

PART 1
BASIC
LAND NAVIGATION



USING THE MILITARY LENSATIC COMPASS



WARNING

This presentation is intended as a quick summary, and not a comprehensive resource. If you want to learn Land Navigation in detail, either buy a book; or get someone, who has the knowledge and skills, to teach you in person.

NOTE

To get the ideas across presented on these slides, many figures, pictures, and calculations may not be to scale and may be exaggerated for clarity.

Note:

Prior to being issued any training *equipment, you will be required to sign a “statement of liability” agreeing to pay for anything you damage or lose.

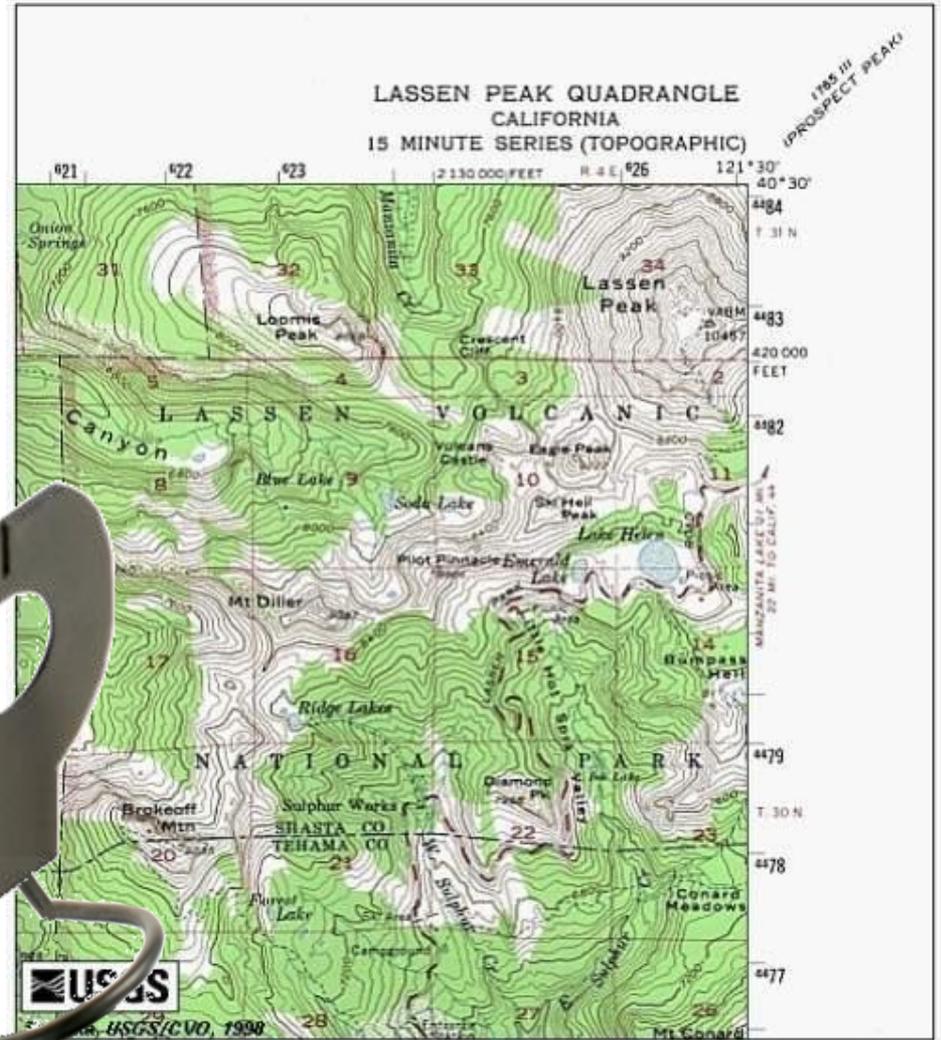
All items will be inspected and inventoried prior to your signature and at the end of the training day too.

If you do not intend to sign this statement, then you may be denied training.

*** You may use your own equipment.**

Any Questions?

LAND NAVIGATION WITH MAP AND LENSATIC COMPASS



LAND NAVIGATION

Why Learn Land Navigation? *Training and practicing land navigation on foot provides the following everyday navigation (how not to get lost) benefits;*

- *Tracking present location (Where am I ?)*
- *Determining Distance (How far is it and am I there yet ?)*
- *Sense of direction (Where do I want to go and where am I actually going ?)*
- *How to read a topographic map (Do I understand the map ?)*
- *Terrain and map association (What hill or river am I looking at ?)*
- *Spatial skills (Can I mentally visualize the landscape in 3D ?)*
- *Planning safe, practical routes (Take a long safe route or a short risky route ?)*
- *And more Navigational skills*

The best way to learn LAND NAVIGATION is to get "dirt time", that is, get out there with a map and compass!

Navigation is not about finding yourself after you are lost (although that's what happens sometimes); it's about keeping track of your position as you move away from a known point. As you move you have to remain cognizant of the terrain you are leaving, of the terrain you are passing, and of the terrain that is ahead.

Navigation in the wilderness means knowing your starting point, your destination, and your route to get there.

These skills will allow you to venture farther off the beaten path than you ever thought before.

THIS PRESENTATION IS DIVIDED INTO FOUR PARTS

PART 1 Basic Land Navigation

- The Lensatic Compass
- The Topographic Map
- The Land and Map Association

PART 2 Intermediate Land Navigation

- Making Sense of Direction
- Tracking Present Location
- Determining Travel Distance

PART 3 Advance Land Navigation

- Planning to Navigate
- Navigation Methods to Stay On Course
- Additional Skills of Land Navigation

PART 4 Expert Land Navigation

- Navigation in different types of Terrain
- Night Navigation
- Sustainment

Any Questions?

PART 1

BASIC LAND NAVIGATION



- **The Lensatic Compass**

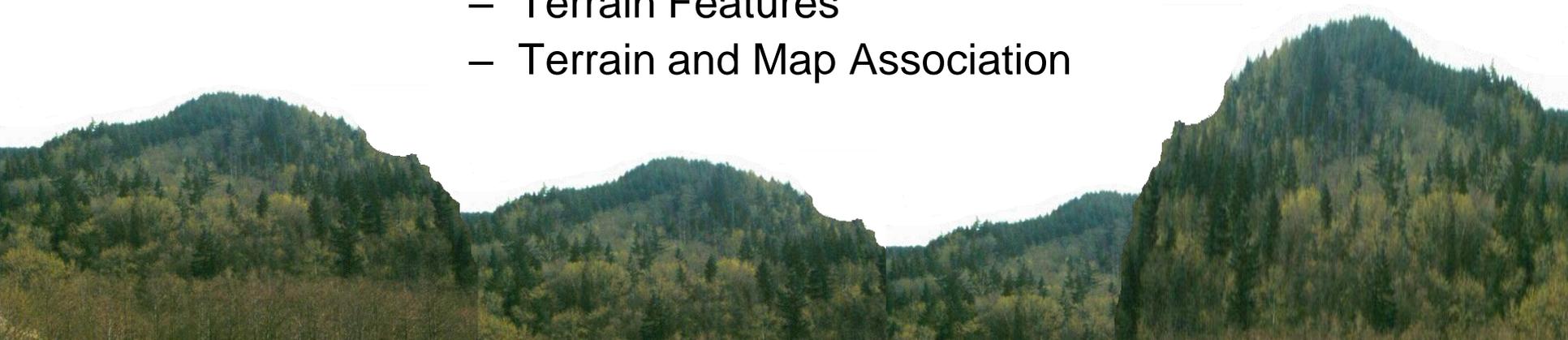
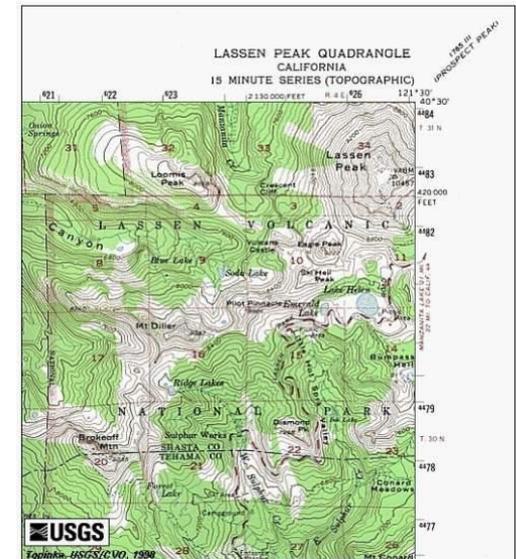
- Description
- Parts and Features

- **The Topographic Map**

- Description
- How to Read

- **The Land**

- Terrain Features
- Terrain and Map Association



THE LENSATIC COMPASS

The genuine Lensatic compass differs from the type most hikers are familiar with, the traditional "orienteering" compasses. The Lensatic, a design preferred by military forces for its precision and durability, is designed to take hyper-accurate bearings for land navigation and directing artillery fire!



LENSATIC COMPASS DESCRIPTION

- Preferred by military for its precision and durability, and its hyper-accuracy in land navigation and combat.
- Battle tested - shock, water, sand proof, and functional from -50°F to +150°F.
- Uses a retractable lens to read the bearing while simultaneously sighting an object.
- With the Lensatic you just point and shoot one target and immediately move on to the next.
- Luminous Lights allow for navigation in low-light conditions and night navigation.
- Equipped with a magnifying lens, sight wire, and dial graduations in both degrees and mils to ensure accurate readings.
- Copper induction dampening system slows the rotation of the magnet without the use of liquids. Retractable lens locks the dial jewel bearing when stowed to lessen wear and tear.
- Employs a "Card" type compass Dial, and this makes for single handed operation. (Most magnetic "needle" type, always requires 2 hands.)
- A 'deep-well' design is used to allow the compass to be used globally with little or no effect in accuracy caused by a tilting compass dial.
- Lensatic sighting compasses are so simple and rugged and incredibly easy to use that it is no wonder they are the standard type used for navigation by the U. S. Military.

LENSATIC COMPASS

GENUINE or IMITATION

Cheap Lensatic Copies

When someone tried to buy a genuine **CAMMENGA LENSATIC COMPASS** from websites, they came across a whole raft of cheap imitations. Most outlets tell you they are selling '**Military Style**' Lensatic compasses (fake, inaccurate, missing features) – but some claim to offer U.S. Government Military Lensatic compasses for just \$14.95, which are also fake cheap imitations.

Cheap copies break easily, are not accurate, have false features displayed on the compass glass face and will mislead you.

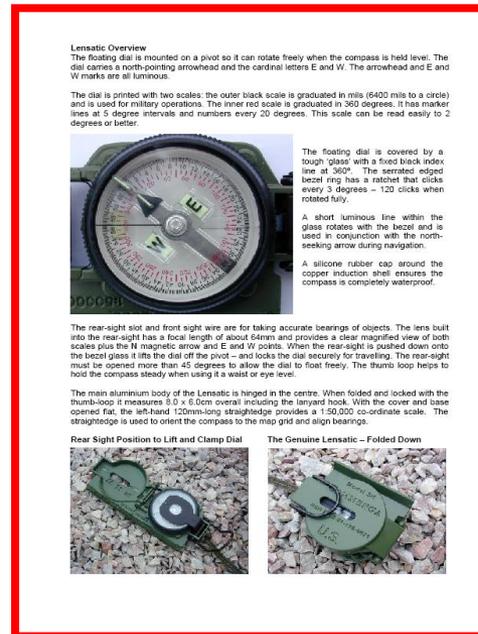
The genuine lensatic compass used by the military is very durable, accurate, and easy to use. It can survive rough handling and harsh environments.

Buy the Genuine Article
Purchasing a genuine
CAMMENGA LENSATIC
COMPASS is easy, go to
www.cammenga.com

Click below

[Lensatic Compass Evaluation.pdf](#)
to read about the comparison
of compasses...

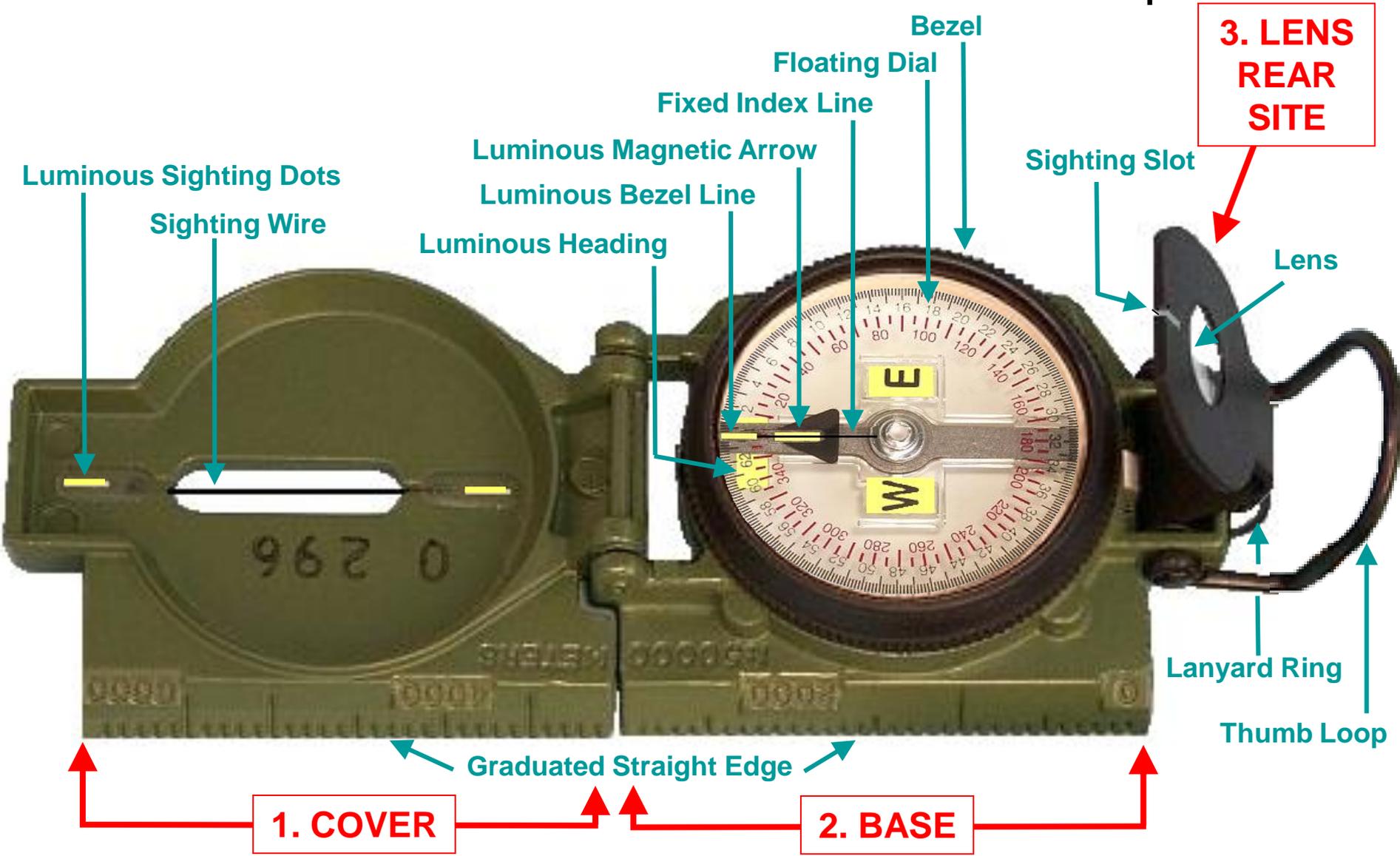
“**orienting compass**
vs.
lensatic compass”.



Any Questions?

LENSATIC COMPASS

PARTS and Features of a Lensatic compass



LENSATIC COMPASS

Cover - Protects the floating dial and other parts of the compass when closed.

- **Sighting Wire** - front sight used with rear sight, for sighting landmarks for azimuth headings.
- **Luminous Sighting Dots** – used in low-light condition and night navigation. Also a visual cue on aligning your body with the compass during night navigation.
- **Graduated Straight Edge** - upper half of a standard 1:50,000 scale map ruler, for measuring distances on a map.



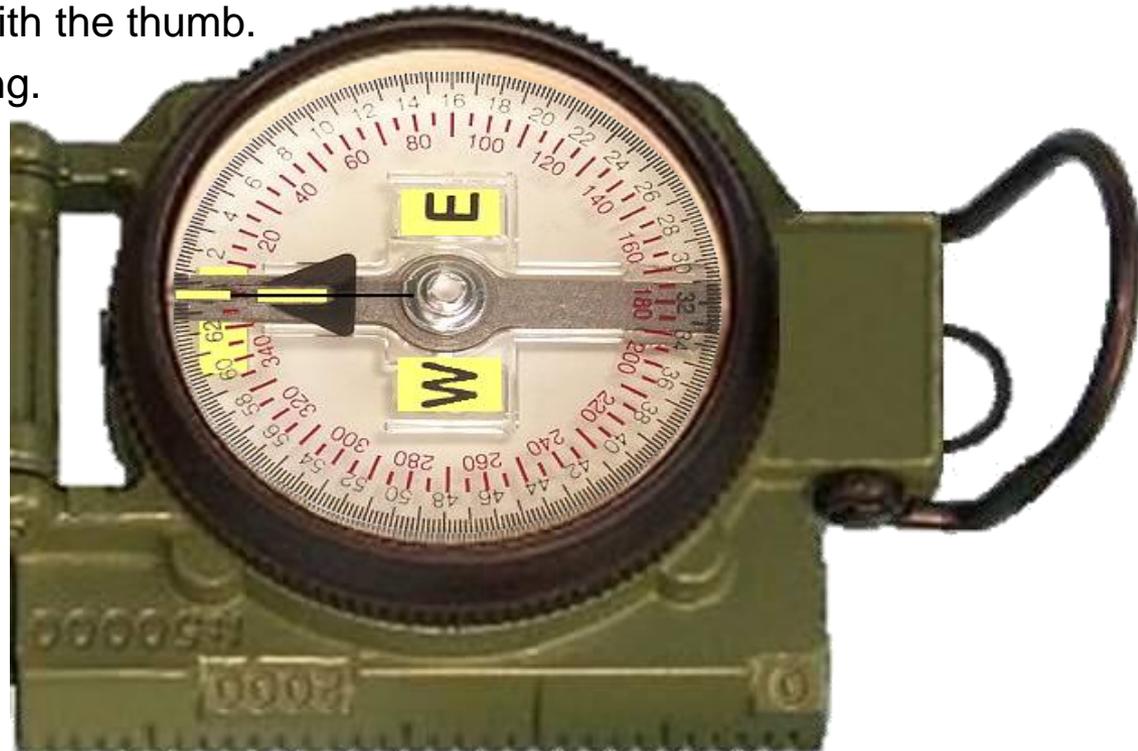
LENSATIC COMPASS

Base - The main body of the compass. If, for any reason, the lensatic compass were to malfunction, the base would be the piece that you would want to still work.

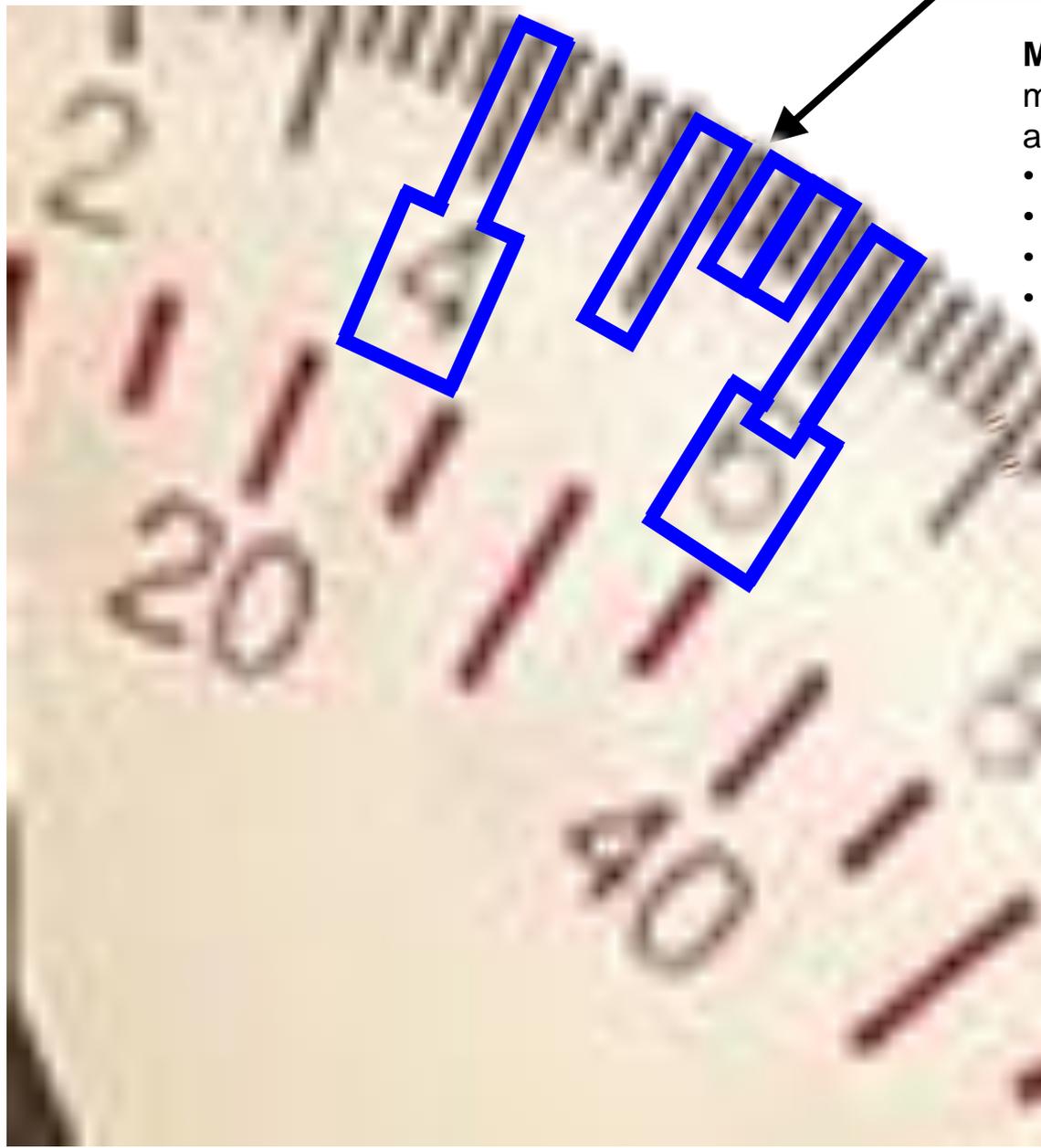
- **Bezel Ring** – device clicks when turned; full 360° rotation is 120 clicks; each click equals 3°.
- **Luminous Bezel Line** – Used to mark a course direction during day or night navigation.
- **Floating Dial** – black scale (mils), red scale (degrees), set in a deep tub for global use.
- **Luminous Heading** – to read azimuth heading in low-light or night conditions.
- **Luminous Magnetic Arrow** – always points to magnetic north.
- **Thumb Loop** – to hold compass with the thumb.
- **Fixed Index Line** – azimuth heading.
- **Lanyard Ring** – for string or rope.

NOTE:

The only way for the compass to malfunction is for the user to misuse and abuse the compass.



FLOATING DIAL SCALE



BLACK RING

Mils - is used mainly in artillery, tank, and mortar gunnery. AND is also used for very accurate azimuth land navigation.

- 6400 Mils to a Circle
- Distance Between Small Marks = 20 Mils
- Distance Between Big Marks = 100 Mils
- Distance Between Numbers = 200 Mils

N = 64 (6400)

E = 16 (1600)

S = 32 (3200)

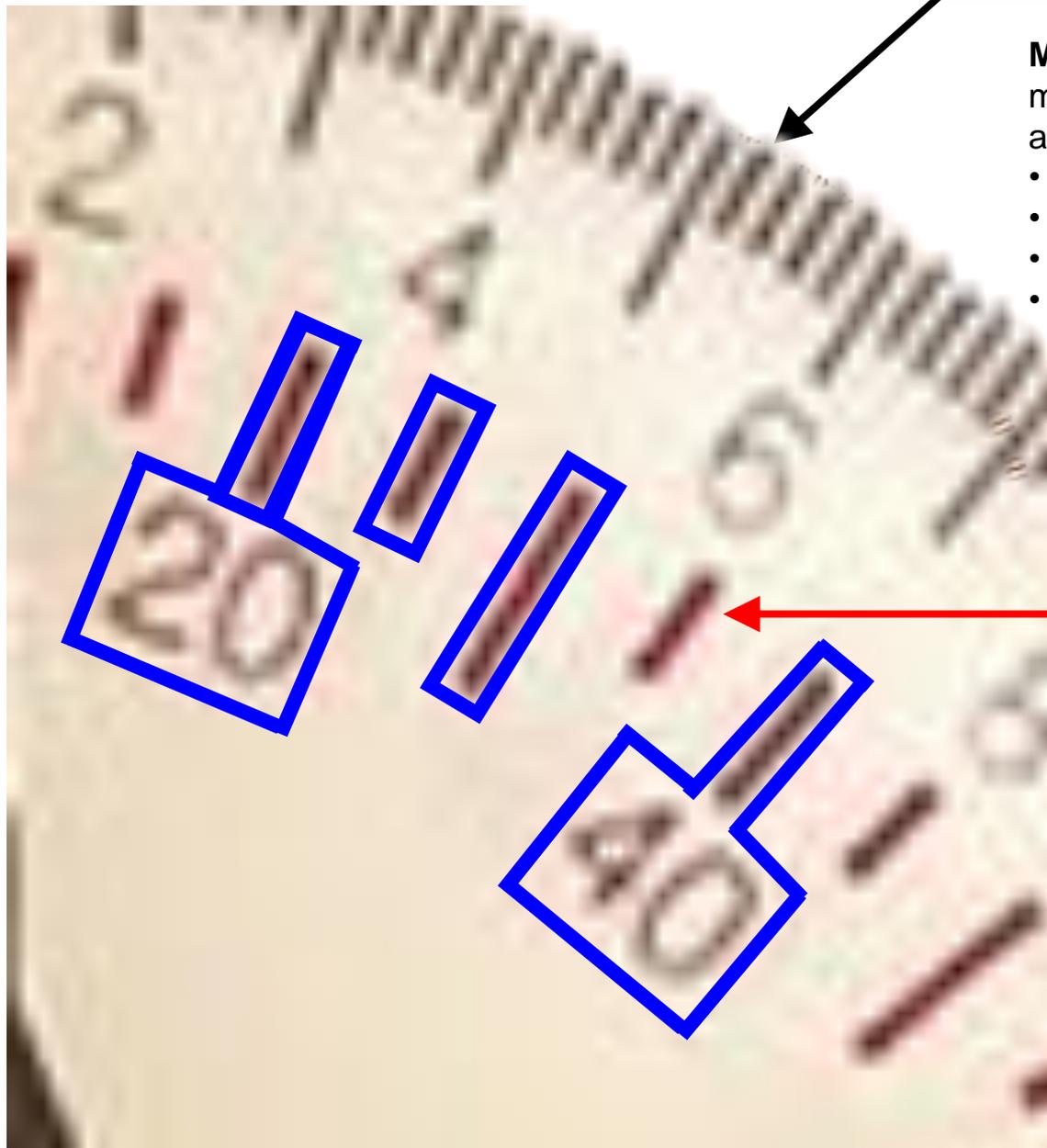
W = 48 (4800)

8.89 Mils = $\frac{1}{2}$ Degree

17.78 Mils = 1 Degree

LENSATIC COMPASS

FLOATING DIAL SCALE



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RED RING

Degrees – common unit of measure is the degree (°).

- 360 Degrees to a Circle
- Distance Between Red Marks = 5°
- Distance Between Big Marks = 10°
- Distance Between Red Numbers = 20°

N = 0°

E = 90°

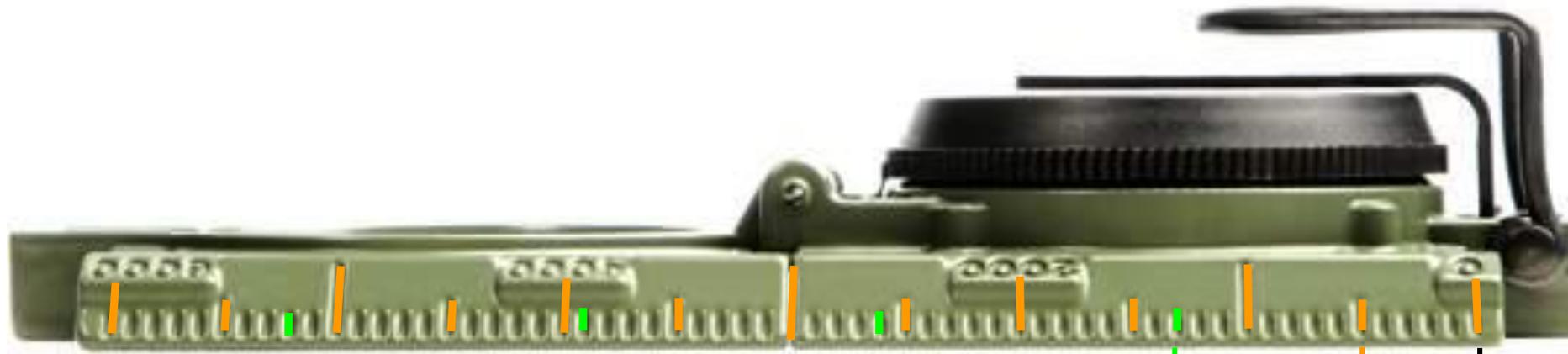
S = 180°

W = 270°

Any Questions?

LENSATIC COMPASS

GRADUATED STRAIGHT EDGE



Approximately 1 inch (every 13 ticks)

Exactly 1 cm (every 5 ticks)

ZERO

Used to take distance measurements from point "A" to point "B" on maps; in conjunction with the distance bar scales on the map.

NOTE

When used on a 1:50,000 map, each tick mark on the edge represents 100 meters (107 yards) of ground distance.

LENSATIC COMPASS

Lens Rear Site - Sighting device.

- **Lens** - used to read the dial.
- **Rear Site** - used in conjunction with the front site wire for sighting on objects.

NOTE:

The Lens Rear Sight also serves as a locking device and locks the dial jewel bearing to protect from wear and tear when closed. Also the rear sight must be opened more than 45° to allow dial to float freely.

When traveling make sure that the rear sight is totally folded down as this will lock the floating dial and prevent vibration, as well as protect the crystal and rear sight from being damaged.



Any Questions?

LENSATIC COMPASS

HANDLING A COMPASS

When buying a new compass check . . .

- That the dial does not stick
- Sighting wire is not bent
- Glass and other parts are not broken
- Numbers on the dial are legible
- Check for accuracy along a known line of direction
 - Discard any type of compass with more than a 3° +/- variation.
 - Lensatic compass is accurate to a $\frac{1}{2}^\circ$ degree (better when using the mils scale).
- ***When traveling make sure that the rear sight is totally folded down as this will lock the floating dial and prevent vibration, as well as protect the crystal and rear sight from being damaged.***



EFFECTS OF METAL AND ELECTRICITY – these sources affect the performance of a compass during use.

- 180 feet / 55 meters *High tension power lines*
- 33 feet / 10 meters *Truck, car, Barbed wires*
- 6 feet / 2 meter *Hunting rifle*
- 1 feet / $\frac{1}{2}$ meter *Knife, flashlight, binoculars, camera*
- Inches / centimeters *Belt buckle, paper clip, jewelry, etc.*
- Misc distances *any local geological magnetic rocks.*

LENSATIC COMPASS

INSPECTING A COMPASS

Compasses are delicate instruments and should be cared for accordingly. A detailed inspection is required when first obtaining and using a compass. Important serviceability checks are outlined below:

VISUAL INSPECTION

- Your compass should be opened to see that the cover glass is not broken, clouded, or cracked and that the compass dial does not stick.
- The front cover should be inspected to see if the cover sighting wire is missing or bent. If it is, use the center of the opening for sighting purposes, not the wire.
- The eyepiece should be placed flat against the cover glass. The index line on the cover glass should bisect the sight slot. Then, with the compass closed, it should be noted that the sighting wire also bisects the sight slot.
 - ✓ This procedure will ensure that the eyepiece is not bent. Gently bend the eyepiece back into proper alignment, if necessary.
- Check the bezel ring around the face of the compass; it should make a distinct click as it is rotated. If it does not click, you will have to use an alternate method for night azimuth settings.

MAINTENANCE

- The lensatic compass is built to detailed specifications that were developed in an attempt to increase its serviceable life. Adherence to very simple maintenance procedures will significantly increase the life of the lensatic compass. Maintenance procedures are outlined below:
- Rinse in fresh water. This is extremely important, especially after exposure to salt water.
- Brush off dirt and grime. Ensure the "ridges" on the bezel ring are free of dirt. Check movement of the rear sight to ensure it is free moving.



LENSATIC COMPASS CALIBRATION

A compass in good working condition is very accurate, but it should be checked periodically on a known line of direction. This process is called compass calibration.

CALIBRATION

- Note the calibration point azimuth. This is the known magnetic azimuth from the calibration point to a designated point.
- Shoot an azimuth from the calibration point to the designated point utilizing the compass-to-cheek technique (described in detail later in this handout).
- Ensure you check for effects on your compass from your eyeglasses, watches, rings, etc. If you wear these items in the field, ensure you wear them when calibrating your compass.

Compare azimuths:

- If your compass shot an azimuth greater than the calibration point azimuth, then you must add the difference between the two azimuths (the calibration point value) to your computed magnetic azimuth.
 - ✓ Conversely, you must also ensure you subtract this value when converting from an actual compass (magnetic) azimuth to a grid azimuth.
- If your compass shot an azimuth less than the calibration point azimuth, then you must subtract the difference between the two azimuths (the calibration point value) from your computed magnetic azimuth.
 - ✓ Conversely, you must also ensure you add this value when converting from an actual compass (magnetic) azimuth to a grid azimuth.



Any Questions?

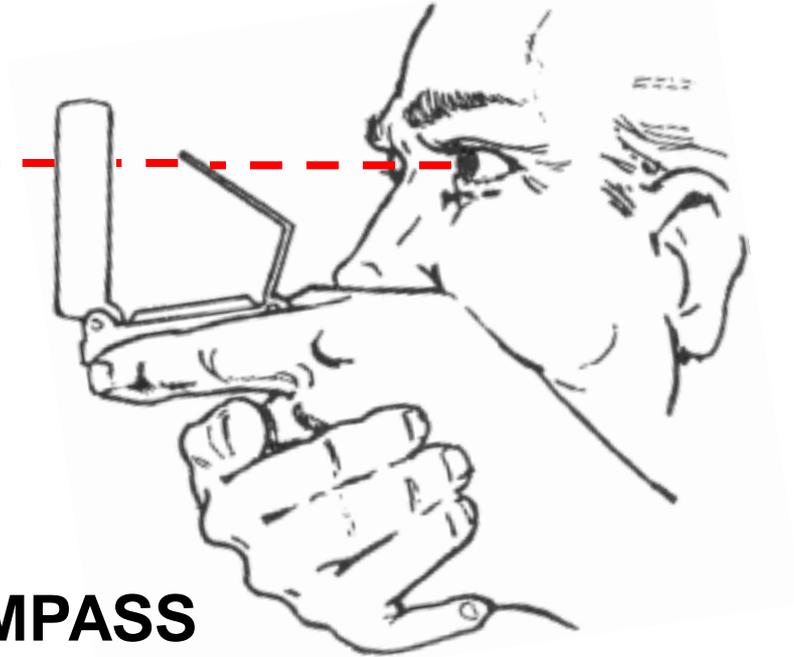
HOW TO SIGHT A LENSATIC COMPASS

SIGHTING A LENSATIC COMPASS

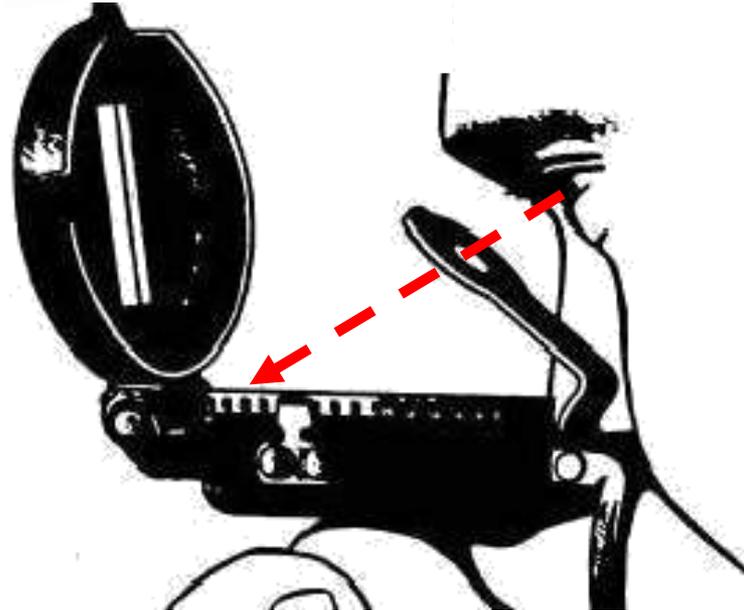
Compass-to-Cheek method for taking a target azimuth bearing

- The compass-to-cheek technique is used almost exclusively for **sighting**, and it is the best technique for this purpose.
- It is the most efficient technique for taking an accurate azimuth bearing.





SIGHTING A LENSATIC COMPASS



**SIGHTING A
LENSATIC
COMPASS**



SIGHTING A LENSATIC COMPASS



Any Questions?

SIGHTING A LENSATIC COMPASS

PART 1 Basic Land Navigation



SIGHTING A LENSATIC COMPASS



65° AZIMUTH

(11.5m = 1,150mils)

SIGHTING A LENSATIC COMPASS

Compass-to-Cheek method for taking a target azimuth bearing

this is worth repeating

- The compass-to-cheek technique is used almost exclusively for **sighting**, and it is the best technique for this purpose.
- It is the most efficient technique for taking an accurate azimuth bearing.



**SIGHTING
LENSATIC
COMPASS**

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**SIGHTING
LENSATIC
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PART 1
Basic Land Navigation

**SIGHTING
LENSATIC
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Any Questions?

LENSATIC COMPASS

Center-Hold method

for taking a **target** azimuth bearing

The center-hold technique is less precise, but is faster to use and can be used under all conditions of visibility.

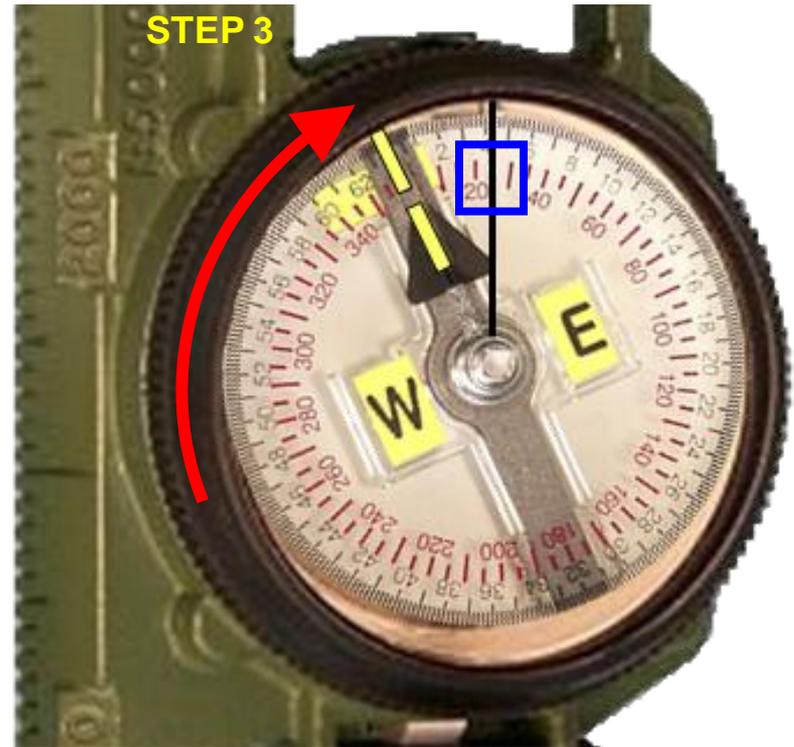
1. Open the cover until it forms a straight edge with the base.
2. Pull the rear sight to the rear most position, allowing the dial to float freely.
3. Next, place your thumb through the thumb loop, form a steady base with your third and fourth fingers, and extend your index finger along the side of the compass.
4. Place the thumb of the other hand between the rear sight and the bezel ring; extend the index finger along the remaining side of the compass, and the remaining fingers around the fingers of the other hand.
5. Pull your elbows firmly into your sides; this will place the compass between your chin and your belt.
6. To measure azimuth, turn entire body toward the object, pointing the compass cover directly at the object.
7. Once you are pointing at the object, look down and read the azimuth from the fixed black index line.



LENSATIC COMPASS

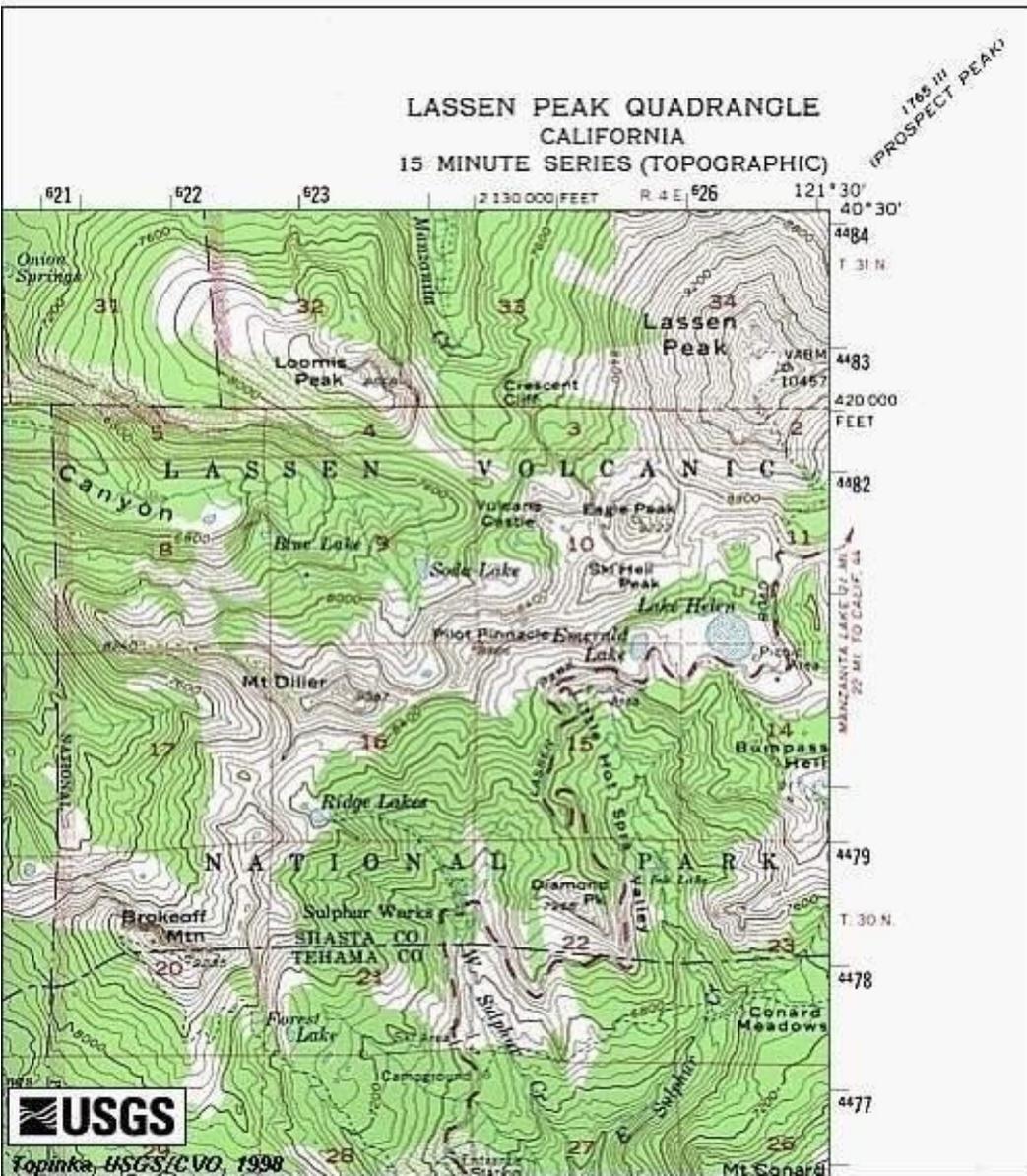
Center-Hold method for **following** an azimuth bearing

1. Using the Center-Hold method to hold the compass to your body.
2. Turn **your body** till desired azimuth is aligned with **Black Index Line**, hold this azimuth. Example **25°**.
3. Without turning compass, **rotate Bezel Ring** till **Luminous Bezel Line** is aligned with **North Arrow**.
4. Once bezel is set leave it there. (Till you are ready to change heading, then start the process over again.)
5. Keeping the **North Arrow** aligned with the **Luminous Bezel Line**, proceed forward in the direction of the desired azimuth **25°** on the **Black Index Line**.



Any Questions?

THE TOPOGRAPHIC MAP



Without ever having been to a particular place, and without talking to someone who has been there, you can already know quite a lot about it with a map. A map is a graphic representation of the earth's surface drawn to scale, as seen from above. It uses colors, lines, symbols, and labels to represent features found on the ground.

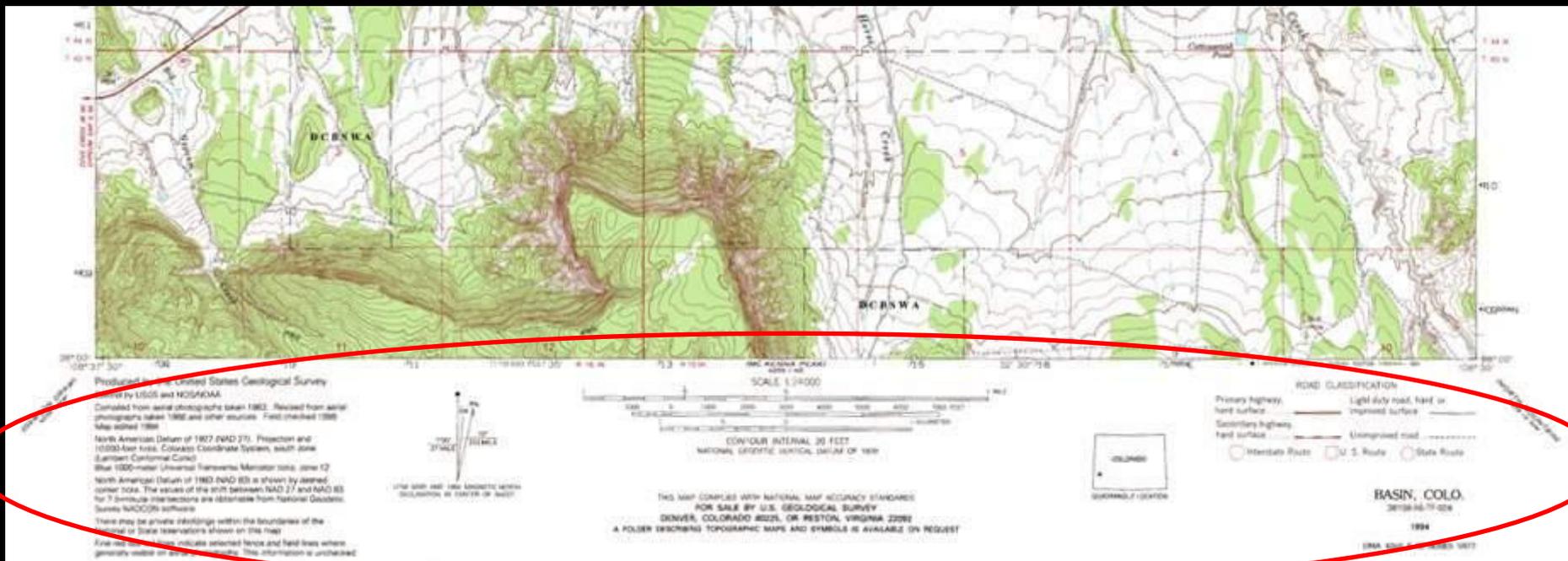
However, the finest maps available are worthless unless the map user knows how to read them.

TOPOGRAPHIC MAP DESCRIPTION

- Reading a map is a language composed of lines, colors, and symbols.
- Five basic colors are used for Topographic Maps.
 - **Brown (Contour Lines)**
 - **Black (Man Made Features, Roads, Trails)**
 - **Blue (Water Features)**
 - **Green (Vegetation)**
 - **Red (Highway and Land Grids)**
 - Two minor colors
 - **Pink (Built up area, civilization)**
 - **Purple (Updated Map Information)**
- Symbols are used to represent the natural and man-made features of the earth.
- Lines show relief and elevation; it indicates variations in terrain features and heights of natural features.
- Every map has Margin Information about the map.
- Maps come in three scale sizes; SMALL, MEDIUM, and LARGE. Which affects the amount of area covered and detail that will be shown.
- A map is read for four basic kinds of information.
 - Direction
 - Distance
 - Position
 - Identification
- Maps must be taken care of and properly folded for field use.

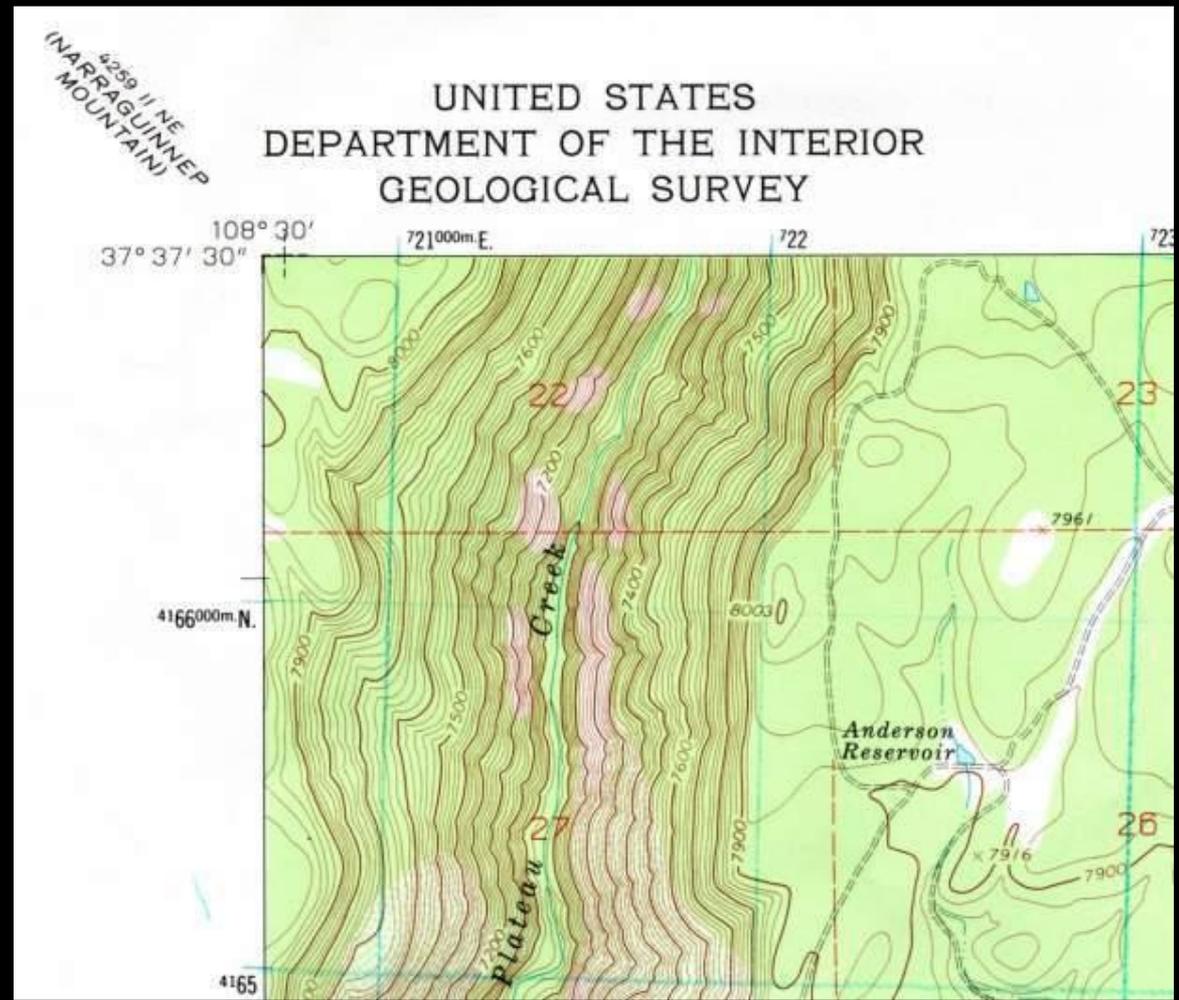
Map Margin Information

- A map could be compared to any piece of equipment, in that before it is placed into operation the user must read the instructions.
- It is important that you know how to read these instructions.
- The most logical place to begin is the marginal information and symbols, where useful information telling about the map is located and explained.
- All maps are not the same, so it becomes necessary every time a different map is used to examine the marginal information carefully.



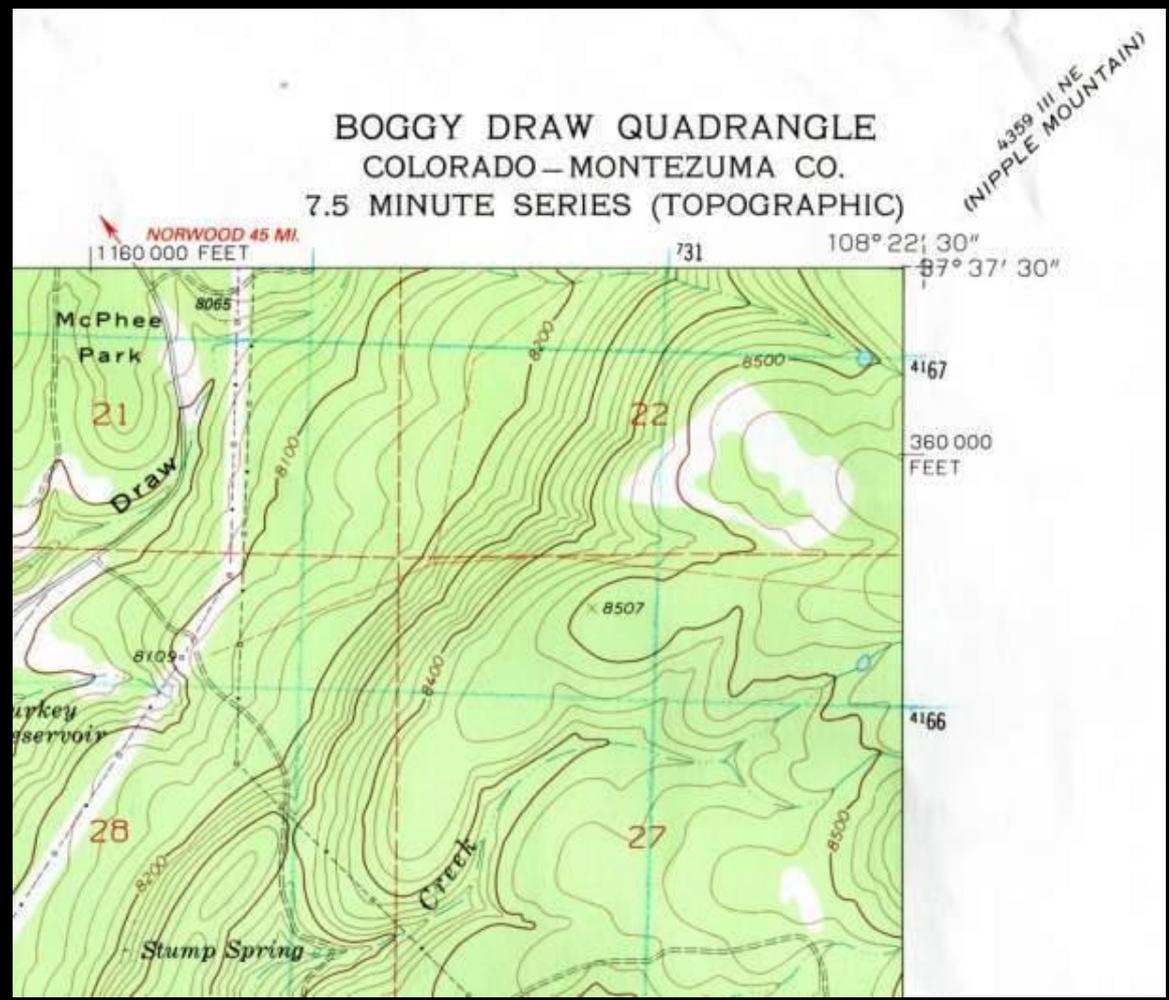
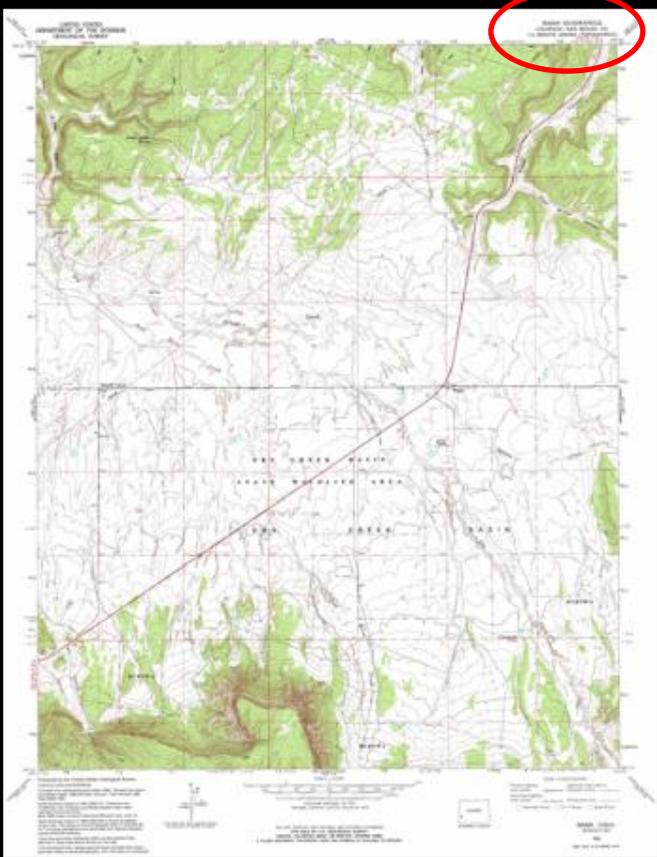
Map Margin Information

The top left corner of all USGS topographic maps carries the imprint of the authority responsible for the mapping .



Map Margin Information

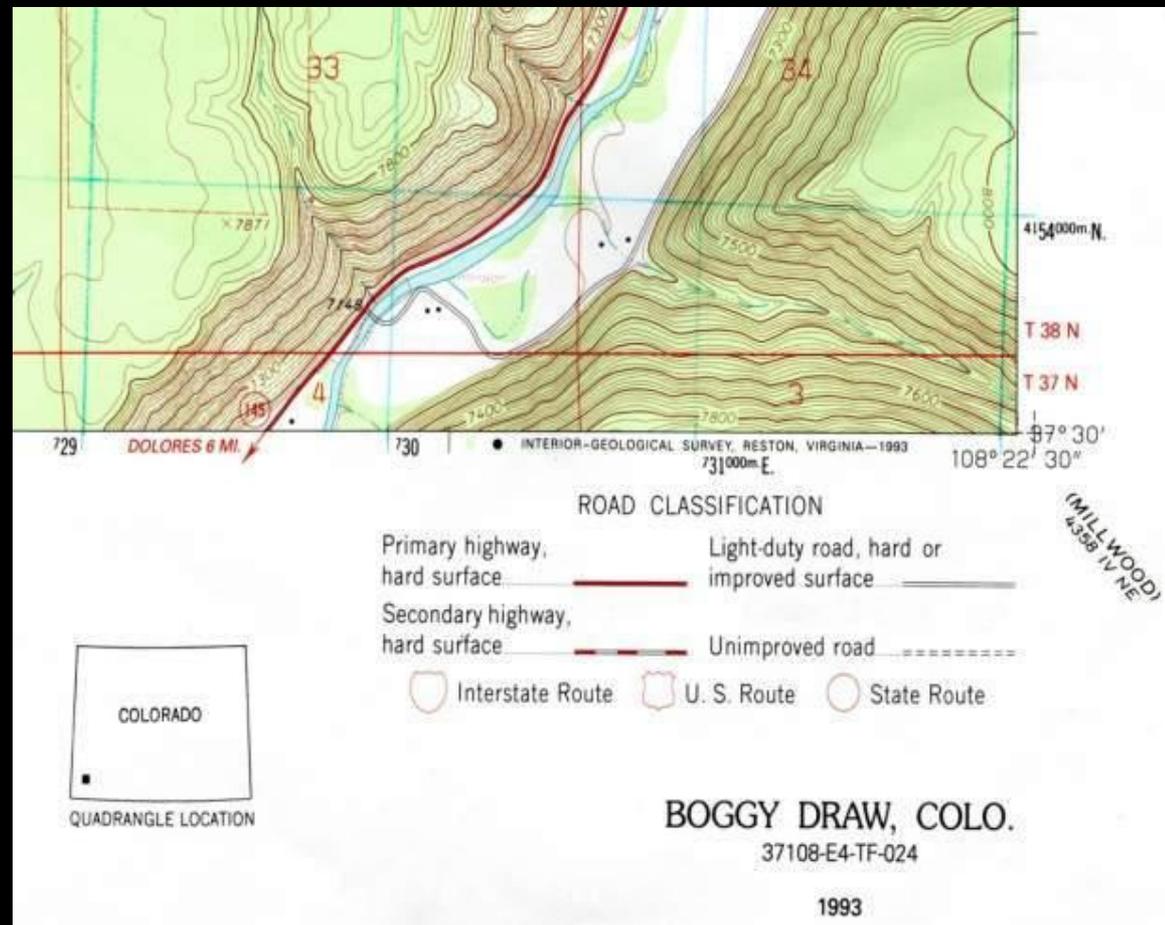
In the upper right corner is the complete quadrangle name. The state is also given, as may be the county. Also included is the area covered and the type of map.



Map Margin Information

In the bottom right corner of the map is a

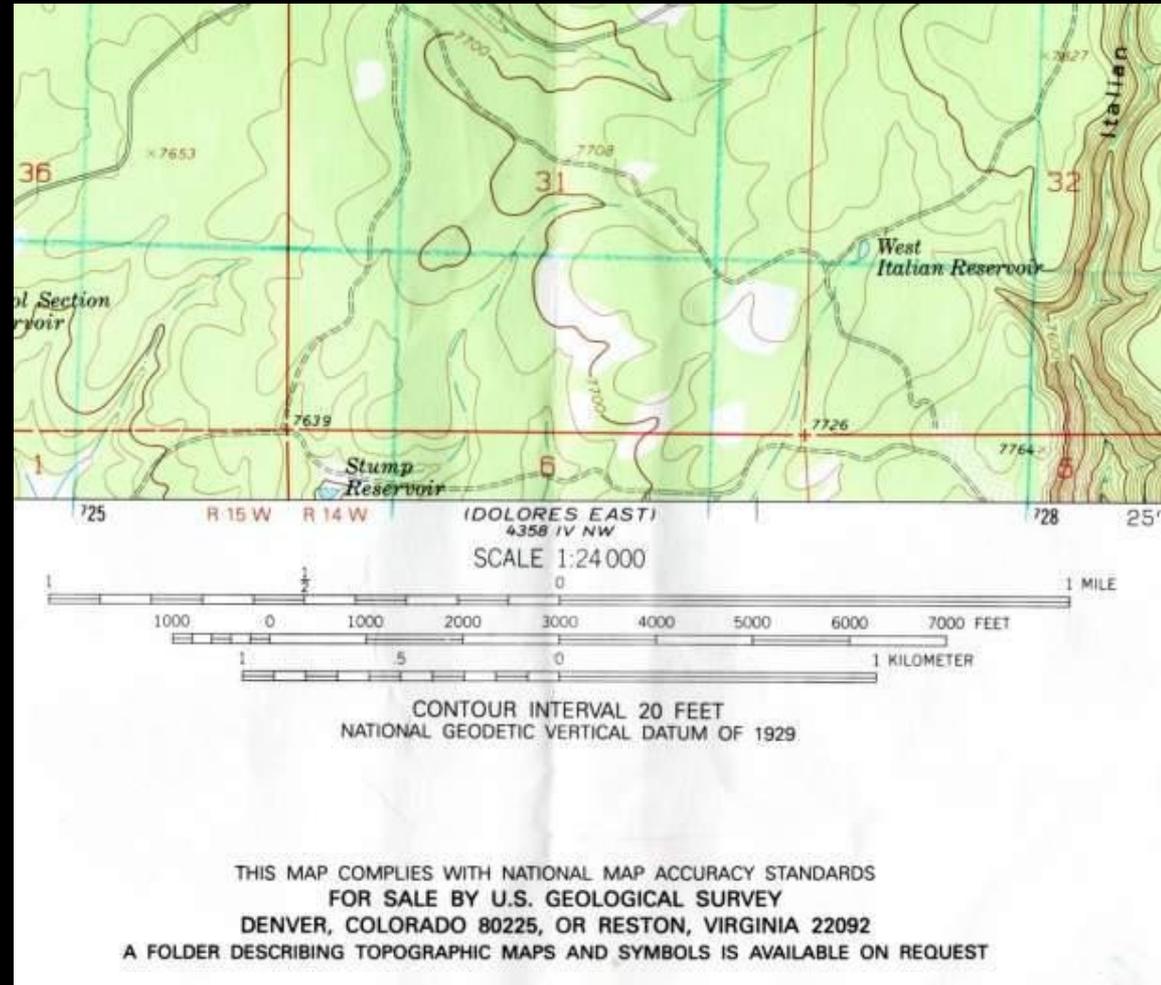
- key to roads on the map.
- Map name and state.
- date of the map - one of the most significant pieces of information available.
- quadrangle location shown as a black square superimposed on a state map.



Map Margin Information

At bottom center is the

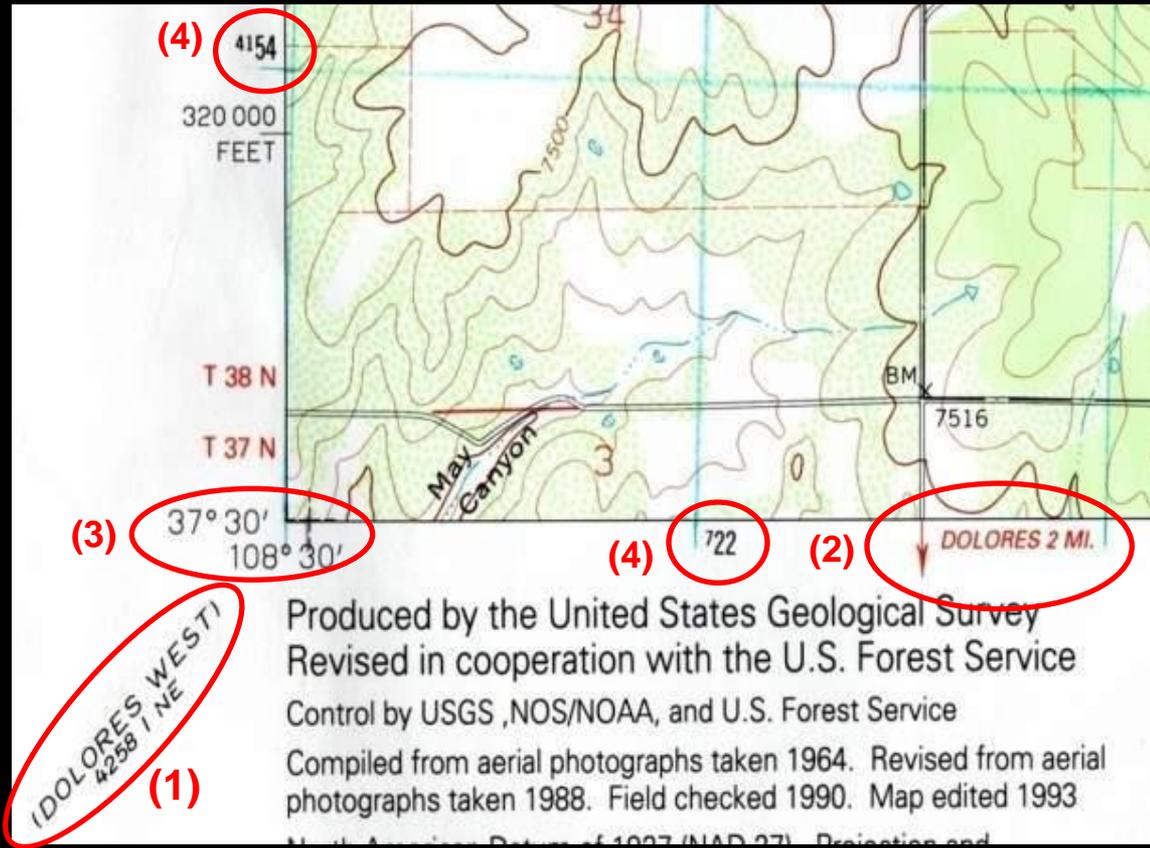
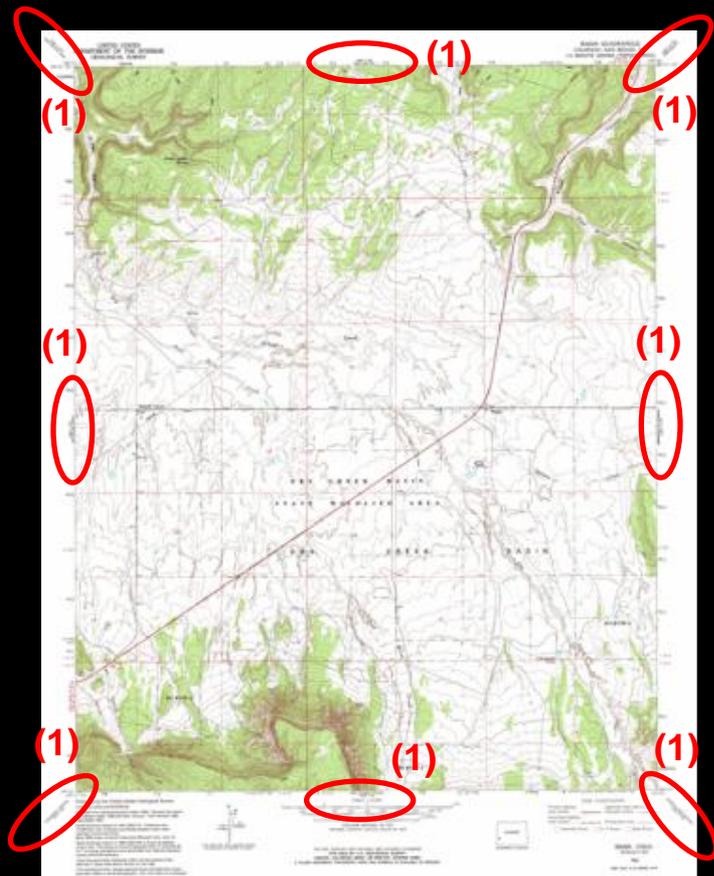
- map scale ratio – size of area covered and terrain detail.
- Distance bar scales show several alternative units for the measurement of distance.
- the contour interval. The contours are the brown lines.



Map Margin Information

Additional information is distributed around the entire map margin. (only “need to know” items are circled)

- (1) names for adjoining quadrangle maps (in black). Adjacent to corners and centers of the map sides.
- (2) In red are the distances by road to the nearest towns.
- (3) The spherical grid, latitude and longitude, complete coordinates are given at each corner of the map.
- (4) the UTM (in black lettering with blue tics) and the UTM grid is in kilometers.



Any Questions?