Cartography Lecture #2
Scale, Graticule and Terrain Representation

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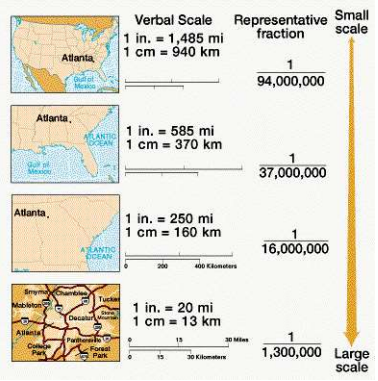
Scale

Scale: It is called representative fraction (RF) or simply scale, it is the ratio between the size of a feature on a map and its actual size on the earth. The larger the scale map the more information that can be included, but smaller the area that can be shown.

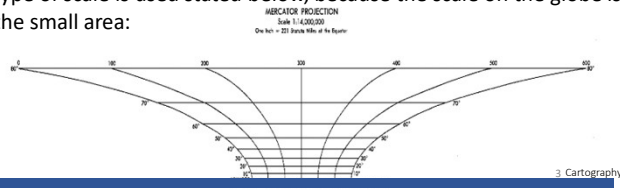


Scale

Different types can be used to write scale:

- Stated scale, 1cm=250km
- Ratio scale, 1:25 000 000
- Graphic scale, it is also called linear scale or bar scale is a line segment placed on a map marked in a map unit.

  Scale bar: 0 2,000 4,000 8,000 12,000 16,000 Kilometers
- Sometimes a special type of scale is used stated below, because the scale on the globe is not the same, unlike the small area:



Scale

- The verbal scale or ward scale is a comparison of meaningful map units to ground units and may be rounded off. thus 1;1,000,000 is expressed as 1 inch representing about 16 miles or 1 mm representing 1 km.

The term large, medium and small-scale the terms are relative, for example, a scale of 1:62,500 is considered a medium-scale topographic map by the U.S. Geological Survey, but the same scale would be very large for the atlas map.

Generally, the large denominator is small scale E.g. scale 1/1,000,000 is large than 1/10,000,000 the latter is showing more area than the first one.

Scale

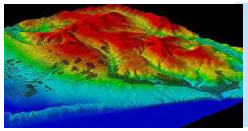
Example: Two towns are known to be 20 miles apart. On a map, they are shown 4 inches apart. What is the scale of this map?

Solution: Four inches on the map represent 20 miles on the ground, or 1 inch represents 20/4 or 5 miles. Five miles is equal to 5x63,360 inches, or 316,800 inches. Therefore, the verbal scale is 1 inch representing 5 miles, and the representative fraction is 1:316,800.

Note: the representative fraction is never rounded off.

The source of the data for cartography:

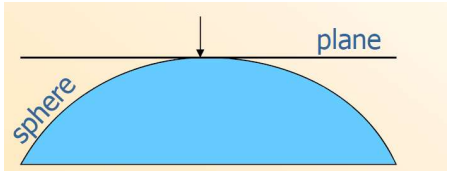
- Field studies
- Statistical sources
- Imagery, including air photos, satellite imagery, radar, and the like.
- Maps
- Interviews.



The source of the data for cartography (continue.)

Filed studies survey Measuring tools and elements:

The earth is so large that its curvature is relatively insignificant at the local scale. Thus, we may use plane geometry instead of spherical geometry for a plane survey.



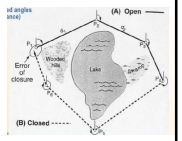
The aim of surveying is basically to define the location of a point. Since location is a relative rather than an absolute concept, surveyors determine new positions concerning an existing reference feature. The geodetic control points provide the frame of reference for surveying. Measurement of distance and angles based on Euclidean geometry

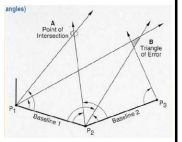
Traditional survey methods.

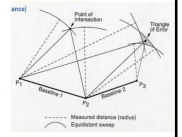
a) Finding the horizontal position

- Traverse: The traverse method involves determining the location of an unknown point by making a series of direction and distance measurements.
- Triangulation: Starting with a baseline of known length on the ground, the position of an off-baseline point can be determined by triangulation, which involves measuring the angles to the point to be located from the ends of the baseline.
- Trilateration : Starting with a baseline of known length on the ground, the position of an off-baseline point can be determined by trilateration, which involves measuring distances to the point to be located from the ends of the baseline.

Ref: (From Robinson, *et al*., 1995.)



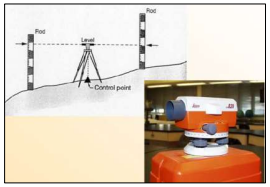




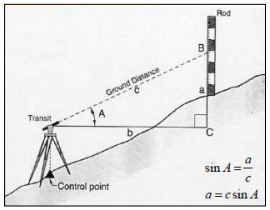
Traditional survey methods.

Finding a vertical position

- Differential levelling



- Trigonometric Levelling: using a transit or theodolite

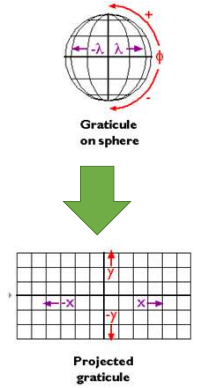


The Earth graticules and projections

Although an unlimited number of arrangements of the earth's graticules is possible. The cartographer should be aware of selecting the most suitable projection which consequently affects the appearance of graticules.

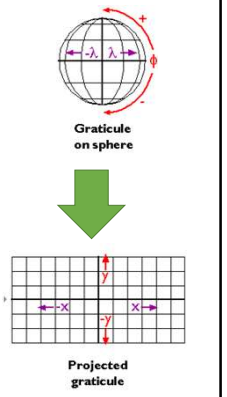
To make the best choice for the projection the following factors should be considered:

1. Subject and the purpose of the map: for the distribution equal-area projection is used, for navigation equal distance or conformal is used.
2. The size and shape of the subject area: for a large-scale map or a city size the projection defiance is negligible, while for a larger area such as a country, the difference is visible.



The Earth graticules and projections (continue..)

4. The audience: some sophisticated projection is not suitable and might be confusing such as interrupted.
5. The appearance of the Graticule: sometimes the complex graticules are not preferred since it is confusing the reader, or when the maps are drawn manually
6. and the size and the shape of the page

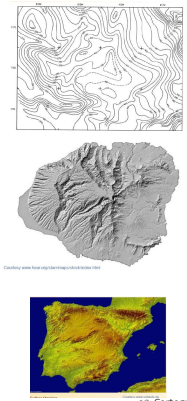


The Earth graticules **Terrain representation**

Is the main problem that encountered the cartographer is representing the hills, mountains, and other terrain features on maps, the methods used to represent the terrain are:

1. Contort lines: are lines that join all points having the same elevation above or below a datum.

2. Relief shading: it is an artistic rendering used in both thematic and general maps. it is used alone or with other techniques such as contour. it is also called hill shading.

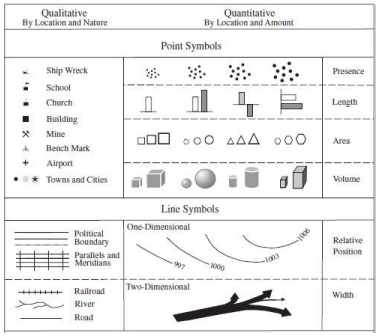


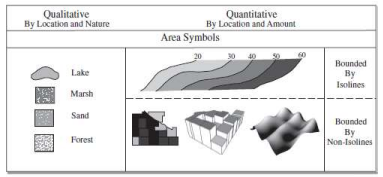
The Earth graticules **Terrain representation (cont..)**

4. Hypsometric Tints: layer tints or altitude tints, it is consisted of adding colours or tones to contour a map to give an impression of relief. It becomes common in atlas maps.
5. Oblique or inclined traces: A pictorial map based on using contour lines as a framework for drawing, but the contour is not included in the drawing
6. Block diagrams: it is not a map, they represent an oblique view of a part of the earth's surface and often include the subsurface structure.

Symbolism

Symbols are the graphic language of maps; the selection and design of symbols are a major part of creating a successful map. Some of them are shown below:





Note: for details of the symbols see the attached file by the USGS for example

Standardizing symbolism (Advantages)

The most important factor in symbolism is standardizing it, thus several advantages and disadvantages have been cited,

The advantages are:

1. The same symbol would always mean the same thing to anyone regardless the nationality.
2. Once learned the symbols it is not varied, therefore, the user is less dependent on the legend.
3. It will be easier to teach and since it become international, therefore can have a place in the school curriculum.
4. The cartographer is less concerned about the used symbol since it is prescribed, and there will be less chance that the reader misunderstands the symbol.

Standardizing symbolism (Disadvantages)

The disadvantages:

1. Cartographers might initially find the system frustrating
2. Standardized symbols might result in less effective communication than a design more carefully fitted to the objective.
3. All map readers are not alike. They vary concerning perceptual abilities, skills, and preferences.