URISA's Preparing for GISP Certification Webinar

- ***April 3, 2018: 1:00 – 3:30 PM Eastern***
- ***April 4, 2018: 1:00 – 4:30 PM Eastern***

The GISP has become a respected and in-demand indication of your skills as a GIS professional. If you are pursuing the GISP credential, or are thinking of doing so, join us on April 3 and 4, 2018 for a six-hour, two day virtual event, as a group of talented GIS experts share valuable information that can increase your chance of success.

Earning the GISP credential requires successfully completing an exam as well as a number of other application requirements.

- Day one (Tuesday, April 3) will explore the reasons that the GISP credential is worth pursuing as well as what is involved in completing each part of the application.
- Day two (Wednesday, April 4) will explore the topics that you need to be familiar with for each of the knowledge areas covered by the GISP exam.

Information presented in this webinar is designed to help professionals who have extensive GIS education and experience, but need to know what topics to review prior to taking the exam. It also will help individuals with some GIS experience that may be lacking in one or more areas covered by the exam and that need to know where to find additional resources to study.

The webinar agenda will be as follows:

Tuesday, April 3, 2018		
All times Eastern	**Topic**	**Presenter**
1:00 to 1:30	GISP: The Road To and Through an Exam	Tripp Corbin
1:30 to 1:35	Break	
1:35 to 3:25	Overview and Planning Ahead	Tripp Corbin
2:05 to 2:10	Break	
2:10 to 2:50	Education Achievements	Kevin Mickey
	Experience Requirements and Documentation	Keri Brennan
2:50 to 2:55	Break	
2:55 to 3:25	Contributions to the Profession	Lynda Wayne

Wednesday, April 4, 2018		
All times Eastern	**Topic**	**Presenter**
1:00 to 1:30	Knowledge Category 1. Conceptual Foundations	Gary Kent
1:30 to 1:35	Break	
1:35 to 2:05	Knowledge Category 2. Cartography and Visualization	Xan Fredericks
2:05 to 2:10	Break	
2:10 to 2:45	Knowledge Category 6. Geospatial Data	Al Karlin
2:45 to 2:50	Break	
2:50 to 3:20	Knowledge Category 4. GIS Analytical Methods	Lisa Fulton
3:20 to 3:25	Break	
3:25 to 3:55	Knowledge Category 5. Data Manipulation	Carl Anderson
3:55 to 4:00	Break	
4:00 to 4:30	Knowledge Category 3. GIS Design Aspects and Data Modeling	Lorne Dmitruk

GIS Professional Education Calendar

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Preparing for the GISP Exam

April 3-4, 2018

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Conceptual Foundations

Gary Kent

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What you need to know

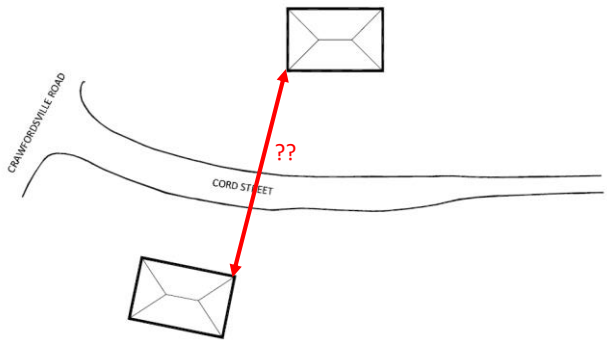
GISCI Geospatial Core Technical Knowledge Exam ® Knowledge Area

	1. Conceptual Foundations
1.	Knowledge of spatial relationships such as distance (e.g., horizontal and vertical), direction, and topology (e.g., adjacency, connectivity, and overlap) that are particularly relevant to geospatial data analysis
2.	Knowledge of standard spatial data models, including the nature of vector, raster, and object-oriented models, in the context of spatial data used in the workplace
3.	Understanding of the conceptual foundations on which geographic information systems (GIS) are based, including the problem of representing change over time and the imprecision and uncertainty that characterizes all geographic information
4.	Knowledge of earth geometry and its approximations, including geoids, ellipsoids, and spheres
5.	Knowledge of georeferencing systems, including coordinate systems, spatial projections, and horizontal and vertical datums

Spatial Relationships

1. Knowledge of spatial relationships relevant to geospatial data analysis
   - Horizontal and vertical distances
   - Direction
   - Topology

Distances



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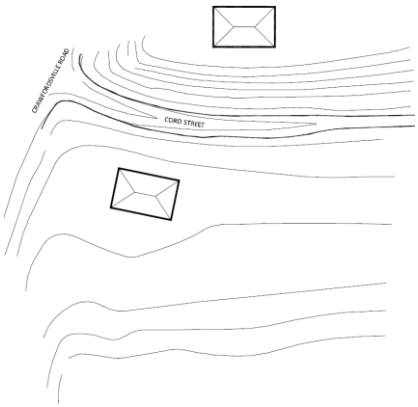

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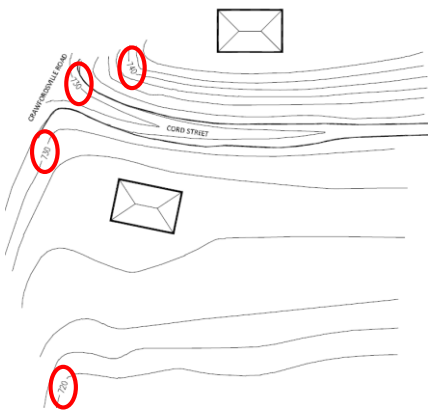

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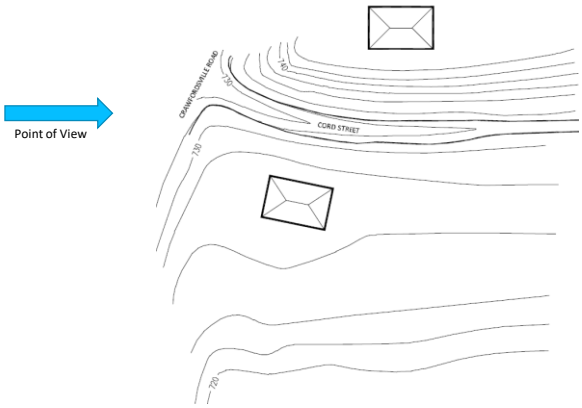
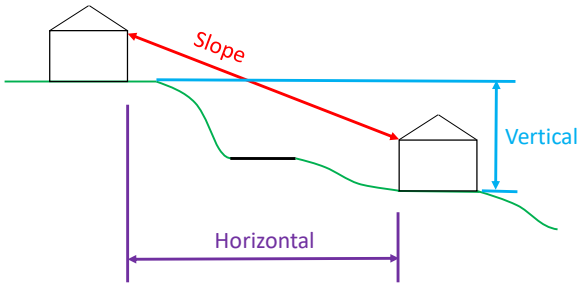
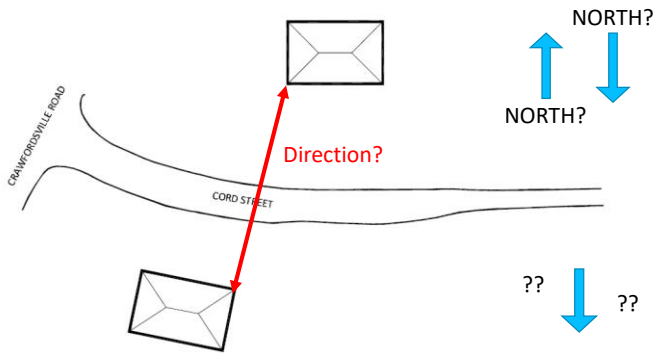


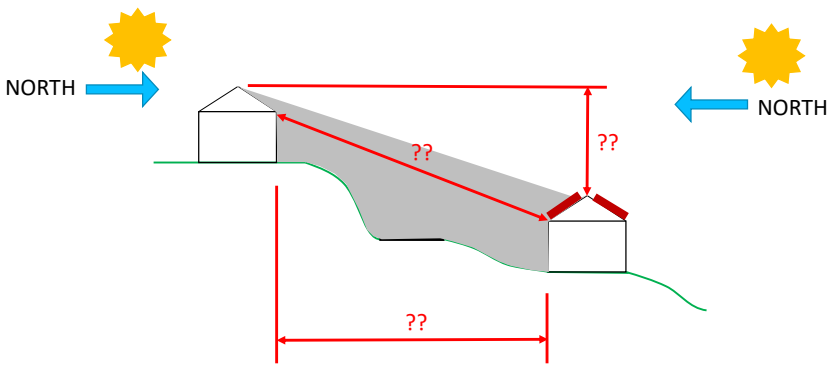
Distances



Direction

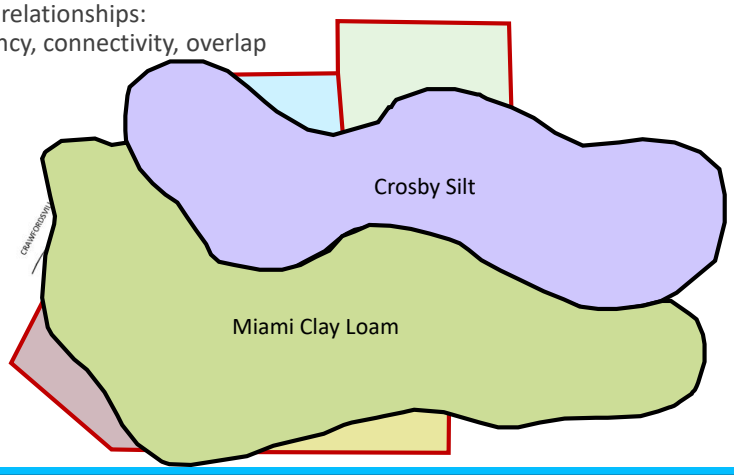


Direction



Topology

Spatial relationships:
Adjacency, connectivity, overlap



Conceptual Foundations

2. Knowledge of standard spatial data models, including the nature of…
   - Vector
   - Raster
   - Object-oriented models

in the context of spatial data used in the workplace

Raster Data

Raster data are comprised of discrete pixels

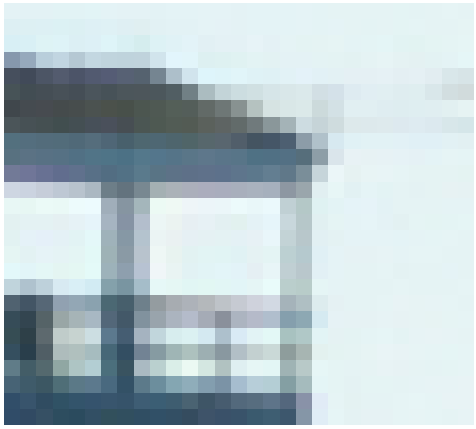
From a normal perspective, a raster image may look crisp and clean

Raster Data

But when zoomed in, the image is obviously formed by millions of squares

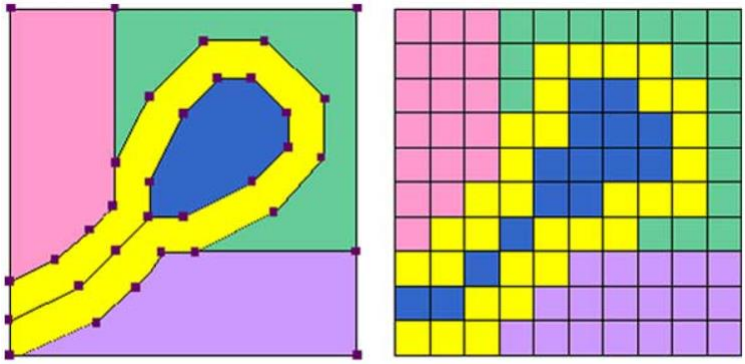
Raster Data

As the image is scaled larger it may become unusable



Vector Data

Vector data are mathematically defined paths rather than a set of pixels



Vector Data

Geographic location of vector data is inherently defined and maintained

No pixelation when zoomed in

Object-oriented Models

In traditional relational data models - spatial data and attribute data are stored separately

- Entities are of a certain class or "type" (e.g., PERSON and CITY)
- Entities have certain associated elements of data or "attributes" (e.g., a "CITY" has a "POPULATION" and a "PERSON" has an "AGE")
- Entities have relationships (e.g., How many "PERSONS" of a certain "AGE" live in "CITIES" of a certain "POPULATION?")

Object-oriented Models

In object-oriented database models - spatial data and attribute data stored in a single system

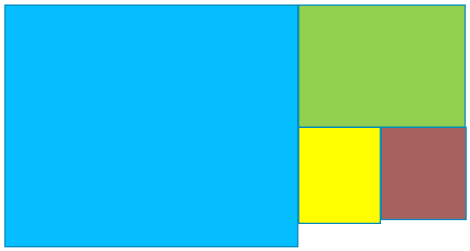
- Entities are represented as objects having properties (including spatial data), behaviors and relationships
- Object types can differ:
  - Simple objects
  - Geographic features
  - Network features
  - Annotation features
- Allows the user to define relationships between classes of objects like association, aggregation, composition, type inheritance, and instantiation

Conceptual Foundations

3. Understanding of the conceptual foundations on which geographic information systems (GIS) are based including the problem of representing change over time, and the imprecision and uncertainty that characterizes all geographic information.

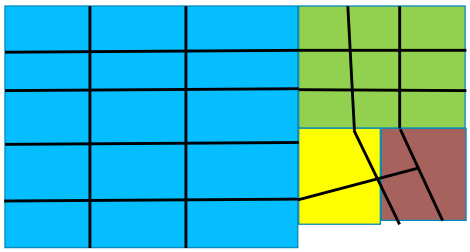
Change over Time

- Cities expand unevenly



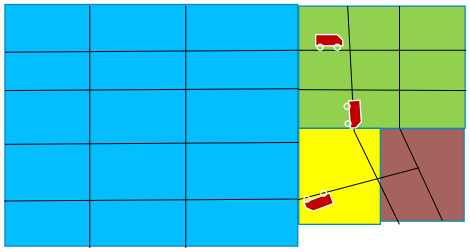
Change over Time

- Roads are built systematically



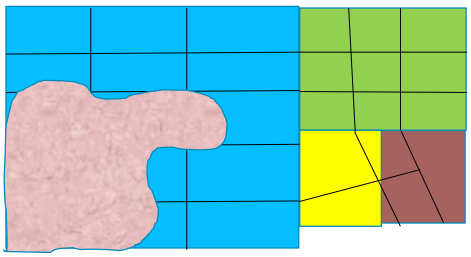
Change over Time

- Vehicles move illogically



Change over Time

- Diseases migrate erratically



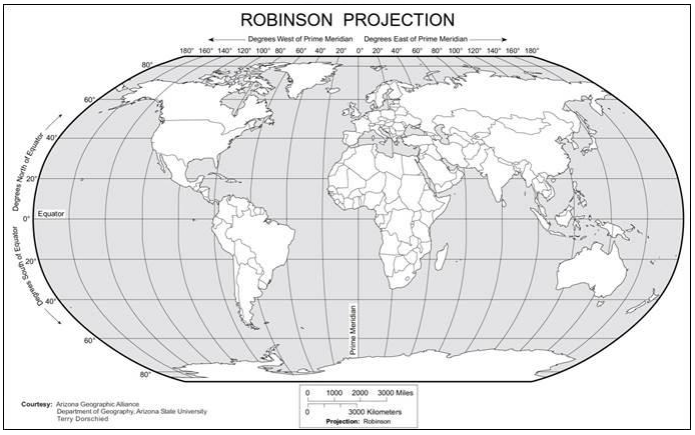
- Yet, historical information and/or context is often just as important as contemporary information.
- And even when we understand context, there is an inherent imprecision in everything we attempt to represent in GIS.

Conceptual Foundations

4. Knowledge of earth geometry and its approximations including geoids, ellipsoids and spheres.

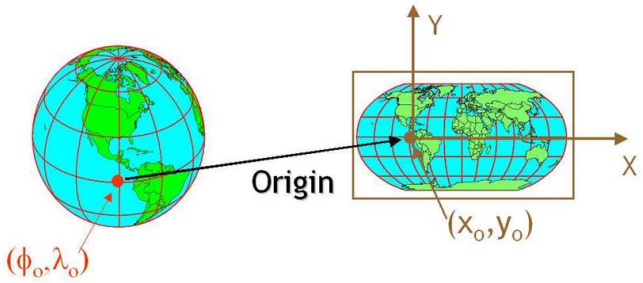
- The earth is not perfectly spherical or elliptical – it is irregular
- We need mathematical models in order to represent it features on it
- How are these models developed; what are they based on?
- What do they represent?
- How "accurate" are they?

The Earth's Geometry



Conceptual Foundations

5. Knowledge of georeferencing systems including:
   - Coordinate systems
   - Spatial projections
   - Horizontal and vertical datums



What you need to know

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Questions

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Preparing for the GISP Exam

April 3-4, 2018

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Knowledge Area:
Cartography and Visualization

Xan Fredericks, GISP
US Geological Survey

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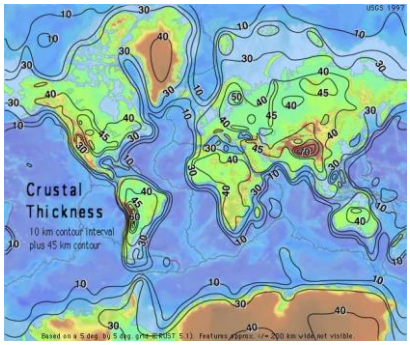
What you need to know

GISCI Geospatial Core Technical Knowledge Exam ® Knowledge Area

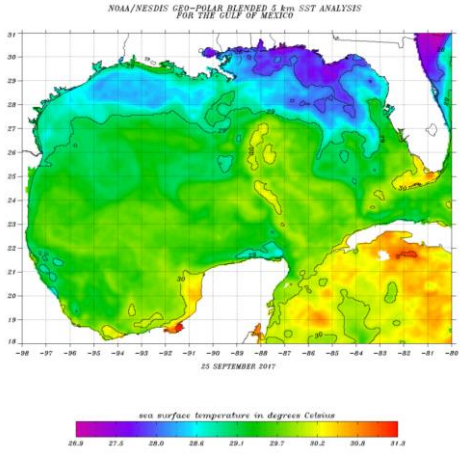
2. Cartography and Visualization
Knowledge of contour mapping
Knowledge of basic physical geography (e.g., types of boundaries, continents, landforms, and topography)
Understanding of how data collection methods influence map design and representation
Knowledge of graphic representation techniques, including thematic mapping, multivariate displays, and web mapping
Knowledge of principles of map design, including symbolization, color use, and typography, for a variety of print and digital formats
Understanding of how the selection of data classification and/or symbolization techniques affects the message of the thematic map

Source: https://www.gisci.org/Portals/0/PDF%27s/EXAM%20PREPARTION%20INFORMATION%207-16.pdf

Contour Mapping

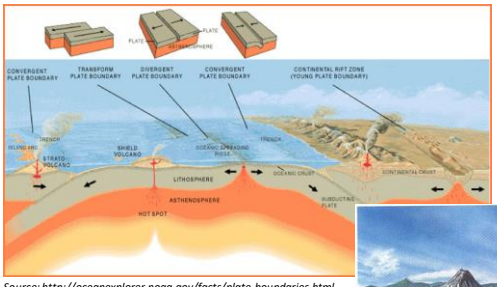


Source: https://earthquake.usgs.gov/data/crust/download.php



Source: http://www.ospo.noaa.gov/Products/ocean/sst/contour/

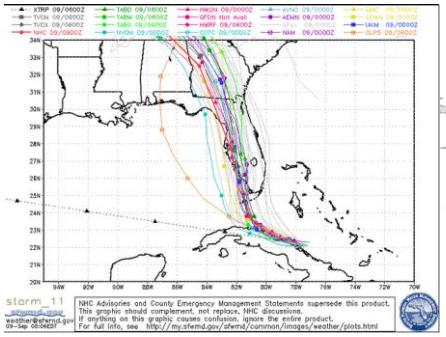
Basic Physical Geography



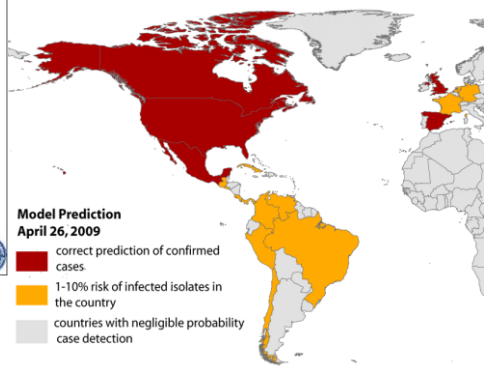
Source: http://oceanexplorer.noaa.gov/facts/plate-boundaries.html

Source: http://worldlandforms.com/landforms/landforms-3/

How Data Collection Methods Influence Map Design and Representation

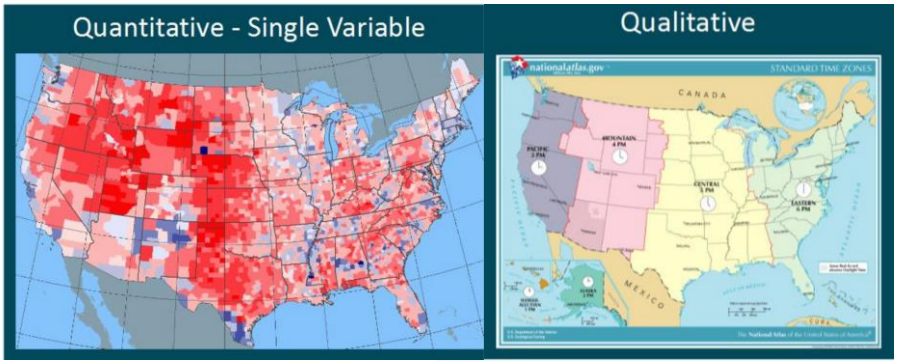


Source: http://heavy.com/news/2017/09/irma-spaghetti-models-update-west-florida-latest-friday-hurricane-right-now-updated-path-track/



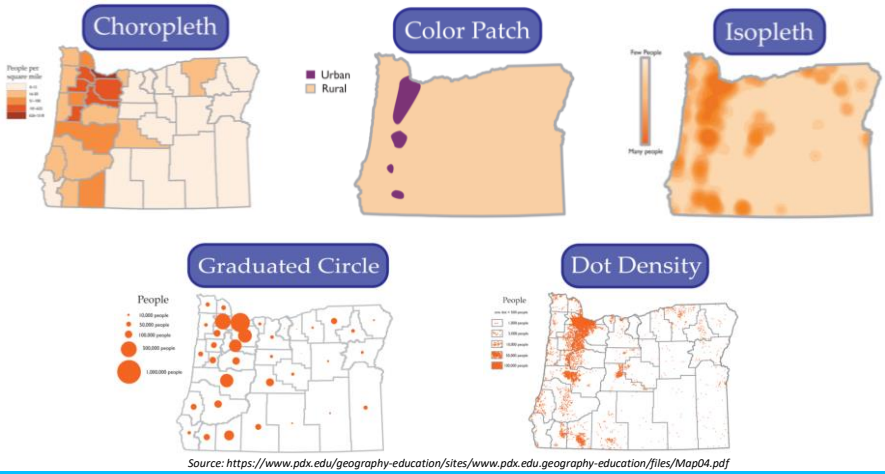
Source: http://www.gleamviz.org/2009/04/new-h1n1-flu-anticipation-by-computational-modeling/

How Data Collection Methods Influence Map Design and Representation



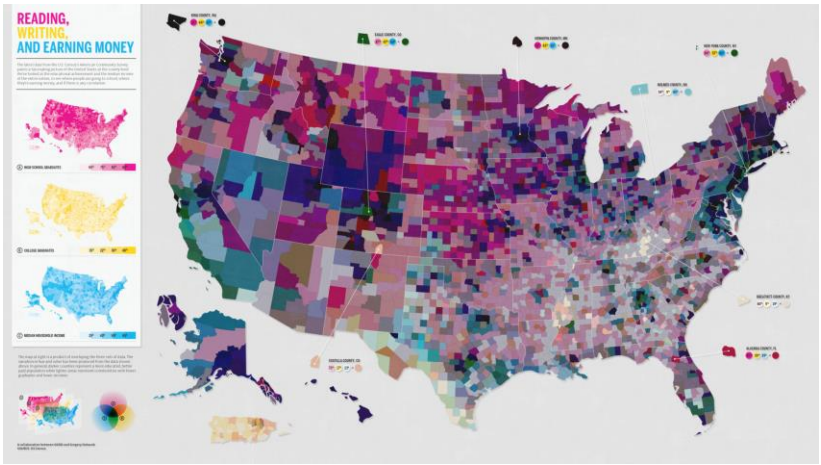
Source: https://learn.canvas.net/courses/464/pages/unit-4-dot-2-kinds-of-maps

Graphic Representation Techniques



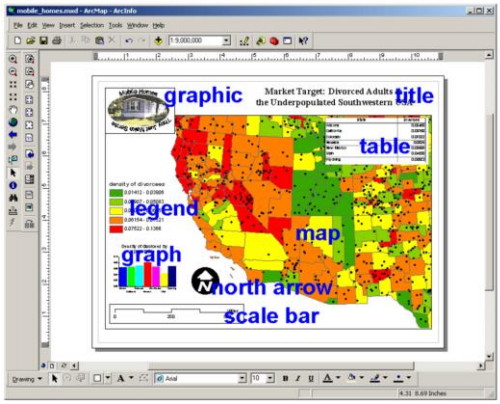
Source: https://www.pdx.edu/geography-education/sites/www.pdx.edu.geography-education/files/Map04.pdf

Graphic Representation Techniques

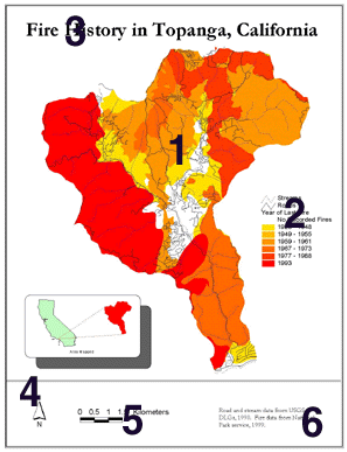


Source: https://www.good.is/infographics/america-s-richest-counties-and-best-educated-counties

Principles of Map Design



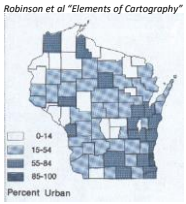
Source: https://courses.washington.edu/gis250/lessons/map_layouts/



Source: https://www.gislounge.com/whats-in-a-map/

How Symbolization/Data Classification Techniques Affect Thematic Maps

Robinson et al "Elements of Cartography"



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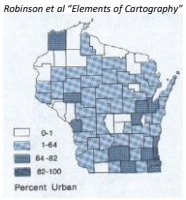

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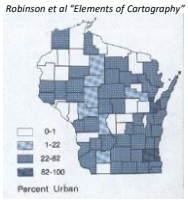
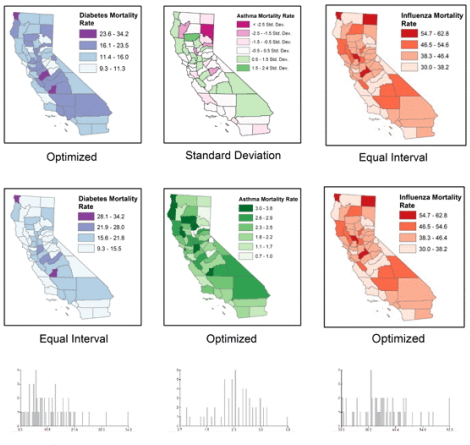


Source: http://rci.rutgers.edu/~oldnb/355/ClassBreaks.jpg



Source: https://www.e-education.psu.edu/geog486/book/export/html/1782

Cartography & Visualization Exam Prep

Knowledge of:

- Contour Mapping
- Basic Physical Geography
- Graphic Representation Techniques
- Principles of Map Design

Understanding of:

- How Data Collection Methods Influence Map Design and Representation
- How Symbolization/Data Classification Affects the Thematic Map Message

GISP Practice Exam Questions

In a map showing contours, the name of the darker contour lines is (Choose the best answer)

A. Index contours

B. Key contours

C. Lines of deviation

D. Lines of Elevations

GISP Practice Exam Questions

The inherent ability to suggest pattern in the phenomena they represent is a fundamental use of (Choose the best answer)

A. Maps
B. Tables
C. Layers
D. Points

GISP Practice Exam Questions

A small-scale map would show (Choose the best answer)

A. A larger geographic area than a large-scale map
B. A smaller geographic area than a large-scale map
C. The same geographic area as a large-scale map, just at a smaller resolution
D. The same geographic area as a large-scale map, just at a larger resolution

GISP Practice Exam Questions

When mapping sensitive data, what are some techniques that can be used in order to avoid revealing details of the data? (Select all that apply)

A. Show the data as a heat map

B. Show the data as a point layer

C. Label the addresses that correspond to the data

D. Aggregate the data into quantities using graduated colors, symbols or proportional symbols

GISP Practice Exam Questions

How does using multiple attributes by category make a map more informative? (Choose the best answer)

A. It makes the map more colorful

B. It provides the reader with multiple layers of information that are easily recognizable on the map

C. It shows a high level of expertise has been obtained by the map creator

D. Multiple attributes only clutter up a map

Questions

Contact:
Xan Fredericks, GISP
US Geological Survey
afredericks@usgs.gov
727-502-8086

GISP Exam Prep – Applicable for all KSAs

GIS&T Body of Knowledge Reference Materials

Exam Preparation Workshops

KSA Materials: books, coursework, online resources, webinars

Useful Links:

- https://www.gisci.org/ExamInfo.aspx
- https://www.gisci.org/ExamInfo/ExamCandidateInformation/ExamPreparationInfo.aspx
- https://www.gisci.org/Portals/0/PDF%27s/EXAM%20PREPARTION%20INFORMATION%207-16.pdf
- https://docs.google.com/document/d/1wifTSbtaR_5oT14U_6aydFmArLpkML8Fd4lMwqIf8qg/edit?usp=sharing
- https://docs.google.com/document/d/1ioKARKLJJpG3lFbPqSqXxNHIdVBhBTrfiQ-H9ivXs_w/edit?usp=sharing

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What you need to know

GISCI Geospatial Core Technical Knowledge Exam ® Knowledge Area

6. Geospatial Data
1- Knowledge of metadata and its standards (e.g. ISO and FGDC)
2- Understanding of the difference between quality control and quality assurance in the context of a given geospatial project
3- Knowledge of data archiving and retrieval
4- Knowledge of the differences among a join, a merge, a union, a clip and an intersection
5- Knowledge of basic geomatics
6- Knowledge of basic field data collection

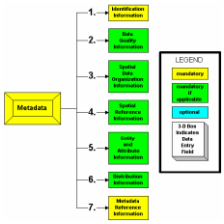
13% of the exam

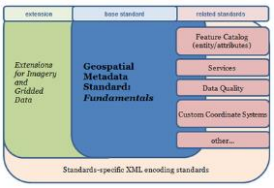
1- Knowledge of metadata and its standards (e.g. ISO and FGDC)

Metadata:

Federal Geographic Data Committee (FGDC) – Standards and Guidelines:

- https://www.fgdc.gov/metadata/geospatial-metadata-standards
- FGDC-Authored: https://www.fgdc.gov/metadata/csdgm-standard
- ISO-Authored: https://www.fgdc.gov/metadata/iso-standards





1- Knowledge of metadata and its standards (e.g. ISO and FGDC)

Metadata, continued:

Esri Metadata Standards:

- http://desktop.arcgis.com/en/arcmap/10.3/manage-data/metadata/the-arcgis-metadata-format.htm

FGDC Learning Resources on ISO:

The 411 on 19115 (URISA 2015)
FGDC ISO Geospatial Metadata Implementation Forum and Presentations
FGDC ISO Geospatial Metadata Implementation Webinar and Presentations
FGDC Metadata Summit and Presentations (2011)

at:

https://www.fgdc.gov/metadata/iso-standards

2- Understanding of the difference between quality control and quality assurance in the context of a given geospatial project

Quality Control and Quality Assurance (QA/QC)

Definitions:

QC: A system of maintaining standards in products by testing a sample of the output against the specification – **PRODUCT ORIENTED**

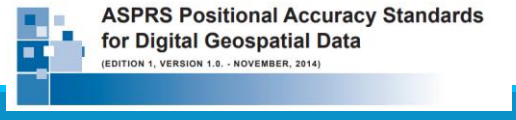
QA: The maintenance of a desired level of quality in a product, especially by attention to every stage of the process of production – **PROCESS ORIENTED**

2- Understanding of the difference between quality control and quality assurance in the context of a given geospatial project

ISO Geographic Information Standards:
https://committee.iso.org/home/tc211

ASPRS Accuracy Standards: https://www.asprs.org/pad-division/

asprs-positional-accuracy-standards-for-digital-geospatial-data.html

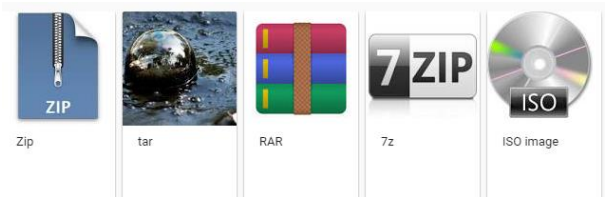


3- Knowledge of data archiving and retrieval

Archiving and Retrieval

Basic Records Management: (1B-26 FAC)
http://dos.myflorida.com/media/31105/basicsrecordsmanagement.pdf

File Formats: ZIP, RAR, TAR, 7z, ISO, JAR, LAZ, etc.



4- Knowledge of the differences among a join, a merge, a union, a clip and an intersection

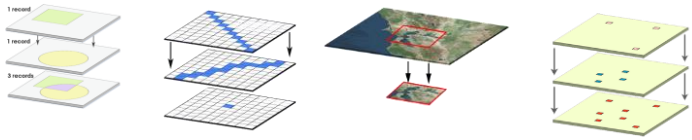
Basic GeoProcessing: Join, Merge, Union, Clip, Intersect

http://gisgeography.com/geoprocessing-tools/

http://grindgis.com/software/qgis/basic-editing-tools-in-qgis

http://desktop.arcgis.com/en/arcmap/10.3/main/analyze/geoprocessing-tools.htm

http://pro.arcgis.com/en/pro-app/help/analysis/geoprocessing/basics/



Union Intersect Clip Merge

5- Knowledge of basic geomatics

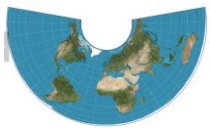
Basic Geomatics – **Projections**, Coordinate Systems & Datums

https://www.geolounge.com/types-map-projections/

https://www.nationalgeographic.org/activity/investigating-map-projections/

http://www.geography.hunter.cuny.edu/~amyjeu/gtech201/fall10/map use_map_projections.pdf

Cylindrical
(Mercator)



Conic
(Albers)

Azimuthal
(Lambert)

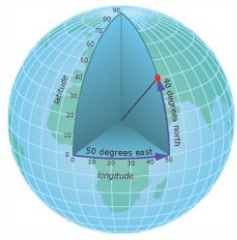
5- Knowledge of basic geomatics

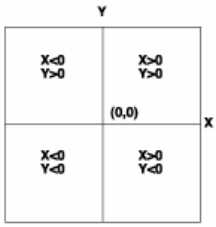
Basic Geomatics – Projections, **Coordinate Systems**, & Datums

Geographic Coordinate Systems/Projected Coordinate Systems

https://www.e-education.psu.edu/natureofgeoinfo/c2_p11.html

http://desktop.arcgis.com/en/arcmap/10.3/guide-books/map-projections/about-geographic-coordinate-systems.htm

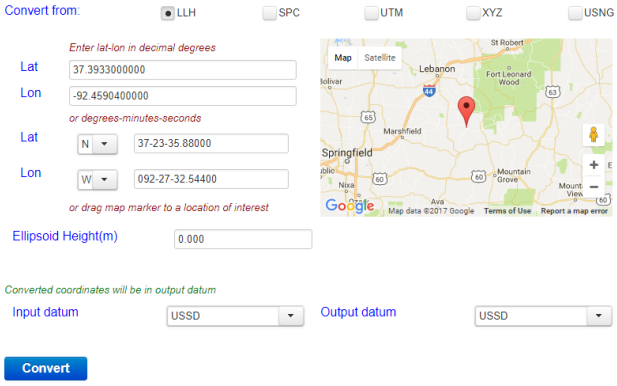




5- Knowledge of basic geomatics

Basic Geomatics – Projections, **Coordinate Systems** & Datums

https://beta.ngs.noaa.gov/gtkweb/

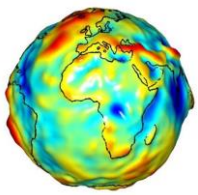


5- Knowledge of basic geomatics

Basic Geomatics – Projections, Coordinate Systems & **Datums**

Horizontal (NAD27/NAD83 with adjustments)

Vertical (NGVD29/NAVD88 with Geoids)

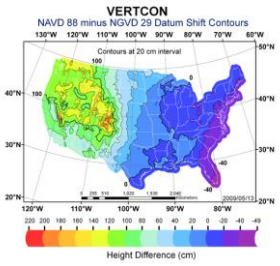


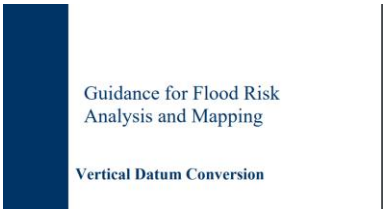
https://www.ngs.noaa.gov/
https://www.ngs.noaa.gov/TOOLS/Nadcon/Nadcon.shtml
https://www.ngs.noaa.gov/TOOLS/spc.shtml

5- Knowledge of basic geomatics

Basic Geomatics – Projections, Coordinate Systems & **Datum**

https://www.ngs.noaa.gov/TOOLS/Nadcon/Nadcon.shtml
https://www.ngs.noaa.gov/TOOLS/Vertcon/vertcon.html
https://www.fema.gov/media-library-data/1406747117296-744b6bd203c18ada4806ad4e90c18b81/Vertical_Datum_Conversion_Guidance_May_2014.pdf





6- Knowledge of basic field data collection

Basic Field Data Collection

Geospatial Data: Exam Prep

Knowledge of:

- Metadata and its standards
- Quality Control and Quality Assurance
- Data Archiving and Retrieval
- Basic Geoprocessing (Join, Merge, Union, Clip and Intersect)
- Basic Geomatics
- Basic Field Data Collection

Understanding of:

- The significance of documenting data source origins
- How to apply best practices to data collection

GISP Practice Exam Questions

The Federal Geographic Data Committee has endorsed (choose the best response)

A. Only the Content Standard for Digital Geospatial Metadata (CSDGM)

B. Only the ISO 19115 Geospatial Metadata Standard

C. Only the CSDGM and the ISO 19115 Metadata standards

D. The CSDGM, ISO 19115, and additional ISO Metadata standards

GISP Practice Exam Questions

The value of "pulldown" menus in mobile data collection allows for certain data to be added without typing. This valuable input technique allows control of input syntax and is a proactive part of (Choose the best response)

A. Data filtering
B. Quality Assurance
C. Cartographic Display
D. Big Data

GISP Practice Exam Questions

What are the main reasons for implementing a data archiving system (Select all that apply)

A. Cost of primary storage
B. Ease of access to historic data
C. Fast access to the most important data
D. Various data export formats

GISP Practice Exam Questions

Which of the following is used to extract features *and their attributes* from one layer using a polygon from another as the boundary of the output (Choose the best response)

A. Join
B. Merge
C. Union
D. Clip

GISP Practice Exam Questions

Which of the following is used to build new features by splitting overlapping features and combining attributes where the features overlap? (Choose the best response)

A. Join
B. Merge
C. Union
D. Clip

GISP Practice Exam Questions

What are some important considerations when converting hand-drawn features from a hard copy map to digital GIS data? (Select all that apply)

A. Colors that will be used to show data in final maps

B. Determining which background data shown on the paper maps is the most accurate to use in georeferencing it

C. Method the field data collector used to orient themselves

D. Ability to understand the notations made and to interpret the attributes for each feature

GISP Practice Exam Questions

When collecting GPS data, what are the most important factors in determining the accuracy of the resulting data? (Select all that apply)

A. Using templates or prescribed schemas for feature creation to ensure data quality

B. The number of and distance between features collected each day

C. The capabilities of the GPS receiver and alignment of GPS satellites at the moment the data are collected

D. The battery power of the data collection device

Questions

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Preparing for the GISP Exam

April 3-4, 2018

URISA
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GIS Analytical Methods

Lisa A. Fulton, MS, GISP

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What You Need to Know

GISCI Geospatial Core Technical Knowledge Exam ® Knowledge Categories

4. GIS Analytical Methods
Knowledge of overlay analysis
Functional knowledge of planar geometry (e.g., points, lines, and polygons) required to convert real world examples into spatial concepts
Knowledge of algebra (e.g., deriving values from a basic formula)
Knowledge of statistics (e.g., descriptives, summary statistics, and R-squared)
Knowledge of basic programming (e.g., scripting, object oriented, query, and extensible)
Knowledge of raster/vector principles
Knowledge of scales (e.g., visual, verbal, relative, absolute, physical, and display vs. data)
Knowledge of units of measurement (e.g., conversion and angular vs. metric)

Knowledge of Overlay Analysis

- Overlay Analysis
  - Understanding Overlay Analysis & More info…
  - Spatial Overlay & Overlay
    - *What do they show?*
    - *Be familiar with the geoprocessing tools*
- Vector Overlay Tools
  - Identity
  - Intersect
  - Symmetrical Difference
  - Union
  - Update

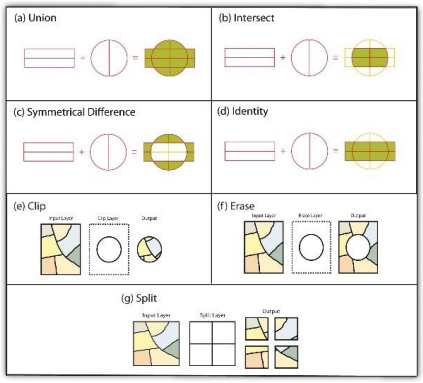


Photo Credit: Essentials of Geographic Information Systems

Knowledge of Overlay Analysis

- Raster Overlay Tools
  - Zonal Statistics Link
  - Combine
  - Single Output Map Algebra
  - Weighted Overlay Link
  - Weighted Sum Link
- Fuzzy Membership (Overlay)
  - All Types –
    - Gaussian, Large, Linear, MS Large, MS Small, Near, & Small
  - *More on ArcGIS.com*
  - *Fuzzy Overlay*

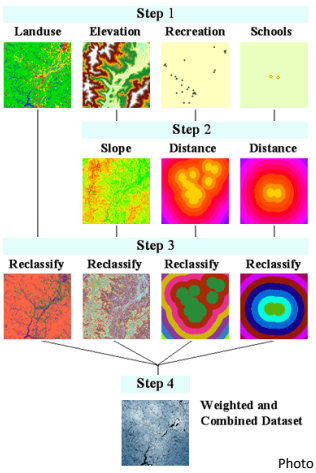


Photo Credit: ESRI.

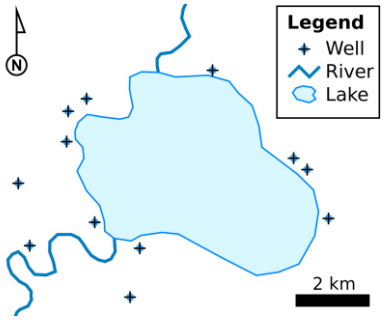
Planar Geometry

Convert reality into *Spatial* Data using the following:

- Planes – Flat, 2D
- Points – Coordinate Pairs
- Lines – Ordered lists of points
- Polygons – Connected Ordered List of Points

Be able to determine the best representation of a geographic feature.

Example: Points best indicate single locations & Lines will often represent rivers well.



Knowledge of Algebra

***Not Comprehensive**

- Map Algebra
  - Wikipedia – good starting point
- Long list of Algebra Topics - Here

In short, just make sure you have a good understanding of how algebra is employed in GIS.

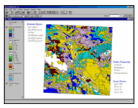
- Where is it used?
  - Querying
  - Expressions
  - Statistics
  - Various Tools

Knowledge of Statistics

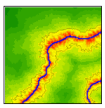
- Descriptive Statistics
  - *mean, variance, standard deviation, coefficient of variation, kurtosis, skewness, etc.*
- Summary Statistics
  - *count, mean, mode, median, range, etc.*
- Coefficient of Determination
  - *R^2, regression coefficients b_0 and b_0, simple linear correlation coefficient r, etc.*
- Spatial Statistics
  - *Inverse Distance, Distance Band, Zone of Indifference, etc.*
- Regression Analysis & Linear Regression
  - *Understand linear relationship analyses*
  - *These are used to ask WHY something is happening; aids prediction.*

Knowledge of Statistics

Traditional GIS → **Spatial Analysis**



Forest Inventory Map

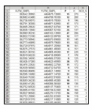


Erosion Buffers

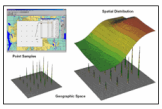
- Points, Lines, Polygons
- Discrete Objects
- Mapping and Geo-query

- Cells, Surfaces
- Continuous Geographic Space
- Contextual Spatial Relationships

Traditional Statistics → **Spatial Statistics**



Minimum= 2.3
Maximum= 4.9
Mean= 3.56
StDEV= .799



Housing Value

- Mean, StDev (Normal Curve)
- Central Tendency
- Typical Response (scalar)

- Map of Variation (gradient)
- Continuous Geographic Space
- Numerical Spatial Relationships

Photo Credit: Innovative GIS

Basic Programming

- Scripting - building code from scratch, line by line.
- Object-Oriented Programming (OOP) – *using collections of attributes in code in the form of procedures known as methods* *See more here*
- Extensibility – *system design that takes future growth into consideration* *More info*

Basically, know what the code is trying to accomplish.

Raster & Vector Principles

- Know definition of Raster & Vector Data
- Advantages & Disadvantages of both

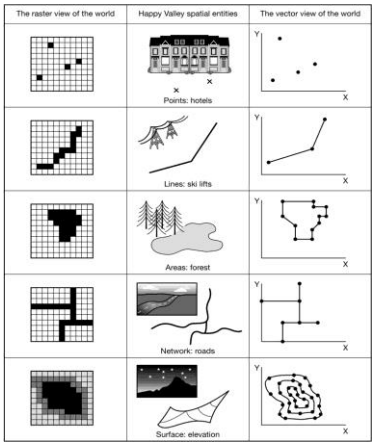
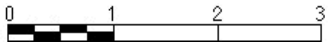


Photo Credit: Indiana University

Knowledge of Scales

- Map Scale
  - Verbal Scale

    One inch represents 50 miles
  - Graphic/Visual Scale → 

  - Representative Scale →

Size of Scale	Representative Fraction (RF)
Large Scale	1:25,000 or larger
Medium Scale	1:1,000,000 to 1:25,000
Small Scale	1:1,000,000 or smaller

  - Absolute Scale - Link

Knowledge of Scales

- Understand how scales are used & their Conversions

$$\frac{1inch_{map}}{18miles_{ground}} * \frac{1_{mile}}{5{,}280_{feet}} * \frac{1_{foot}}{12_{inches}} = \frac{1inch_{map}}{(18*5{,}280*12)inches_{ground}} = \frac{1_{map}}{1{,}140{,}000_{ground}}$$

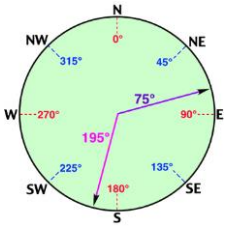
- Good Resource on how to BEST represent data based on scales: Link
- Know the difference between **Abstract** & **Physical** data.

More info on scales

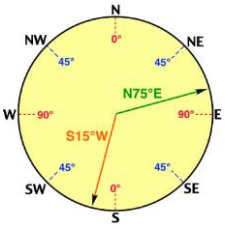
Units of Measurement

- Conversions
- Angular, Metric

- Basic Common Measurements
  - *1 mi = 5280 ft*
  - *1 ft = .3048 m*
  - *1 mi = 1.6093 km*
  - *1 int nautical mile = 2025.4 yd = 6076.12*
- Common Angular Measurements
  - *90° in a right angle, 60 minutes of arc in one degree, 60 seconds of arc in a minute*
  - *Radians - 360° is a whole circle - 2pi x radius is the circle*
  - *Bearings - angle less than 90° within a quadrant defined by the cardinal directions*
  - *Azimuth - angle between 0° and 360° measured clockwise from north*



Azimuth



Bearing

http://www.physicalgeography.net/fundamentals/2b.html

Example Questions

Overlay analysis is based on (Choose the best response)

A. Principal component analysis

B. Spatial diffusion

C. Graph theory

D. Boolean logic

Example Question

Representing features logically in GIS format requires knowledge of GIS primitives. The scale at which a feature is intended to be shown can help define the proper primitive used to create and display that feature. The best option to represent a feature class for rivers in a State-wide map would be: (Choose the best response)

A. Point Feature

B. Polygon feature

C. Line Feature

D. Multi-patch feature

Resources

- GIST Body of Knowledge → Analytical Methods section begins on page 54
  - *Good starting point and guiding document for concepts.*
- Map Analysis: Understanding Spatial Patterns & Relationships → Here
  - *Wonderful visuals in this source.*
- de Smith et al.'s Geospatial Analysis → Here
- ArcGIS Desktop Online Help → https://desktop.arcgis.com/en/arcmap
  - *This could be any version of ArcGIS. Just use your search terms.*
- Google Documents provided by GISCI.org

Questions

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(912) 437-0873

Preparing for the GISP Exam

April 3-4, 2018

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Knowledge Area:
Data Manipulation

Carl Anderson, GISP
New Light Technologies

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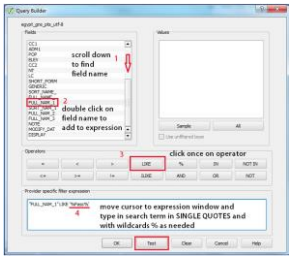
What you need to know

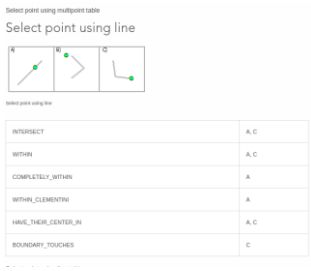
GISCI Geospatial Core Technical Knowledge Exam ® Knowledge Area

5. Data Manipulation
Knowledge of selection queries (e.g., attribute, spatial, and location)
Knowledge of different data types (e.g., SHP, GDB, Coverage, DGN, TXT, and IMG) and formats (spatial, rendered, and tabular)
Knowledge of different field types
Knowledge of data relationships (e.g., one to one and many to many)
Knowledge of data collection, transfer, and format conversion (e.g., export formats, properties, and settings)
Knowledge of data quality, including geometric accuracy, thematic accuracy, resolution, precision, and fitness for use

Selection Queries



Source: https://maps.cga.harvard.edu/qgis/basic/query/



Source: http://desktop.arcgis.com/en/arcmap/10.3/tools/data-management-toolbox/select-by-location-graphical-examples.htm

Data Store(File) Types

Spatial:
- Shapefiles
- File GeoDatabase
- Personal GeoDatabase
- GeoJson
- GML
- GeoPackage
- Mapinfo TAB

Rendered:
- Cell Based Raster

Tabular:
- CSV / TSV
- JSON
- XLSX / XLS
- DBF
- MDB

Other:
- JSON
- XML
- NoSQL variants

Source: https://earthquake.usgs.gov/data/crust/download.php

Source: http://www.ospo.noaa.gov/Products/ocean/sst/contour/

Field Types

String:
- Character
  - ASCII, UTF-8, UTF-16
- Text
- Varchar

Numeric:
- Integer, BigInt, TinyInt
- Float, Real, Double

Time:
- Unix Time
- Javascript Date
- ISO-8601 format

Blobs:
- Binary
- Object
- Geometry

Resources:
https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/Date
https://technet.microsoft.com/en-us/library/ms187752(v=sql.105).aspx
https://dev.mysql.com/doc/refman/5.7/en/data-types.html
http://desktop.arcgis.com/en/arcmap/10.3/manage-data/databases/dbms-data-types-supported.htm

Data Relationships

Cardinality of Data Sets

Apples Oranges Mangos	⟷	Apples Oranges Papaya
Apples Oranges Mangos Apples	⟷	Apples Oranges Papaya Apples

Apples Oranges
Apples Oranges Apples Apples Apples

Resources:
https://en.wikipedia.org/wiki/Many-to-many_(data_model)
https://en.wikipedia.org/wiki/One-to-one_(data_model)
https://www.diffen.com/difference/Inner_Join_vs_Outer_Join
https://lornajane.net/posts/2011/inner-vs-outer-joins-on-a-many-to-many-relationship

Source: http://www.ospo.noaa.gov/Products/ocean/sst/contour/

Data Relationships

Cardinality and Inner Joins, Outer Joins, and Query Results

Apples Oranges Mangos	⟷	Apples Oranges Papaya	Apples Oranges
Apples Oranges Mangos Apples	⟷	Apples Oranges Papaya Apples	Apples Oranges Apples Apples Apples

Resources:
https://en.wikipedia.org/wiki/Many-to-many_(data_model)
https://en.wikipedia.org/wiki/One-to-one_(data_model)
https://www.diffen.com/difference/Inner_Join_vs_Outer_Join
https://lornajane.net/posts/2011/inner-vs-outer-joins-on-a-many-to-many-relationship

Data Collection, Transfer, and Format Conversion

Time Conversions:
- Object Based
- Integer Based
- Floating Point Based
- Character Based

Geography Based:
- DMS ↔ Decimal Degrees
- WKB ↔ Object / Blob
- USNG ↔ Object / Blob

Source: https://earthquake.usgs.gov/data/crust/download.php

Geography Based:
- DMS ↔ Decimal Degrees
- WKB ↔ Object / Blob
- USNG ↔ Object / Blob

Data Quality, Accuracy, Resolution, and Fitness for Use

Spatial Accuracy
- NSSDA
- National Standard for Spatial Data Accuracy (Part 3 of GPAS)

Higher Order Datasets (accuracy wise)

Accuracy Reporting
- *Tested ____ (meters, feet) horizontal accuracy at 95% confidence level*
- *Compiled to meet ____ (meters, feet) vertical accuracy at 95% confidence level*

Resulting Accuracy of Mixing Data of Different Accuracy

Source: https://www.fgdc.gov/standards/projects/accuracy/part3/chapter3

Data Quality, Accuracy, Resolution, and Fitness for Use

Attribute Accuracy / Attribute Completeness Reports
- STDS – Spatial Data Transfer Standard

Higher Order Datasets (accuracy wise)

Accuracy Reporting
- *Confustion Matrix*
  - *True Positive Rate*
  - *False Positive Rate*

True
Fals

		Actual class		
		Cat	Dog	Rabbit
Predicted class	Cat	5	2	0
	Dog	3	3	2
	Rabbit	0	1	11

Source: https://en.wikipedia.org/wiki/Confusion_matrix

Source: https://www.fgdc.gov/csdgmgraphical/datqq/attaccy/faq.htm
https://mcmcweb.er.usgs.gov/sdts/SDTS_standard_nov97/part1bo4.html
https://en.wikipedia.org/wiki/Confusion_matrix

GISP Practice Exam Questions

Showing data based on defined parameters is one of the greatest benefits of GIS. Filtering data based on the specific content stored in a field refers to which of the following: (Choose the best response)

A. Attribute query

B. Spatial query

C. Locational query

D. Cartographic query

GISP Practice Exam Questions

The shapefile format is a digital vector format for storing geometric locations and associated attribute information. While it can consist of several files with different file name extensions, three file names are needed to be properly identified as a shapefile. These are: (Choose the best response)

A. shp, sbn, prj

B. shp, shx, dbf

C. shp, sbn, dbf

D. shp, sbn, sbx

GISP Practice Exam Questions

Calculations (sum, average, median, etc.) can't be performed on this type of field (Choose the best response)

A. Character

B. Integer

C. Floating

GISP Practice Exam Questions

When converting Degrees/Minutes/Seconds of latitude in the Northern Hemisphere to decimal degrees (Choose the best response)

A. Add the three values together and divide the sum by 3600, i.e., (Deg+Min+Sec)/3600

B. Subtract the seconds from the minutes, then the minutes from the degrees i.e. (Deg-(Min-Sec))

C. Multiply the Minutes by 60, multiply the seconds by 3600 and then add all to the degrees, i.e., (Deg+(Min*60)+(Sec*3600))

D. Divide the Seconds by 3600, divide the Minutes by 60, then add those values to the degrees, i.e. (Deg+(Min/60)+(Sec/3600))

GISP Practice Exam Questions

If converting Degrees/Minutes/Seconds of latitude in the Southern Hemisphere to decimal degrees, what would change from question 39? (Choose the best response)

A. You would add the derived value to 180
B. You would subtract the derived value from 180
C. You would multiply the derived value by -1
D. You would divide the derived value by -1

GISP Practice Exam Questions

How would you determine the horizontal accuracy of an ortho-rectified aerial image? (Choose the best response)

A. The image is compared to a historic photograph and 90% of the well-known points must match,
B. Photo-identifiable field points are surveyed and the Root-Mean Square error between the image and the Photo-ID points is computed,
C. Points are heads-up digitized from the ortho-rectified aerial image and compared to points from GIS layers
D. Have multiple technicians measure football fields end zone to end zone (300 feet) (or other well-known structures) and the standard deviation of those measurements is the accuracy.

GISP Practice Exam Questions

What is the most common statistical method to determine the attribute (land classification) accuracy of a raster- derived land use/land cover map? (Choose the best response)

A. Use photo-identifiable points for ground truthing and compute a RMSe
B. Have multiple technicians compile vector polygons and then do a Union Overlay. The total area of the sliver polygons is the statistical error
C. Compute a Confusion Matrix based on ground truthing a stratified random sample of polygons
D. Compute the variance in the number of polygons of each land use/land cover class

Questions

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GISP Exam Prep – Applicable for all KSAs

GIS&T Body of Knowledge Reference Materials

Exam Preparation Workshops

KSA Materials: books, coursework, online resources, webinars

Useful Links:

- https://www.gisci.org/ExamInfo.aspx
- https://www.gisci.org/ExamInfo/ExamCandidateInformation/ExamPreparationInfo.aspx
- https://www.gisci.org/Portals/0/PDF%27s/EXAM%20PREPARTION%20INFORMATION%207-16.pdf
- https://docs.google.com/document/d/1wifTSbtaR_5oT14U_6aydFmArLpkML8Fd4lMwqIf8qg/edit?usp=sharing
- https://docs.google.com/document/d/1ioKARKLJJpG3lFbPqSqXxNHIdVBhBTrfiQ-H9ivXs_w/edit?usp=sharing

Preparing for the GISP Exam

GIS Design Aspects and Data Modeling

Lorne Dmitruk

URISA
Fostering Excellence in GIS
www.URISA.org

What You Need to Know

GISCI Geospatial Core Technical Knowledge Exam ® Knowledge Area

3. GIS Design Aspects and Data Modelling
312. Knowledge of data exchange procedures
313. Knowledge of security restrictions on data (e.g., user permissions and access rights)
314. Knowledge of database administration
315. Understanding of systems architecture and design
316. Understanding of the enterprise environment
317. Knowledge of schemas and domains and how they interact
318. Knowledge of digital file management

29% of Exam

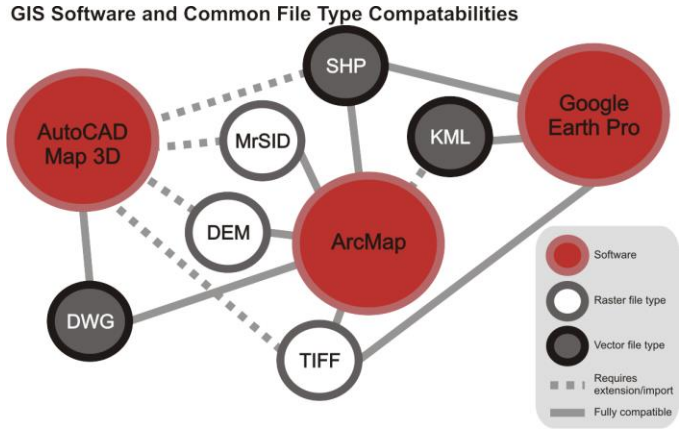
What You Need to Know

GISCI Geospatial Core Technical Knowledge Exam ® Knowledge Area

3. GIS Design Aspects and Data Modelling
319. Knowledge of database design
320. Knowledge of database general structure (e.g., tables and data)
321. Knowledge of geospatial data structure (e.g., topology rules)
322. Understanding of desktop, server, enterprise, and hosted(e.g., cloud) applications available, including their benefits and shortcomings
323. Working knowledge of GIS hardware and software capabilities (e.g., application servers, data servers, storage devices and workstations)
324. Knowledge of data models, including vector, raster, grid TIN, topological, hierarchical, network and object-oriented

29% of Exam

Knowledge of Data Exchange Procedures

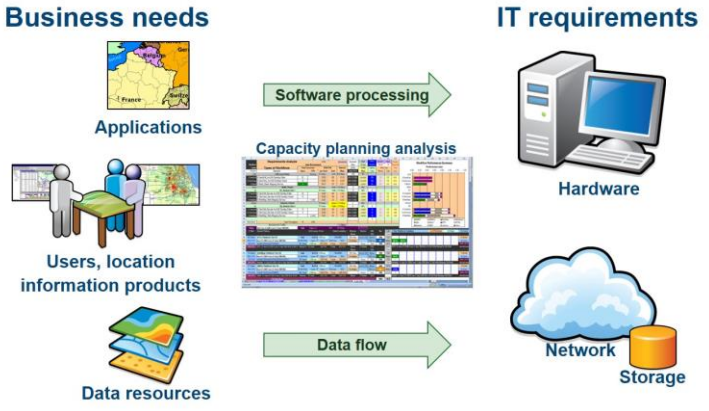


Knowledge of Security Restrictions on Data

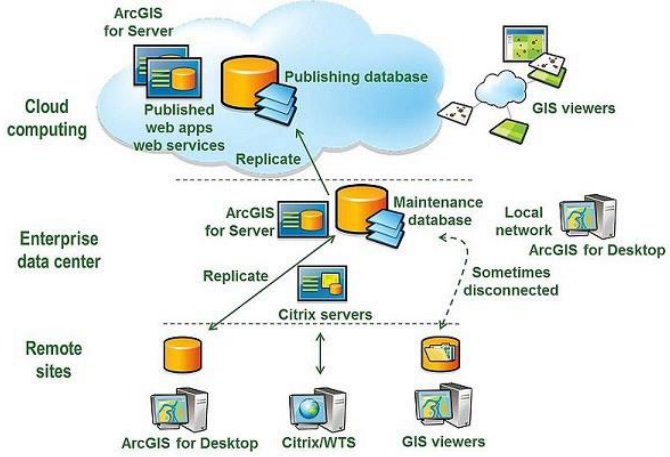
	General Privileges	Default role					
		Viewer	User	Publisher	Administrator	Custom 1	Custom 2
Groups	— Create, update, and delete				✓		
	— Join organizational groups		✓	✓	✓		
	— Join external groups			✓	✓		
	— View groups shared with organization	✓		✓	✓	✓	✓
Content	— Create, update, and delete		✓	✓	✓		✓
	— Publish hosted feature layers			✓	✓		✓
	— Publish hosted tile layers			✓	✓		✓
	— Publish hosted scene layers			✓	✓		✓
	— View content shared with the organization		✓	✓	✓	✓	✓
Sharing	— Share with groups		✓	✓	✓	✓	
	— Share with organization		✓	✓	✓	✓	
	— Share with public			✓	✓	✓	
	— Make groups visible to organization			✓	✓	✓	
	— Make groups visible to public			✓	✓	✓	
	— Make groups available to Open Data			✓	✓	✓	
Premium Content	— Geocoding				✓		
	— Network Analysis			✓	✓		
	— Spatial Analysis				✓		
	— GeoEnrichment			✓	✓		
	— Demographics			✓	✓		
	— Elevation Analysis				✓		
Features	— Edit features based on permissions set on the layer		✓		✓		✓
	— Edit with full control		✓	✓	✓		✓
Open Data	— Manage Open Data site(s)				✓	✓	

Knowledge of Database Administration

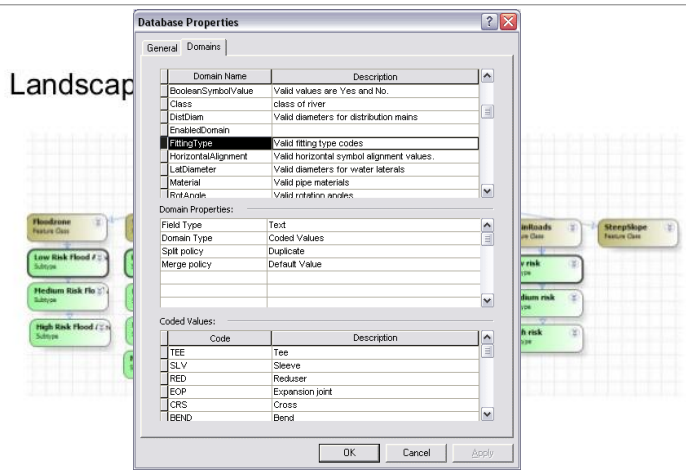
Understanding of Systems Architecture and Design



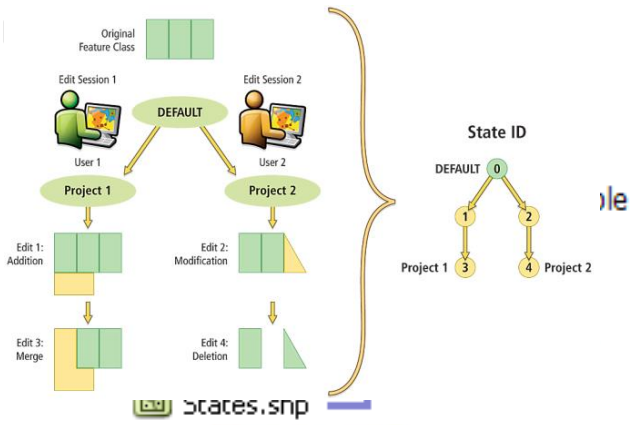
Understanding of the Enterprise Environment



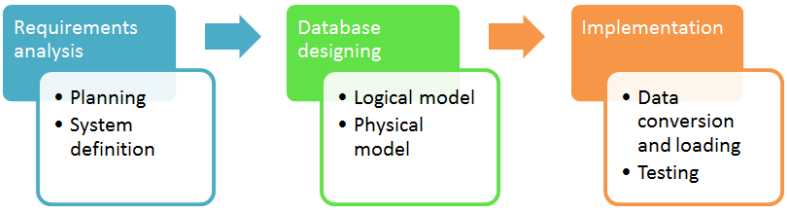
Knowledge of Schemas and Domains



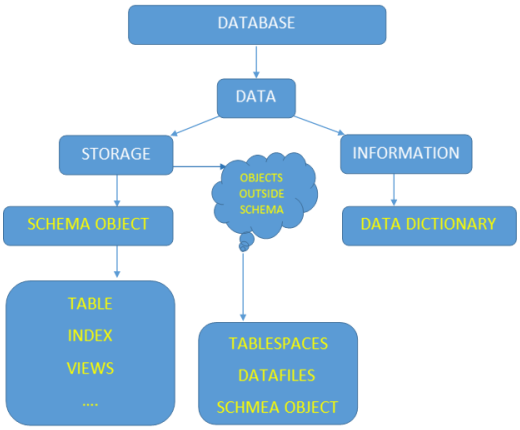
Knowledge of Digital File Management



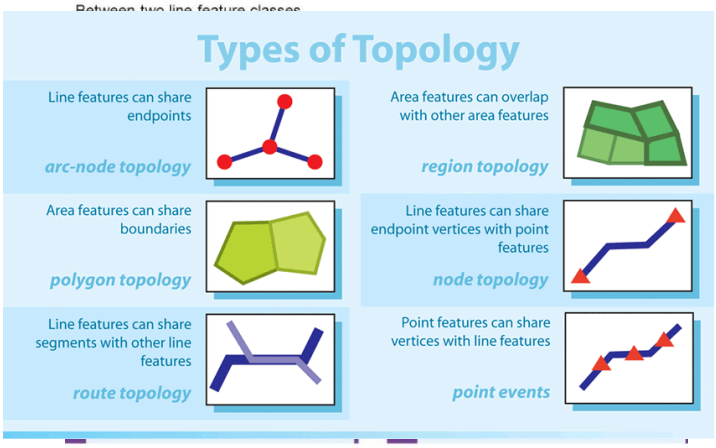
Knowledge of Database Design



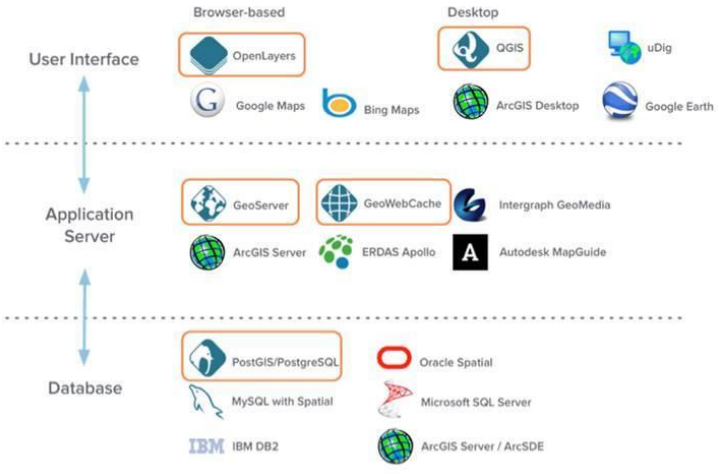
Knowledge of Database General Structure



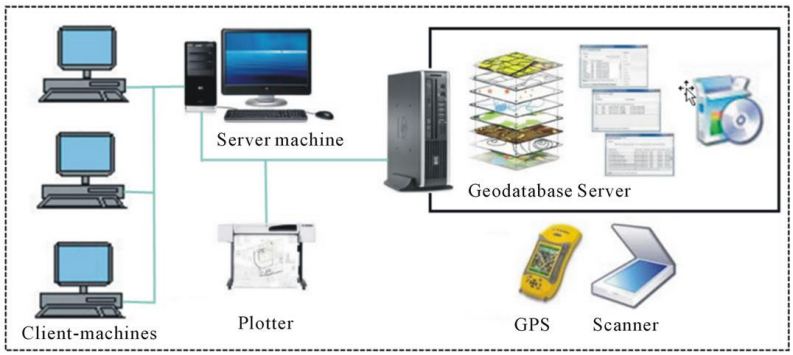
Knowledge of Geospatial Data Structure



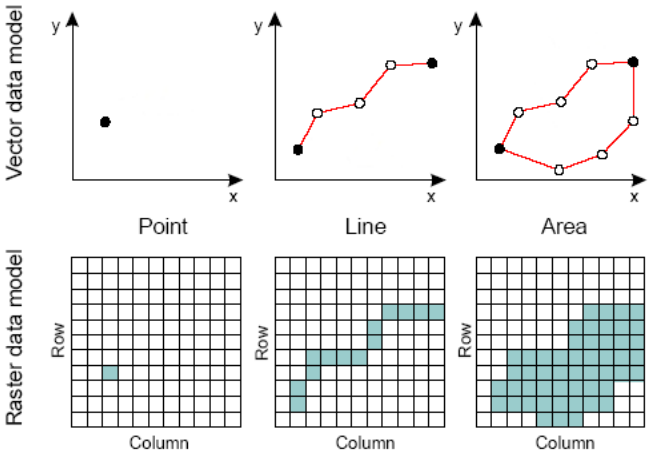
Understanding of Desktop, Server, Enterprise, and Hosted Applications



Working Knowledge of GIS Hardware and Software Capabilities



Knowledge of Data Models



GISP Practice Exam Questions

312. Which of the following data formats would most likely represent a file exported from AutoDesk-AutoCAD? (Choose the best response)

A. .SHP

B. .DXF

C. .TXT

D. .LAS

GISP Practice Exam Questions

324 Which of the following is NOT a true relational database? (Choose the best response)

A. SQL Server

B. Access

C. Oracle

D. PostgreSQL

GISP Exam Prep – Applicable for GIS Design and Data Modelling

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- https://www.gisci.org/Portals/0/PDF%27s/EXAM%20PREPARTION%20INFORMATION%207-16.pdf
- https://docs.google.com/document/d/1wifTSbtaR_5oT14U_6aydFmArLpkML8Fd4lMwqIf8qg/edit?usp=sharing
- https://docs.google.com/document/d/1ioKARKLJJpG3lFbPqSqXxNHIdVBhBTrfiQ-H9ivXs_w/edit?usp=sharing

Questions

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Presenter Company
Presenter Email
Presenter Phone