

PART 3

ADVANCE 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.**

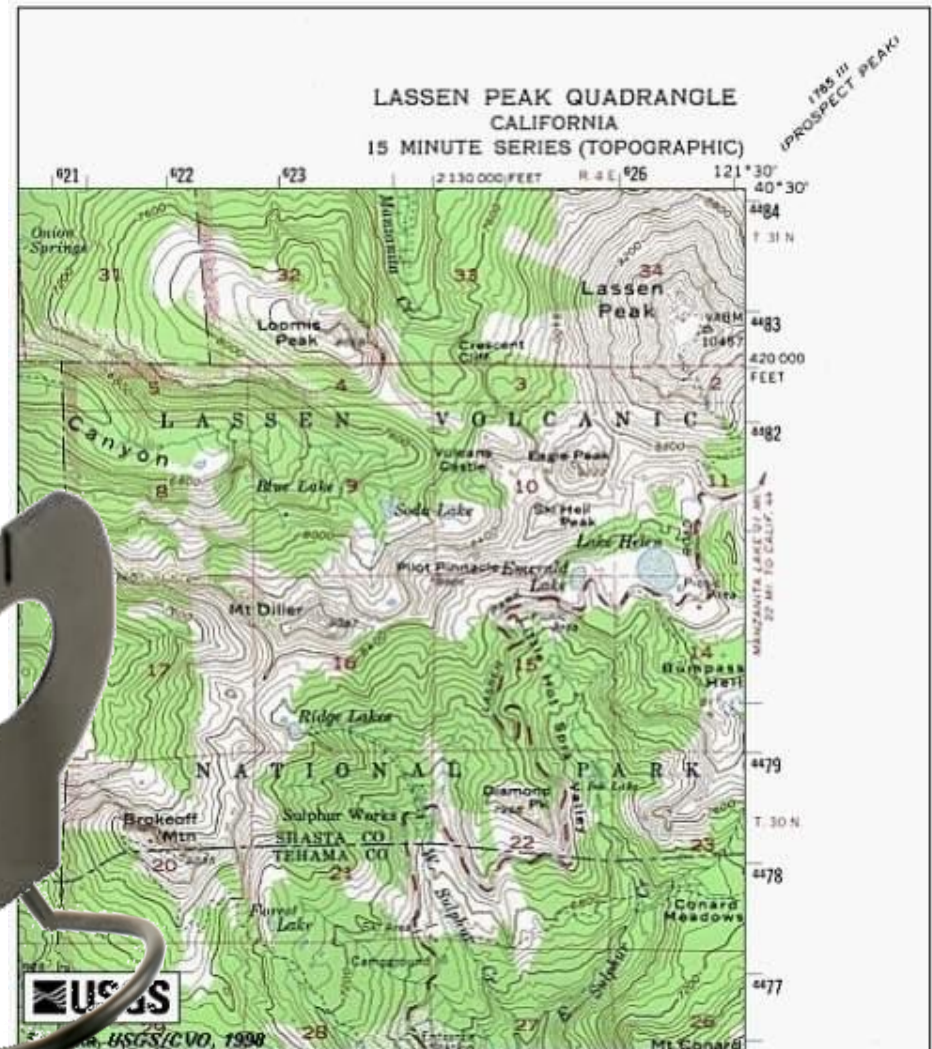
Any Questions?

BREAK TIME

... and now on with the ...



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

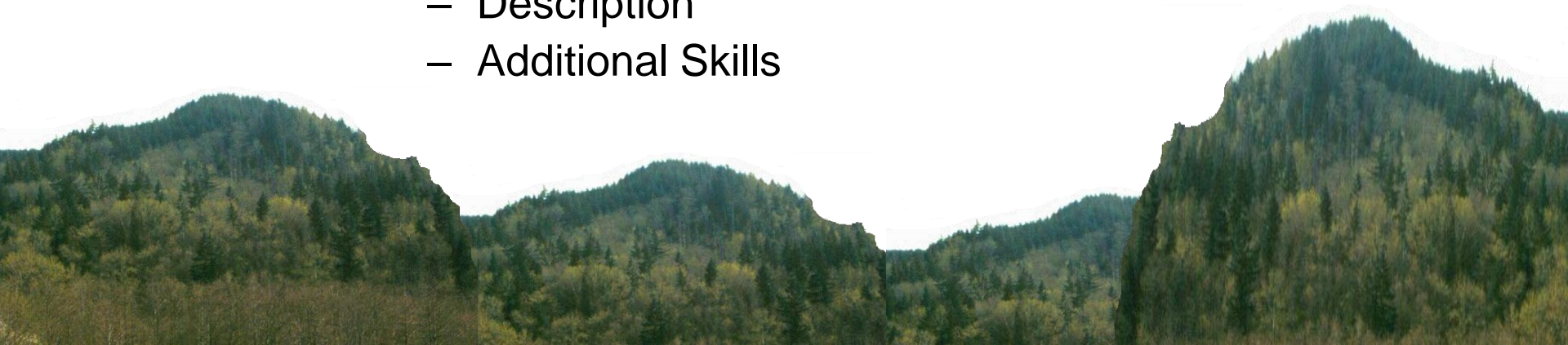
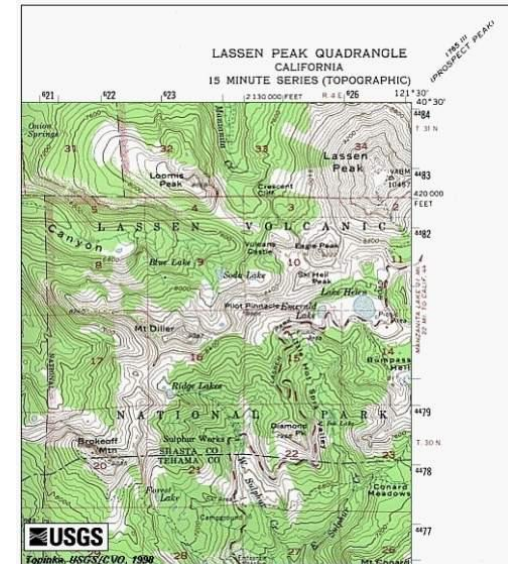
Any Questions?

PART 3

ADVANCE LAND NAVIGATION



- **Planning to Navigate**
 - Description
 - Planning
- **Navigate to Stay on Course**
 - Description
 - Staying on Course
- **Additional Navigation Skills**
 - Description
 - Additional Skills



PLANNING TO NAVIGATE

DESCRIPTION



EVERY TIME you enter a wilderness area, familiar or not, alone or in a group, you should prepare as though you were going in alone.

In spite of rules for following the leader's decisions, or those of the majority, and rules for keeping the group together (as well as rules for not going alone) the plain truth is that in the wilderness an individual is potentially a unit of one.

Always "**BE PREPARED**". Leaders have been known to fail, and the group's best of intentions do not always keep a group together.

Example, in a group of three - one of them sustains a serious injury and the other must stay with the injured person, while the third person goes for help. The third person now becomes a navigator, regardless of whether or not the person was one.

- Enjoying the great outdoors means navigating, perhaps camping overnight and then moving on again.
- It is important to have all the right equipment, and have a travel plan, with safety always in mind. Planning ahead (research) can prevent future frustration. To do this, you must think about the following.
 - The Group or traveling alone (individual strengths and weaknesses, physical and mental needs)
 - Equipment (essentials and comforts)
 - Safety (rules to follow, emergency plans)
 - Responsibilities (group or traveling alone)
 - The terrain (a detailed map study, weather)
 - Route selection (practical routes, alternate routes, the group type)

Any Questions?

PLANNING TO NAVIGATE

GROUP or ALONE

GROUP

- **Choose your group carefully** (unless it is a family trip) - if people are stubborn, inflexible and finicky at home, they will be even more so in the wilderness.
- **Leader** - a group must elect a leader, who should assess the capabilities of each individual before making plans to travel. A leader must have competence and the skills to lead a group. Above all, the leader must at all times avoid the appearance of indecision.
- **Leadership** - is very difficult, especially under the pressure of Life-or-Death situation, and particularly if some people, within the group, are unwilling to be led.
 - ❖ There are four types of leadership and all are equally important.
 - ~ **Designated Leadership** - taking responsibility for the group, motivating and guiding the group toward its goals, and determining how the group will achieve these goals.
 - ~ **Group Leadership (Active Followership)** - supporting and following the designated leader, and participating in “group decision making” by giving input and seeking clarity.
 - ~ **Peer Leadership** - the team works together and supports each other in achieving group goals, and each team member sees what needs to be done and does it.
 - ~ **Self Leadership** - each person takes care of themselves, so they can take care of the group, and everyone shows personal initiative and character.
- **Individual strengths and weaknesses** – must be carefully and privately considered by the leader, whose plan of action will be determined by what the group as a whole is capable of doing. Each individual must know and accept their own strengths and weaknesses.
- **Physical and mental needs** – the group will have a better time if its needs are met and stays together; its integrity maintained through good, caring, leadership. Like medications, eyewear, hearing aids, socializing, feeling needed, eliminate boredom, etc.

PLANNING TO NAVIGATE GROUP or ALONE

ALONE

- **The more experience** you have navigating and camping with others, the better qualified you are to go it alone.
- Remember, all of your experiences, good and bad, become **more intense** when you are alone.
- **Trekking the wilderness alone** for any number of reasons entails much greater risks from the consequences of injury or becoming lost than trekking with a group does.
- **These are risks** that you personally and willingly accept for the rewards of solitude.
- Ironically, the reward for trekking solo is a **heightened awareness** of potential dangers and a stricter adherence to safety concerns.
- A person who has spent a vast amount of time in the wilds alone, is **more careful** than a person who has someone to watch their back.
 - ✓ You look at the cliff a little longer before deciding if it's **safe** to climb. Or find a safer spot to cross a river.
- **Individual strengths and weaknesses** – you must know and except your own strengths and weaknesses.
- **Physical and mental needs** – you must asses your own needs, like medications, eyewear, isolation, boredom, etc.
- A solitary wanderer becomes **more conscious** about leaving a note behind.

Any Questions?

PLANNING TO NAVIGATE EQUIPMENT

ESSENTIALS

- Without a doubt the single most important item in your gear is **YOU**.
 - ✓ A clear, cool head (mind) atop a body in good physical and mental condition.
 - ✓ An adventurous spirit.
 - ✓ And good common sense.
- How much gear is needed? ***Just enough to stay dry, warm, and nourished.*** A light pack will allow for increased awareness and enjoyment of the surroundings while in route to your destination.
- **Individuals** - must have these twelve (12) essential items in a **daypack**.

1. A PLAN - never travel without it.	5. Whistle	9. Emergency rain gear
2. Map	6. Personal first-aid kit	10. Flashlight
3. Compass	7. Insect repellant/sun screen	11. Water
4. Pocket knife	8. Matches, waterproof	12. Food

 - ❖ Backpacking (campsite essentials)

1. Tent & tarp	4. Individual stove & fuel	7. extra food
2. Sleeping bag & pad	5. Water purifier	8. toiletries
3. Eating / cooking utensils	6. Extra clothing	9. binoculars
- **Groups** - any additional gear for the group to complete their goals. Carrying these extra items will be distributed among the group as evenly as possible by weight.

COMFORTS

- What are comforts? Non-essential gear not listed above, such as a chair, radio, pillow, reading book, etc.
- Determine the comfort gear that **YOU NEED** to maintain your personal level of security and comfort. Also, note that you must carry your own personal comfort gear.

Any Questions?

PLANNING TO NAVIGATE SAFETY

- Leave copies of **your plans**, destination and schedule, with a family member or Ranger Station.
- Always carry your daypack, with the **twelve essentials**, with you.
- In a group - pace the hike to the slowest member of the group. **STAY TOGETHER**, start as a group, hike as a group and end as a group. Always use the buddy system.
- Each member should study the planned route on the map and have their own copy of the map & route.
- The group should come up with **safety rules** that are adhered to and enforced by all.
- In a group - when navigating, **divide responsibilities**.
 - ✓ SCOUT – selecting the best path (footing), avoiding dead falls, loose rocks, etc.
 - ✓ NAVIGATOR – makes sure the SCOUT stays on course.
 - ✓ HEAD COUNT – at intervals stops the group and the group does a head count.
 - ✓ EQUIPMENT – at intervals (during head count) perform group and personal equipment inventory.
 - ✓ EVERYONE - keep a lookout for hazards, and keeps all persons in visual and talking range.
- When a group or lone navigator cannot know for certain where they are going, they had better be certain of where they have been. They must in some way **remain oriented** to their base camp, the trail head, or some other point which means food and shelter (safety).
 - ✓ Check your approximate location on the map and try to compare its markings with your surroundings. Do this every 30 minutes to an hour. Sooner, if the group desires.
- Bad weather or unexpected hazards, turn back and return to base camp (safety). **DO NOT** take any risk.
- **Pre-trip equipment check**; make sure everything works and that you know how to use it.

PLANNING TO NAVIGATE SAFETY

THE RULE OF THREE'S

- 3 SECONDS** – (**MIND**) the time you have to decide to escape or take action on an immediate danger.
- 3 MINUTES** – (**AIR**) the average time you can survive without breathable air.
- 3 HOURS** – (**SHELTER**) without it, time before you start dying from hypothermia (cold) or hyperthermia (heat).
- 3 DAYS** – (**WATER**) the time before dehydration can claim your life because lack of water.
- 3 WEEKS** – (**FOOD**) the time before you cannot do any daily necessary task because of lack of food.
- 3 MONTHS** – (**HOPE**) the time without meeting anybody else before a solid depression catches you.

Any Questions?

PLANNING TO NAVIGATE

RESPONSIBILITIES

- **Alone** you have the responsibility to keep yourself physically and mentally alert, aware, and safe.
- **In a group** everyone needs a responsibility; this gives a person the satisfaction of belonging to a team.
- **In a group - when navigating**, divide responsibilities and **rotate the responsibilities**.
**** It is possible for one person to hold more than one position if need be. ****
 - ✓ # 1 **SCOUT** (point man) – selects the best path (footing), avoiding dead falls, loose rocks, hazards. DOES NOT go fast and after an obstacle waits and allows everyone to catch-up before moving on.
 - ✓ # 2 **NAVIGATOR** (compass) – ensures the SCOUT/group stays on course, with map and compass.
 - ✓ # 3 **LEADER** – at intervals stops group for rest period, keeps all group members within visual and talking distance. Makes sound decisions at a moment's notice, taking into consideration the current situation as well as all possible contingencies. Consults with the ASSIST LEADER.
 - ✓ # 4 **PACE COUNT** – keeps track of how far the group has traveled by pace count and time.
 - ✓ # 5 **ASSIST NAVIGATOR** (compass) – ensures the group stay on course, with map and compass.
 - ✓ # 6 **ASSIST PACE COUNT** – keeps track of how far the group traveled by pace count and time.
 - ✓ # 7 **HEAD COUNT / EQUIPMENT** – during rest period ensures the whole group does a head count, a personal equipment inventory, and takes in nourishments (water and food).
 - ✓ # 8 **REAR (Assist Leader)** – keeps a lookout for hazards from behind and makes sound decisions at a moment's notice. If someone in the back of the group needs to stop, relays message to Leader to halt group. Consults with the LEADER.

NOTE – **primary** and **assistant** positions must compare findings with each other, to verify results.
 Navigator-to-Navigator (on course) and Pacer-to-Pacer (travel distance)

PLANNING TO NAVIGATE

RESPONSIBILITIES

GROUP OF EIGHT

SCOUT

NAVIGATOR

LEADER

PACE COUNT

ASSIST NAVIGATOR

ASSIST PACE COUNT

HEAD COUNT / EQUIP

REAR

GROUP OF FOUR

SCOUT / NAVIGATOR

LEADER / PACE COUNT

ASSIST NAVIGATOR / PACE COUNT

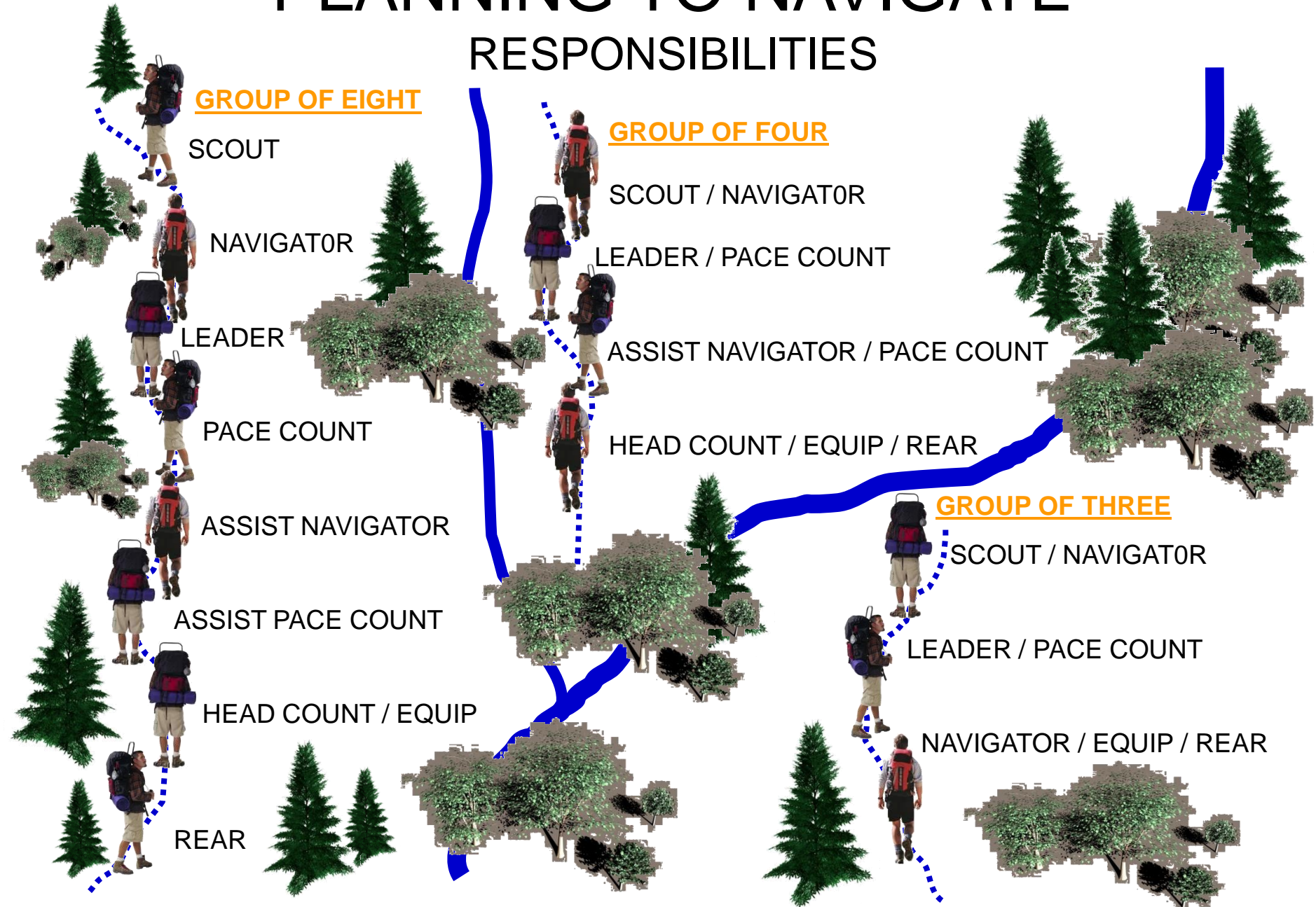
HEAD COUNT / EQUIP / REAR

GROUP OF THREE

SCOUT / NAVIGATOR

LEADER / PACE COUNT

NAVIGATOR / EQUIP / REAR



Any Questions?

PLANNING TO NAVIGATE THE TERRAIN

TERRAIN

- Review park brochures, internet photos, maps, and all other sources, to get a visual of the landscape.
- Detailed map study – take a good look at the map before you pack for the wilderness.
 - ✓ It will show you treasures and obstacles along the way.
 - ~ A great ridge top for a breathtaking view.
 - ~ A challenging water crossing.
- Elevations can tell you where you may encounter snow (high elevations) in early summer.
- Contour lines will show steep or gentle slopes on a planned route.
- Maybe you need special equipment to cross difficult terrain.
- Seasonal considerations.
 - ✓ Rainy Season – has that small stream turned into a raging flooded uncrossable river?
 - ✓ Dry Hot Season – that water hole or small stream you planned to take a rest at, is it dried up?
 - ✓ Are there dangers of seasonal wildfires?
- Timing is everything.
 - ✓ What can be an easy low water stream crossing in the early morning can become a dangerous or impassable river by the afternoon.
 - ✓ That swamp full of bugs in the morning may be easier to navigate in the evening high winds.

PLANNING TO NAVIGATE

ROUTE SELECTION

ROUTE SELECTION

There are two types of routes.

- ✓ **A route that fits the group or solo person** – physical and hiking skills are limited. No experience.
- ✓ **A group or solo person that fits the route** – the route is so challenging and requires special skills.
- Will it be a **loop route** (point “A” to “A”) or a **one-way route** (point “A” to “B”)?
- Select a group and routes with the right qualifications.
 - ✓ What type of group is it? Informal (friends) or formal (paying customers, educational class)?
 - ✓ What are the goals of each group member? Do they want to be there or do they have to be there?
 - ✓ What is the experience level of each member?
 - ✓ Are there group members that can lead and manage the group?
 - ✓ What is the physical condition of each member?
 - ✓ Are there health issues among the group?
 - ✓ Plan the routes at a level that will be fun, educational, challenging, and safe for everyone.
- Use binoculars –they save a lot of legwork. Survey the area from different vantage points, trying to understand where streams and rivers flow, lay of the hills, terrain footing and obstacles, etc.
 - ✓ Scanning – scan very slowly, looking hard into, rather than at, the terrain.
- Expect the unexpected.
 - ✓ Select routes that can be modified for unseen situations.
 - ~ Bad weather
 - ~ Trail conditions
 - ~ Broken equipment
 - ~ Injuries, etc

Any Questions?

STAYING ON COURSE

DESCRIPTION



The difference from classroom into the wilderness is the difference between **THEORY** and **PRACTICE**.

The wilderness is not crisscrossed with reference grid lines, like a map, to aid the navigator.

There is difficulty encountered in *holding to a selected course under conditions where the objective cannot be seen*.

- Wilderness navigation is a **DISCIPLINE** when traveling off the beaten path. To stay on course DO NOT rely on your “sense” of direction. You must rely on your compass and all navigation techniques available to you.
 - Human reference point
 - Making a reference point
 - Baselines
 - Thumbing the map

STAYING ON COURSE

HUMAN REFERENCE POINT

1. Navigator #1 stays stationary, while navigator #2 goes ahead to the limit of visibility.
 - With binoculars and walkie-talkies, the distance can be further.
2. Then navigator #1, with compass in hand at desired azimuth, signals navigator #2 to move left or right till navigator #2 is aligned with compass azimuth bearing.
3. Navigator #1 catches up with navigator #2 and the process is repeated.

NAVIGATOR #1



NAVIGATOR #2



MOVE

DESIRED
AZIMUTH

MOVE

NOTE

By keeping track of distance as well as the direction of each zig & zag while traveling, and doing some careful map work, the group will have a running assessment of their approximate location.

STAYING ON COURSE

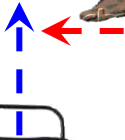
HUMAN REFERENCE POINT

Even though this is a slow process, it is very effective when needed.

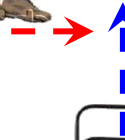
NAVIGATOR #2



MOVE
THIS
WAY



MOVE
THIS
WAY



ON
COURSE
MOVE
AHEAD



STOP
I WILL
CATCH
UP
WITH
YOU



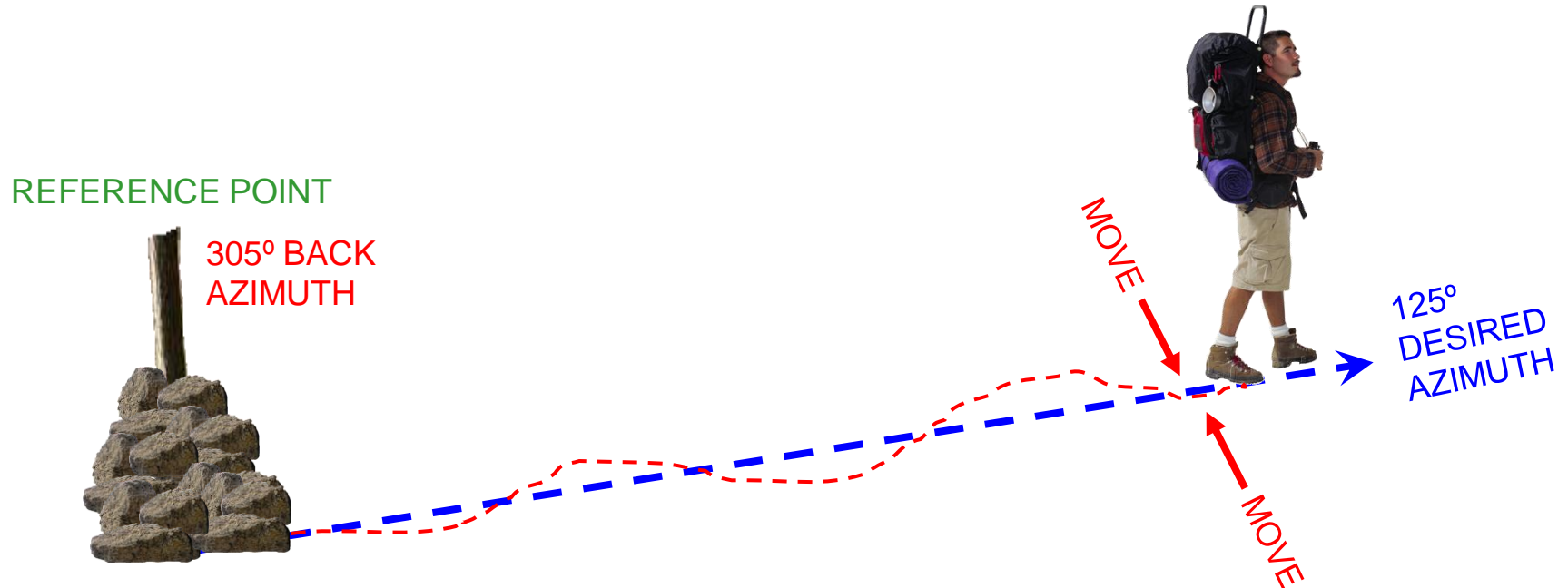
NAVIGATOR #1

STAYING ON COURSE

MAKING A REFERENCE POINT

As a lone navigator, this is an alternate method to the “human reference point” when resources are available. However, it is time consuming to assemble.

1. At your current position, pile up rocks or other landscape debris laying around.
2. Ensure it is large enough to be seen from a long distance away on your route.
3. Set your **desired azimuth**, say 125° and calculate your **back azimuth** ($125^\circ + 180^\circ = 305^\circ$ back azimuth).
4. Walk as far as you can on your **desired azimuth** 125° , occasionally looking back to the reference point and checking the **back azimuth** 305° to the reference point, as you walk forward.
5. Move left or right to maintain the **back azimuth** 305° , which keeps you on course, eliminating lateral drift.



Any Questions?

STAYING ON COURSE

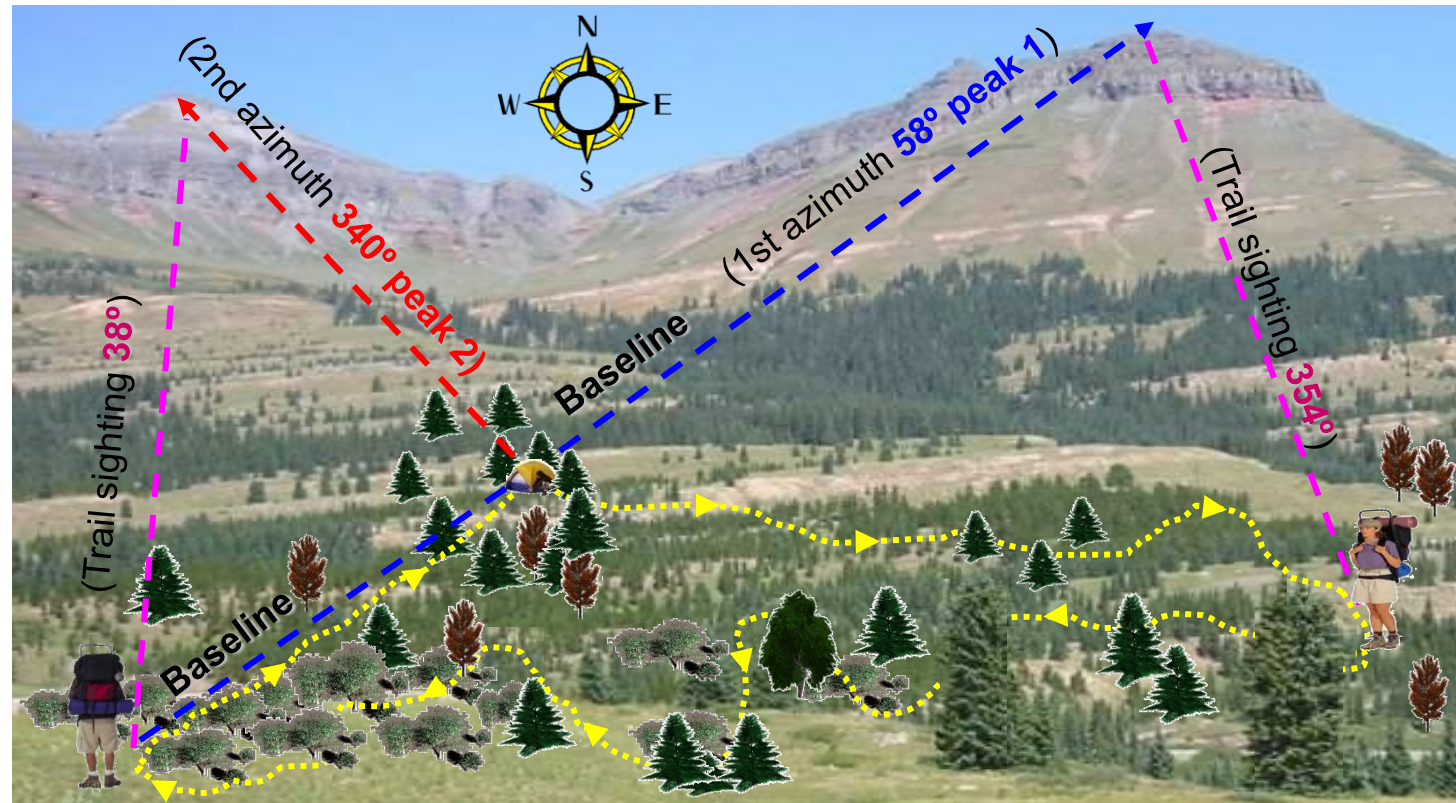
BASELINES ADVANCED

Azimuths can serve as **baselines** that let you explore a “trail less” area from your camp sight.

1. You create a **baseline** with the first azimuth measured from your camp (starting point) to a landmark (**58° peak 1**).
2. Taking a second azimuth landmark (**340° peak 2**) fixes the campsite's exact location on the first azimuth **baseline**.
3. With the cross azimuths written down you're free to wander around the area.
4. You explore the area and sight on **peak 1** to find your azimuth is **354°**, which puts you east of the **baseline**.
5. You head west towards the **baseline** till your azimuth to **peak 1** is **58°**, which puts you on the **baseline**.
6. Now you are at the **baseline** of **58°**, but which way to turn, to go to camp? West or east?
7. You sight on **peak 2** to find your azimuth is **38°**, which puts you west of camp, so you turn east.
8. Walk the **58° baseline** till **peak 2** is **340°**, if you don't stray off the baseline, you will reach the camp sight.

NOTE

To avoid getting off course from the **baseline**, remember to make use of intermediate landmarks along the **baseline**, keeping close track of deviations as you make them, and correct for any detours, get back to the **baseline** as soon as possible.



STAYING ON COURSE

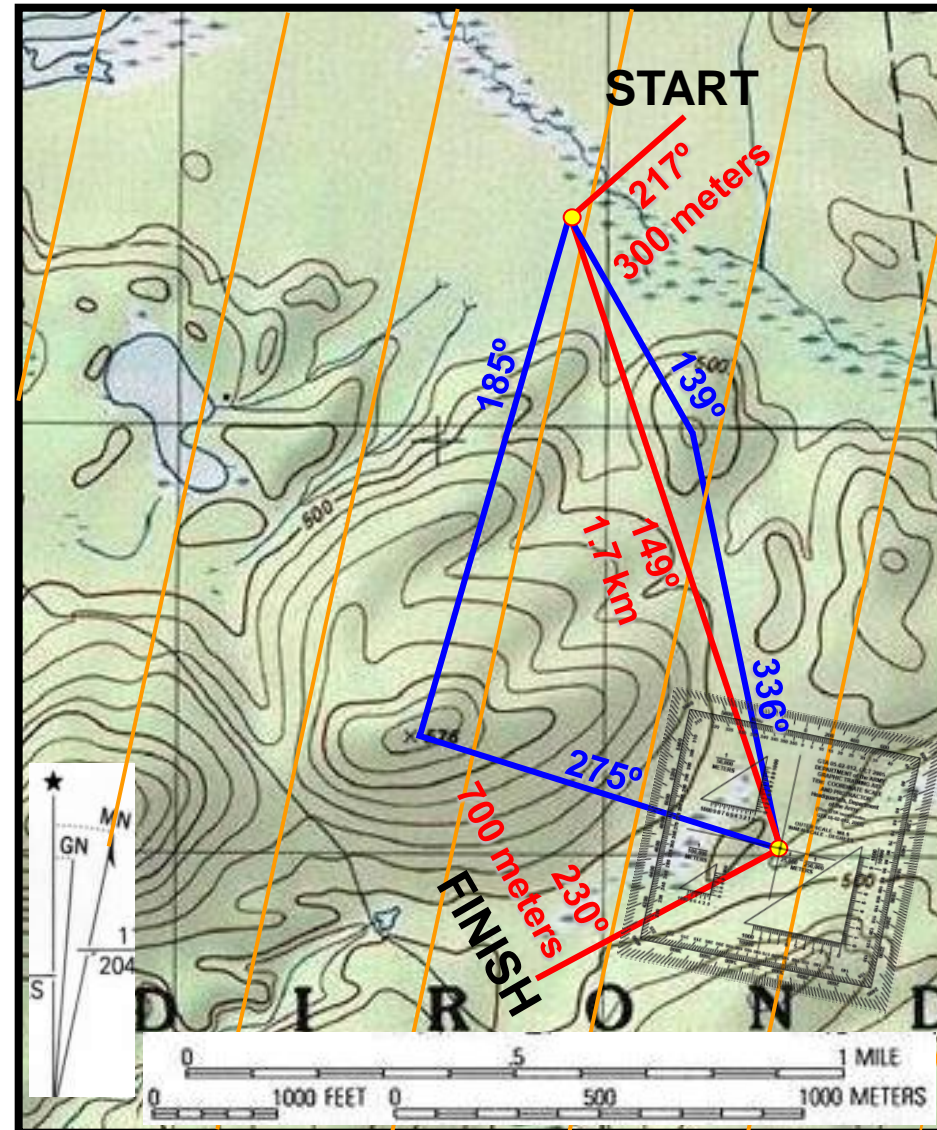
BASELINES ADVANCED

Going somewhere you cannot see - You want to travel to a destination beyond a group of hills.

1. On the map; mark your start and finish points.
2. Choose the best route between them and draw the **route legs**.
3. Using a protractor; determine the route leg azimuths on the map and estimate distance between each leg of the route.
4. Locate features or landmarks on the map that will help you identify each leg ● junction on arrival; such as junction 1 (**hill at 139°** and **hill at 185°**) MN azimuth on the compass or use "Pace & Time Count".
5. Write them down on the map or on a paper and follow your bearings (**BASELINES**).

NOTE

If you have **MN LINES** drawn on the map, align the **protractor** to a MN LINE and get the MN azimuth, you DON'T have to do any **MN conversions** for compass.



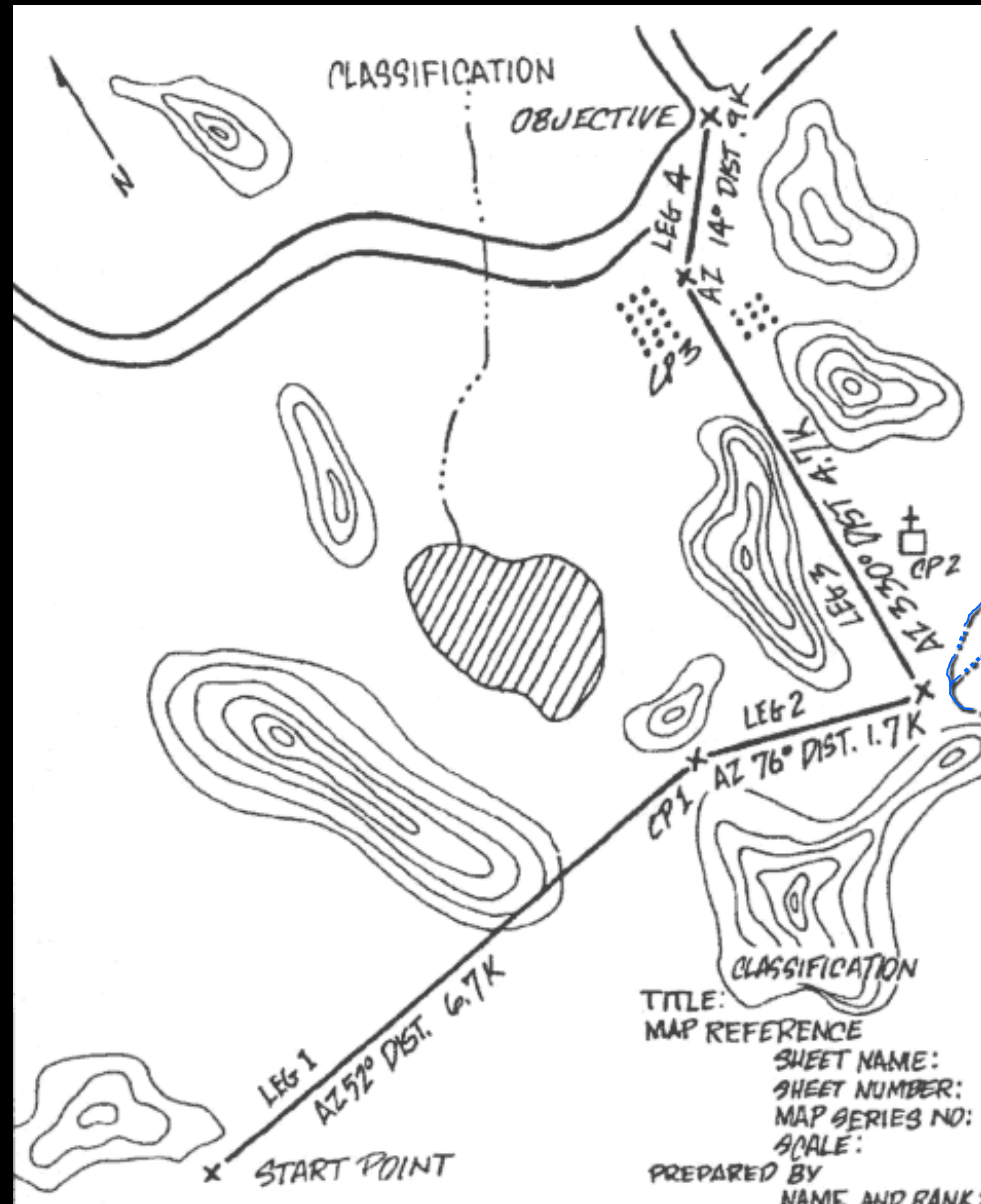
STAYING ON COURSE

BASELINES ADVANCED

HERE IS ANOTHER EXAMPLE

Here you use intermediate landmarks as
LEG (x) JUNCTIONS.

- LEG 1 starts at base of hill
- LEG 2 starts between two hills
- LEG 3 starts between three landmarks (stream, ridge spur, and hill).
- LEG 4 starts between two orchard fields and ends at road junction.
- Note: "CP" stands for "Check Point". ANY visual land mark reference, to ensure you are still on the right course to your goal.
CP1 = between hills
CP2 = church building
CP3 = orchard field



Any Questions?

STAYING ON COURSE

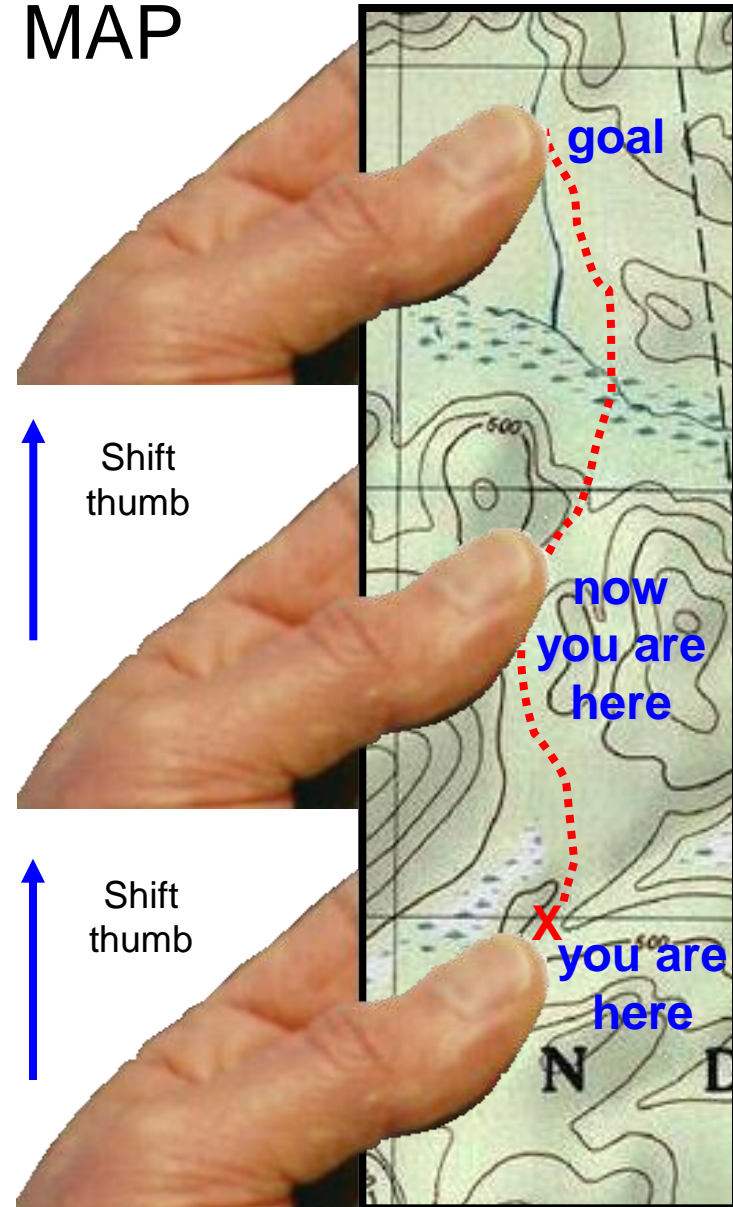
THUMBING THE MAP

It is a great technique that will keep you from getting lost or confused. As you gain skill, it becomes a great technique for increasing your travel speed as well! It is based on maintaining map contact.

1. Fold the map so it is more manageable. (see map folding techniques – Part 1 Basic land Navigation)
2. Find your location on the map.
3. Hold your map in one hand with your thumb close behind your location (don't cover it up).
4. Shift your thumb on the map as you progress on the ground.
5. When you come to an obvious feature on the map and on the ground, shift your thumb to mark your new location.
6. Keep your thumb on your map as a "You Are Here" marker and you'll save yourself lots of time and confusion!

NOTE

It is mostly used for "Orienteer Trail Racing". But this can be used for normal navigation. And there are other ways to thumb the map, i.e. use a pencil to quickly mark your location, as you travel.



Any Questions?

ADDITIONAL NAVIGATION SKILLS

DESCRIPTION



You already have been given Land Navigation techniques to give you a good start in becoming a competent navigator. You have learned how to operate your own lensatic compass with a map and other **LAND NAVIGATION TECHNIQUES** in Parts 1 and 2 of these lessons, plus “Part 3 Advance Land Navigation” skills.

Here you will find additional wilderness navigation **SKILLS THAT WILL GREATLY AID YOU** in navigating the wilderness and improve your Land Navigation experience level.

- These additional skills, when used, will provide you with essential data. Information that will aid you in making necessary decisions in various situations.
 - Estimating how much daylight is left
 - Binoculars with internal compass & rangefinder
 - Estimate distance with Lensatic Compass MILS
 - Conserve energy
 - ~ Rest break durations, 4 minutes or 30 minutes, and why
 - ~ Rhythmic breathing
 - ~ The “Rest Step”
 - ~ Walking sticks
 - Blisters
 - Weather prediction

ADDITIONAL NAVIGATION SKILLS

ESTIMATING DAYLIGHT

Knowing the **TIME** of sunrise and sunset for the area you are hiking and having a watch with you is something you should know and have. Example; sunrise is 6:30am and sunset 7:15pm, you have 12 hrs 45 mins of daylight. And with a watch, while hiking, you can know how much daylight is left before it gets dark.

However, if you **do not know** the **TIME** of sunrise and sunset, you can calculate the hours of daylight left with your hands. Reaching your destination before it gets dark is important. To estimate when the sun will disappear behind a hill, ridge, horizon, or canyon floor. . .

1. Hold both your hands at arms length, palms facing you and fingers horizontal.
2. Line up the bottom of the sun with the top of the upper finger with one hand, and the other hand lined up to the bottom of the other hand.
3. Count the number of fingers to the horizon.
4. Every finger is about 15 minutes of **daylight left before sunset**.



Any Questions?

ADDITIONAL NAVIGATION SKILLS

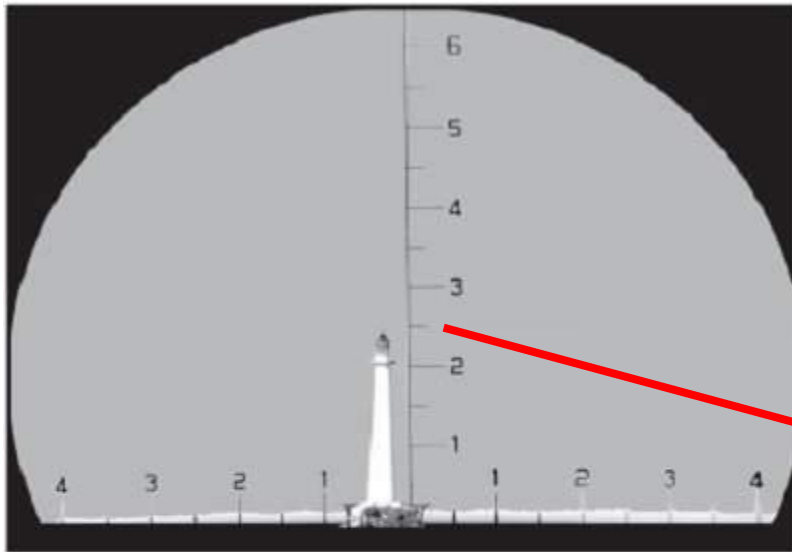
BINOCULARS WITH COMPASS & RANGEFINDER

- This item is a luxury, BUT is a very useful luxury.
- The compass alone is a **quick way** to find An azimuth to a very far away distant landmark.
- The range finder is very easy to use and the data received from it is invaluable.



ADDITIONAL NAVIGATION SKILLS

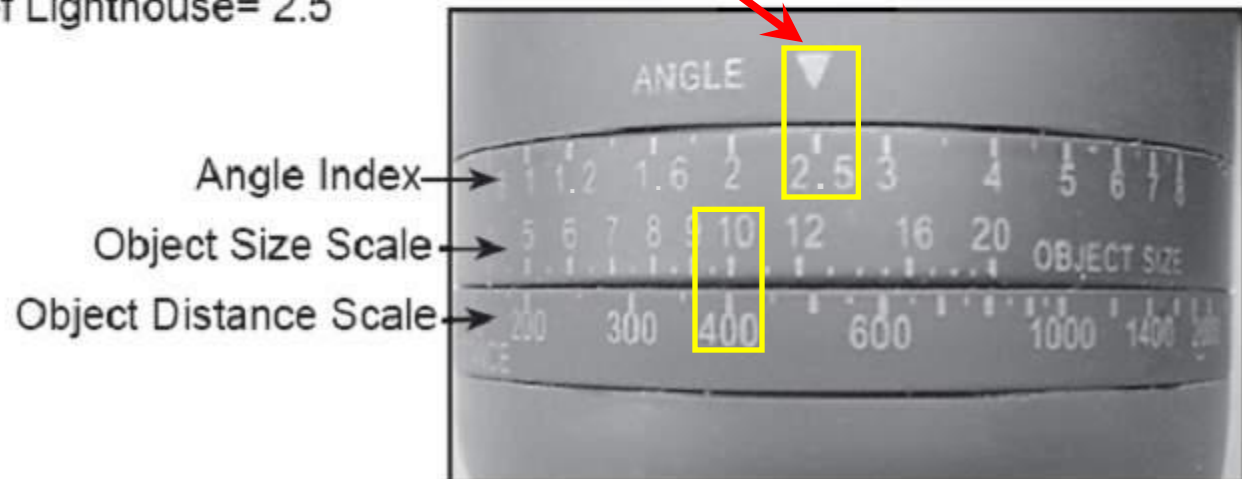
BINOCULARS WITH COMPASS & RANGEFINDER



Reticle Angle Index Scale
Base to Top of Lighthouse = 2.5

Example: Top of lighthouse is level with 2.5 on reticle angle scale. Rotate calculator dial so "2.5" on angle index is opposite the mark. If lighthouse is known to be 100' high, distance to the lighthouse is 4000'.

IMPORTANT: Always remember that the Distance and Object Size scales are in a "ratio" to each other. When you add "0's" to one, you must add an equal number of "0's" to the other.



ADDITIONAL NAVIGATION SKILLS

BINOCULARS WITH COMPASS & RANGEFINDER

When the object size is known, its distance is determined as follows:

1. Look through your binocular and place the **horizontal** reticle line at the **base** of the object.
2. Count the number of reticle divisions from the base to the top of the object. (In the example on the previous slide, the top of the lighthouse comes to 2.5 on the Reticle Scale)
3. Rotate the Calculator Dial and place this number (2.5) at the Angle Index Mark
4. Assuming you know that the height of the lighthouse is 100 ft., look below the Angle Index Mark and find the object size on the scale labeled "Object Size". In this example, use "10".

NOTE

The object size divisions are from 1 to 20. In dealing with an object that is 100 feet, mentally add a zero to the 10 indicator on the object size scale.

5. Now read the distance scale directly beneath the object size. It is 400 but remember, because you added a "0" to the "10" in Step 4, you must add a zero to the 400. Thus, the distance from you to the lighthouse is 4000 feet.

When distance to the object is known, its size is determined as follows:

1. Count the reticle divisions occupied by the object
2. Rotate the Calculator Dial, so that the Angle Index Mark points to the number from the reticle scale .
3. Look at the Distance Scale, and find your known distance to the object (for example, 4000 feet, or 400 on the scale). The number on the Object Size scale that is opposite this distance indicates the size of the object (for example, 100 feet).

ADDITIONAL NAVIGATION SKILLS

BINOCULARS WITH COMPASS & RANGEFINDER

(Using binocular ring calculator)

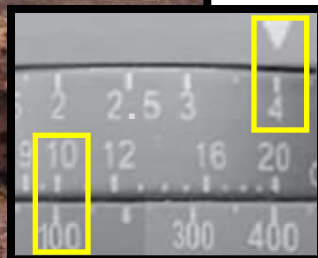
- Map indicates Landmark is 100 yards wide.
- Landmark covers 4 marks on binocular scale.
- You are 1000 yards away from landmark.
- At your current speed, 30-40 minutes away.



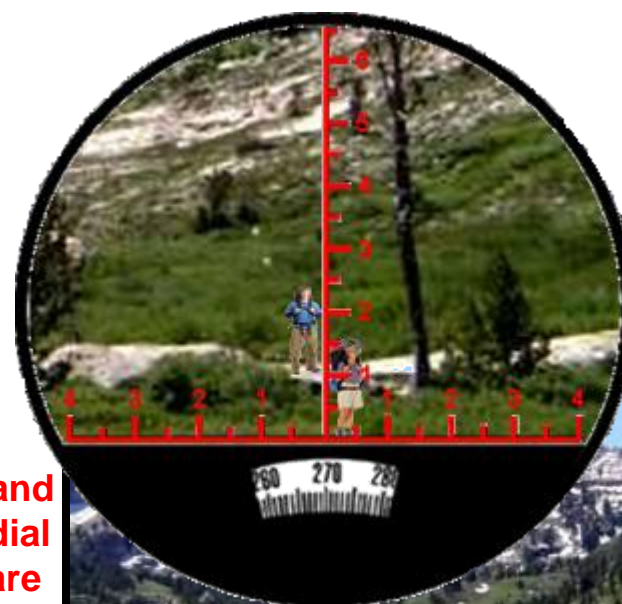
NOTE

drawings and
binocular dial
numbers are
exaggerated
for clarity.

Follow the
binocular
instruction
manual.



- Both hikers are about 5'4" tall.
- Hiker covers 1½ (1.5) marks on binocular scale.
- Hikers are 950 feet (316 yards) away from camp.
- 10-15 minutes before they reach camp.

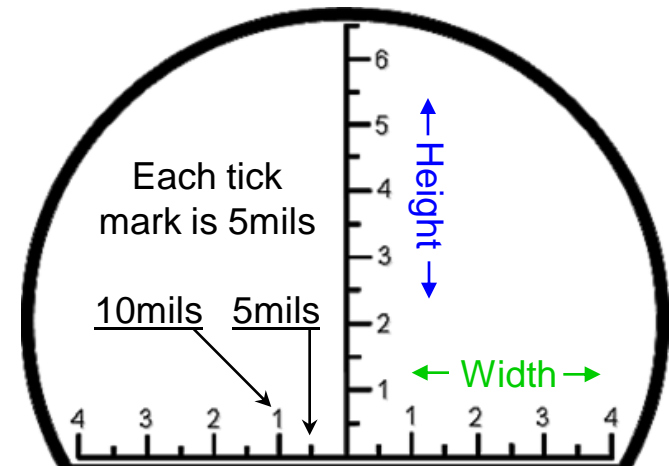
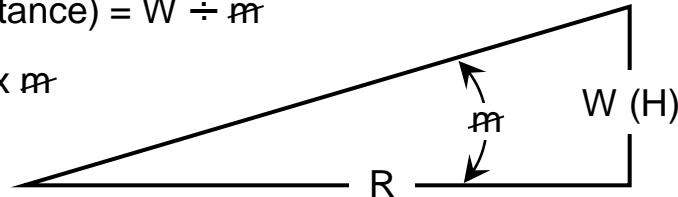


ADDITIONAL NAVIGATION SKILLS

BINOCULARS WITH COMPASS & RANGEFINDER

(Using binocular tick mark MILS and formula)

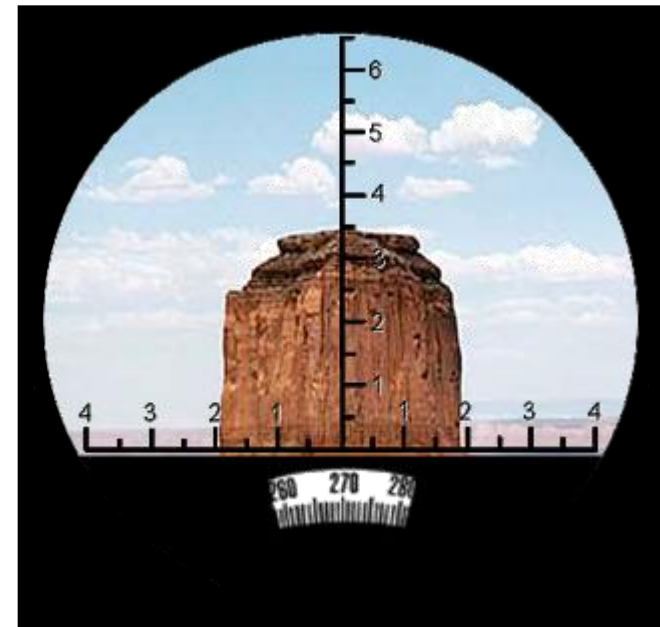
- Range (distance) = $W \div m$
- Width = $R \times m$
- $m = \frac{W(H)}{R}$
- m is the angular width (height) of the object in MILS.
- $W(H)$ is the width (height) of the object in meters.
- R is the range or distance in thousand (1000) meters.



Landmark is 92 meters (100yds) **W**idth

binocular total tick mils is **40m**ils

92W ÷ **40m** = 2.3 x **1000 meters** = 2300 meters (2.3Km or 1½ miles)



Any Questions?

ADDITIONAL NAVIGATION SKILLS

ESTIMATING DISTANCE WITH COMPASS MILS (Technique 1)

This technique is used with landmark information

Landmark is 92 meters (100yds) **Width**

Azimuth of the left side of landmark is 5200mils

Azimuth of the right side of landmark is 5300mils

Compass mils is $5300 - 5200 = 100\text{mils}$

$92 \div 100 = 0.92 \times 1000 \text{ meters} = 920\text{m} (1,006\text{yds})$

• Range (distance) = $W \div \text{m}$

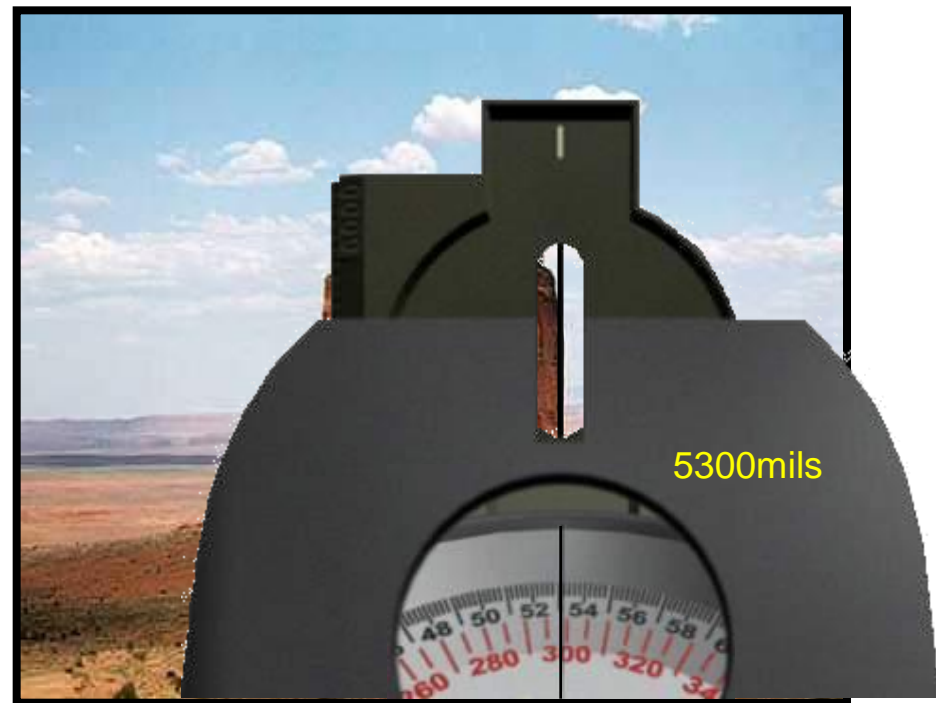
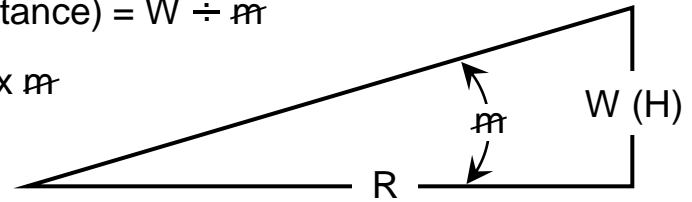
• Width = $R \times \text{m}$

$$\text{m} = \frac{W (H)}{R}$$

• m is the angular width (height) of the object in MILS.

• W (H) is the width (height) of the object in meters.

• R is the range or distance in thousand (1000) meters.



Any Questions?

ADDITIONAL NAVIGATION SKILLS

ESTIMATING DISTANCE WITH COMPASS DEGREES

This technique is good to use when you **DO NOT HAVE A MAP**. A Lensatic Compass is the best type of compass to use, it is easy to sight a landmark and is accurate.

1. You see a far away hill that you want to know the distance to, so you take a bearing reading to a spot on the hill. (Example 75 degrees)
2. You then walk perpendicular (right angle) to a measured distance. (Example 100 meters)
3. Then take another bearing reading to the exact same spot on the hill. (Example 80 degrees)
4. Next find degree difference and use the calculation to get the distance to the hill.

Deg	Tangent
1	0.017
2	0.035
3	0.052
4	0.070
5	0.087
6	0.105
7	0.123
8	0.141
9	0.158
10	0.176
11	0.194
12	0.213
13	0.231
14	0.249
15	0.268
16	0.287
17	0.306
18	0.325
19	0.344
20	0.364
21	0.384
22	0.404
23	0.424
24	0.445
25	0.466
26	0.488
27	0.510
28	0.532
29	0.554
30	0.577

Deg	Tangent
31	0.601
32	0.625
33	0.649
34	0.675
35	0.700
36	0.727
37	0.754
38	0.781
39	0.810
40	0.839
41	0.869
42	0.900
43	0.933
44	0.966
45	1
46	1.036
47	1.072
48	1.111
49	1.150
50	1.192
51	1.235
52	1.280
53	1.327
54	1.376
55	1.428
56	1.483
57	1.540
58	1.600
59	1.664
60	1.732

Deg	Tangent
61	1.804
62	1.881
63	1.963
64	2.060
65	2.145
66	2.246
67	2.356
68	2.475
69	2.605
70	2.747
71	2.904
72	3.078
73	3.271
74	3.487
75	3.732
76	4.011
77	4.331
78	4.705
79	5.145
80	5.671
81	6.314
82	7.115
83	8.144
84	9.514
85	11.430
86	14.301
87	19.081
88	28.636
89	57.290
90	

$$d = ((\tan(90 - (A - B))) \times \text{Ref})$$

80 degrees

A = Greater value of measured bearing angles

75 degrees

B = Lower value of measured bearing angles

11.430 (85 deg)

Tan = Tangent value (of the resultant angle)

100 meters

Ref = Measured reference distance

1143 meters

d = Distance (to be calculated)

1143 meters (1.1 Km) = ((11.430 (90 - (80 - 75))) x 100 meters)

$$d = ((\tan(90 - (A - B))) \times \text{Ref})$$

1. **(A - B) 80 - 75 = 5**

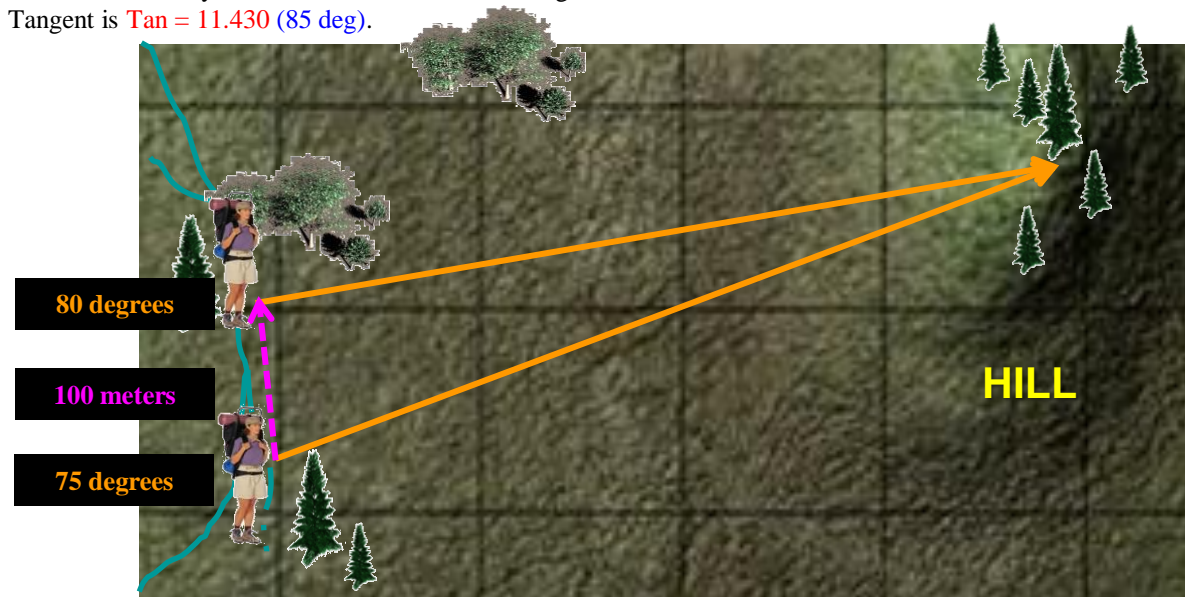
2. **(90 - (A - B)) 90 - 5 = 85 Deg**

3. View chart and find **85 Deg** to locate **Tangent. 11.430**

4. **(Tangent x Ref) 11.430 x 100 = 1143**

5. **d = 1,143 meters (1.1 Km)**

Note: When you have a degree that reads less than 360 and the other more than 360 (0 degrees), example **358 degrees** and **3 degrees**, all you are looking for is the degree difference, just like the above example. $3 + 360 = 363$, so you subtract $363 - 358 = 5$. Tangent would be the same as above; $90 - 5 = 85$ so the Tangent is **Tan = 11.430 (85 deg)**.



ADDITIONAL NAVIGATION SKILLS

ESTIMATING DISTANCE WITH COMPASS DEGREES

THIS TECHNIQUE IS A SIMPLIFIED VERSION OF THE PREVIOUS SLIDE.

NOTE: You can use any degree that is at least 1 degree or more.

1. You see a far away hill that you want to know the distance to, so you take a bearing reading to a spot on the hill.
2. You then walk perpendicular (right angle) till you reach an off-set of at least 1 degree. (This example is **2 degrees**)

NOTE: The further the landmark, the more distanced walked is needed to get a minimum of 1 degree difference and the closer the landmark, the less distance walked is needed.

3. Then measure the distance walked from start to finish. (This example is **18 meters**)

NOTE: you can use centimeters, meters, feet, yards or any measurement value.

4. Next use the calculation to get the distance to the hill.
5. Use this information to plot your location on the map, using one of the azimuths and distance on your calculation.

Deg	Tangent
1	57.290
2	28.636
3	19.081
4	14.301
5	11.430

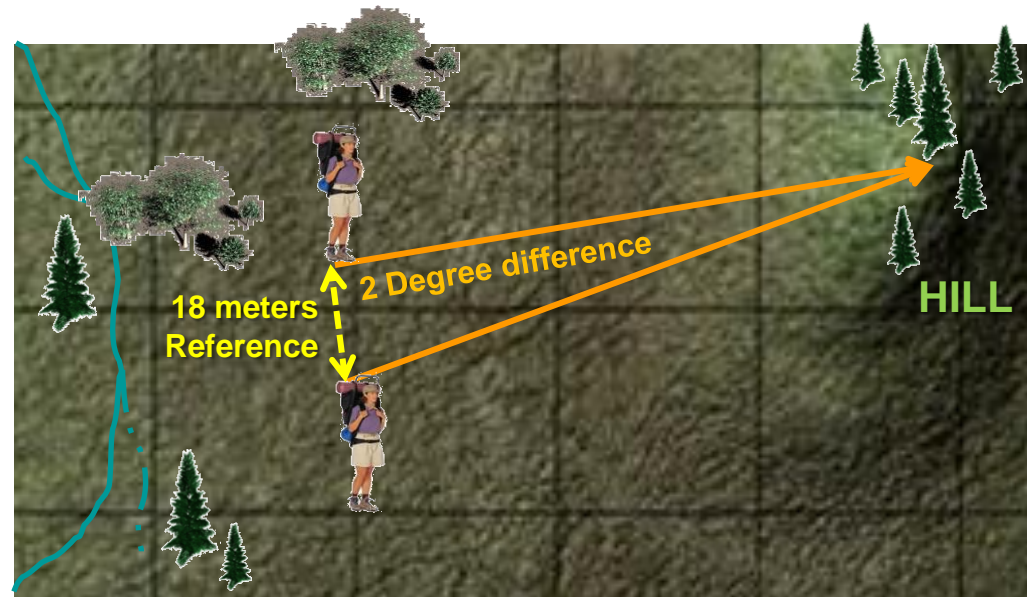
$$d = (\tan [\text{Deg difference}]) \times \text{Ref}$$

28.636 [2 deg] $\tan = \text{Tangent value [of the resultant angle]}$

18 meters $\text{Ref} = \text{Measured walked reference distance}$

515 meters $d = \text{Distance (to be calculated)}$

515 meters (0.5 Km) = **28.636 x 18 meters**



Any Questions?

ADDITIONAL NAVIGATION SKILLS

ESTIMATING DISTANCE WITH COMPASS MILS (Technique 2)

This technique is good to use when you DO NOT HAVE A MAP. And a Lensatic Compass is the best type of compass to use, because it is easy to sight a landmark and is more accurate when you use the MILS scale.

Mil	Tan	Mil	Tan	Mil	Tan	Mil	Tan	Mil	Tan
10	0.01	330	0.336	650	0.741	970	1.406	1290	3.184
20	0.02	340	0.347	660	0.757	980	1.435	1300	3.297
30	0.029	350	0.358	670	0.773	990	1.466	1310	3.417
40	0.039	360	0.369	680	0.788	1000	1.497	1320	3.546
50	0.049	370	0.38	690	0.805	1010	1.53	1330	3.684
60	0.059	380	0.391	700	0.821	1020	1.562	1340	3.832
70	0.069	390	0.403	710	0.837	1030	1.597	1350	3.992
80	0.079	400	0.414	720	0.854	1040	1.632	1360	4.165
90	0.089	410	0.426	730	0.871	1050	1.669	1370	4.353
100	0.098	420	0.437	740	0.889	1060	1.707	1380	4.558
110	0.108	430	0.449	750	0.907	1070	1.745	1390	4.782
120	0.118	440	0.461	760	0.924	1080	1.786	1400	5.027
130	0.128	450	0.473	770	0.943	1090	1.827	1410	5.299
140	0.138	460	0.485	780	0.961	1100	1.871	1420	5.600
150	0.148	470	0.497	790	0.981	1110	1.917	1430	5.936
160	0.158	480	0.51	800	1	1120	1.963	1440	6.314
170	0.168	490	0.522	810	1.02	1130	2.011	1450	6.741
180	0.179	500	0.535	820	1.04	1140	2.062	1460	7.230
190	0.189	510	0.547	830	1.061	1150	2.12	1470	7.793
200	0.199	520	0.56	840	1.082	1160	2.17	1480	8.449
210	0.209	530	0.573	850	1.104	1170	2.226	1490	9.224
220	0.219	540	0.585	860	1.125	1180	2.287	1500	10.153
230	0.23	550	0.599	870	1.148	1190	2.35	1510	11.288
240	0.24	560	0.613	880	1.171	1200	2.415	1520	12.706
250	0.25	570	0.626	890	1.195	1210	2.483	1530	14.528
260	0.261	580	0.64	900	1.219	1220	2.555	1540	16.957
270	0.271	590	0.654	910	1.244	1230	2.631	1550	20.355
280	0.282	600	0.668	920	1.269	1240	2.712	1560	25.452
290	0.293	610	0.683	930	1.295	1250	2.795	1570	33.943
300	0.303	620	0.697	940	1.321	1260	2.884	1580	50.923
310	0.314	630	0.711	950	1.349	1270	2.978	1590	101.86
320	0.325	640	0.726	960	1.376	1280	3.078	1600	0

Use the same technique from the previous slide.

1. Take a bearing reading to a spot on the hill. (Example 1330 mils)
2. walk perpendicular to a measured distance. (Example 100 meters)
3. Take another bearing to the same spot on the hill. (Example 1420 mils)
4. Find mils difference and use the calculation to get the distance to the hill.

$$d = (((\text{Tan}(1600 - (A - B))) \times \text{Ref}))$$

1420 mils

1330 mils

11.288(1510 mils)

100 meters

1128.8 meters

A = Greater value of the two measured bearing angles

B = Lower value of the two measured bearing angles

Tan = Tangent value (of the resultant angle)

Ref = Measured reference distance

d = Distance (to be calculated)

1128 meters (1.1 Km) = $((11.288 (1600 - (1420 - 1330))) \times 100 \text{ meters})$

Note: When you have mils that read less than 6400 and the other more than 6400 (0 mils), example **6360 mils** and **50 mils**, all you are looking for is the mils difference, just like the above example. $50 + 6400 = 6450$, so you subtract $6450 - 6360 = 90$, so the Tangent is the same as above; $1600 - 90 = 1510$ mils so the Tangent is **Tan = 11.288 (1510 mils)**.



ADDITIONAL NAVIGATION SKILLS

ESTIMATING DISTANCE WITH COMPASS MILS

NOTE: THIS TECHNIQUE IS A SIMPLIFIED VERSION OF THE PREVIOUS SLIDE.

NOTE: You can use any mils that is at least 10 Mils or more.

1. You see a far away hill that you want to know the distance to, so you take a bearing reading to a spot on the hill.
2. You then walk perpendicular (right angle) till you reach an off-set of at least 10 Mils. (This example is **20 Mils**)
 NOTE: The further the landmark, the more distance walked is needed to get a minimum of 10 Mils difference and the closer the landmark, the less distance walked is needed.
3. Then measure the distance walked from start to finish. (This example is **30 feet** or **10 yards**)
 NOTE: you can use centimeters, meters, feet, yards or any measurement value.
4. Next use the calculation to get the distance to the hill.
5. Use this information to plot your location on the map, using one of the azimuths and distance on your calculation.

Mil	Tangent
10	101.86
20	50.923
30	33.943
40	25.452

$$d = (\tan [\text{Deg difference}]) \times \text{Ref}$$

50.923 [20 Mil] $\tan =$ Tangent value [of the resultant angle]

10 yards $\text{Ref} =$ Measured walked reference distance

509 yards $d =$ Distance (to be calculated)

509 yards (0.3 Miles) = **50.923 x 10 yards**



ADDITIONAL NAVIGATION SKILLS

ESTIMATING DISTANCE WITH COMPASS

Here is some charts that simplify it even more. You can print and attach to the map margin or keep as laminated cards.

Distance to a landmark is already calculated.

1. Select **ANGLE (Mil or Deg)** used.

2. Select **REF** (distance walked in feet or meter, etc)

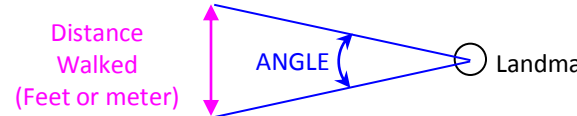
3. Where it intersects is **DISTANCE** (feet or meter, etc)

MIL (ANGLE)				
REF	10	20	30	40
1	102	51	34	25
2	204	102	68	51
3	306	153	102	76
4	407	204	136	102
5	509	255	170	127
6	611	306	204	153
7	713	356	238	178
8	815	407	272	204
9	917	458	305	229
10	1019	509	339	255
11	1120	560	373	280
12	1222	611	407	305
13	1324	662	441	331
14	1426	713	475	356
15	1528	764	509	382
16	1630	815	543	407
17	1732	866	577	433
18	1833	917	611	458
19	1935	968	645	484
20	2037	1018	679	509

NOTE: If REF is greater than 20... example 30, add a ZERO to the 3 to get 30 and also add a ZERO to the DISTANCE value.

Example : MIL 20 REF 30 DISTANCE 1530

DEGREE (ANGLE)					
REF	1	2	3	4	5
1	57	29	19	14	11
2	115	57	38	29	23
3	172	86	57	43	34
4	229	115	76	57	46
5	286	143	95	72	57
6	344	172	114	86	69
7	401	200	134	100	80
8	458	229	153	114	91
9	516	258	172	129	103
10	573	286	191	143	114
11	630	315	210	157	126
12	687	344	229	172	137
13	745	372	248	186	149
14	802	401	267	200	160
15	859	430	286	215	171
16	917	458	305	229	183
17	974	487	324	243	194
18	1031	515	343	257	206
19	1089	544	363	272	217
20	1146	573	382	286	229

Calculate distance to a landmark manually.					
MIL	TAN	D = TAN x REF DISTANCE equals TANGENT times REFERENCE	DEG	TAN	
10	101.86		1	57.290	
20	50.923		2	28.636	
30	33.943		3	19.081	
40	25.452		4	14.301	
			5	11.430	
<p>D is distance from you to landmark TANgent is the ANGLE difference in MIL or DEG REFERENCE is distance walked to get ANGLE difference</p> 					
NOTE:					
1. If you use feet , use feet for all calculations.					
2. If you use meter, use meter for all calculations.					
3. If you use other unit of measurement, use it for all calculations.					
1 mile = 1760 yard = 5280 feet			1 yard = 3 feet		
1 Km = 1000 meter = 100,000 cm			1 m = 100 cm		
1 feet = 30.5 cm			1 cm = 0.03 feet		
1 yard = 0.9 meters			1 meter = 1.09 yards		
1 mile = 1.6 Km			1 Km = 0.6 mile		

ADDITIONAL NAVIGATION SKILLS

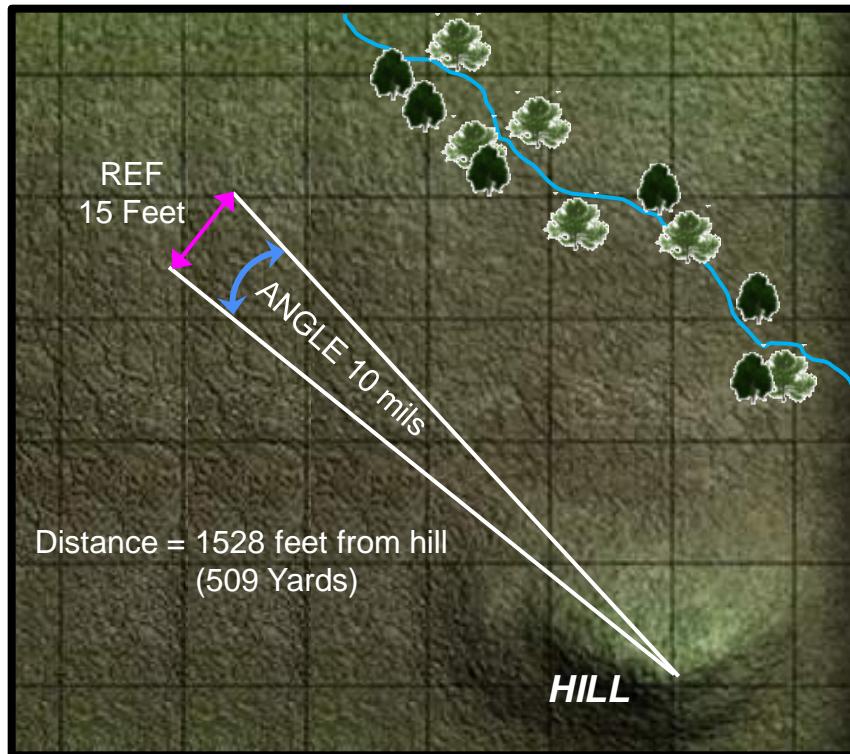
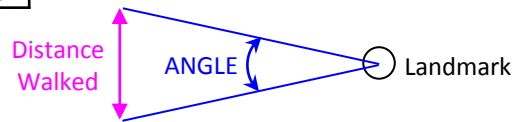
ESTIMATING DISTANCE WITH COMPASS

Plotting location on the map, using one azimuth reference to a landmark.

MIL	TAN
10	101.86
20	50.923
30	33.943
40	25.452

$$D = \text{TAN} \times \text{REF}$$

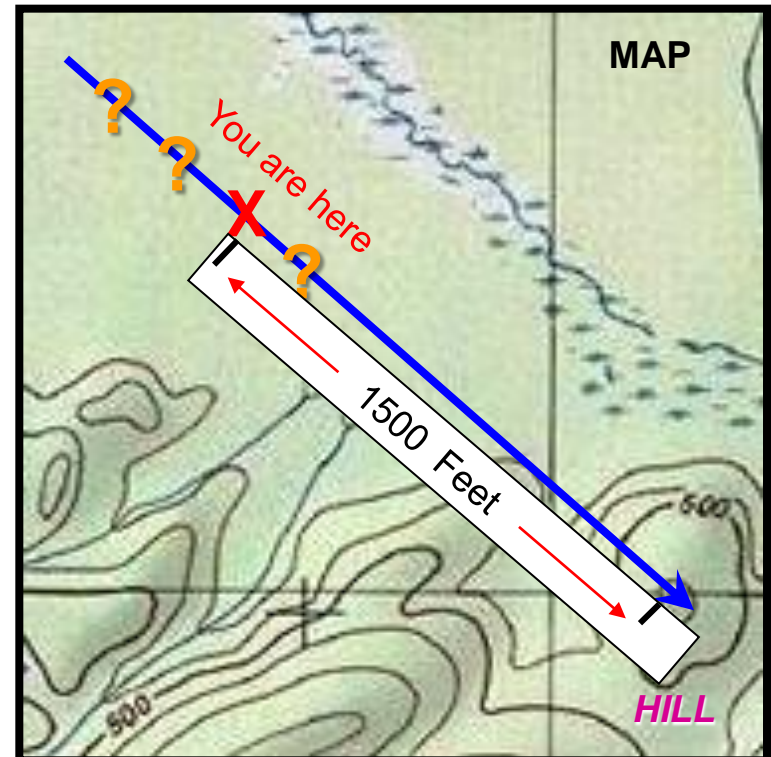
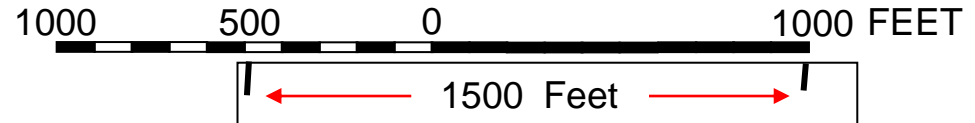
$$(1528 = 101.86 \times 15)$$



NOTE:

1. If you use feet, use feet for all calculations.
2. If you use meter, use meter for all calculations.
3. If you use other unit of measurement, use it for all calculations.

MAP SCALE BAR



ADDITIONAL NAVIGATION SKILLS

ESTIMATING DISTANCE WITH COMPASS

NOTE: If **REF** is greater than **20**... example **30**, add a ZERO to the **3** to get **30** and also add a ZERO to the **DISTANCE** value.

Example : **MIL 20 REF 30 DISTANCE 1530**

For calculations use the same (**feet or meters or other**) for all measurements

1. Use the actual measurement (**feet or meter, etc**) used to walk your distance.
2. Use the actual **ANGLE** (**mil or degree**) achieved for distance walked.
3. Select the **REF** in **feet or meters** actually used in step one above.

BELOW is an example. As you can see **REF 30 Feet** is very different from **REF 30 Meters**, with the same **ANGLE 20 Mils**. Distances are different.

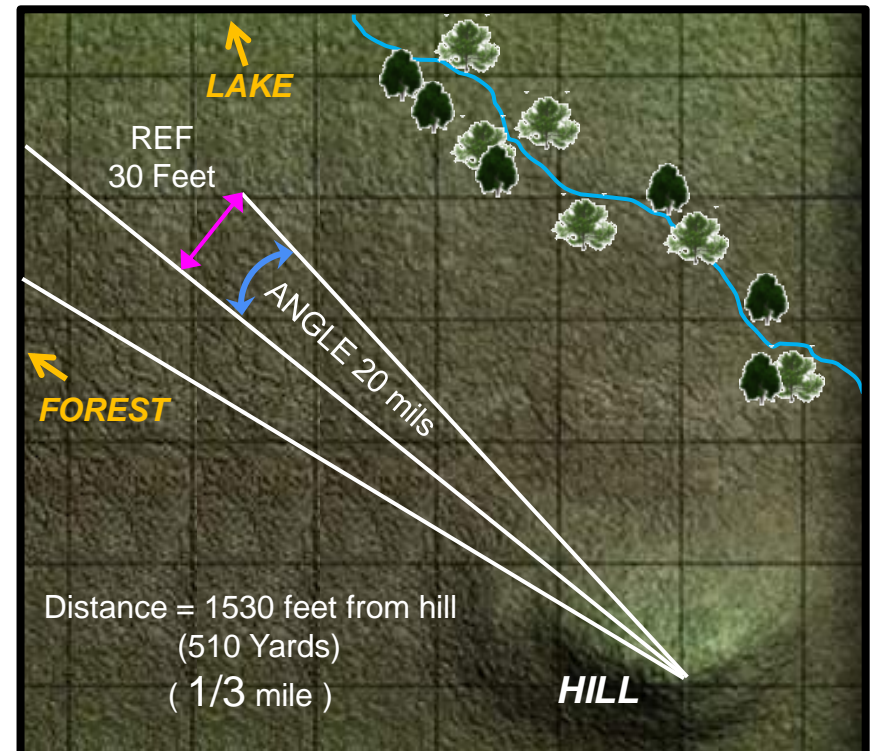
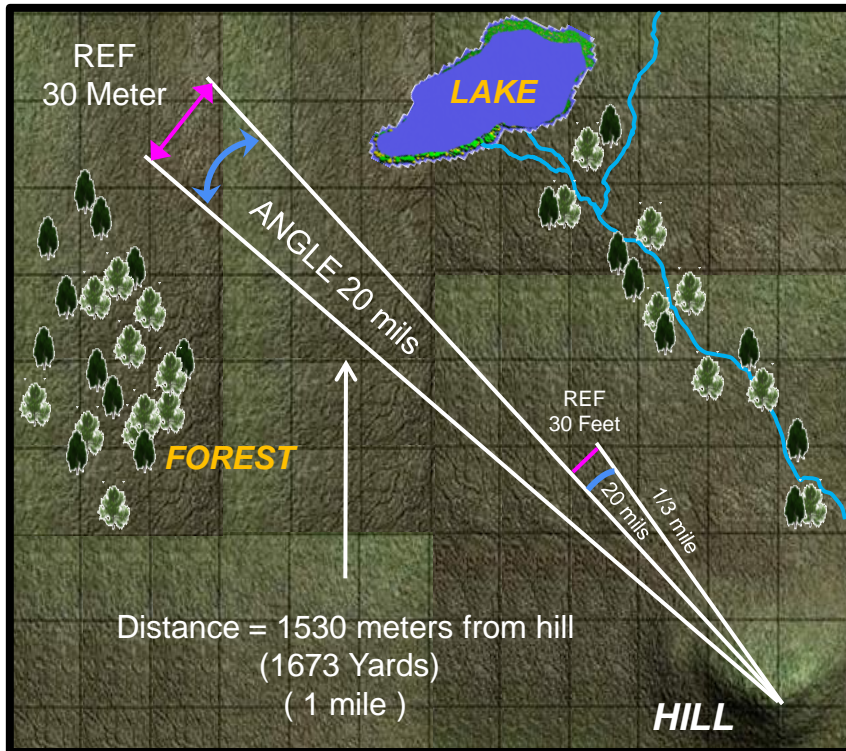
Distance to a landmark is already calculated.

1. Select **ANGLE (Mil or Deg)** used.
2. Select **REF (distance walked in feet or meter, etc)**
3. Where it intersects is **DISTANCE** (feet or meter, etc)

MIL (ANGLE)					DEGREE (ANGLE)					
REF	10	20	30	40	REF	1	2	3	4	5
1	102	51	34	25	1	57	29	19	14	11
2	204	102	68	51	2	115	57	38	29	23
3	306	153	102	76	3	172	86	57	43	34
4	407	204	136	102	4	229	115	76	57	46

NOTE: If **REF** is 3 to get 30 and at 10 to get 100

Examp



Any Questions?

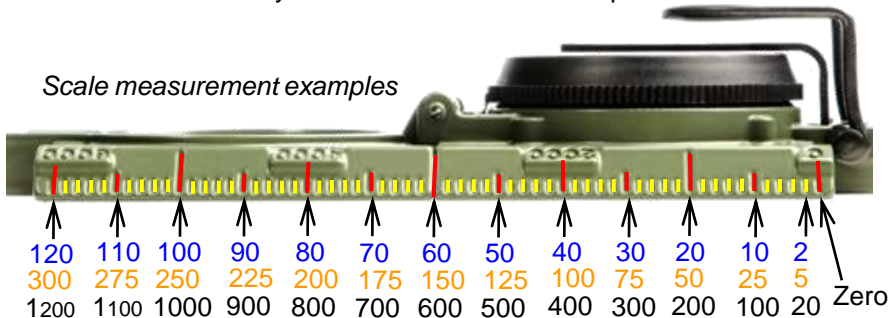
ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

This technique is good to use when you **DO NOT HAVE A MAP** and you want to draw a map of the local wilderness area. Here is an example.

1. From your campsite (select landmarks that stand out and can be seen) take two bearing readings each; to the Hill, Lake, Tower, and River - one bearing from the campsite and the other from a perpendicular (right angle) to a measured distance.
 2. With the bearing readings calculate the distance from your campsite to each landmark selected. Hill, Lake, Tower, and River.
 3. On a sheet of paper draw the camp site as a starting point and Magnetic North on top of the map. With MN there is no need to do any GN conversions.
 4. With a protractor covering the campsite and using the **campsite bearings**, draw light tick marks on the paper at the edge of the protractor bearing.
 5. With the Lensatic Compass on the paper, measure from the campsite, thru the bearing, to a determined distance for each landmark and draw the landmark at the measured distance.
- NOTE: When using the Lensatic Compass Graduated Straight Edge, decide which measurement scale you want to use... it can be any value.*
6. Add trees and any other information to the map.

Scale measurement examples



When finished, you will have a useful map to explore and navigate the local area.

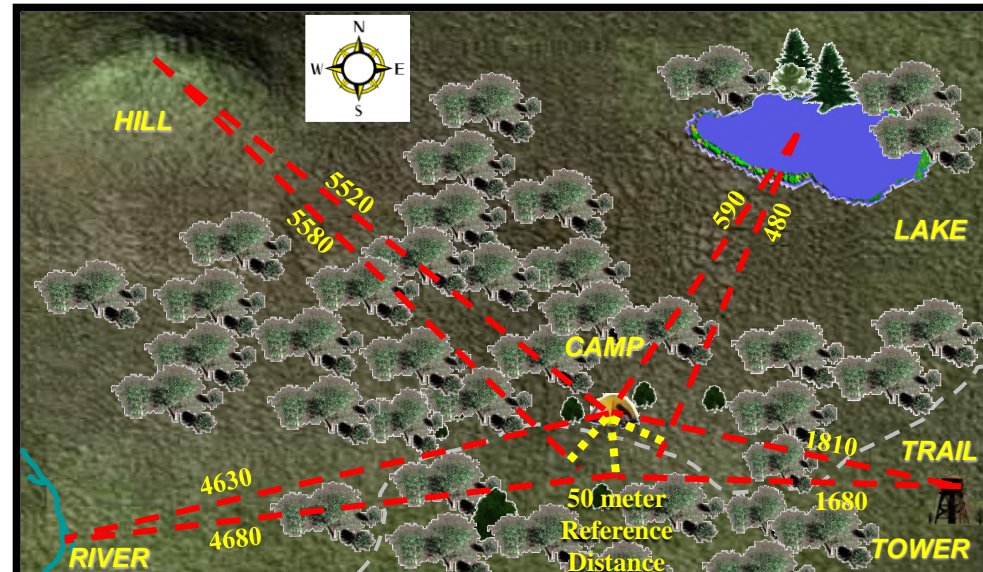
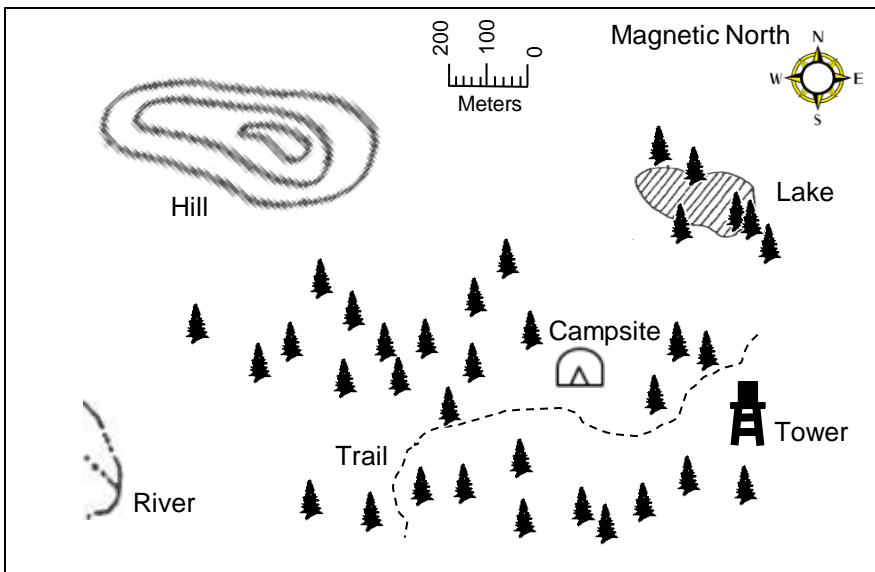
$$d = ((\tan(1600 - (A - B))) \times \text{Ref})$$

HILL distance 861.4 meters. $((17.288(1600 - (5580 - 5520))) \times 50 \text{ meters})$

LAKE distance 468 meters. $((9.36(1600 - (590 - 480))) \times 50 \text{ meters})$

TOWER distance 393.25 meters. $((7.865(1600 - (1810 - 1680))) \times 50 \text{ meters})$

RIVER distance 1088.4 meters. $((21.768(1600 - (4680 - 4630))) \times 50 \text{ meters})$

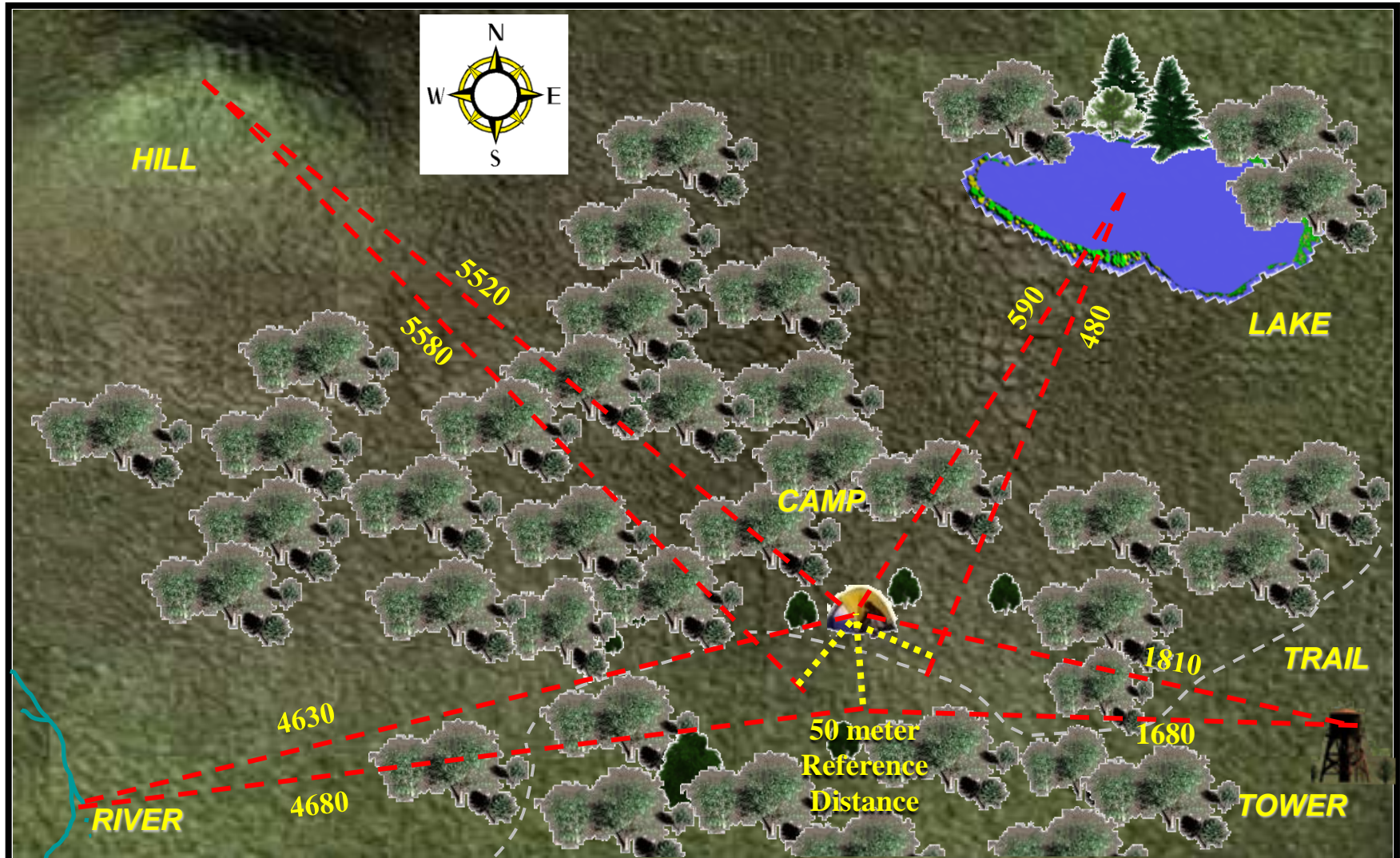


ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

STEP ONE

- From your campsite (select landmarks that stand out and can be seen) take two bearing readings each; to the Hill, Lake, Tower, and River - one bearing from the campsite and the other from a perpendicular (right angle) to a measured distance.



ADDITIONAL NAVIGATION SKILLS

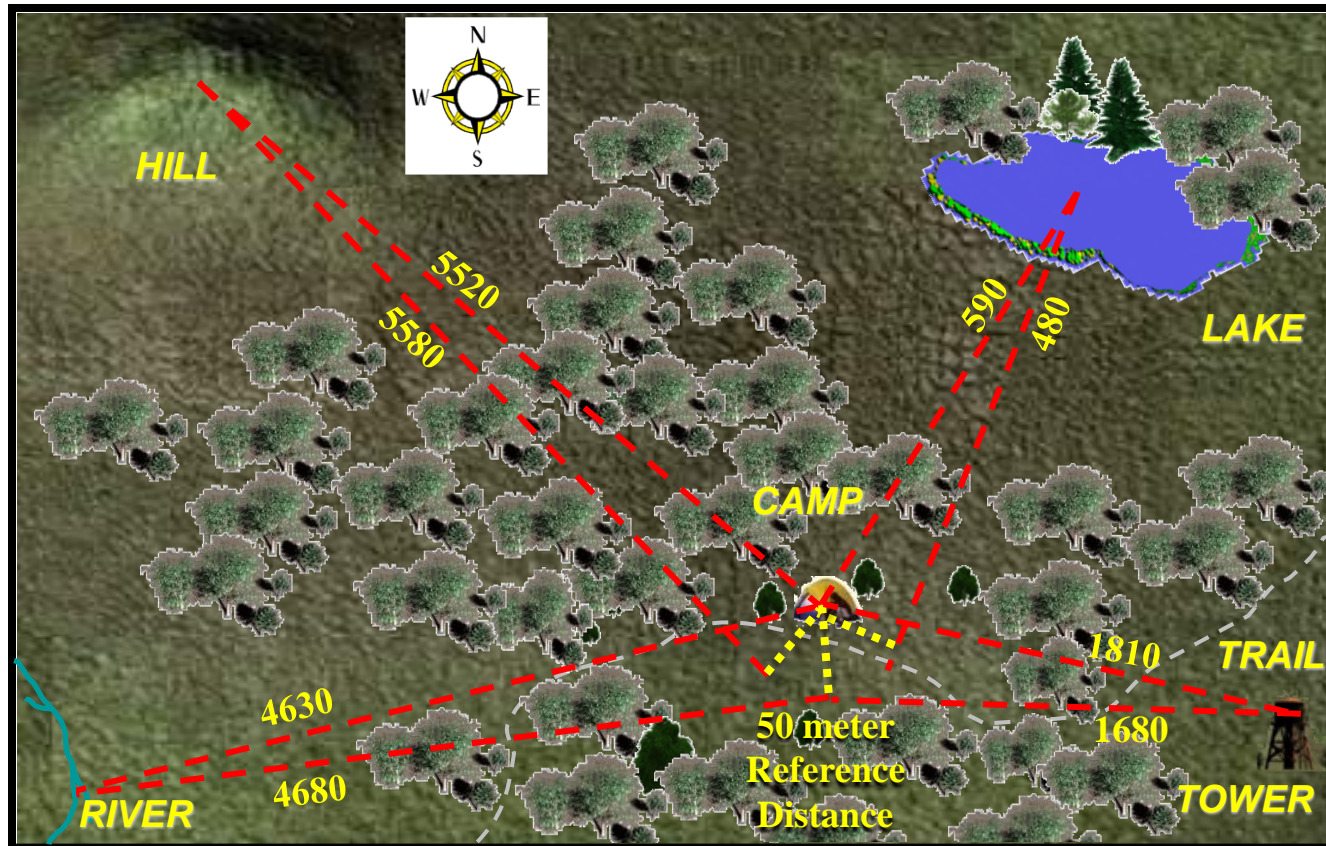
DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

STEP TWO

- With the bearing readings calculate the distance from your campsite to each landmark selected. Hill, Lake, Tower, and River.

$$d = ((\text{Tan } (1600 - (A - B))) \times \text{Ref})$$

Mil	Tan	
1540	17.288	HILL distance 861.4 meters. $((17.288 (1600 - (5580 - 5520))) \times 50 \text{ meters})$
1490	9.36	LAKE distance 468 meters. $((9.36 (1600 - (590 - 480))) \times 50 \text{ meters})$
1470	7.865	TOWER distance 393.25 meters. $((7.865 (1600 - (1810 - 1680))) \times 50 \text{ meters})$
1550	21.768	RIVER distance 1088.4 meters. $((21.768 (1600 - (4680 - 4630))) \times 50 \text{ meters})$



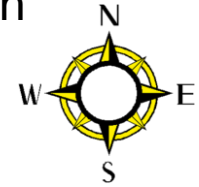
ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

STEP THREE

- On a sheet of paper draw the **campsite** as a starting point and Magnetic North on top of the map. With **MN** there is no need to do any GN conversions.
See Part 2 Intermediate Land Navigation – “Make map speak compass language”.

Magnetic North



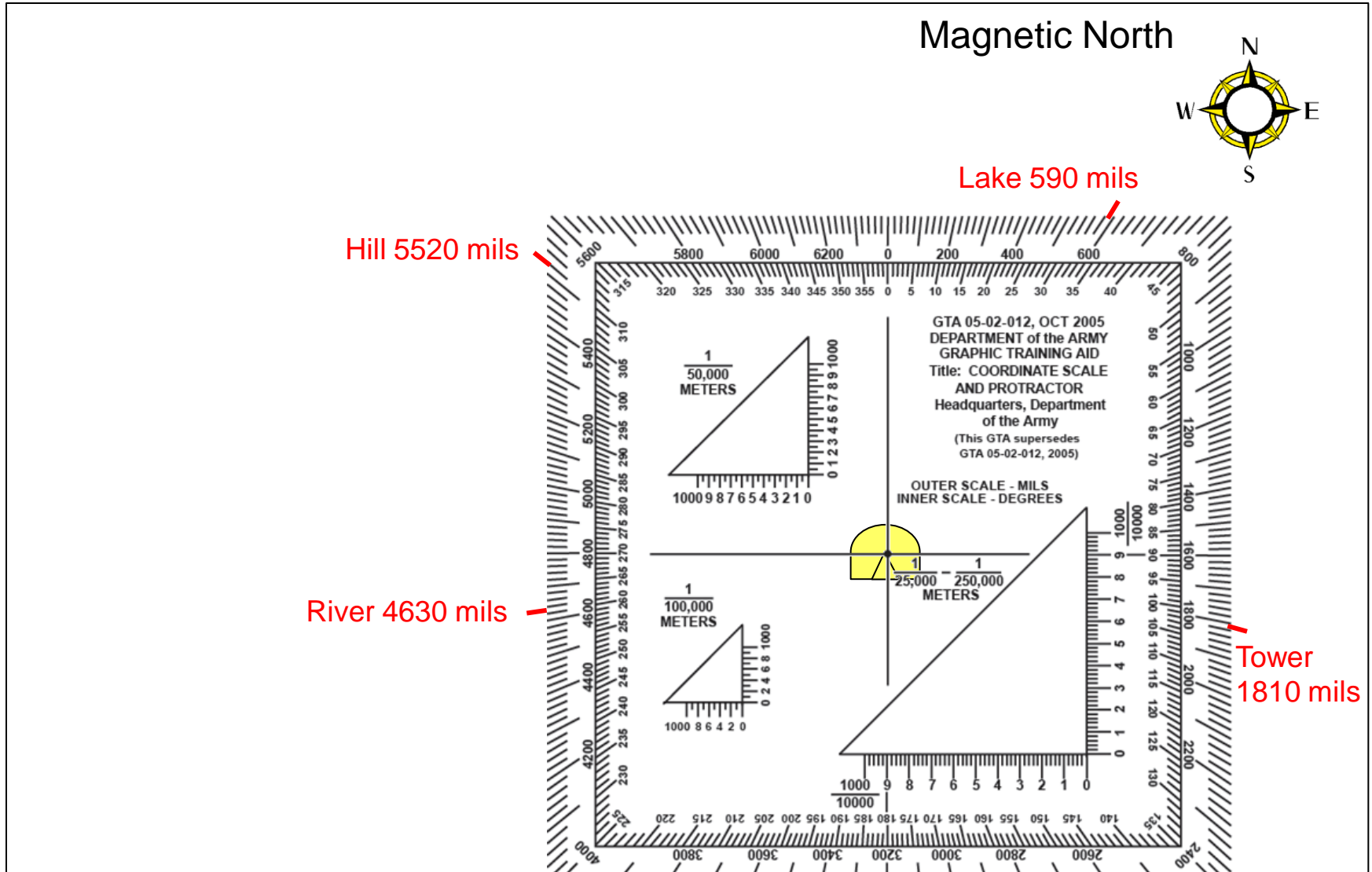
Campsite

ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

STEP FOUR

- With a protractor covering the campsite and using the **campsite bearings**, draw light **tick marks** on the paper at the edge of the protractor bearing.



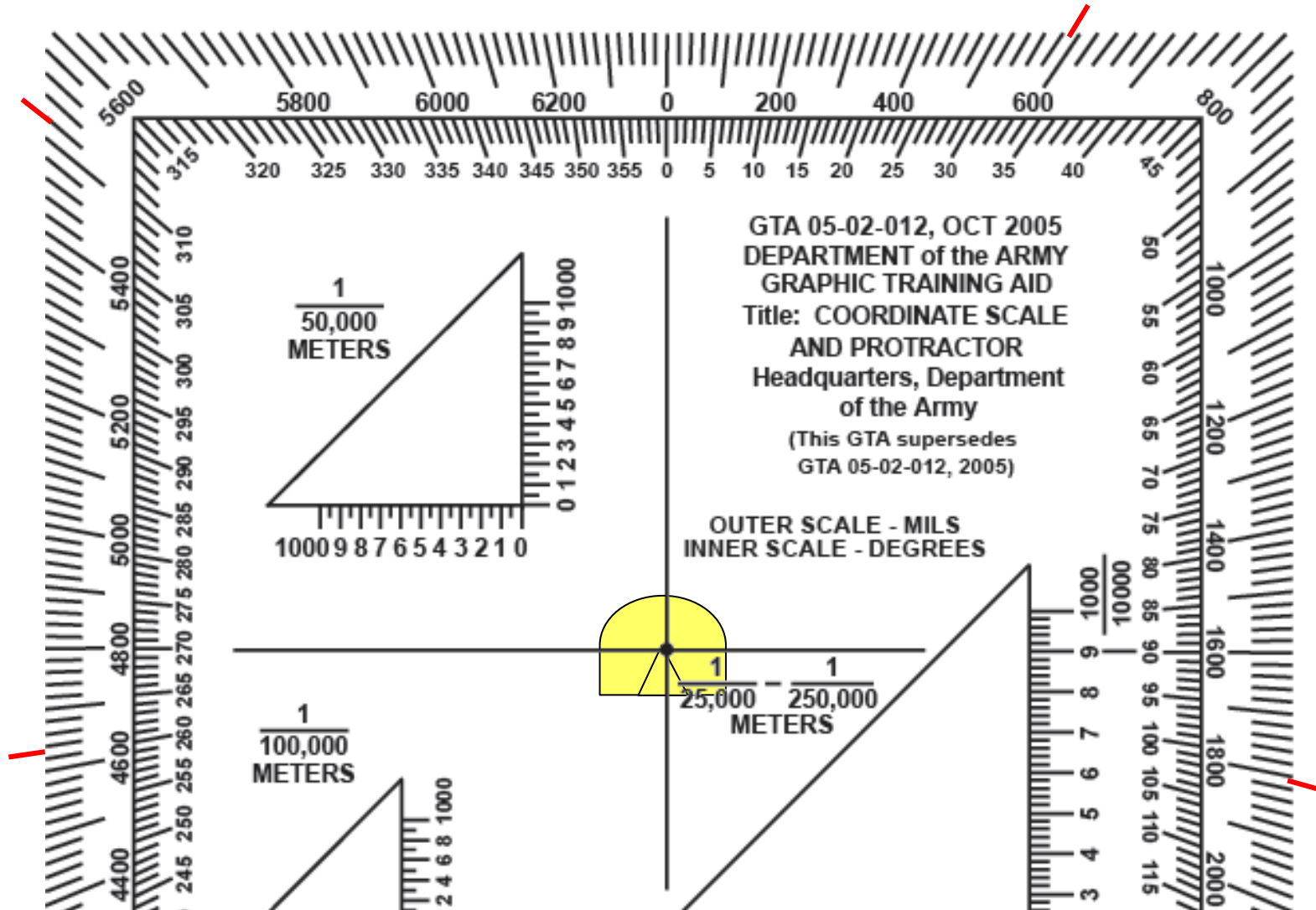
ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

STEP FOUR (A closer look)

- With a protractor covering the campsite and using the **campsite bearings**, draw light **tick marks** on the paper at the edge of the protractor bearing.

Hill 5520 mls
Lake 590 mls
Tower 1810 mls
River 4630 mls



ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

STEP FIVE

- With the Lensatic Compass on the paper, measure from the campsite, thru the bearing **tick marks**, to a determined distance for each landmark and draw the landmark at the measured distance

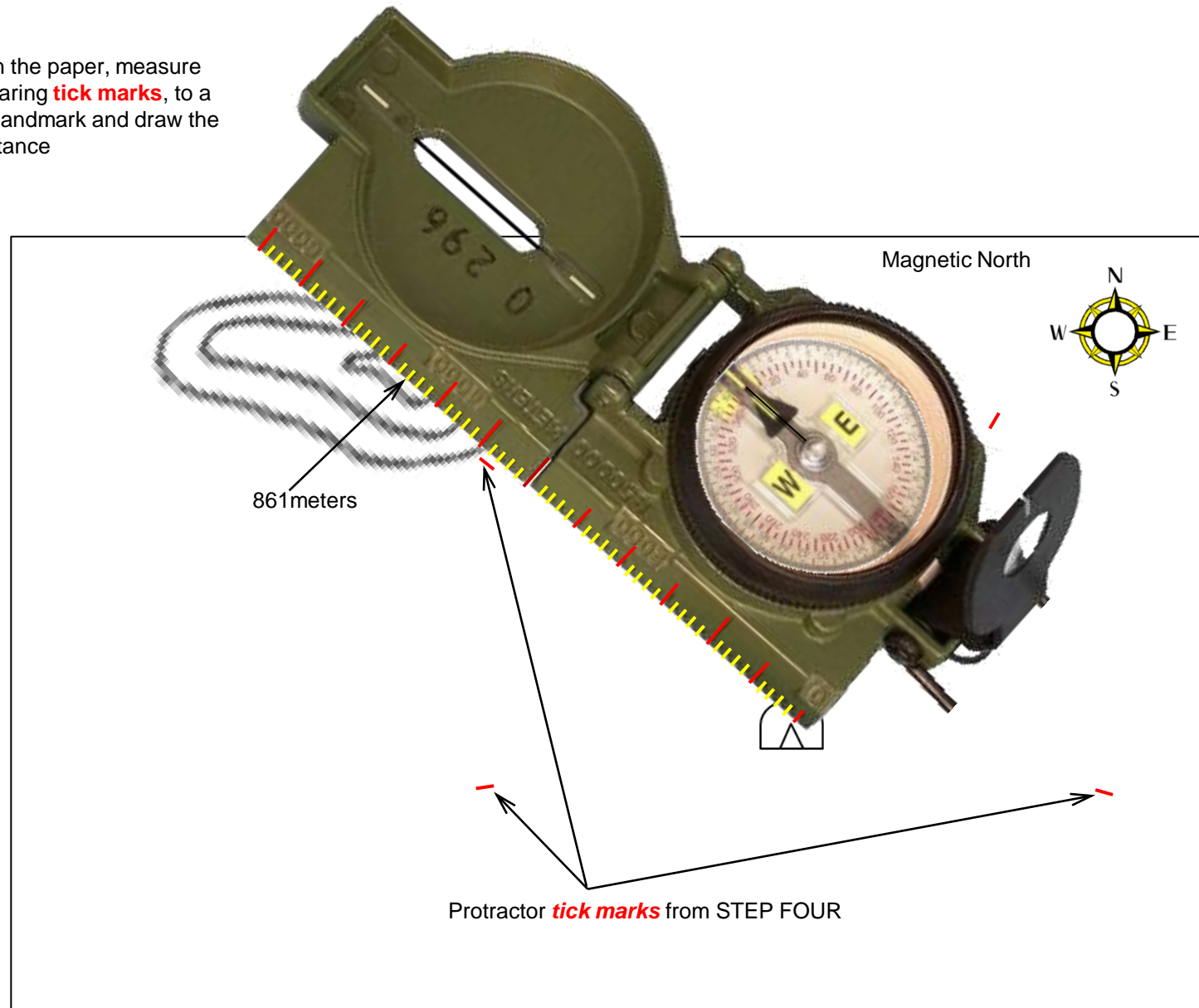
NOTE

When using the Lensatic Compass Graduated Straight Edge, decide which measurement scale you want to use.

In this example the scale used is

Yellow = 20m

Red = 100m

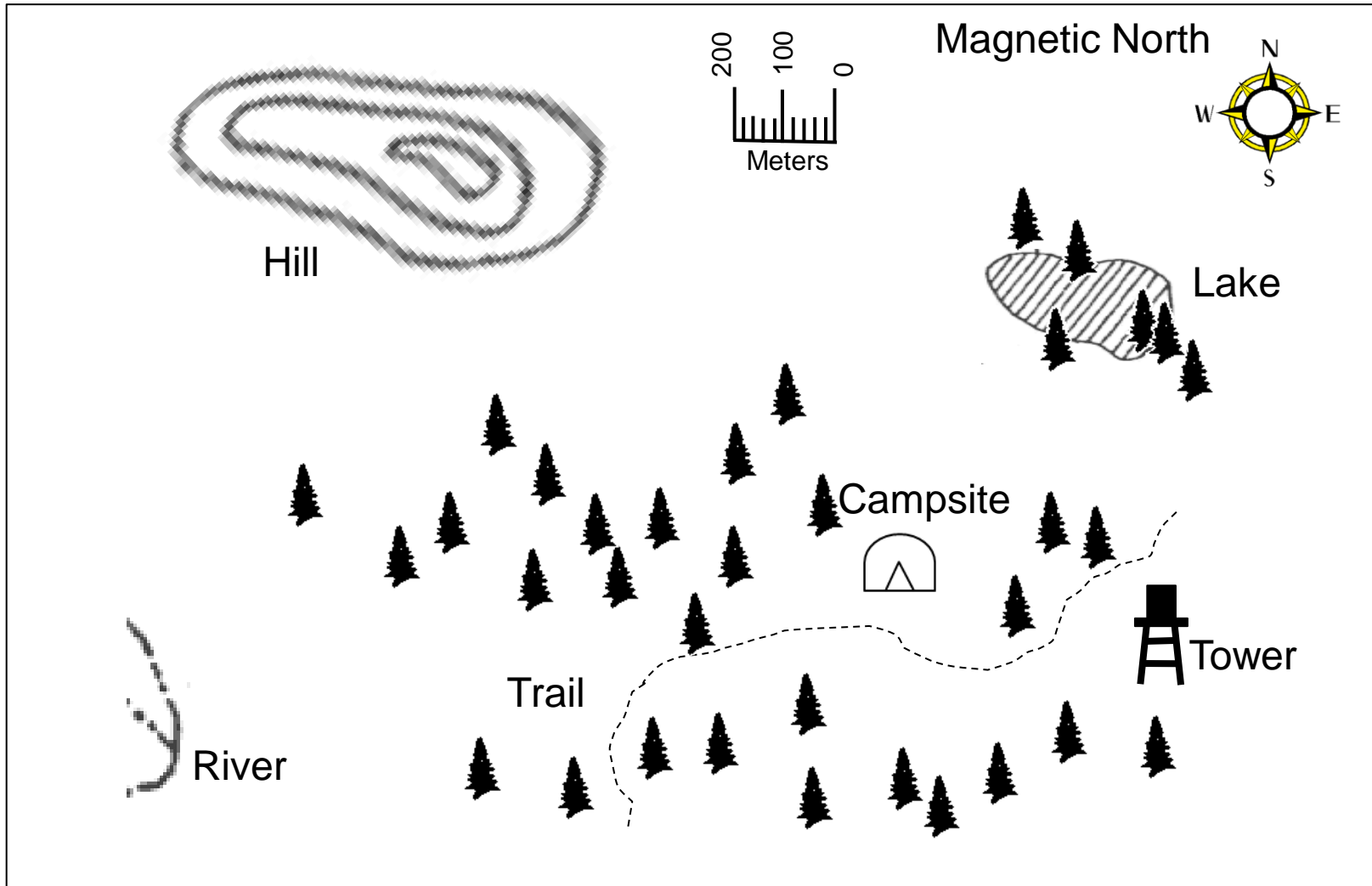


ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

STEP SIX

- With all the landmarks (Hill, Lake, Tower, and River) drawn in, you can then add the following – *Trees, Trails, Landmark names, and any other information you want to add. Such as the scale ruler.*
- When finished, you will have a useful map to explore and navigate the local wilderness. And keep track of your position on your drawn map.



Any Questions?

ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

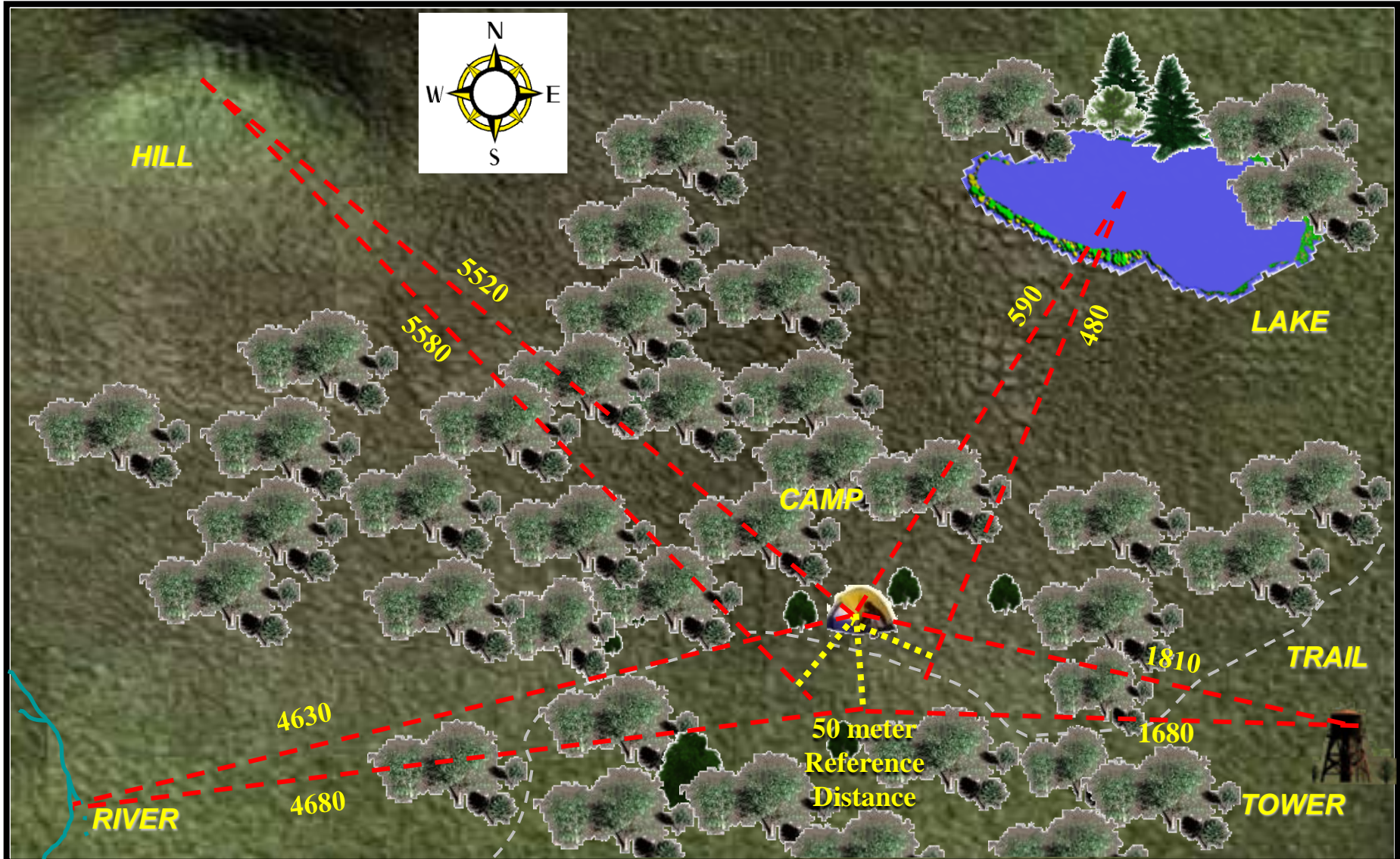
Here is a summary of making a map.



ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

Here is a summary of making a map.

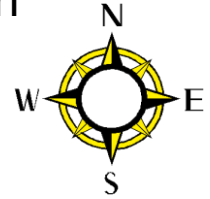


ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

Here is a summary of making a map.

Magnetic North



Campsite

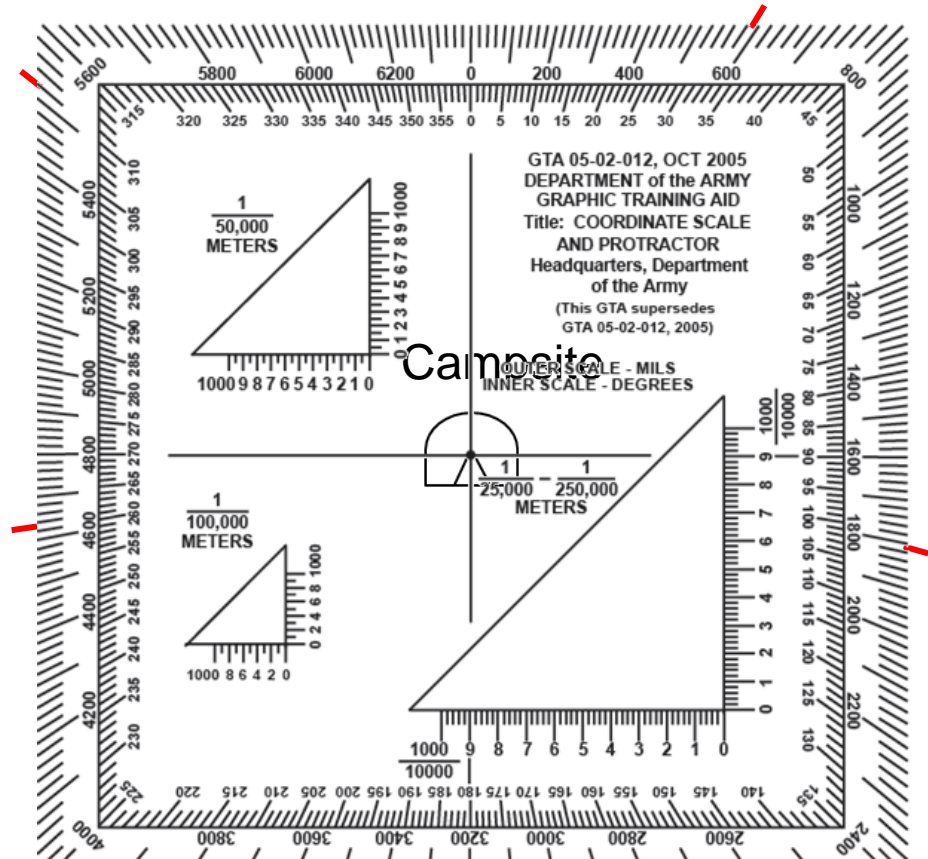
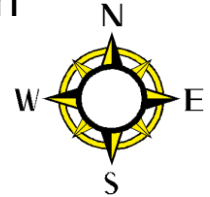


ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

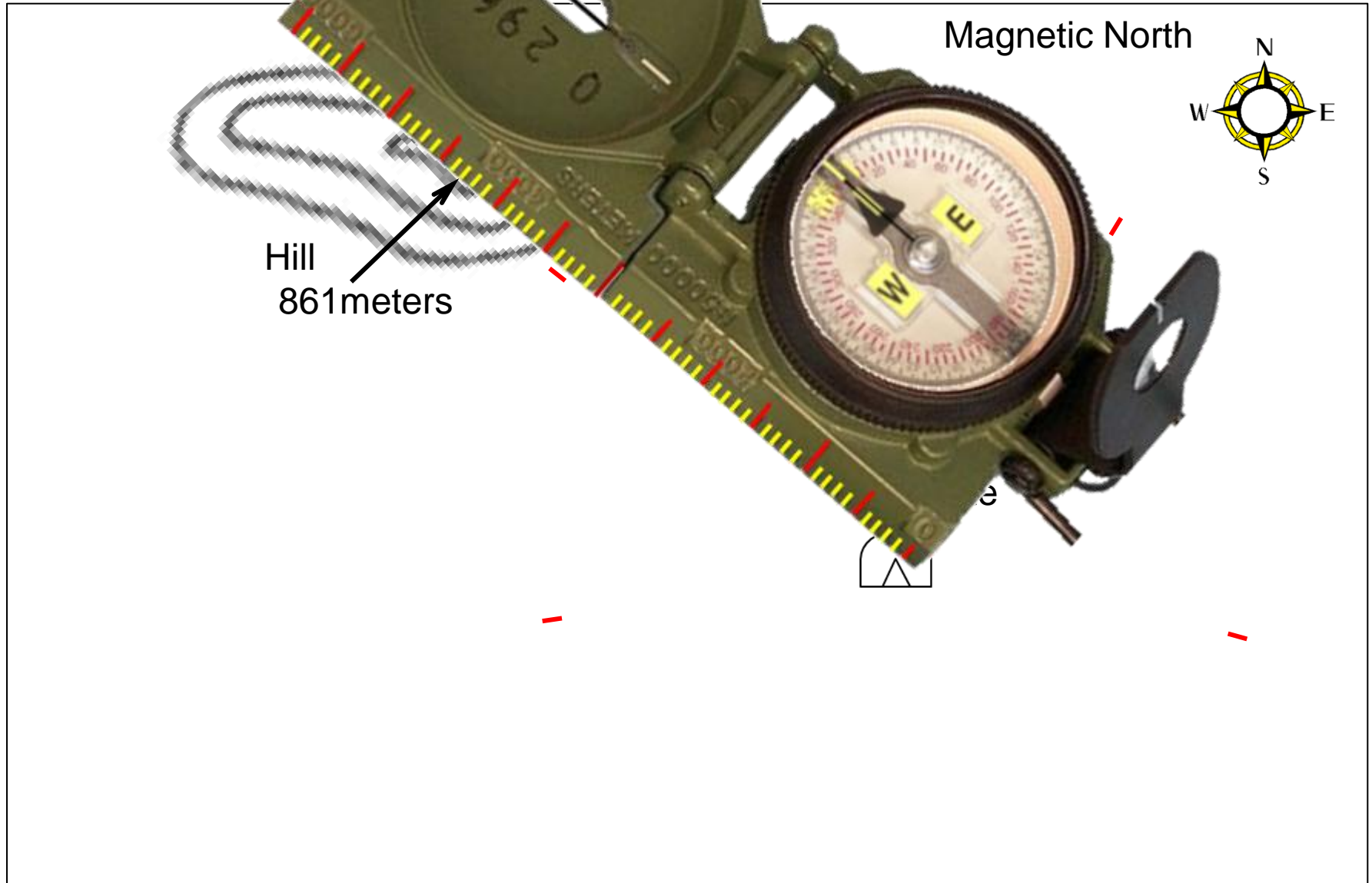
Here is a summary of making a map.

Magnetic North



ADDITIONAL NAVIGATION SKILLS

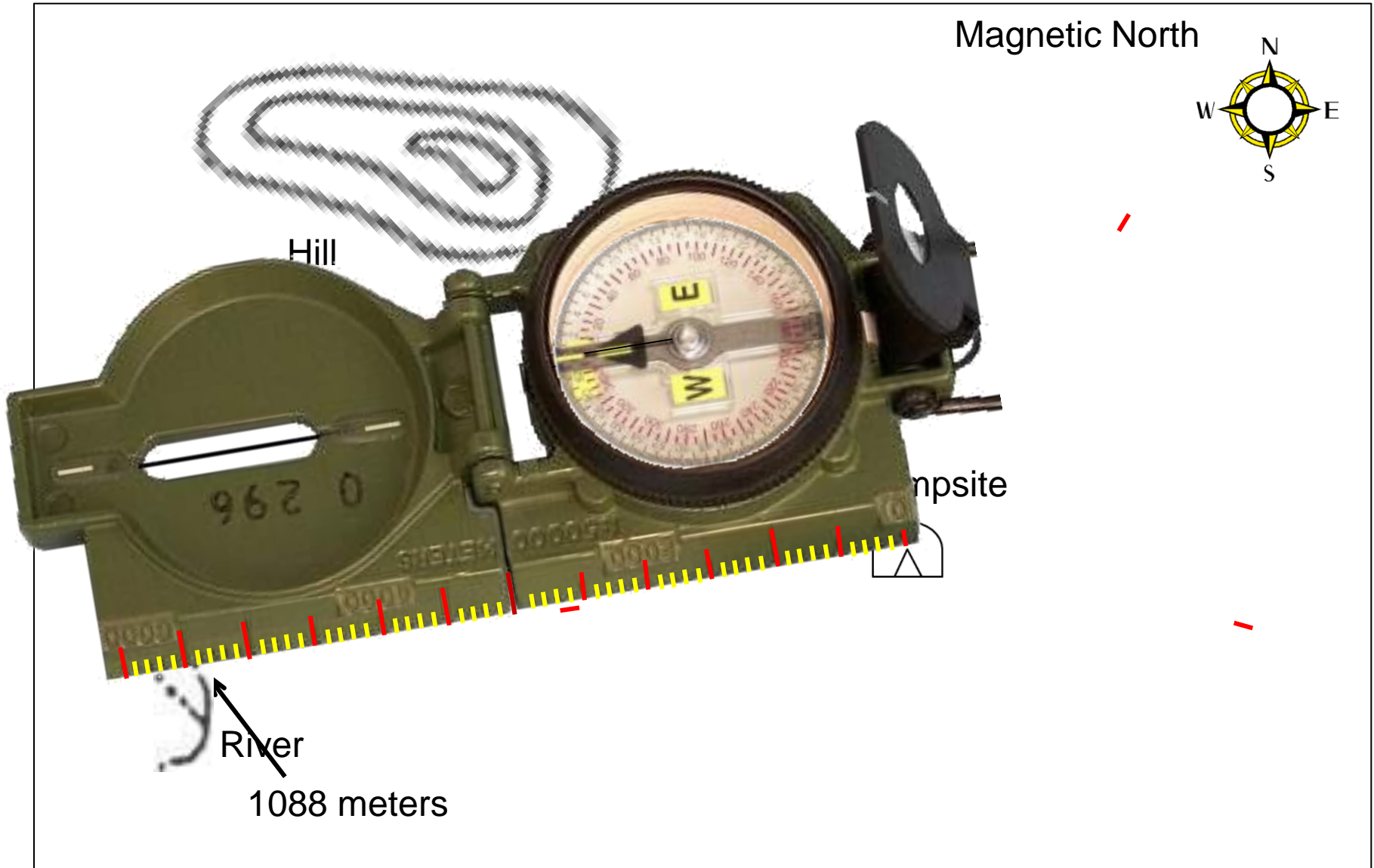
DRAWING A SKETCH OF PREVIOUS SLIDE TECHNIQUES
making a map.



ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

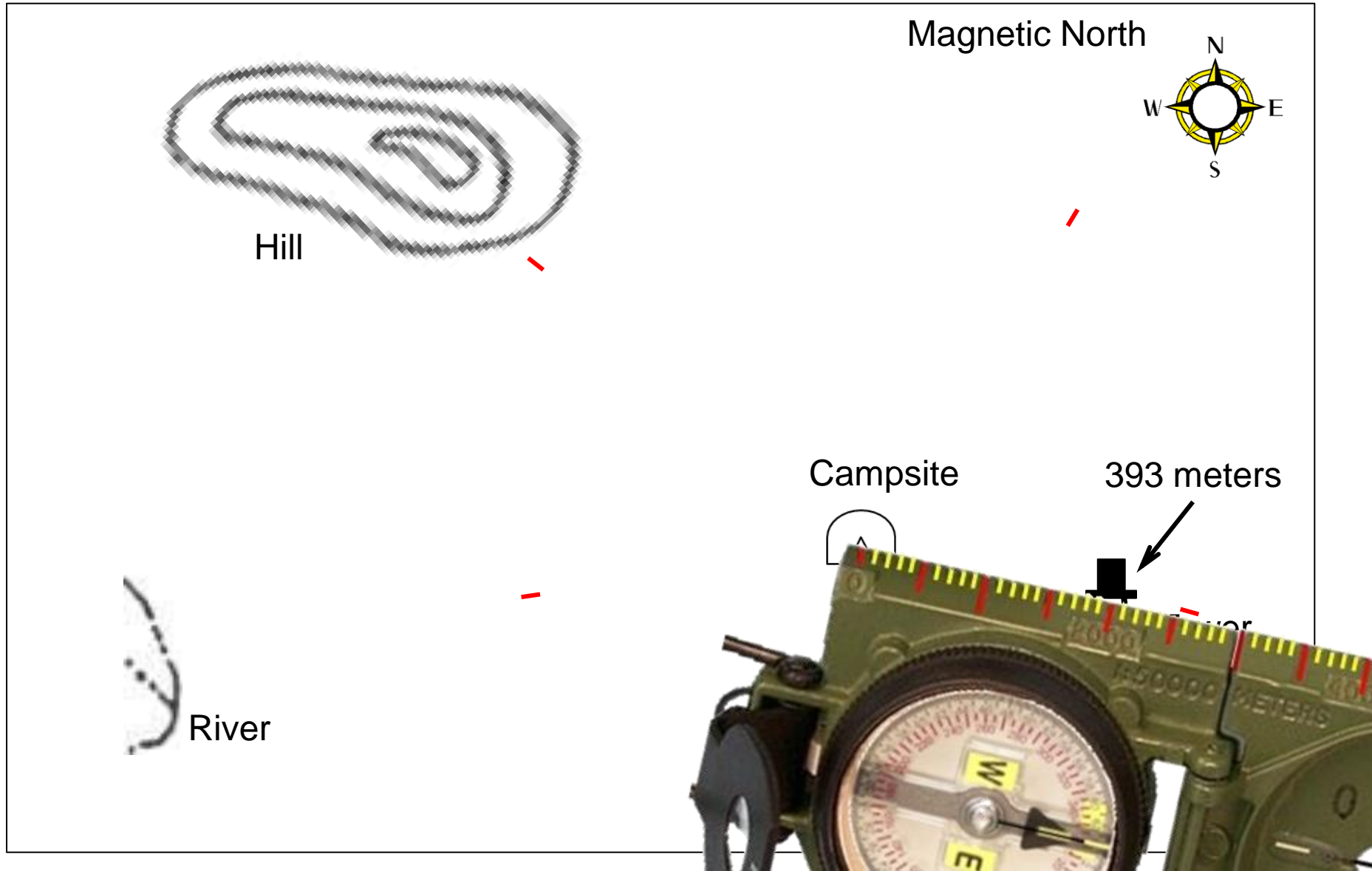
Here is a summary of making a map.



ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

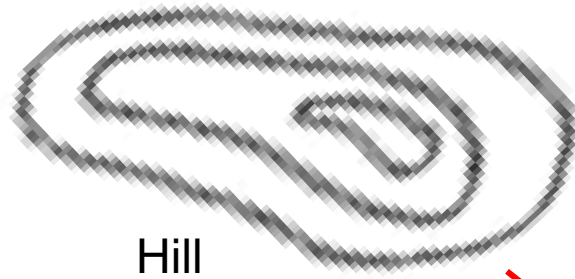
Here is a summary of making a map.



ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

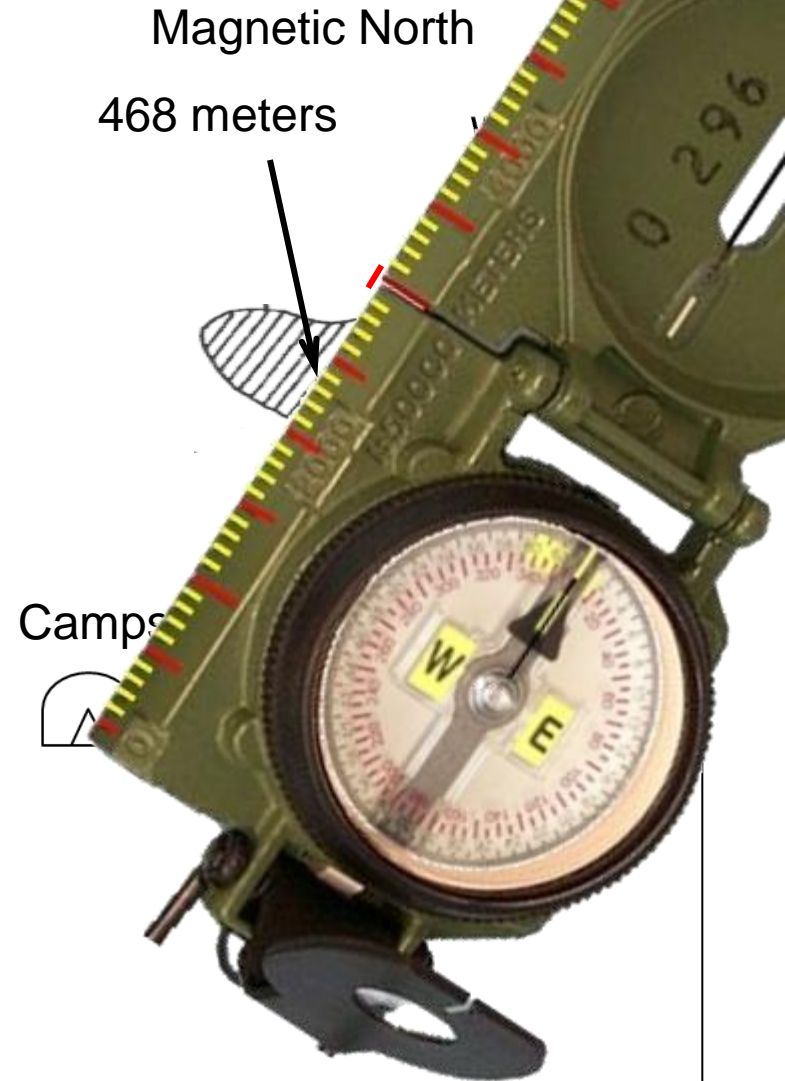
Here is a summary of making a map.



Hill



River



Magnetic North

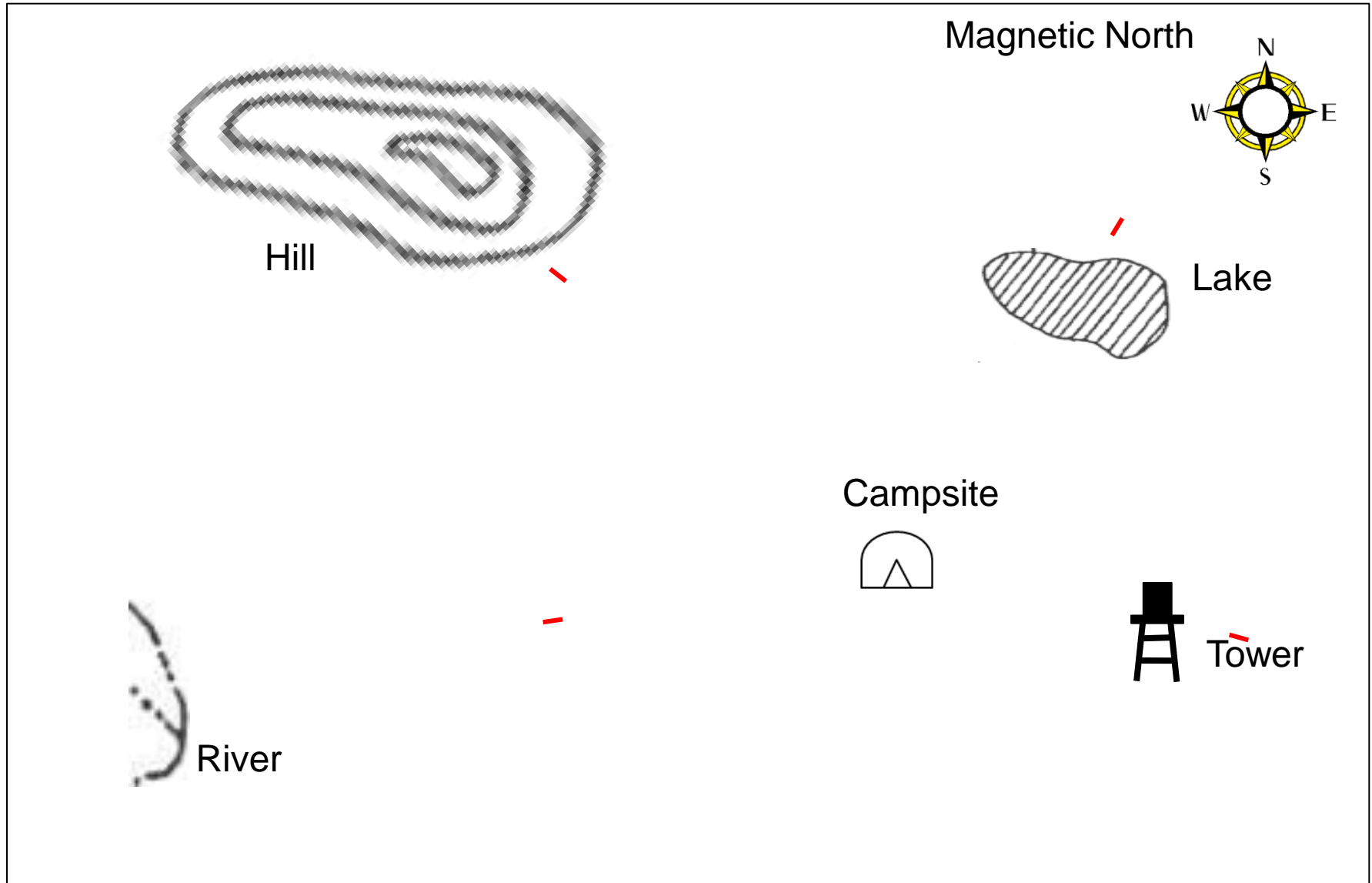
468 meters

Camps

ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

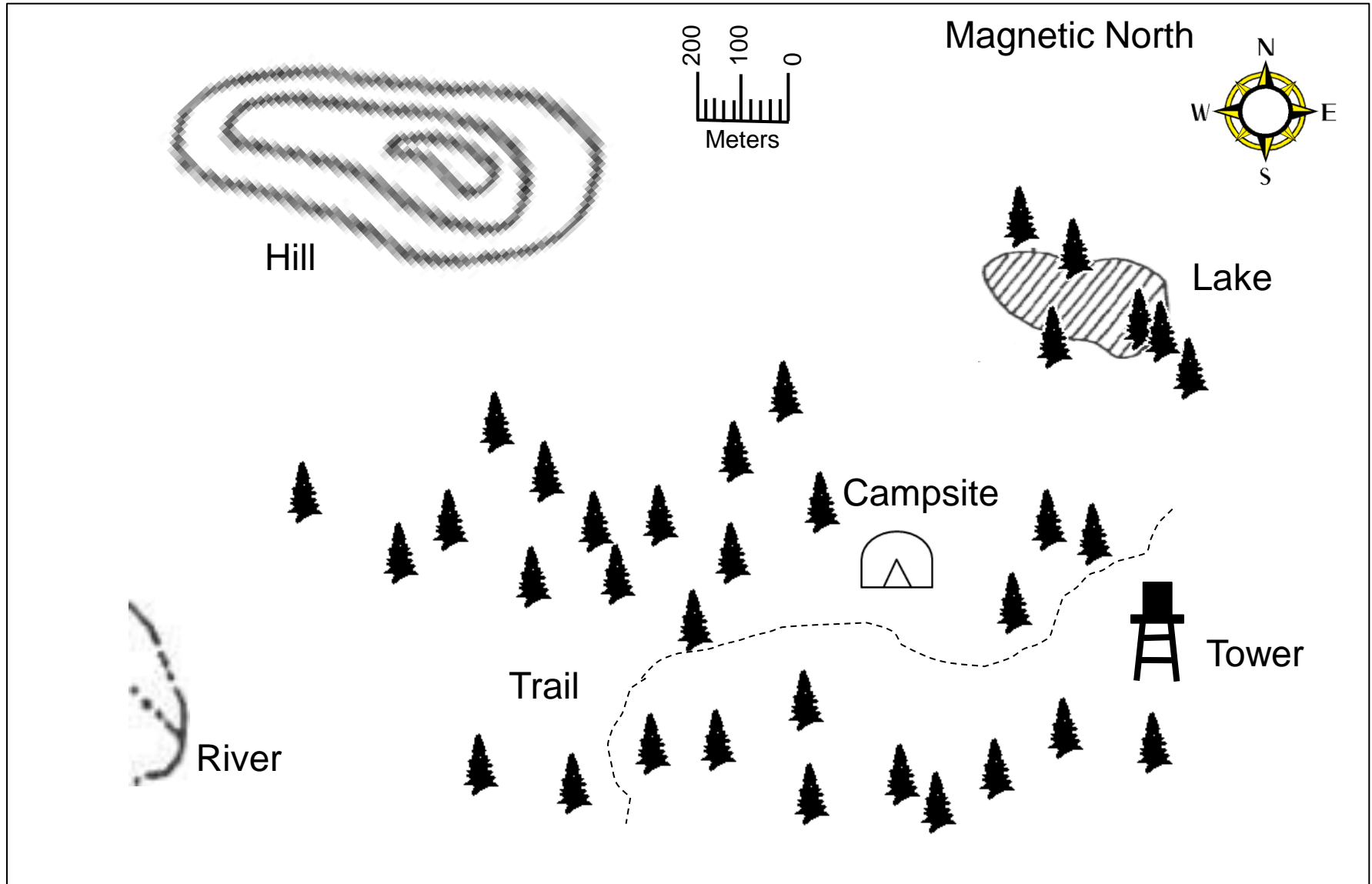
Here is a summary of making a map.



ADDITIONAL NAVIGATION SKILLS

DRAWING A MAP USING THE PREVIOUS SLIDE TECHNIQUES

Here is a summary of making a map.



Any Questions?

ADDITIONAL NAVIGATION SKILLS

CONSERVE ENERGY – REST BREAKS

All groups need to take regular rest breaks in order to hike effectively throughout the day.

- A good schedule is about 5 minutes of rest for every hour of hiking, which will minimize lactic acid buildup in the body.
- Lactic acid is the by-product created when your muscles burn glucose while you exercise, it's what causes your muscles to feel sore.
- When you stop, lactic acid continues to be produced and remains in the system.
- If you stop for less than 5 minutes, this buildup is not a problem.
- If you stop for more than 5 minutes, you may begin to feel muscle soreness and tightening.
- In that case it is best to extend the stop to 25 minutes to allow the excess lactic acid to be cleared out of your system.

Lactic Acid during REST BREAK

Less than 5 minutes – no problem

More than 5 minutes – muscle soreness and tightening

25 minutes or more – body clears the lactic acid

- **Encourage everyone to re-hydrate at every break.**

ADDITIONAL NAVIGATION SKILLS

CONSERVE ENERGY – RYTHMIC BREATHING

- Keeping a breathing rate and pattern is one of the best ways to monitor and control your energy output while hiking.
- **RYTHMIC BREATHING** - you should move at a pace that allows you to breathe comfortably and be able to speak.
- If you are constantly gasping for breath or if you can't keep up a conversation, then you are hiking too fast for your conditioning level.
- The best way to control your pace is to synchronize the rhythm of your walking (REST STEP) with the rhythm of your breathing.
- As the hiking load increases from steep terrain, humid weather, or a heavier pack, your breathing rate will increase.
 - ✓ Slow your pace to regain that controlled breathing rate.
 - ✓ When the load is reduced, you can pick up your pace again.
- This technique, when used with the REST STEP (next slide), will maintain a high endurance output over a long period of time.

ADDITIONAL NAVIGATION SKILLS

CONSERVE ENERGY – THE REST STEP

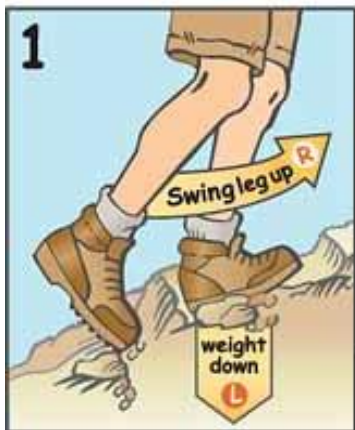
The mountaineer's "**REST STEP**" is your greatest ally on steep ascents. With every step, you briefly transfer weight from your leg muscles to the skeletal system. It takes a bit of practice, but if done correctly allows you to climb farther without excessive tiring. Here is how it works:

Step forward with your right leg while keeping your weight on your back (left) leg and momentarily "locking" the back leg in a straight position. Pause for a split second on your locked left leg. This allows your bones, rather than your leg muscles, to support your weight.

Swing your left leg forward to take the next step, while locking and transferring your weight to your right (now the back) leg. Repeat the process with each step, always putting your weight on your locked rear leg.

It's not really a short rest. Instead it's a pause while sinking into the hip deeply. It's more of a stop motion to the continuous fluid swing of the leg movement that usually happens. This will also allow you to breathe more evenly and less heavily.

You can tell if you are doing the **REST STEP**, if your step is heavy on the terrain and you aren't breathing too hard.



You need to get into a steady rhythm of doing that for each step you take. You may feel like a robot walking slowly up the mountain, but you'll feel much better when you get there.

The **REST STEP** should be used in conjunction with rhythmic breathing. The **REST STEP** keeps your breathing rate easy.

ADDITIONAL NAVIGATION SKILLS

CONSERVE ENERGY – WALKING STICKS

WHY CARRY A WALKING STICK?

IT WILL HELP YOU KEEP YOUR BALANCE

- Crossing creeks, streams, rivers
- Traversing hillsides
- Crossing shale, scree
- Carrying heavy loads
- Resting en route



IT WILL REDUCE STRESS ON BACK & LEGS

- Provides extra power & balance going uphill
- Reduces shock on knees, going downhill
- Takes pressure off back and hips (mainly uphill)

OTHER USES

- Center or side pole for a tarp
- To prop up your pack
- To lean on when resting
- Pushing aside spider webs and brush
- Self defense against animals, snakes, etc.



IT WILL HELP YOU MANEUVER

- Crossing downed trees over trails
- To break or prevent a fall

SHOULD YOU USE TWO SKI POLES, ONE SKI POLE, ONE WOODEN STAFF, OR SOMETHING ELSE?

- It boils down to what is your preference, or more specifically, what feels right on the trail.
- Hikers use two snow poles when on snow.
- On the trail hikers use one or two poles.
- It takes some time to get use to walking sticks.
- Experiment using both.
- Do what's comfortable, what ever works for you.



Any Questions?

ADDITIONAL NAVIGATION SKILLS

PREVENTING BLISTERS

- Blisters demand attention. If you ignore them, you will pay dearly later.
- Always carry a blister kit, even on day hikes.
- Once you hit the trail, you'll want to pay particular attention to your feet.
- Blisters happen fast, but they do give you a warning.
- If you feel a hot spot, stop immediately.
- Don't worry about holding up your hiking partners. A short break to check your feet is far better than limping around on blisters.
- If you do get a blister, first aid treatment makes it possible to walk on a blister, in varying degrees of comfort.



BLISTER BUSTING TIPS

- Make sure boots fit properly
- Treat boots with oils
- Wear non-cotton sock liners
- Keep feet dry
- Go easy on walking mileage
- Pay attention, any rubbing or soreness, stop immediately and check for foot problems
- If you get blisters in certain areas of feet, put moleskin over it in advance, prior to starting your walk



Any Questions?

ADDITIONAL NAVIGATION SKILLS



Not all of these sayings hold true every time under every circumstance, but you might be surprised at just how accurate they tend to be.

THE MOON

- If you can see the dark part of the crescent moon, it means 24 to 48 hours of good weather.

- A ring around the moon brings rain. By counting the number of stars contained within the ring, you can fairly accurately predict how long away the rain will be. Each star represents 24 hours, faint star 12 hours.
- If the moon's face is red, of water she speaks. The red color is due to the presence of dust being pushed ahead of a low pressure front bringing in moisture.

THE SUN

- rainbow or white band around the sun, look for a drastic change in the weather within 12-24 hours. If the weather is clear, plan on stormy weather; if the weather is dreary, plan on fair weather to arrive.
- *Red Sun:* A red sun at dusk or dawn indicates dry weather (fair). **Don't confuse a red sky in the morning with a red sun in the morning. If the sun itself is red and the sky is a normal blue color, the day will be fair.**
- *Red Sky:* A red sky at night, hikers delight, Red sky at morning, hikers take warning.

RAINBOWS

- Rainbows in the morning to the west indicate approaching rain.
- A rainbow at sunset indicates that the rain is leaving and fair weather is on the way.

ADDITIONAL NAVIGATION SKILLS



ATMOSPHERIC LOW PRESSURE (rain)

- If you find yourself out in a marsh or swamp and the air really seems to stink more than normal, expect rainy weather.
- Birds and bats have a tendency to fly much lower to the ground right before a rain due to the “thinning” of the air.
- Smoke hanging low means rain is on the way.

ATMOSPHERIC HIGH PRESSURE (fair)

- Things won't smell quite so strong, fair weather.
- The atmosphere becomes more dense and birds can easily fly at higher altitudes, dry air.
- Smoke rising straight into the air means fair weather.

CLOUDS

- An ability to accurately read cloud formations is invaluable in predicting the weather. For a more detailed look into this, consult a good book on the weather. Each type of cloud is caused by specific actions in nature building up to fair weather or rainy weather.

PLANTS

- *Pine cones* - One of the most reliable of all natural weather indicators are pine cones. In dry weather, pine cones open out as the scales shrivel up and stand out stiffly. When it is damp, they absorb moisture and as the scales become flexible again, the cone returns to its normal shape.
- *Flowers* - flowers bloom in fair weather and close when rain is approaching.
- *Grass* – dew on the grass, rain will never come to pass. When grass is dry at morning light, look for rain before the night.

Any Questions?

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.**

TESTING

Now it is time for the following . . .

- Written exam
- Hands-on / Outdoors exam

THE END OF
LAND NAVIGATION
PRESENTATION
PART 3