the rest of the map.	Grid has appropriate spacing between grid lines. The lines are also straight, even, and not distracting.
Map Index	Map index is unable to be read or missing.	Index is messy, inaccurate, or distracting from the rest of the map.	Index is easy to understand and clear to read. It is in alphabetical order, typed, and an appropriate sized font.	Index includes all important locations and features. It is also organized and blends in well with the map. It is not distracting, but is easy to find and easy to read.

DIRECTION

How to Represent Direction

The *compass rose* shows how the direction on a map relates to the direction in the real world. The compass rose uses such as North, South, East, and West. A compass rose is very important when maps are used to travel or find directions to somewhere.

Examples



A compass rose may show the four cardinal points of North, South, East, and West. Sometimes they will show intermediate points, such as Northeast, Southeast, Southwest, and Northwest.

Sometimes only North will be given on a map. For this reason, it is very important for us to be able to determine which directions are West, East, and South, based on just North.

Some *important things* to keep in mind when making a compass rose:

- It needs to be accurate
- North is not *always* "up" on a map
- Display of scale should be clear
- As you plan your map, think where you will place the compass rose
- Consider the design of your compass rose
- Look at other compass roses for ideas

A *quality* compass rose is easy to find and clear to read. It is also accurate.

A *high quality* compass rose will often not just be clear, but creative as well. The style of the compass rose may match the style of the map.

KEY AND LEGEND

How to Create a Quality Key and Legend

The *legend* or *key* is the place on the map that shows the important information needed to be able to understand the map. The legend most often includes the definitions of *symbols* used on the map, but sometimes it will also include the scale or compass.

Examples

Legend

Interstate	NPDES Facilities
US and State Highway	Dams
Local Thoroughfare	ESA Points
Toll Road	State Boundary
Ramp	Public School
Railroad	Private School
USGS 100K Index	Airports
Municipal Boundary	ESA
Water Bodies	Tribal Land
Rivers	USCG Jurisdiction

Map Legend produced by the EPA Region 1 GIS Center on April 20th, 2006.

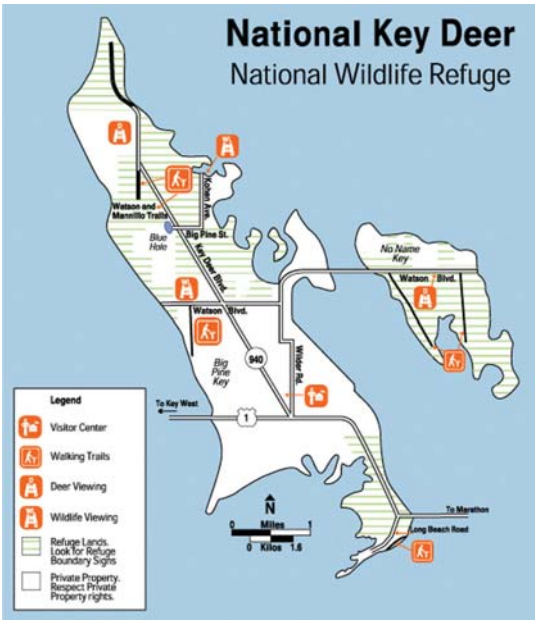


Image courtesy of the U.S. Fish and Wildlife Service.

Without a *legend* or *key*, a map reader may have a very difficult time understanding what all of the symbols mean.

Some *important things* to keep in mind when making a legend or key:

- Be clear
- Include examples of the symbols
- Label as "Legend" or "Key"
- Consider using a small border to separate it from the rest of the map
- Remember to include all the symbols your map uses
- As you plan your map, think about the space you will need for a legend
- Consider typing the text in your legend

A *quality* legend or key is easy to find and clear to read. It shouldn't be so large that it distracts from the rest of the map, but it shouldn't be so small that it is hard to find or read.

A *high quality* legend or key will often not just be clear, but creative as well. The style of the legend might match the overall style of the map.

MAP GRID

How to Create a Quality Map Grid

The *map grid* is a set of vertical and horizontal lines overlaid on the map. Not all maps use a *grid and index*, but it is very useful if the map will be used to find locations. A grid and index is common in an atlas and on road maps. Sometimes maps will use *latitude and longitude*, but smaller maps use a more basic grid with numbers and/or letters.

Example

A location on a map can be identified by following the intersection of the rows and columns. If a map maker wants to display where *San Salvador* is, the map maker would look at the top and side of the map to see that it is in the grid where B and 2 intersect. In the *index*, San Salvador would be listed as B2.

Some *important things* to keep in mind when making a legend or key:

- Be clear
- Make the grid lines light enough to still be able to read the map
- Consider using a lighter color for the grid lines
- Label the top, bottom, and sides of the grid
- Use a ruler to measure out the grid spacing before drawing the lines

A *quality* grid is easy to understand and clear to read. It shouldn't be so large that it distracts from the rest of the map.

A *high quality* grid will have appropriate spacing between grid lines. The lines will also be straight, even, and not distracting.

MAP INDEX

How to Create a Quality Map Index

The *map index* helps the map reader find a specific location. A map with an index often uses a *grid*. The reader can look at the index for a listing of locations contained on the map.

Example

Index

- Española—C3
- Fernandina—A2
- Genovesa—C1
- Isabela—B2
- Marchena—B1
- Pinta—B1
- San Cristobal—D2
- San Salvador—B2
- Santa Cruz—C2
- Santa Fe—C2
- Santa Maria—C3

Notice that the index is in *alphabetical order*, so it is easy to look up the name of the place.

The numbers next to the names of the cities are *coordinates*. These help the map reader find the city by using the *map grid*.

Some *important things* to keep in mind when making a legend or key:

- Be clear
- Make the list in *alphabetical order*
- It is best to type the index and then apply it to a map
- Label the Index
- While planning your map, consider where you will place the index

A *quality* index is easy to understand and clear to read. It is in alphabetical order, typed, and an appropriate size font.

A *high quality* index includes all important locations and features. It is also organized and blends in well with the map. It is not distracting, but also easy to find and easy to read.

SCALE

How to Represent Scale

The *scale* shows the map reader how the distance on the map compares to the distance in the real world. If a map is *to scale*, real world distances can be calculated using the map. If a map is *not to scale*, you could use a map to find where something is, but not exactly how far. For example, on a map of stores in a mall, you may not care how many feet away your favorite store is, you probably just care about going in the right direction.

Examples

1:25,000

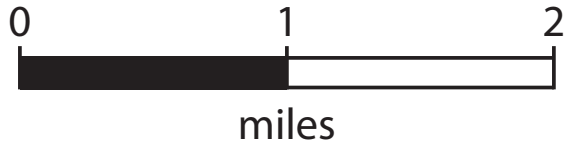
Numerical

Scale is shown as a ratio. In this scale, every 1 foot on the map equals 25,000 feet in the real world. Maps that show large areas (world maps) often use numerical.

One inch to one mile

Verbal

This scale tells you how the measurements on the map match the real world. If you measure 3 inches on the map, it is 3 miles in reality.



Graphical

With a graphical scale, a distance is placed on the map and converted to real world distance.

Some *important things* to keep in mind when making scale:

- It needs to be accurate
- Include the unit of length if using verbal or graphical (miles, feet, etc.)
- If a map is going to be "to scale" it must match the real world
- Display of scale should be clear
- As you plan your map, think of the space you will use to place your scale
- Consider typing the scale or use a ruler when making a graphical scale

A *quality* scale is easy to find and clear to read. It is also accurate.

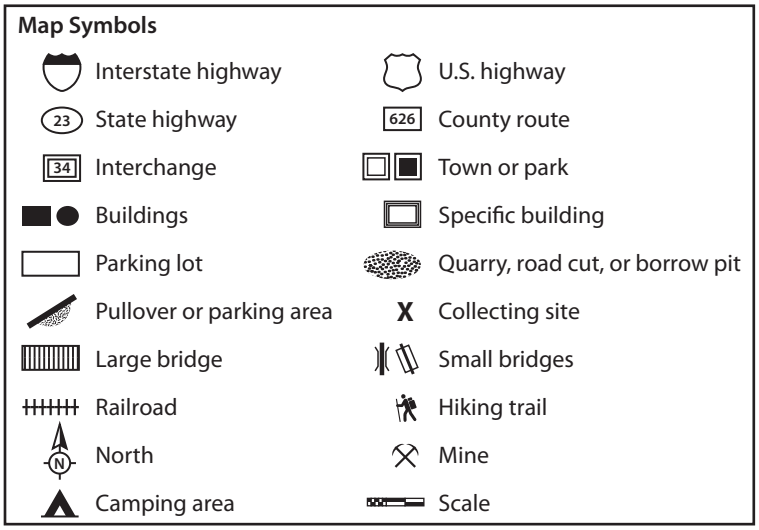
A *high quality* scale will often not just be clear, but creative as well. The style of the scale might match the overall style of the map.

SYMBOLS AND LABELS

How to Represent Places

Symbols and *labels* help the reader to identify important locations or information on a map. *Symbols* are graphics that represent something on a map. Symbols can be simple shapes, colors, patterns, or icons. *Labels* are words that identify something. Labels can show the name of a street, city, or river. Sometimes symbols have a label.

Examples



The map maker decides on what symbols are used on the map, but they are explained in the *key* or *legend*.

A *label* simply provides the words to identify a specific place on a map. When there are multiple cities, rivers, or other places, labels are helpful.

Some *important things* to keep in mind when making a compass rose:

- Symbols and labels should be clear
- Symbols should be distinct enough that they aren't confused with other symbols
- Only provide labels and symbols for parts of the map that are important to the reader
- As you plan your map, think of what you need to label or identify
- Look at other maps for symbol ideas

Quality symbols and labels are easy to spot and clear to understand.

High quality symbols and labels will often not just be clear, but creative as well. The style of the symbols may match the style of the map.

Name: _____ Date: _____ Per.: _____

MAP ELEMENTS POSTER DIRECTIONS

Create a Poster Explaining Your Map Element

Read the handout describing your map element. *Discuss* the element as a group to answer the following questions. *Create* a poster about your element and be ready to share!

1. What is your group's *map element*?

2. What is the *purpose* of this map element?

3. Why is this map element *important*?

4. How do you make a *clear* and *quality* example of this element?

5. When would a map *not need* this element?

Create your poster

Your poster must include:

- The *name* of the element
- A *large example* of the map element
- The *definition* and *purpose* of the element
- Tips on how to make a *very high quality* example

Name: _____ Date: _____ Per.: _____

BLANK MAP

Apply *legend* or *key*, *compass rose*, *scale*, *grid*, *index*, and *symbols* and *labels* to this map. This is your chance to show that you can create all the elements of a map. On this map 1 inch is equal to 355 miles.

Name: _____ Date: _____ Per.: _____

MAP DESIGN EXIT TICKET

Show Your Thoughts on Map Design

You have learned about the important parts of a map. *Reflect* on what you have learned. *Consider* what you still want to know. *Answer* the questions below.

1. Can you make your own map from scratch?

2. What other *tools* or *materials* would help you make a map?

3. What is your *favorite element*? Why?

4. What else do you *need to know* in order to make your own map?

Lesson 4—Intro to Analyzing Spatial Relationships

Understanding How Places Affect Places

One class period of instruction

This lesson introduces students to *analyzing spatial relationships*. This is done by first discussing what *analyzing* means. The definition of *spatial relationships* is also broken down. Students are introduced to the 3 steps of analyzing spatial relationships (structures, relationships, processes). Through a short discussion and activity, students apply spatial relationship analysis to the classroom.

The next three lessons go deeper into each step of spatial relationship analysis.

Copy instructions
Print one copy of both the handout and the Exit Ticket for each student. Have one copy of the activity directions available for your reference.

Materials Needed

- **Analyzing Spacial Relationships** handout
- **Spatial Relationship Analysis Exit Ticket**
- Classroom Spatial Relationship Analysis Activity Directions
- Piece of paper with "IDEA" written on it

National Standards

NGS 3B—Analyze and explain patterns of land use such as distance, accessibility, and connections.

Learning Objectives

1. Understand what analyzing is.
2. Understand why we analyze space and relationships.

Evidence of Learning

Handout
- Spatial Relationship Analysis Exit Ticket

Students answer questions about spatial analysis.

Lesson Sequence

1. Define

Analyzing—examining details to discover or reveal something.

2. Think/Pair/Share

Why do we analyze? What is an example of something people analyze?

3. Introduce

Spatial = Space. Spatial Relationship = how spaces relate to each other.