

Navigation 101 Clinic

Topography and Topographic Maps

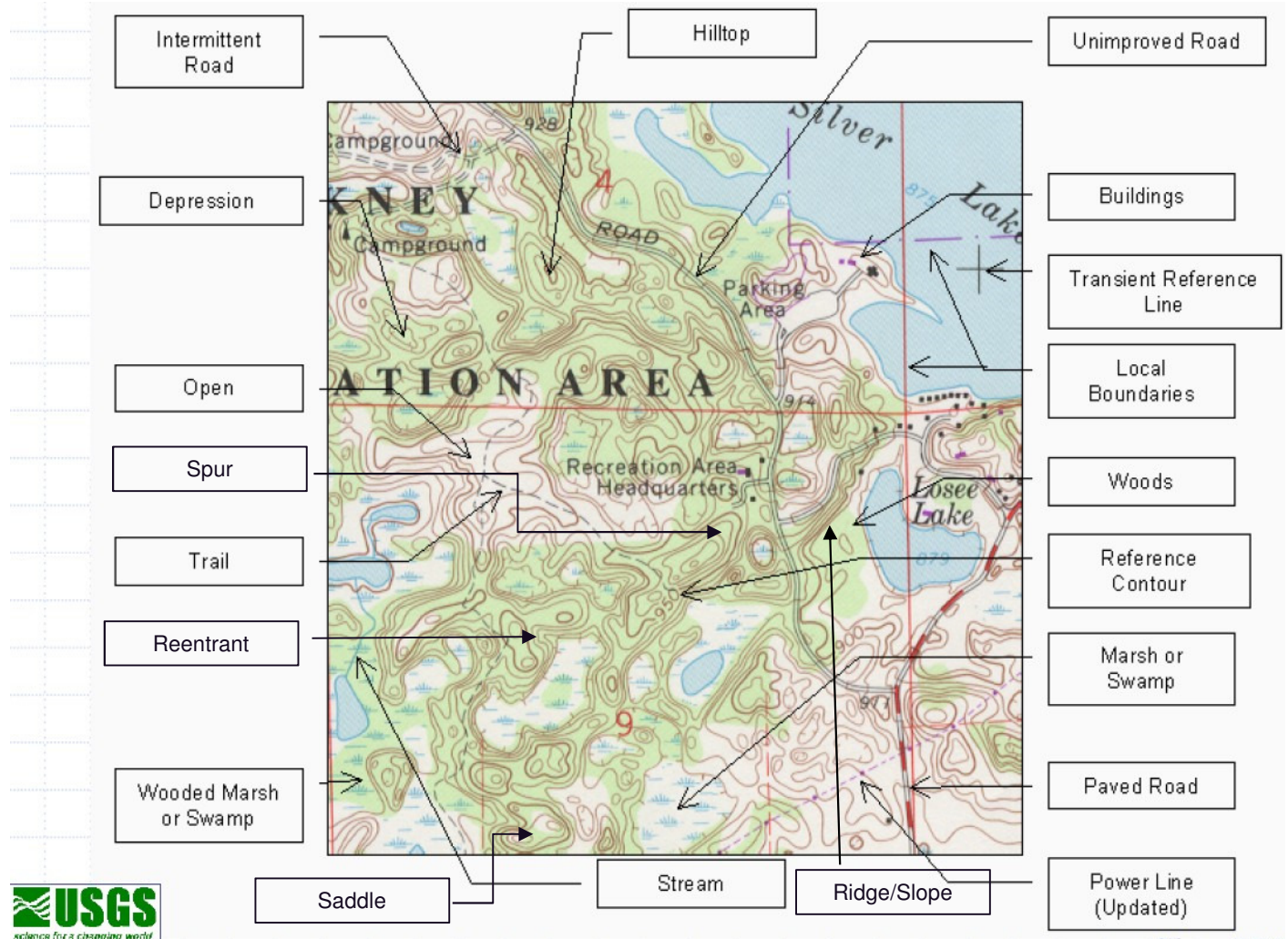
Basic Features

- **Steep slopes** - contours closely spaced
- **Gentle slopes** - contours less closely spaced
- **Summits/hilltops** - concentric circles
- **Depressions** - concentric circles with lines radiating to the center
- **Spurs** - bulge off of a ridge line. U-shaped series of lines off high ground.
- **Reentrants** (gullies) - indentations along ridges (marking water drain). V-shaped series of lines off high ground.
- **Saddles** - area between summits
- **Ridges** - parallel lines sloping down hill

Colors

- Green: woods, brush
- Blue: water
- White: light vegetation
- Brown: contour lines
- Red/gray: urban areas

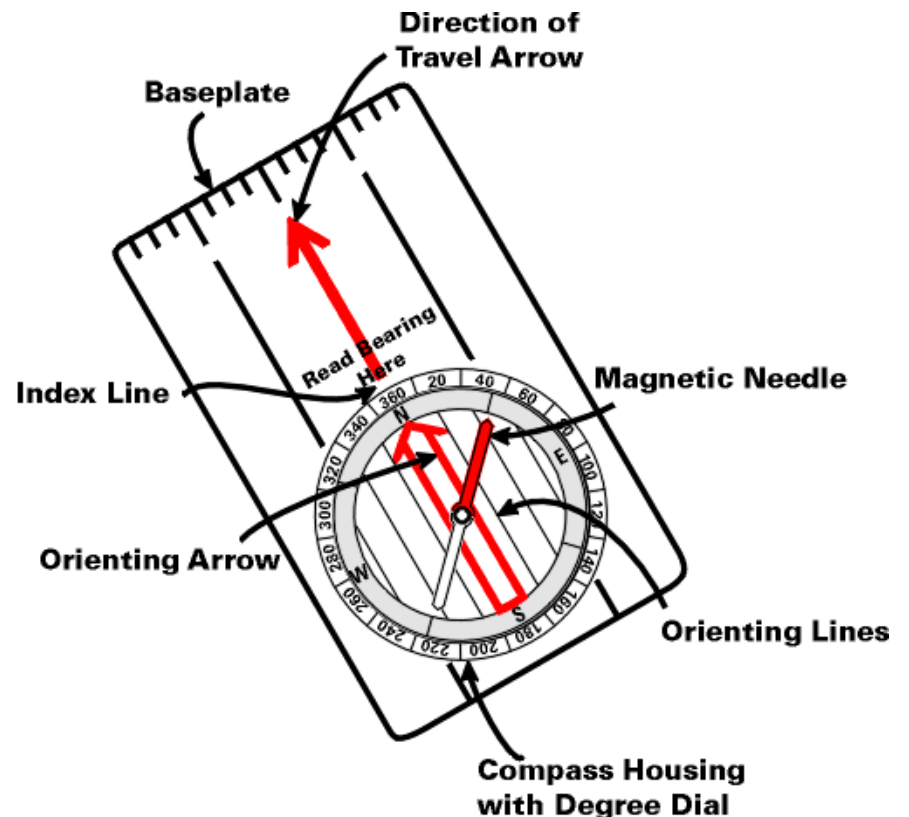
• **NOTE** - Look for low spots and water. Water flows down hill.



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Compass Elements, How to Use

- Rotate compass housing to align with the desired direction (“bearing”, e.g., west or 270 degrees) with the direction of travel arrow.
- Follow the direction of the travel arrow on the compass, keeping the magnetic needle aligned with the orienting arrow on the housing (red in the shed).
- To determine what direction you are facing, point the direction of travel arrow and rotate the compass housing until the needle is aligned with the orienting arrow.



How to Navigate with Compass & Map

To find the Bearing from point X to Y

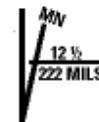
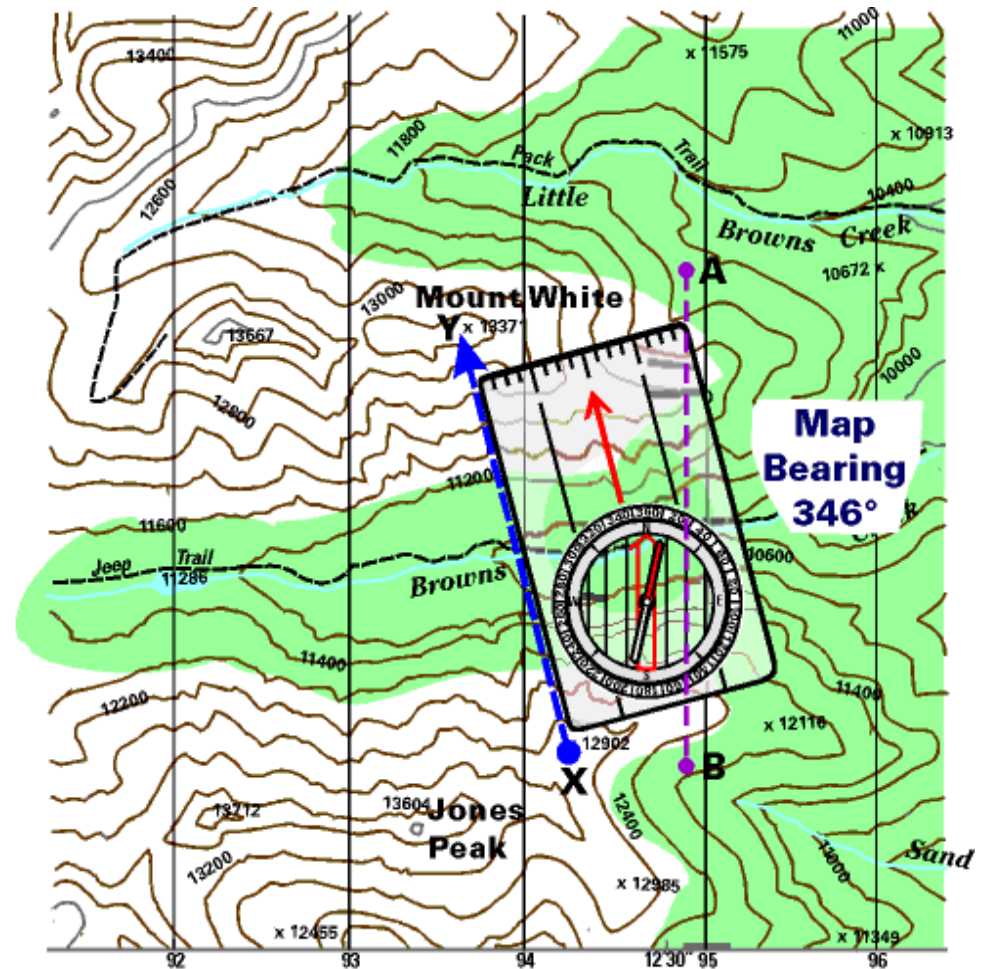
- Align the edge of the compass with starting (X) and finishing (Y) points
- Rotate the compass housing until the orienting lines on the compass line up with the N/S orientation lines on the map. North on the compass degree dial should match North on the map. Read bearing.

To “orient the map”

- Rotate the map and compass together until the red end of the compass needle points north (red in the shed).

To go from X-> Y

- Follow the direction of the **travel arrow** on the compass (the arrow on the baseplate, not the red end of the compass needle), keeping the needle aligned with the orienting arrow on the housing. Use objects such as trees in the distance to follow rather than always looking down at compass.



Common Mistakes

- Orienteering only works if you know where you are (X).
- Ensure that you are lining up the compass with direction of travel arrow pointing from X (where you are) to Y (destination), not Y to X.
- When you rotate compass housing to line up north/south lines on compass with those on the map, make sure that north on the compass matches north on the map.
- Make sure you know how far you have to go (distance)
 - On a 1:24,000 scale map, every 1 cm = 240 meters
 - On a 1:10,000 scale map, every 1 cm = 100 meters
- Try counting your steps or paces (every other step) in the woods to get a good idea of how far you are going. And measure how long it takes you on average to travel 100, 400, 800 meters in various types of terrain.



Strategy

Practice

- Review past races, attend clinics, get tips online
- Yankee Springs Permanent Orienteering Course <http://michigano.thecyberdesigner.com/permanent-course.htm>
- Do it yourself
 - ✓ Use online topo maps or a free smartphone gps app (e.g., Terrain Navigator Pro) and take a hike off-trail
 - ✓ Draw a line from one point to another, find every feature as you pass by it
 - ✓ Create “streamer” courses for each other (or create online and then find features)

Format Considerations

- Breakout/score (Winter, Lake MI) vs. traditional/linear vs. hybrid (Epic)
- Sections – run, bike, paddle (strengths, limited canoes in some of our races, crowds)
- Difficulty/length – magnetic declination, pacing
- Venue – known vs. unknown, online research, past race maps

Challenges

- ✓ Avoiding lines/limited equipment and stations
- ✓ When it’s good to have other teams around
- ✓ Time of day, time of race considerations



Strategy

Trails

- Is the trail on the map? How confident am I about this?
- Will it take me where I need to go; could it suck me into where I don't want to go?
- How fast can I travel on trail vs. off-trail? How much farther is it to take the trail? How certain is it I will know where I am along the way and at the end?
- Does it have attack points ("kinks" or intersections, elevation changes, natural features) that tell me where I am?
- If it's winter, are the trails likely to have been used prior to the race? Can I tell where they are? What trails are groomed? (Pre-run trails when possible)

Terrain

- The sure (slow) thing vs. the (fast) unknown (e.g., going over a hill on bearing vs. wrapping around)
- Where does the terrain usually suck? Near creeks, reentrants (fall lines)
- Where does the terrain help guide you ("handrails")? Creeks, reentrants, ridge lines.
- Stay within sight of creeks and reentrants but above them... e.g. on ridge lines or "spines"
- Pay careful attention to contour lines
- Climbing vs. descending. Climb early while fresh?

Measurement

- Pre-race: compass ruler, map wheel
- During race: compass, pace counting, stopwatch, counting features (e.g., reentrants)



Strategy

Recovery/Relocation

1. When you feel you have lost contact with the map, stop. Stop sooner rather than later.
2. Orient the map with the compass.
3. Re-establish your location by looking at the oriented map and the features around you.
4. If you can't relocate right away, then reconstruct with teammate(s) where you think you went since the last place you knew you were.
5. If you still can't figure out where you are, find a feature that you know is on the map (e.g., hilltop, trailhead) or return to the last place of known position.
6. Once you have relocated, don't rush to make up lost time except when you know where you are (e.g., a trail, road, on a river).

End Game

- Exiting an orienteering course
- Managing time (e.g., measure distance from furthest point)
- Design with the end in mind
 - ✓ finish near the finish
 - ✓ Create loop that maximizes CPs and gets you back closer to the finish
 - ✓ plan for short on time and long on time



Strategy

ATTACK POINT

A location that you are confident that you can identify and take a compass bearing from.

Best strategy if the control isn't on or near a handrail or other large, distinct, easily identifiable feature, choose an

Your accuracy in following the bearing decreases as the distance you travel increases.

Note: using an attack point is also useful in less challenging situations, where you don't have to use a compass.

HANDRAIL

Features that you can follow easily (like a handrail on a staircase).

Trails, roads, fences, streams, ditches, the edges of fields, and other long, narrow features just as easily.

Takes much less concentration than following a compass bearing.

AIMING OFF

Deliberately aiming to one side of a feature on or near to confidently predict which side it will appear on.

For example, if you aim right at a bend on a stream, but don't see it when you hit the stream, you won't know whether to go upstream or downstream to look for it.

VISUALIZATION & COLLECTING FEATURES

Constantly visualize features in your mind before you get to them, then identify the features as you pass them, and locate or "collect" them on the map. "There should be a reentrant coming up on my right, and then there'll be a marshy area off to my left"),

If necessary, break a long leg up into several shorter sections between identifiable features, even if it means following a zig-zag course.

CATCHING FEATURE

Lets you know if you've gone too far.

Look on the map a short distance beyond the CP you are heading for, and pick out a big, distinct feature that you can't fail to recognize. If you arrive at this catching feature, you will know you have overshot the control, and can turn around and go back. "Catches" you.



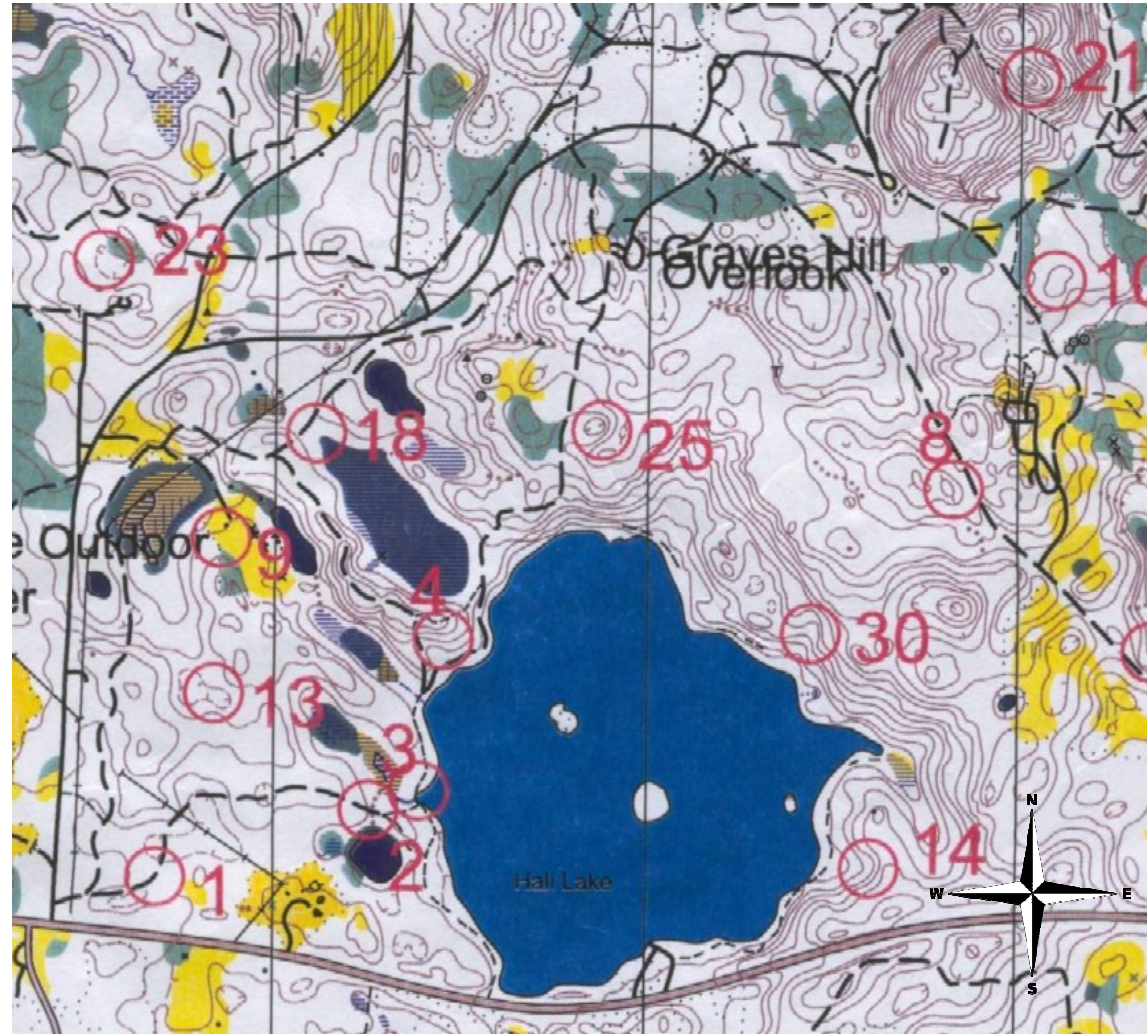
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Learn to Find a Bearing Worksheet

(courtesy Grand Rapids Area
Adventure Racing)

Find the bearing (number on the
compass housing) from the following
checkpoints:

- A: CP25 to CP4. Bearing = _____
B: CP4 to CP9. Bearing = _____
C: CP25 to CP30 Bearing = _____
D: CP30 to CP8 Bearing = _____
E: CP8 to CP14 Bearing = _____



Answers: A= 217 B= 294 C= 135 D= 44 B= 193



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