FIELD GEOLOGY

UNIT I

Unit II : Rock outcrops and their surficial expressions. Basic concepts: strike, dip, apparent dip and rock trends. Introduction to the outcrop features used in mapping: foliations, lineations, bedding, and lithological contacts. Geological mapping: Techniques of mapping: Traverse methods: Compass and Contact traverse, Exposure mapping, Variable lithology mapping, Line maps. Preparation of field note based data sheet.

Unit III : Field Equipments - Clinometer compass: different parts and their functions.

Definition and its scope

Fieldwork is an important part of **Geology** as it provides many of the data on which our knowledge of the Earth and its evolution along with that of life through time. It can be considered as the glue that binds together all of the different subdisciplines within the study of our planet.

As the term implies, *field geology* means Field work, geology as practiced by direct observation of outcrops, exposures, landscapes, and drill cores. Those engaged in field geology investigate rocks and rock materials in their natural environment. Field geologists thus attempt to describe and explain surface features, underground structures, and their interrelationships. Lahee (1961), however, emphasizes that although field geology is based on observation, many conclusions are predicated on inferences. He states that “the ability to infer and infer correctly is the goal of training in field geology” (p. 4). Proficiency as a geologist is largely measured by one's ability to draw reasonable conclusions from observed phenomena and to predict the occurrence of features, conditions or processes using field experience.

Field work, supplemented by laboratory studies, is critical to advances in knowledge of the geology of the earth. Whether in the acquisition of original...

Prior planning

Field trips are generally motivating for students, bring a vividness or reality you cannot bring with conventional lessons, and provide information for learning in a relevant real world context. If you are planning to use field trips, review the following information.

General Guidelines

- must be relevant to the objective, curriculum and grade level
  visit the site
  teach the behavior - field trip
  chaperons & chaperon training
  bus drivers
  create a data collection device
  never leave students alone
  run a closure
  thank you notes

1. Establish the educational purposes of the trip. Write educational goals. The activities and content examined during the field trip must be relevant and connected to outcomes and objectives in the curriculum. Field trips can certainly be entertaining, but if entertainment is the only outcome, the teacher must rethink the trip with respect to the use of time and and other resources that are both limited and precious.
   Select a date.
   Verify date and time with authority at the destination.
   Determination the costs and who will pay. Determine any arrangements for transportation and if the costs will be covered by the administration or other sources need to be found.
   Obtain administrative permission. In writing if necessary from your administration for the activity.
   Make arrangements for transportation.
   Contact the docent or, on site education director, or a person who can help coordinate the visit. They may have different tours available and you may request a packet of information from them to learn more about what is available. Those materials could include a map of the site, buildings, rules, highlights, if guided tours are available, and if so, then make sure the docent knows the goals for your trip.
   Make arrangements for the visit: time to leave, schedule, activities and special materials.
   Discuss the field trip. What will students learn? What things in particular do we want to observe? What questions do we want to ask the guide? This preparation will help the students be more observant and guide their research during the field trip. Chances are good that some students will be taken to places they have been before. The first-grader has been to the supermarket a hundred times with their parents. Most of them have seen trains, been to the airport, been to the zoo, and all have been to a gas marts and convenience stores. Why, then, should

the school take children to such places on field trips? The answer is in your goals. And the better prepared students are to observe and collect data the more likely they will achieve the goals, by looking for things they would not otherwise see.
Provide students with a data collection activity so they are engaged in a meaningful examination and interaction while on-site. This activity could be a note-taking framework and/or questions to answer and/or items to examine. In the case of a museum visit, it could be a scavenger hunt with questions to answer on items or exhibits in the museum.
Review the rules, give groups color coded name tags, bracelets or all wear one color of shirts. Take a supply bag containing: first aid kit, photography supplies, trash bags, ...

Basic equipment requid for field work

Following is a list of all equipment that is likely to be needed in the field:

1. Adhesive tape
2. Aerial photographs
3. Altimeter
4. Binoculars
5. Calculator
6. Camera, tripod, film, etc
7. Chemicals for staining rocks
8. Cold chisel
9. Color pencils
10. Colored tape or paint for marking localities
11. Brunton compass or other
12. Drawing Board
13. Erasers
14. Field case for maps and photographs
15. Field glasses
16. First aid kit
17. Flashlight
18. Gloves
19. Gold pan
20. Grain-size card
21. Geologists Hammer
22. Hand lens
23. Dilute Hydrochloric Acid

24. Ink, waterproof; black, brown, blue, red and green
25. Insect repellent
26. Jacob staff
27. Knapsack
28. Lettering set
29. Loose-leaf blinder
30. Magnet
31. Maps, topographic, geologic
32. Microscope
33. Mineral hardness set
34. Field notebooks
35. Paper, lined
36. Paper, quadrille
37. Paper, scratch
38. Pen, drop circle
39. Pen, holders
40. Pen, ruling
41. Pens, ballpoint
42. Pen, inkflow, for photographs
43. Pencils, 3B to 9H
44. Pencil pointer
45. Pick or mattock
46. Pocket knife
47. Protractors
48. Rain gears
49. Rangefinder, Camera
50. Reference library
51. Sample bags
52. Scale, plotting, 6 in.
53. Shovel
54. Stereo-graphic net
55. Tally counter
56. Tape, 6-ft
57. Tape, 100-ft
58. Triangles, drawing
59. Satellite phone
60. Watch

Types of investigation

The extent of required investigations should be dictated by hazard classification, nature of structures, and quantity of data already available. Existing dams without adequate data should be evaluated as carefully as proposed structures; not to do so is to be dangerously presumptive. Geotechnical investigations for proposed sites should be generally divided into three separate phases to minimize costs and for developing the necessary data at each stage of the approval, design, and construction of a project: • Preliminary Investigations (Adequate information to justify site selection and preliminary cost estimates). • Initial Design Investigations (Information necessary to obtain regulatory approvals, refine cost estimates, and develop engineering and environmental data). • Final Design Investigations (Information necessary for developing plans and specifications, obtaining bids, and constructing the project). 5-6 For existing dams, the extent of data needed may be relatively limited, depending upon the adequacy of existing data and construction documentation. Evaluation of an existing structure generally requires detailed foundation data that may only be obtained by drilling, sampling, and testing that is concentrated on specific site areas or problems. Such investigations, when needed, should be planned to provide the engineer with information and data to answer questions on specific dam safety problems and to perform dam safety analyses. 5-7.1 Preliminary Investigations (Adequate information to justify site selection and preliminary cost estimates). This investigation should provide a first general impression of the engineering and geological aspects of the proposed site, and should determine if further study of the site is warranted. The field work generally would include preliminary field geologic mapping, some preliminary hand auger holes for soil and overburden sampling, a limited number of core holes into rock and possibly some preliminary seismic refraction lines. This information would be used to answer questions raised by an office study. The data would also be used to plan the type, location, and amount of explorations and laboratory testing required for future, more detailed investigations. 5-7.2 Initial Design Investigations (Information necessary to obtain regulatory approvals, refine cost estimates, and develop engineering and environmental data). These investigations would be undertaken to provide more detailed information on foundation characteristics on a particular site or several sites, and to provide data for preliminary considerations of the design requirements and construction methods. This type of information is usually developed for inclusion in the license application or in reports providing conceptual analyses of existing project structures. This phase of field investigation should include surface and subsurface exploration and sampling through borings, test pits, test trenches, material testing, geologic mapping, and additional geophysical surveys to supplement drilling. Data developed from these activities should be used to compare alternative sites, to analyze different types of structures that might serve the same purpose, and to develop economic evaluations of the sites. An end product of this investigation usually is an application for license, which includes a specifically identified site and appurtenant structures. 5-7.3 Final Design Investigations (Information necessary for developing plans and specifications, obtaining bids and constructing projects). These investigations would be primarily composed of detailed drilling, sampling, and testing concentrated on specific features at the selected project site; and should be specifically planned to provide the engineer with information that is necessary to design structures, estimate quantities, determine rates of construction progress, develop cost estimates, prepare plans and specifications, and obtain bids.

<u>Field work objectives</u>

Fieldwork is designed to provide the student with an opportunity for a practical, "real world" experience for the purpose of developing direct leadership, programming, and administrative skills sufficient for entry into a professional career.

At the completion of Fieldwork, students will have:

1. Gained exposure to and responsibility for varied practical situations under qualified supervision.

2. Gained knowledge and competence in working with individuals and groups in a structured program setting.

3. Developed an in depth understanding of kinesiology and health interests and needs, and the variations of services delivered by multiple kinesiology and health service agencies and organizations.

4. Demonstrated through actions a level of competence in leadership, programming, and administrative abilities, as well as a commitment to human values and ethics.

5. Demonstrated analytical and research abilities by means of written reports on the organizational structure and administrative functions of the Fieldwork agency.

Types of data collected

Field data collection is a **data collection** project executed in person, in a specifically chosen physical location or environment (as opposed to remotely). **Field data** is **collected** for the purpose of training an artificial intelligence algorithm using real-world, naturalistic **data** in a variety of realistic use cases.

why businesses gather and use information from the field. Today we'll dive deeper into some of the different methods for collecting data.

There is not one "best" data collection technique — every process comes with pros and cons. Some methods are better for projects that only require quantitative data, while others are better for uncovering qualitative data.

What is the difference between quantitative and qualitative data?

Quantitative data is counted and expressed in numbers: *There are **five** fire hydrants on Main Street.* Qualitative data is based on attributes (or qualities): *The fire hydrants on Main Street are **yellow**.*

A combination of techniques that gathers both quantitative and qualitative information will yield the most comprehensive results.

So without further ado, let's talk about some data collection methods:

Observations

Making direct observations is a simple and unobtrusive way of collecting data. Gathering firsthand information in the field gives the observer a holistic perspective that helps them to understand the context in which the item being studied operates or exists.

The observations are recorded in field notes or on a mobile device if the observer is collecting data electronically (like with Fulcrum).

Some examples of observational data collection are building inspections, safety checklists, agricultural surveys, and damage assessments.

Observation is an effective method because it is straightforward and efficient: It doesn’t typically require extensive training on the part of the data collector, and he or she is generally not dependent on other participants.

The biggest drawback of observational data is that it tends to be superficial and lack the context needed to provide a complete picture.

Surveys / Questionnaires

Questionnaires are a popular means of data collection because they are inexpensive and can provide a broad perspective. They can be conducted face-to-face, by mail, telephone, or Internet (in which case, they can include respondents from anywhere in the world).

Surveys are often used when information is sought from a large number of people or on a wide range of topics (where in-depth responses are not necessary). They can contain yes/no, true/false, multiple choice, scaled, or open-ended questions — or all of the above. The same survey can be conducted at spaced intervals to measure change over time.

Some of the advantages of surveys are that respondents can answer questions on their own time, and may answer more honestly as questionnaires provide anonymity (whether real or perceived). And while the responses may be biased on the part of the participant, they are free from the collector’s bias.

The main drawbacks are low response rate, delay in response, and the possibility of ambiguous or missing answers (and since questionnaires are a passive tool, it’s usually not possible to receive clarification).

Tips for designing a survey

- Keep it short and simple

Include an introduction with basic directions

List questions in a logical sequence

Avoid jargon and complex language

Provide adequate space for answers

Introduction to topographic maps

Topographic maps are two dimensional models of the Earth's, which is considered three dimensional. Topographic maps are also known as contour maps. Topographic maps illustrate elevation above sea level using contour lines.

Topographic Maps

Contour Line: A line on a map that connects points of equal elevation. These lines not only show elevation but also show the shape of the land.

Contour Interval: This is the difference in elevation between each line. The spacing is always equal. This contour interval is 20 feet.

Index Contours :These help the map reader determine elevation. Every fifth line is darker and has an elevation printed on it.

Rules for Contours

1. Contour lines never cross each other.

2.Contours always form closed loops even if not shown on the map.

3.Contour lines bend upstream (uphill) when crossing a river.

4.The maximum possible elevation for a hill is one less than the value that would have designated the next contour line. In other words, the highest possible elevation of the hill is just below the value of the next contour line, even though that line is not shown.

Closely-Spaced Contours- On a steep slope, the contour lines are close together.

Widely-Spaced Contours- On a gradual slope, the contour lines are far apart

Depressions Contour lines that show a depression, crater, or sinkhole on a map are represented by dashed lines (hachure marks) on the inside of a contour line.

The elevation of the first depression contour is the same as the nearest regular contour line.

The lowest possible elevation for a depression is one more than what the next contour should be. The lowest possible elevation of a depression is just above the value of the next line that is not shown.

Benchmarks

Benchmarks are locations whose exact elevation is known and is noted on a brass or aluminum plate. Benchmarks are indicated on maps with an X followed by BM. Map Scales Map scales indicate the distance on the map compared to distance in the real world. Graphical scales use a line divided into equal parts and marked in units of length.

Map Scales

Numerical scales display a ratio to represent the distances in the real world. 1:63,360 One inch on the map equals 63,360 inches in the real world because there are 63,360 inches in a mile.

Parts ,symbols and other information

The first features usually noticed on a topographic map are the area features such as vegetation (green), **water** (**blue**), some information added during update (purple), and densely built-up areas (gray or red). Many features are shown by lines that may be straight, curved, solid, dashed, dotted, or in any combi- nation.

- Brown lines – contours (**note** that intervals vary)
  Black lines – roads, railroads, trails, and boundaries.
  Red lines – survey lines (township, range, and section lines)
  Blue areas – streams and solid is for larger bodies of **water**.
  Green areas – vegetation, typically trees or dense foliage.

A **topographic map** is a detailed and accurate illustration of man-made and natural features on the ground such as roads, railways, power transmission lines, contours, elevations, rivers, lakes and geographical names.

The distinctive characteristic of a topographic map is the use of elevation contour lines to show the shape of the Earth's surface. Elevation contours are imaginary lines connecting points having the same elevation on the surface of the land above or below a reference surface, which is usually mean sea level. Contours make it possible to show the height and shape of mountains, the depths of the ocean bottom, and the steepness of slopes.

USGS topographic maps also show many other kinds of geographic features including roads, railroads, rivers, streams, lakes, boundaries, place or feature names, mountains, and much more. Older maps (published before 2006) show additional features such as trails, buildings, towns, mountain elevations, and survey control points. Those will be added to more current maps over time.

The phrase "USGS topographic map" can refer to maps with a wide range of scales, but the scale used for all modern USGS topographic maps is 1:24,000. That covers a quadrangle that measures 7.5 minutes of longitude and latitude on all sides, so these are also referred to as 7.5-minute maps, quadrangle maps, or “quad” maps (modern topographic maps for Alaska have a scale of 1:25,000 and cover a variable distance of longitude). Each topographic map has a unique name.

Within this domain there are two product categories:

- US Topo maps are the current topographic map series, published as digital documents (that can also be printed) from 2009 to the present.

The Historical Topographic Map Collection (HTMC) is scanned images of maps originally published (at all scales) as paper documents in the period 1884-2006.

The USGS also publishes other kinds of maps, including some topographic maps that are not standard quadrangle maps.

Basic concept

Relief

Relief is the variations in the elevation of the ground surface, also features of height above a plain or reference datum. On a **relief map**, relief is depicted by hachures or shading, or, more accurately, by contours or by spot elevations or both

Contours

Contour line, a line on a map representing an imaginary line on the land surface, all points of which are at the same elevation above a datum plane, usually mean sea level. map: **contour** lines. The diagram illustrates how **contour** lines show relief by joining points of equal elevation.

Slope

Slope is the measure of steepness or the degree of inclination of a feature relative to the horizontal plane. **Gradient, grade, incline** and **pitch** are used interchangably with slope. Slope is typically expressed as a **percentage**, an **angle**, or a **ratio**. The average slope of a terrain feature can conveniently be calculated from contour lines on a topo map. To find the slope of a feature, the horizontal distance (run) as well as the vertical distance (rise) between two points on a line parallel to the feature need to be determined. The slope is obtained by dividing the **rise over run**.

Gradient

Slopes represent the rising or falling of the land surface. Slopes can either be gentle or steep. The slope is said to be steep when the land surface is rising/falling sharply and said to be gentle when the rising/falling of the land surface is mild.
A gradient is usually used to measure how steep or how gentle the slope is. In other words, it measures the rate at which the slope is rising/falling. However, due to the fact that the surface of the land is rarely uniform, gradient measures the average steepness of the slope of a piece of land.
A gradient is basically *the average rate at which the ground slopes*. With the help of contours, the gradient of a given slope or a terrain feature can be conveniently determined from a topographic map.

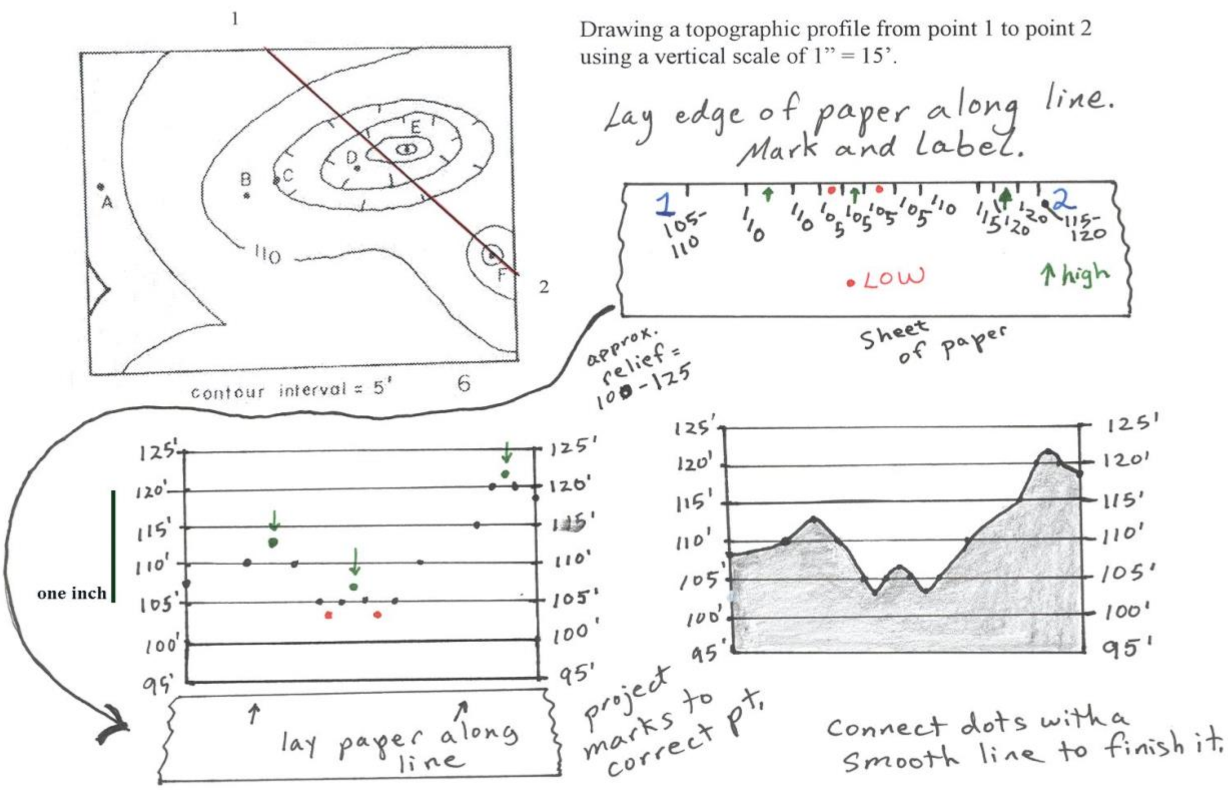
Profiles and section

A map view looks at the surface of the earth from overhead. Contour maps use the contour lines to represent the third dimension of elevation. In a previous lesson we examined geologic maps. We also looked at geologic cross sections that cut through the earth and showed the rocks beneath the surface. The top line on the cross section represented the surface of the earth. We can apply this same alteration of perspective to contour maps. From the information provided by the contour map, we can produce a cut across this surface into the earth and, thus, show a side view like a silhouette or skyline. This illustration is called a TOPOGRAPHIC PROFILE.

A topographic profile is a diagram that shows the change of elevation of the land surface along a given line. As indicated above, it represents graphically the skyline viewed from a distance. The VERTICAL scale is the scale used to plot the elevation. It is usually larger than the horizontal or map scale, EXAGERATED, in order to emphasize the difference in the relief. The MAXIMUM RELIEF is the difference in elevation between the highest and lowest points.

Following are the steps for drawing a topographic profile.

1. Lay the edge of a strip of paper along the line between the starting and ending points for the profile.
2. Mark on the edge of the strip the EXACT places where each CONTOUR, STREAM, and HILLTOP crosses this line.
3. Label these marks with the elevation and correct identification.
4. Mark any important other features such as bottoms of depressions or landmarks to be included.
5. If a graph is not provided, construct the horizontal line for your profile of the SAME LENGTH as your profile (unless a different horizontal scale is to be used for the profile.) Generally, the same horizontal scale is used. Prepare the VERTICAL SCALE by lightly drawing lines parallel to your horizontal base line on the proper scale for each of the elevations to be represented. Label these lines with the correct elevations starting one or two intervals below the lowest elevation that will be plotted (lowest elevation on the profile). Thus, the side represents a kind of graphic scale.
6. Place the edge of the strip of paper with the labeled contour lines at the bottom of the profile base line and project each contour and feature to the horizontal line of the same elevation. Put a small dot at the intersection of these two lines.
7. Connect all of the points with a smooth line being careful to show all hilltops at the proper height and all valleys and depressions at their correct approximate values.



Interpretation of topographic maps

A map is a visual representation of an area—a symbolic depiction highlighting relationships between elements of that space such as objects, regions, and themes. Many maps are static two-dimensional, geometrically accurate (or approximately accurate) representations of three-dimensional space, while others are dynamic or interactive, even three-dimensional. Although most commonly used to depict geography, maps may represent any space, real or imagined, without regard to context or scale; e.g. brain mapping, DNA mapping, and extraterrestrial mapping.

Maps are one of the most important tools researchers, cartographers, students and others can use to examine the entire Earth or a specific part of it. Simply defined maps are pictures of the Earth's surface. They can be general reference and show landforms, political boundaries, water, the locations of cities, or in the case of thematic maps, show different but very specific topics such as the average rainfall distribution for an area or the distribution of a certain disease throughout a county. Today with the increased use of GIS, also known as Geographic Information Systems, thematic maps are growing in importance. A map is a visual representation of an area – a symbolic depiction highlighting relationships between elements of that space such as objects, regions, and themes. There are however applications for different types of general reference maps when the different types are understood correctly. These maps do not just show a city's location for example; instead the different map types can show a plethora of information about places around the world. The following is a list of each major map type used by geographers and a description of what they are and an example of each kind. Political Map: A political map does not show any topographic features. It instead focuses solely on the state and national boundaries of a place. They also include the locations of cities - both large and small, depending on the detail of the map. A common type of political map would be one showing the Indian States and their borders along with the International borders Physical Map: A physical map is one that shows the physical landscape features of a place. They generally show things like mountains, rivers and lakes and water is always shown with blue. Mountains 2 and elevation changes are usually shown with different colors and shades to show relief. Normally on physical maps green shows lower elevations while browns show high elevations. An example of a physical map is one showing the state of Hawaii. Low elevation coastal regions are shown in dark green, while the higher elevations transition from orange to dark brown. Rivers are shown in blue. Topographic Map: A topographic map is similar to a physical map in that it shows different physical landscape features. They are different however because they use contour lines instead of colors to show changes in the landscape. Contour lines on topographic maps are normally spaced at regular intervals to show elevation changes (e.g. each line represents a 100 foot (30 m) elevation change) and when lines are close together the terrain is steep. For example a topographic map showing the Big Island of Hawaii would have contour lines that are close together near the steep, high elevation mountains of Mauna Loa and Kilauea. By contrast, the low elevation, flat coastal areas show contour lines that are spread apart. Climate Map: A climate map shows information about the climate of an area. They can show things like the specific climatic zones of an area based on the temperature, the amount of snow an area receives or average number of cloudy days. These maps normally use colors to show different climatic areas. Road Map: A road map is one of the most widely used map types. These maps show major and minor highways and roads (depending on detail) as well as things like airports, city locations and points of interest like parks, campgrounds and monuments. Major highways on a road map are generally red and larger than other roads, while minor roads are a lighter color and a narrower line. Thematic Map: A thematic map is a map that focuses on a particular theme or special topic and they are different from the six aforementioned general reference maps because they do not just show natural features like rivers, cities, political subdivisions, elevation and highways. If these items are on a thematic map, they are background information and are used as reference points to enhance the map's theme.

Orientation of maps The orientation of a map is the relationship between the directions on the map and the corresponding compass directions in reality. The word "orient" is derived from Latin oriens, meaning East. Modern digital GIS maps typically project north at the top of increase counter-clockwise), rather than compass degrees (0 is north, degrees increase clockwise) for orientation. Compass decimal degrees can be converted to math degrees by subtracting them from 450. 1.4. Scale and accuracy Many, but not all, maps are drawn to a scale, expressed as a ratio such as 1:10,000, meaning that 1 of any unit of measurement on the map corresponds exactly, or approximately, to 10,000 of that same unit on the ground. The scale statement m the curvature of the Earth to be neglected, for example in a town planner's city map. Over larger regions where the curvature cannot be ignored we must use map projections from the curved surf Earth (sphere or ellipsoid) to the plane. The impossibility of flattening the sphere to the plane implies that no map projection can have constant scale: on most projections the best we can achieve is accurate scale on one or two lines (not nece introduce the concept of point scale, which is a function of position, and strive to keep its variation Thematic Map Orientation of maps The orientation of a map is the relationship between the directions on the map and the corresponding compass directions in reality. The word "orient" is derived from Latin oriens, meaning East. Modern digital GIS maps typically project north at the top of the map, but use math degrees (0 is east, degrees clockwise), rather than compass degrees (0 is north, degrees increase clockwise) for orientation. Compass decimal degrees can be converted to math degrees by subtracting them from 450. e and accuracy Many, but not all, maps are drawn to a scale, expressed as a ratio such as 1:10,000, meaning that 1 of any unit of measurement on the map corresponds exactly, or approximately, to 10,000 of that same unit on the ground. The scale statement may be taken as exact when the region mapped is small enough for the curvature of the Earth to be neglected, for example in a town planner's city map. Over larger regions where the curvature cannot be ignored we must use map projections from the curved surf Earth (sphere or ellipsoid) to the plane. The impossibility of flattening the sphere to the plane implies that no map projection can have constant scale: on most projections the best we can achieve is accurate scale on one or two lines (not necessarily straight) on the projection. Thus for map projections we must introduce the concept of point scale, which is a function of position, and strive to keep its variation 4 Thematic Map The orientation of a map is the relationship between the directions on the map and the corresponding compass directions in reality. Compass decimal degrees can be converted to math degrees by subtracting them from 450. Many, but not all, maps are drawn to a scale, expressed as a ratio such as 1:10,000, meaning that 1 of any unit of measurement on the map corresponds exactly, or approximately, to 10,000 of that same unit ay be taken as exact when the region mapped is small enough for the curvature of the Earth to be neglected, for example in a town planner's city map. Over larger regions where the curvature cannot be ignored we must use map projections from the curved surface of the Earth (sphere or ellipsoid) to the plane. The impossibility of flattening the sphere to the plane implies that no map projection can have constant scale: on most projections the best we can achieve is accurate ssarily straight) on the projection. Thus for map projections we must introduce the concept of point scale, which is a function of position, and strive to keep its variation within narrow bounds. Although the scale statement is nominal it is usually accura the most precise of measurements. Large scale maps, say 1:10,000, cover relatively small regions in great detail and small scale maps, say 1:10,000,000, cover large regions such as nations, continents and the whole globe. The large/sm terminology arose from the practice of writing scales as numerical fractions: 1/10,000 is larger than 1/10,000,000. There is no exact dividing line between large and small but 1/100,000 might well be considered as a medium scale. Examples of large scal on the other hand maps intended for motorists at 1:250,000 or 1:1,000,000 are small scale. It is important to recognise that even the most accurate maps sacrifice a certain amount of accuracy in scale to deliver a greater visual usefulness to its user. For example, the width of roads and small streams are exaggerated when they are too narrow to be shown on the map at true scale; that is, on a printed map they would be narrower than could be perceived by the maps where the smallest unit is the pixel. A narrow stream say must be shown to have the width of a pixel even if at the map scale it would be a small fraction of the pixel width. Visual Representation of Map Sc 1.5.

Slope

Slope can be defined as the steepness or gradient of a unit of terrain, usually measured as an angle in degrees or as a percentage. Aspect can be defined as the direction in which a unit of terrain faces. Aspect is usually from north. Slope can be measured in degrees from horizontal (0 slope (which is the rise divided by the run, multiplied by 100). A slope of 45 degrees equals 100 percent slope. As slope angle approaches vertical (90 degrees), the percent slope approaches infinity. The slope of a TIN face is the steepest downhill slope of a plane defined by the face. The slope for a cell in a raster is the steepest slope of a plane defined by the cell and its eight surrounding neighbors.

Base map

A base map is a layer with geographic information that serves as a background. A base map provides context for additional layers that are overlaid on top of the base map. Base maps usually provide location references for features that do not change often like boundaries, rivers, lakes, roads, and highways. Even on base maps, these different categories of information are in layers. Usually a base map contains this basic data, and then extra layers with a particular theme, or from a particular discipline, are overlaid on the base map layers for the sake of analysis.
Some base maps look like **Vector Layers** but are actually tiled **Raster layers**. Tiled images are used because they display faster and deliver a good combination of layers for providing context and orientation. If your base map has raster layers, you cannot turn the layers off and on.

For example, if you wanted to show all the different types of endangered plants within a region, you would use a base map showing roads, provincial and state boundaries, waterways and elevation. Onto this base map, you could add layers that show the location of different categories of endangered plants. One added layer could be trees, another layer could be mosses and lichens, another layer could be grasses.
In the top right corner of the Viewer map, there is a base map control allows you to choose between at least two base maps:

- **Streets**: A traditional map showing roads, topography, airfields etc.
- **Imagery**: An image taken from a satellite or airplane.

Map scale

Map scale refers to the relationship (or ratio) between distance on a map and the corresponding distance on the ground. For example, on a 1:100000 scale map, 1cm on the map equals 1km on the ground.

Map scale is often confused or interpreted incorrectly, perhaps because the smaller the map scale, the larger the reference number and vice versa. For example, a 1:100000 scale map is considered a larger scale than a 1:250000 scale map.

By

M. P. Kowsalya