3. Lesson Content

Diagnostic Assessment

Lead a discussion to assess the learners' knowledge of the need for symbols.

Suggested questions:
1. *What is a cartographer?*
2. *How do cartographers draw maps?*
3. *Why do you think they use symbols?*
4. *Why do you think they use common symbols to represent common features?*

Answers:
1. A person who creates maps as a profession.
2. For a very long time maps were drawn by conducting surveys and then to generalize "things" that they saw using various symbols on maps. **These "things" which the cartographer wanted to map are called map features.** Nowadays a lot of mapping is done by obtaining imagery of an area and then to use that at a backdrop to capture the required features. Often existing maps (e.g. the 1:50 000 Topographic map series) are used as a backdrop and surveys conducted by plotting the features on these maps.
3. Cartographers use symbols to represent features on maps as too much writing or an exact replica of what they see, would clutter the map and make it unreadable. Can you imagine if you had to draw all the features of trees on a map? Therefore, trees are drawn simply by representing it as a point.
4. So that maps can be easily read and used by multiple people.

3.1. Topic 1: Introduction to map features

Whenever we map an area, the map must show the features (rivers, roads, erf boundaries, trees etc.) that one would like to map as well as their spatial relation to one another. When this mapping is done, real world features such as roads are normally mapped in different colours and sizes depending on the type of road (double black line for highways; thin black line for tarred roads, brown line for dirt roads etc.). Cartographers normally use common symbols to represent feature so as to make it easier for map users to recognize different features on different maps. This lesson introduces map features, differentiates between natural and artificial features and looks at the shapes used to represent features.

Slide 3 – Map Features

A **map feature** is any natural or artificial object that a cartographer (map maker) chooses to show on the map. Different feature types will be used to represent/capture objects to show on the map. Feature types used are: points, lines and polygons.

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Houses

Erfs in a surburb

Rivers

Trees

Koppie landform

Lesson 2: Map Features

esri South Africa

We differentiate between Natural and Artificial features.

3.1.1. Natural Features

Natural features are objects that are found in nature and have been made by natural processes such as weathering with no human involvement. Most of these features were formed before humans existed and took a long time to form. They include features such as rivers, hills, valleys, wetlands, islands, beaches and mountains.

Slide 4 – Natural Features

- *The slide shows a number of natural features namely: mountains, plants, rocks etc.*

Natural Features

Pan

Field of Flowers

Natural Vegetation

Stone hedge
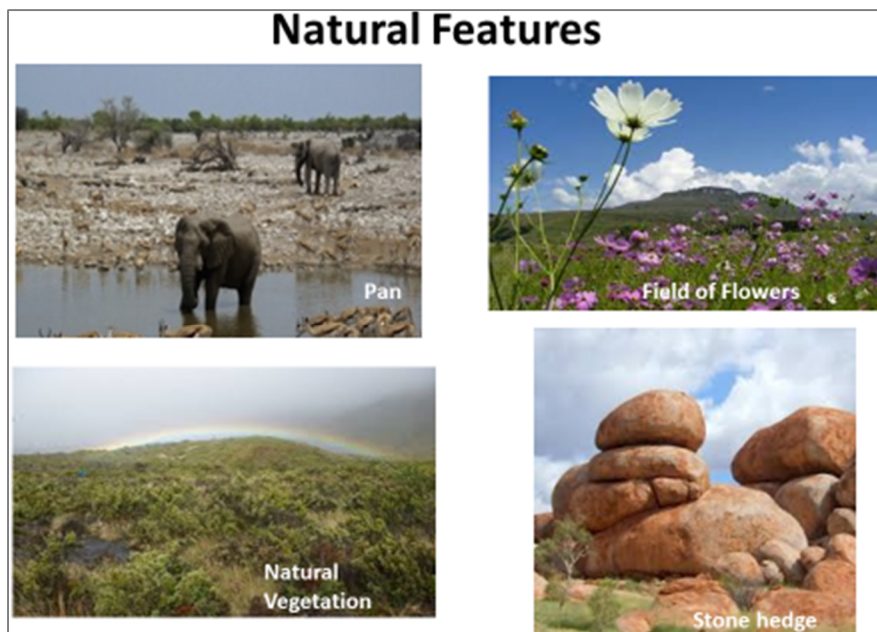
3.1.2. Artificial Features

Artificial features are objects that are made by humans. These include canals, dams, buildings, tarred roads, powerlines, railways and reservoirs. Some of them may appear natural e.g. Lake Nassar but as long as they are manmade they do not qualify as natural features. These features have only been around since humans existed and have been built quicker than those made from natural processes.

Slide 5 – Artificial Features

- *The slide shows a number of artificial features namely: marine beacon, tarred road, buildings, electricity tower and swimming pool.*
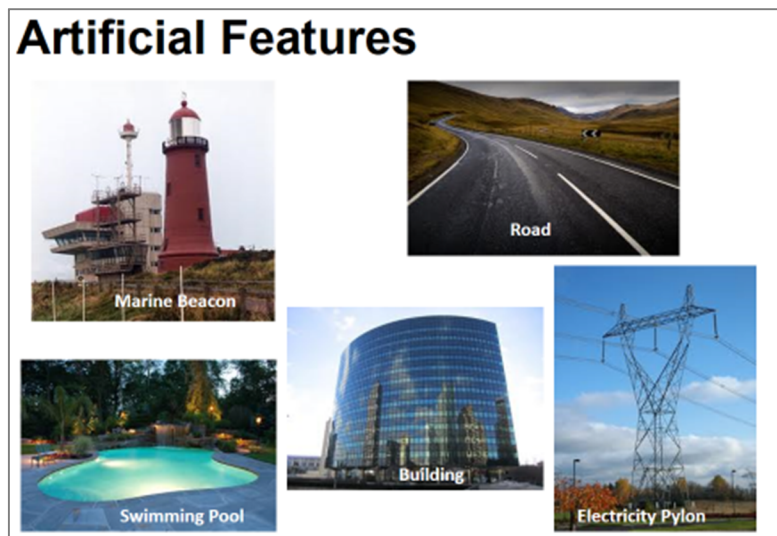
A simple map feature **is the feature type that a cartographer uses to represent/capture objects that a cartographer (map maker) chooses to show on the map. Feature types used are: points, lines and polygons.**

Map features are represented on a map using three simple types of shapes namely; points, lines and polygons. Point features are those features too small to represent as a polygon on a selected scale, line features are those used to represent linear features and polygons are used to represent features that takes up an area. The following table summarises the characteristics of the different shapes of features:

Slide 6 – Map Features representation

Point features	Line features	Area/Polygon features
Represent features that occupy fixed positions on the earth	Represent features that have a linear shape on the earth	Represent features that can be demarcated as a boundary with area (regular or irregular)

Do not have a dimension of length and width	Have one dimension of length	Have a width and breadth
Examples: Trigonometrical beacons, spot heights, trees, reservoirs	Examples: narrow rivers, roads and railway lines	Examples: cultivated lands, built up areas, dams and vineyards

Table 1: Point, line and polygon feature shapes

Note: In a GIS these map features that are represented by points, lines and polygons are known as Vector Data.

Next we look at an activity that practices identifying features on maps.

Activity 1 - Map Features

3.2. Topic 2: Map symbols

In Lesson 1, the learners have learned that a map can be a picture (satellite image) or a simplified, generalized and reduced representation or abstraction of the earth or a specific area of the earth. We have just learned that the "things" that need to be mapped are called features and that these features are represented by symbols. Symbols vary in shape, colour and size and the legend or key explains what features are represented by each symbol. This lesson will look at different ways that symbols are used to represent features and how changing different properties about the symbols changes the meaning of the symbols as well the features that they represent.

Slide 7 – Map Symbols

Map symbols are graphic "icons" consisting of various shapes, colours and sizes used to represent features on the map.

Note: There are specific symbols used called Conventional symbols (standard signs used to represent a feature across different map series). These will be extensively handled in the Topographic map lessons.

Symbolization is the process used by the cartographer to differentiate between map features/objects by using different symbol shapes, sizes and colours depending on what message he/she would like to convey.

Map symbols are distinguished by three characteristics namely their shape, their size or their colour:

3.2.1. Symbol shape

Features on maps are represented using symbols that has different shapes. Often the symbol selected represents the shape of the actual feature (e.g. a small rectangle for a car parked in a

parking lot, a winded line for a small river) on the earth as well as the scale that the feature is drawn in (e.g. small dots for towns that have a small population or a large dot for towns that has a large population). Features are represented by symbols in three shapes; points, lines and polygon shapes. The shape of a symbol will also depend on the scale of the map. On a large scale map e.g. street map, a tree may be represented as a polygon, but on a small scale map e.g. a country map, the tree may only be able to be represented as a point.

3.2.2. Symbol size

Symbol size speaks to the hierarchy represented of a specific feature. When we are looking at the same type of feature, the smaller symbol will represent a lower order in the hierarchy compared to larger ones. For example, highway roads will appear larger in a thick black line than an arterial road in a thin black line. The symbol for a city will mostly be larger than that of a town regardless of the actual sizes. See Figure 1 below to get an idea of how the size of the symbol is used to indicate population in America.

Major U.S. cities displayed using proportional symbols based on 2007 population
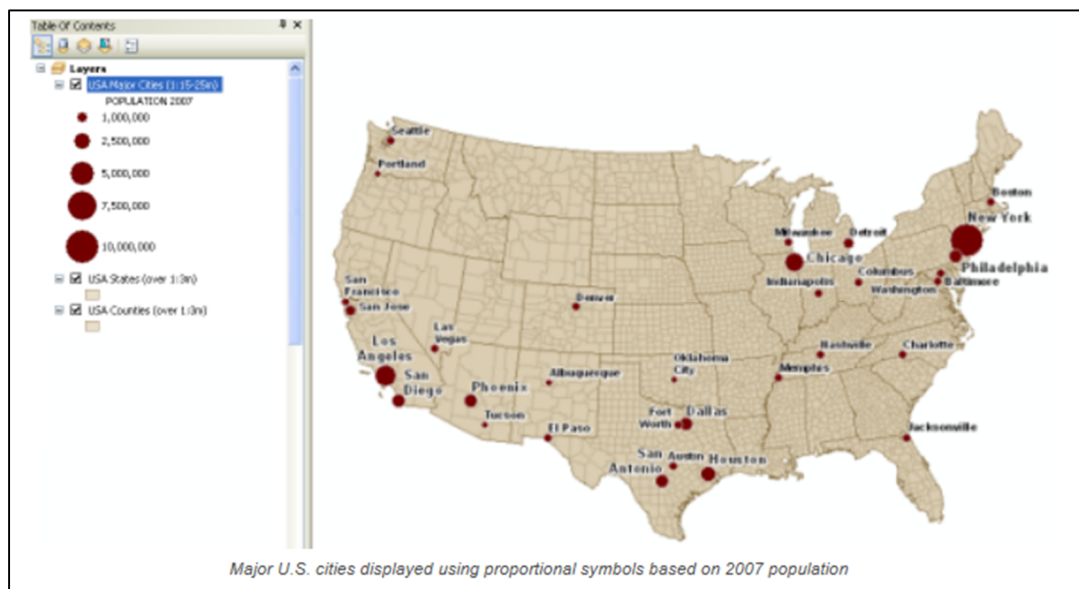
Figure 1: Population Density map of the USA

3.2.3. Symbol colour

Symbols are presented using different colours to make it easier to recognise features. In activity two we will be looking at how the same colour used for features on the 1:50 000 topographical map series makes it easier to recognise features. We use colour for the following:

o   To recognize different classes of features. For example blue symbolizes water features and green generally symbolizes vegetation.

o   To recognize hierarchy of map features. For example, with roads on a topographic map, national roads are bright red and blue colours, whilst provincial and secondary roads are duller reds and brown.

Figure 2: Classes of Roads

o To add understanding of the intensity of certain phenomena. For example, a South African maximum temperature map shows bright reds for areas with higher temperatures and pastel colours e.g. beige for areas with cooler temperatures.
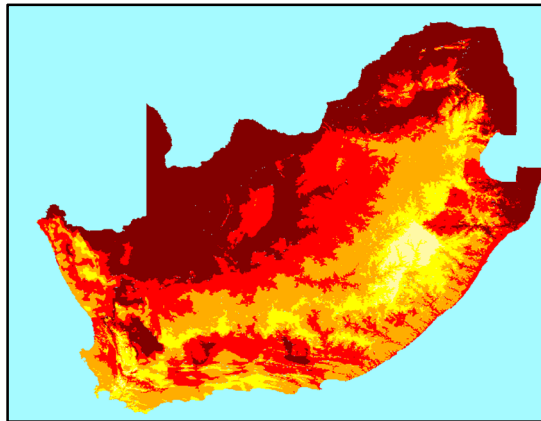

Figure 3: Temperature map

 Funda Lula Activity 2 – Map symbols: Shape, Color and Size

 Activity 3 – Importance of colours in symbols

3.3. Topic 3: Qualitative and Quantitative symbols

Geographic, and other related data may be symbolized in many ways. The types of symbols used to display this data can be divided into qualitative (categorical) and quantitative (numerical).

This is based on whether they show a type of feature (quality) or an amount/quantity relating to a feature.

3.3.1. Qualitative symbols

Qualitative symbols represent information that deals specifically with descriptions. This means that the data you see on your map can be observed and ranked but not measured.

Figure 6: Names of mountains are an example of qualitative symbols
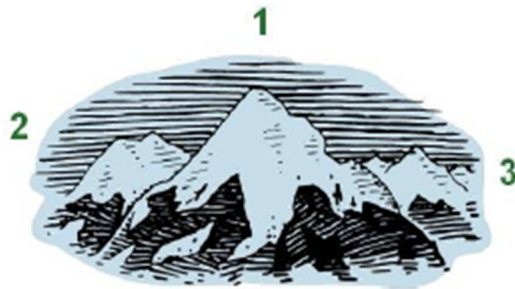
Figure 7: Numbers representing ranks are an example of qualitative symbols. You cannot add, subtract, multiply or divide the numbers but you can rank them.

3.3.2. Quantitative symbols

Quantitative symbols show information about quantities; that is, information on your map that can be measured and written down with numbers.

Figure 8: The height of a mountain is an example of qualitative symbols

Slide 9: Qualitative and Quantitative Symbols

- *This slide shows the differences between qualitative and quantitative symbols.*
- *The symbol for all the trees is the same.*
- *The different types of the trees are represented by using a symbols that describes its quality.*
- *The heights of the trees are represented by the different numerical values that show quantity.*

Symbols	Tree Type		Tree Height	
	Qualitative		Quantitative	
🌼	Yellowwood	🌼	10 m	🌼

🌼	**Pine**	✿	10 m	🌸
🌼	**Oak**	🌸	50 m	🌸
🌼	**Pine**	✿	50 m	🌸
🌼	**Pine**	✿	20 m	🌼
🌼	**Yellowwood**	🌸	10 m	🌸

Figure 9: Table of qualitative and quantitative symbols

Funda Lula Activity 4: Qualitative and Quantitative symbols