



Using the earth's magnetic field to find direction

# DECLINATION



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# Declination

What is declination?

Declination is **the angle between magnetic north and true north.**

Why does it matter?

Because **compasses align with magnetic north** and **maps align with true north.**



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# Declination

What else is important?

- Declination is complex
- Declination changes with time

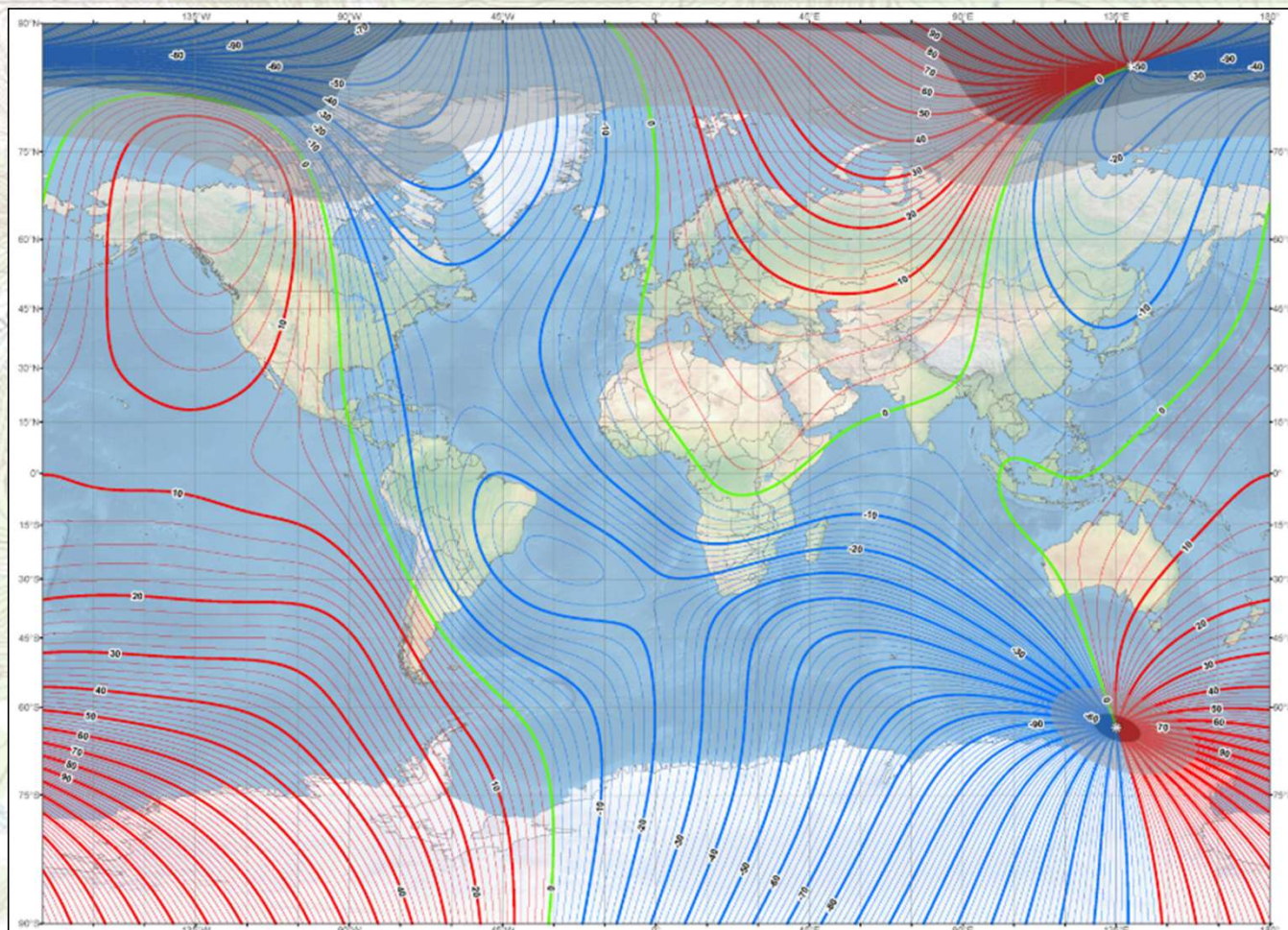


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# World Declination: 2025



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# Current Declination: Olympia Friends House

15.04° E, changing by 0.12° W per year

<http://www.ngdc.noaa.gov/geomag-web/#declination>

Or search for “magnetic declination”



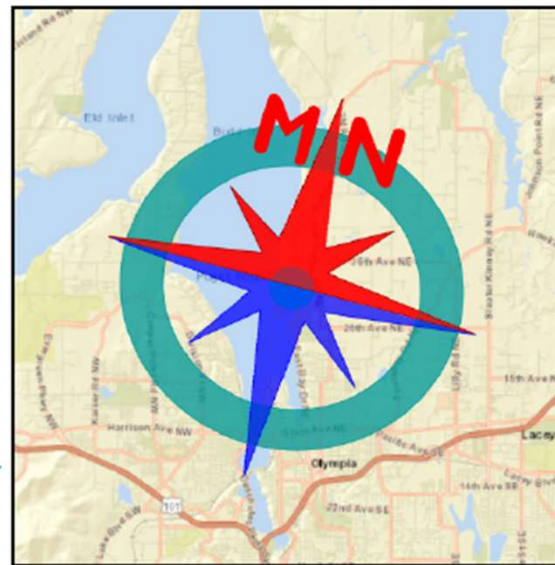


# Current Declination: Olympia Friends House



## Declination

<b>Date</b>	2025-04-01
<b>Latitude</b>	47.077778° N
<b>Longitude</b>	122.896944° W
<b>Elevation</b>	0.0 km GPS
<b>Model Used</b>	WMM-2025
<b>Declination</b>	15.04° E changing by 0.12° W per year
<b>Uncertainty</b>	0.38°



The compass shows the bearing of the local magnetic field relative to geographic north.





# How do You Correct for Declination?

1. Do the math (Various mnemonics for this)
2. “Set it and forget it.”





# Do the Math:

Necessary if you do not have an adjustable compass

- You have to add or subtract the adjustment
  - Based on whether you are converting from a MB to a TB or vice versa
  - Based on east or west declination





Mnemonics:

Declination East, Compass Least

Empty Sea add Water

True to Mag, Subtract East

Mag to True, add East





Do the Math:

East Declination is Positive (+)

West Declination is Negative (-)

Converting MB to TB: Add the declination

[If the declination is west you are “adding” a negative number.]





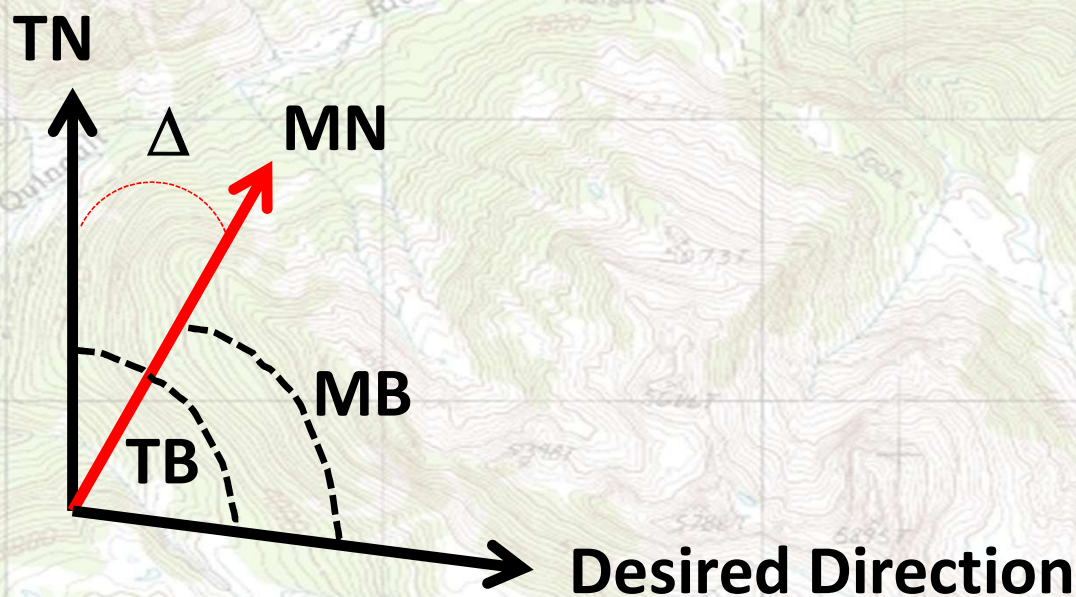
# Do the Math: Correcting a Magnetic Bearing for East Declination

$$TB = MB + \Delta$$

$$MB = 285^{\circ}$$

$$\Delta = 15^{\circ} \text{ E}$$

$$TB = 300^{\circ}$$

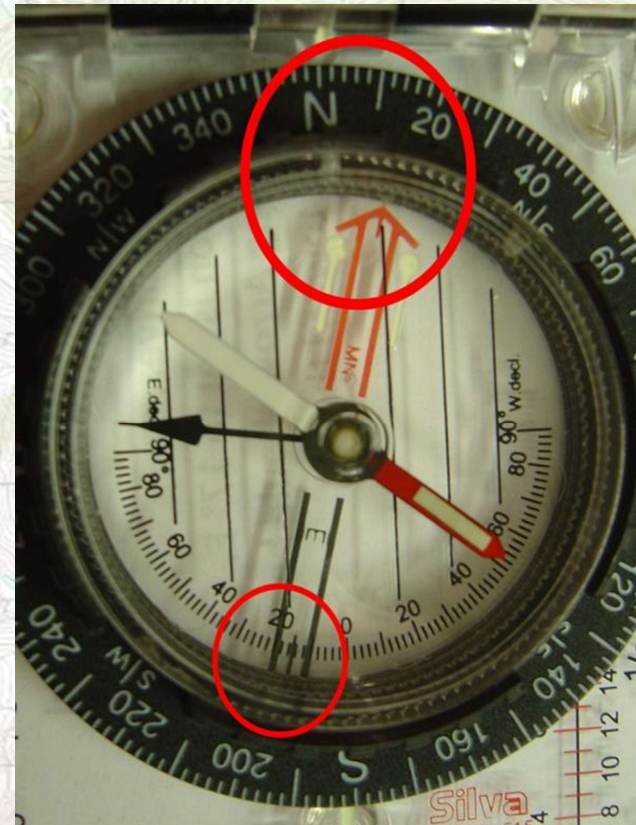




# “Set it and Forget It”

## How to Set Declination

1. Use screwdriver on the lanyard to twist the adjustment screw.
2. Set to 15° E. Use the line in the middle of the south end of the orienting arrow.
3. The orienting arrow should point east of north.







Questions?



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# Break Time



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How to enhance your sense of direction with a tool

# COMPASS USE



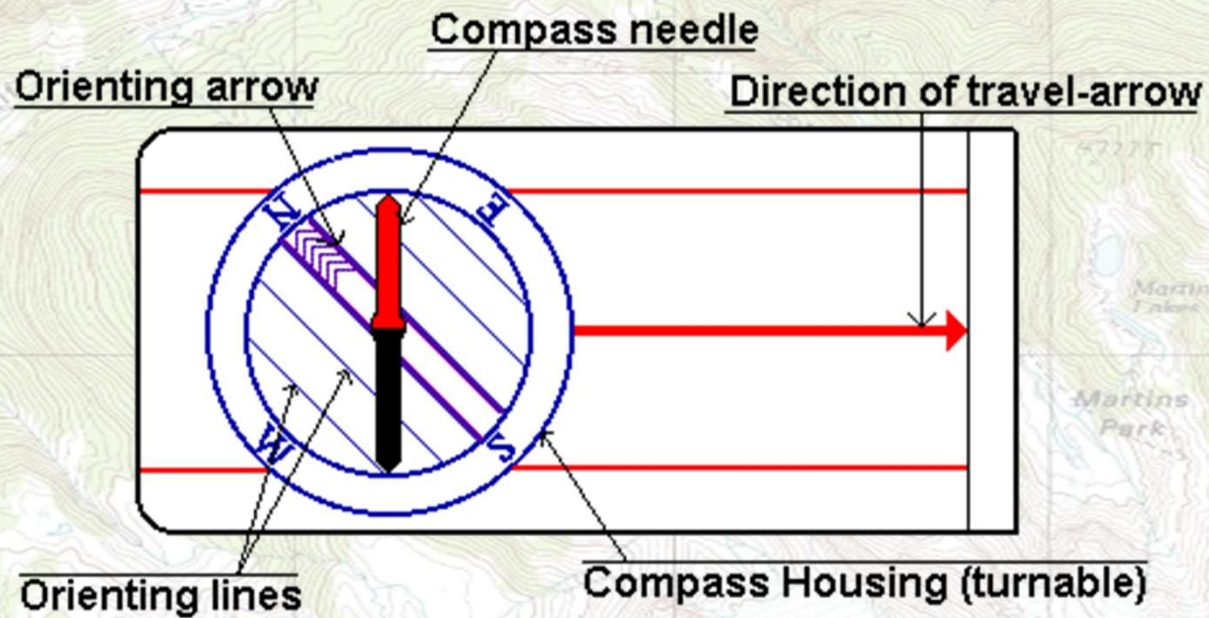
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# Compass: Components





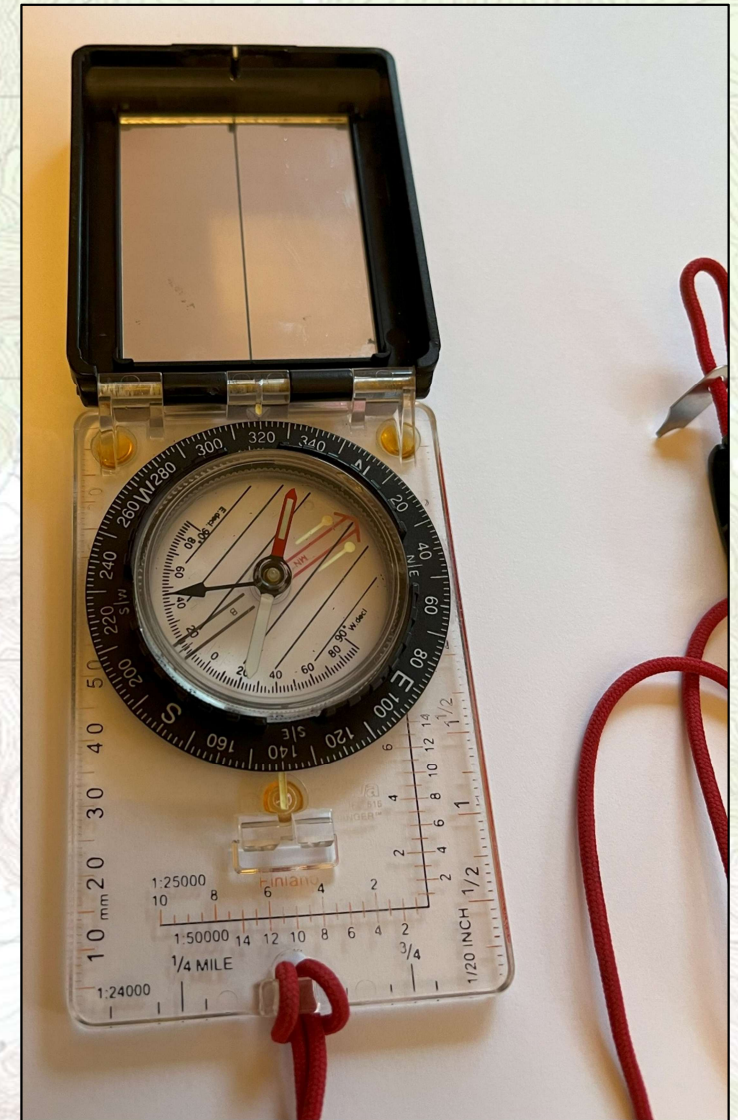
# Compass:

## Main Components

- Sighting Mirror and Notched Sights
- Index Line (aka direction of travel “line” or “arrow”)
- Base Plate
- **Magnetic Needle**
- Rotating Bezel
- Meridian Lines + Orienting Arrow
- Declination Scale



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# Compass:

## Other Components

- Rulers
- Roamer Scales
- Clinometer
- Lanyard
- “Screwdriver”
- Magnifying Glass
- Pads



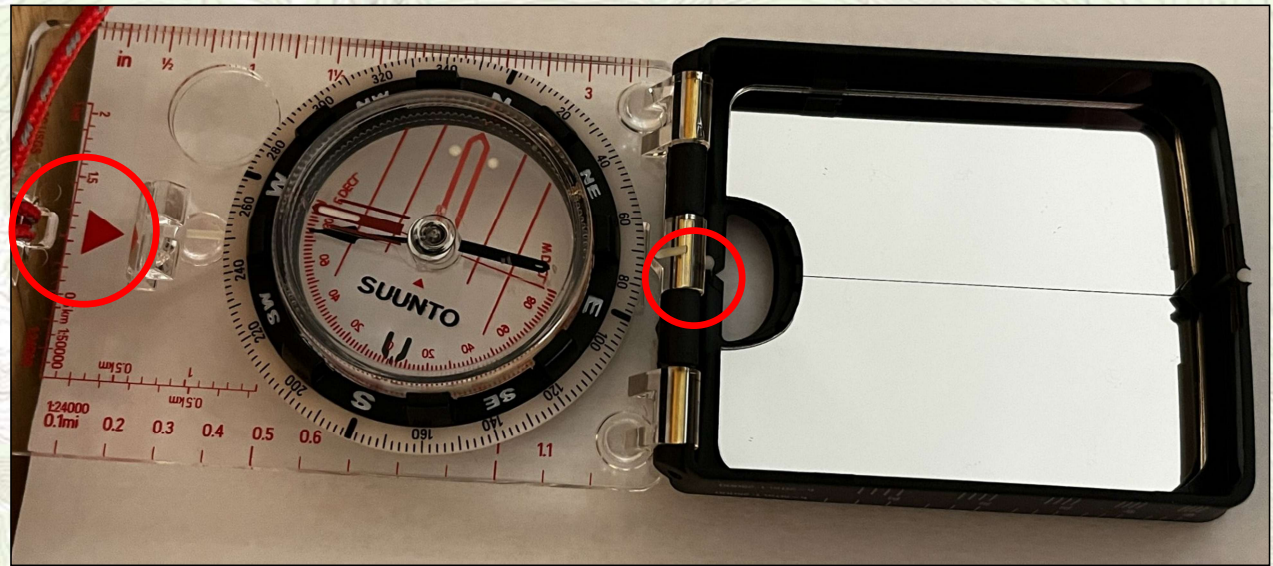
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# Compass: Components

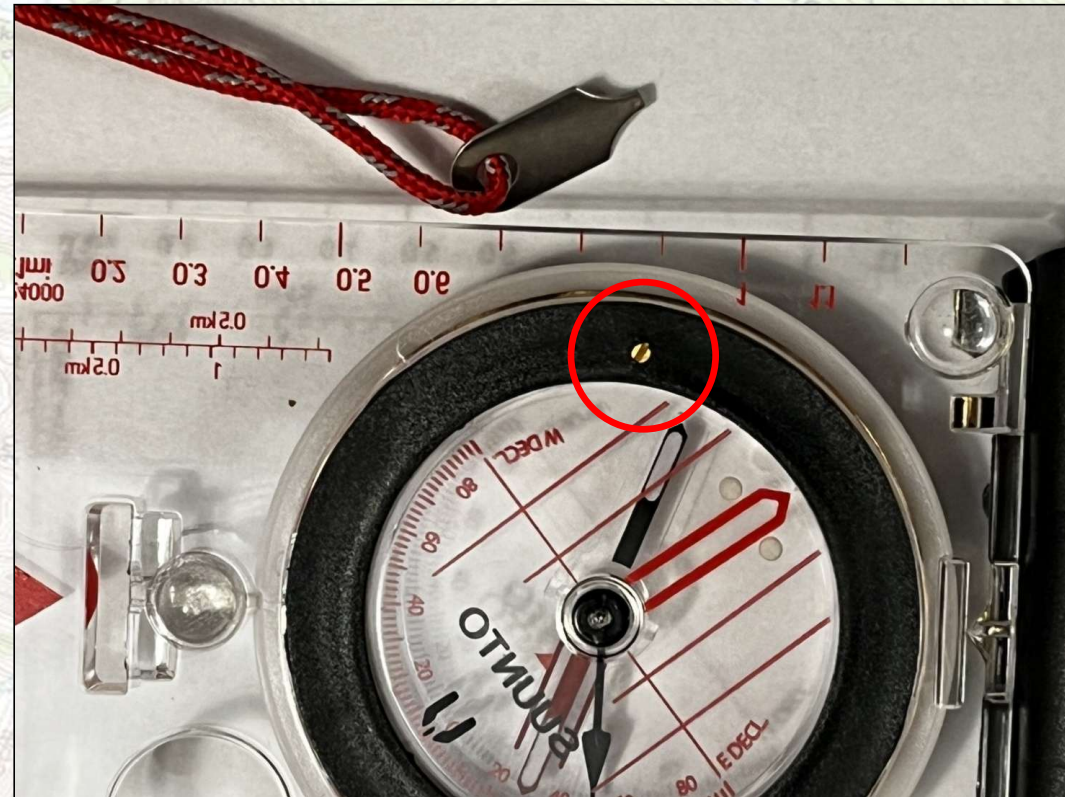
- Direction of travel arrow
- Index Line  
(Read bearings there.)





# Compass: Components

- Declination Adjustment Screw
- Declination Scale
- Declination Adjustment Tool





# Compass: Use - Bearing to an Object

1. Point the direction of travel arrow toward the object, holding the compass level, and sighting along the sight lines.
2. Twist the dial until the magnetic needle lines up with the orienting arrow ("box the needle").
3. Read the bearing in degrees by looking at the tick on the dial at the direction pointer.





# Compass: Use – Plot Bearing onto a Map

1. Set your compass to **185°** – put it on the map.
2. Line up one of the baseplate edges with your position or a known landmark. **Use Paradise Visitors Center.**
3. Turn the baseplate, keeping the straightedge on your point, until the north on the graduated dial points to the map's true north. Now align the meridian lines with the north-south lines of the map
4. Follow the straightedge to the destination.

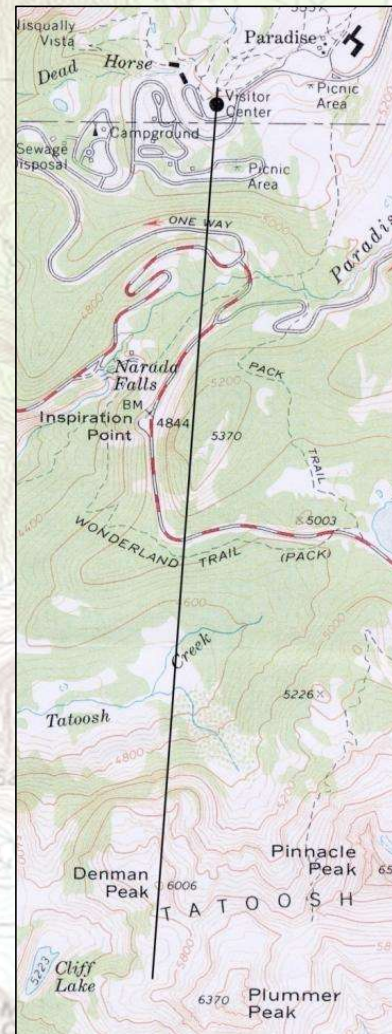




# Compass: Bearing onto a Map



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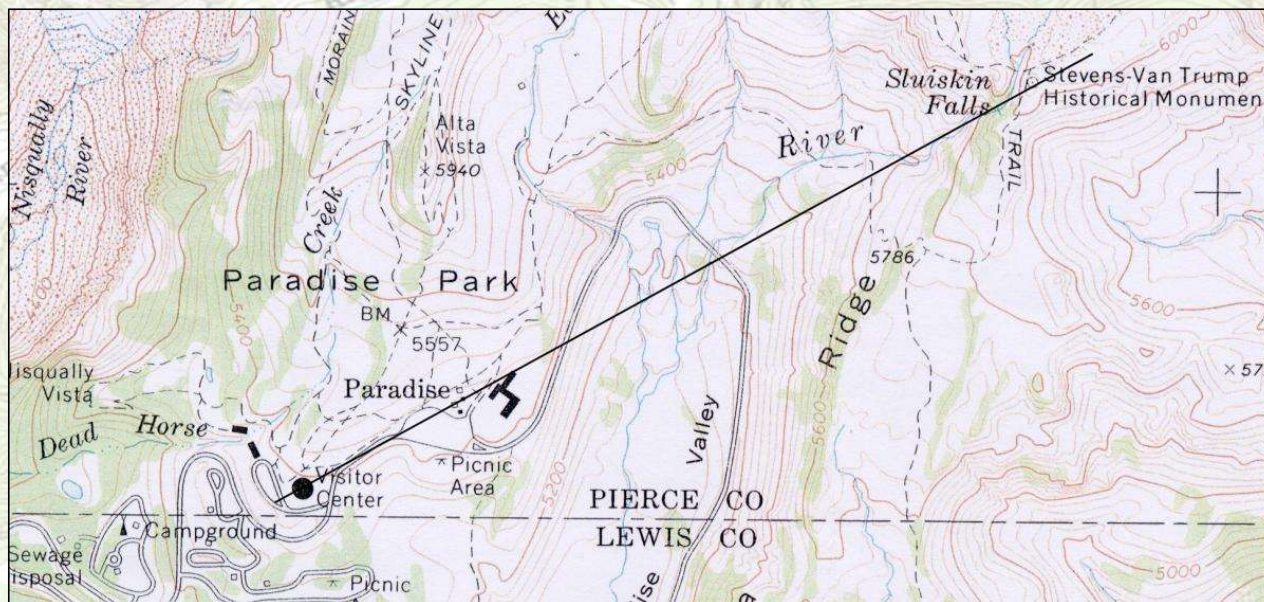
# Compass: Bearing from a Map

1. Put your compass on the map, lining up the edge of the base plate so that both your starting point and the destination lie along it. **Use Paradise Visitors Center and Sluiskin Falls.**
2. Twist the bezel, keeping the base plate edge on both points, until the orienting arrow points toward the north end of the map. Now align the meridian lines with the north-south lines of the map.
3. Read the bearing in degrees by looking at the tick on the dial at the direction pointer.





# Compass: Bearing from a Map





# COMBINING MAP AND COMPASS

Provides the most confident way to navigate v. using only one or the other.



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# ORIENTING THE MAP

1. Set compass to North.
2. Lay one edge of the compass along a N-S line of the map.



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# ORIENTING THE MAP

3. Rotate map and compass together until the needle is boxed.
4. Map should now be oriented with the terrain.



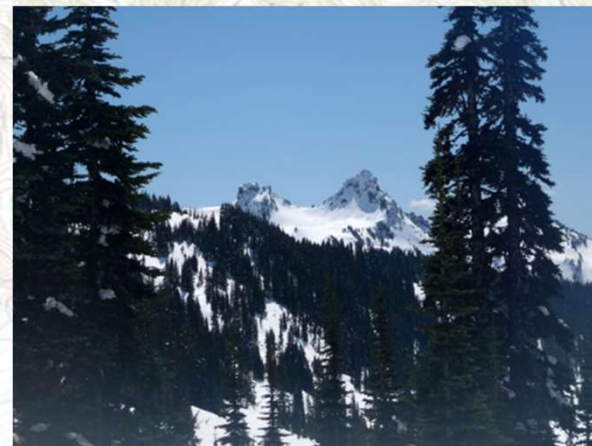
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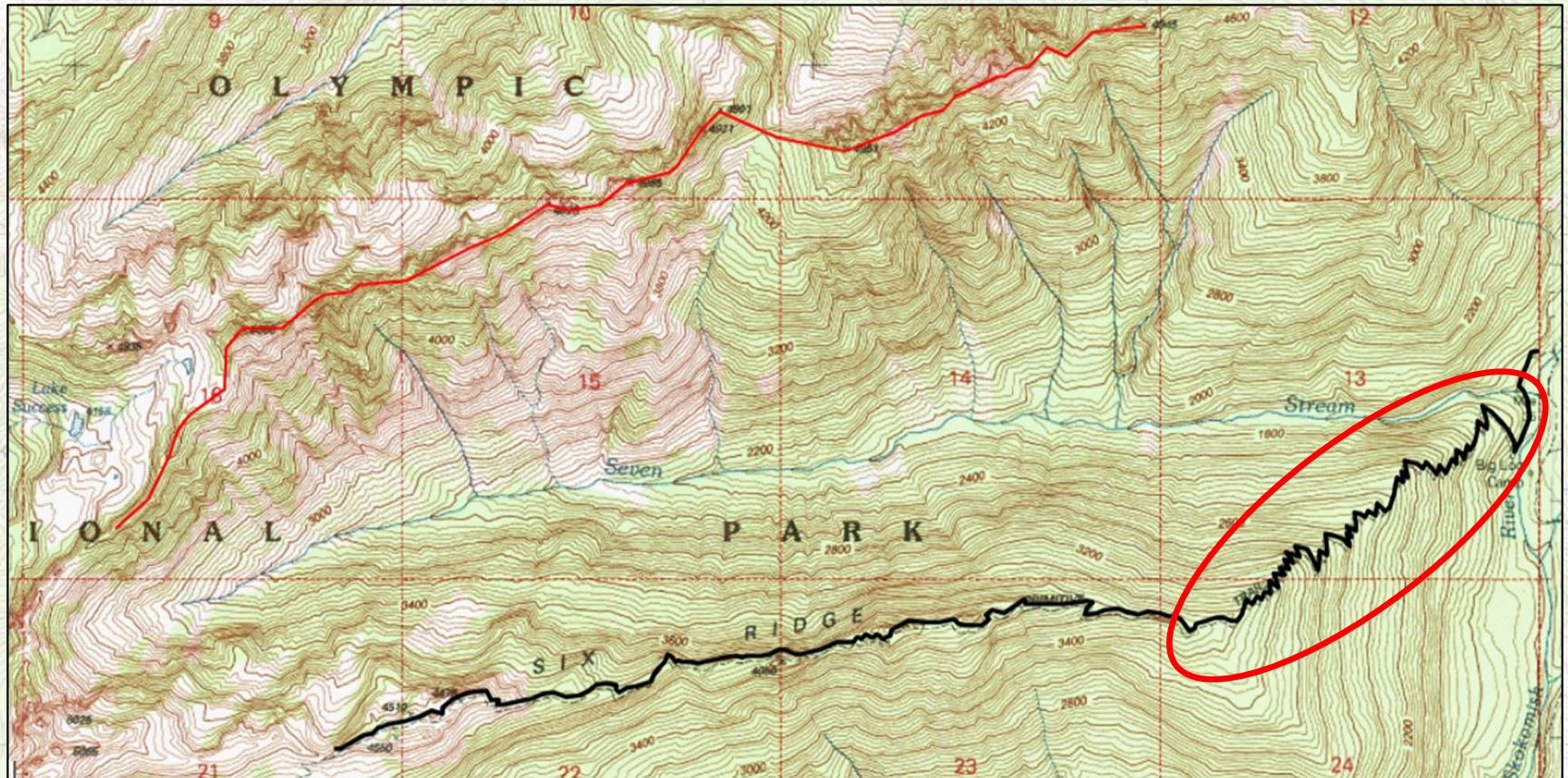
# Compass: Intersection (Triangulation)

- Using the intersection of two lines to find your location.
- What kinds of lines might work?
  - Contour lines, if you know your elevation
  - Ridges, valleys, and creeks
  - Trails, roads, power lines, etc.
  - One or more *compass bearings*





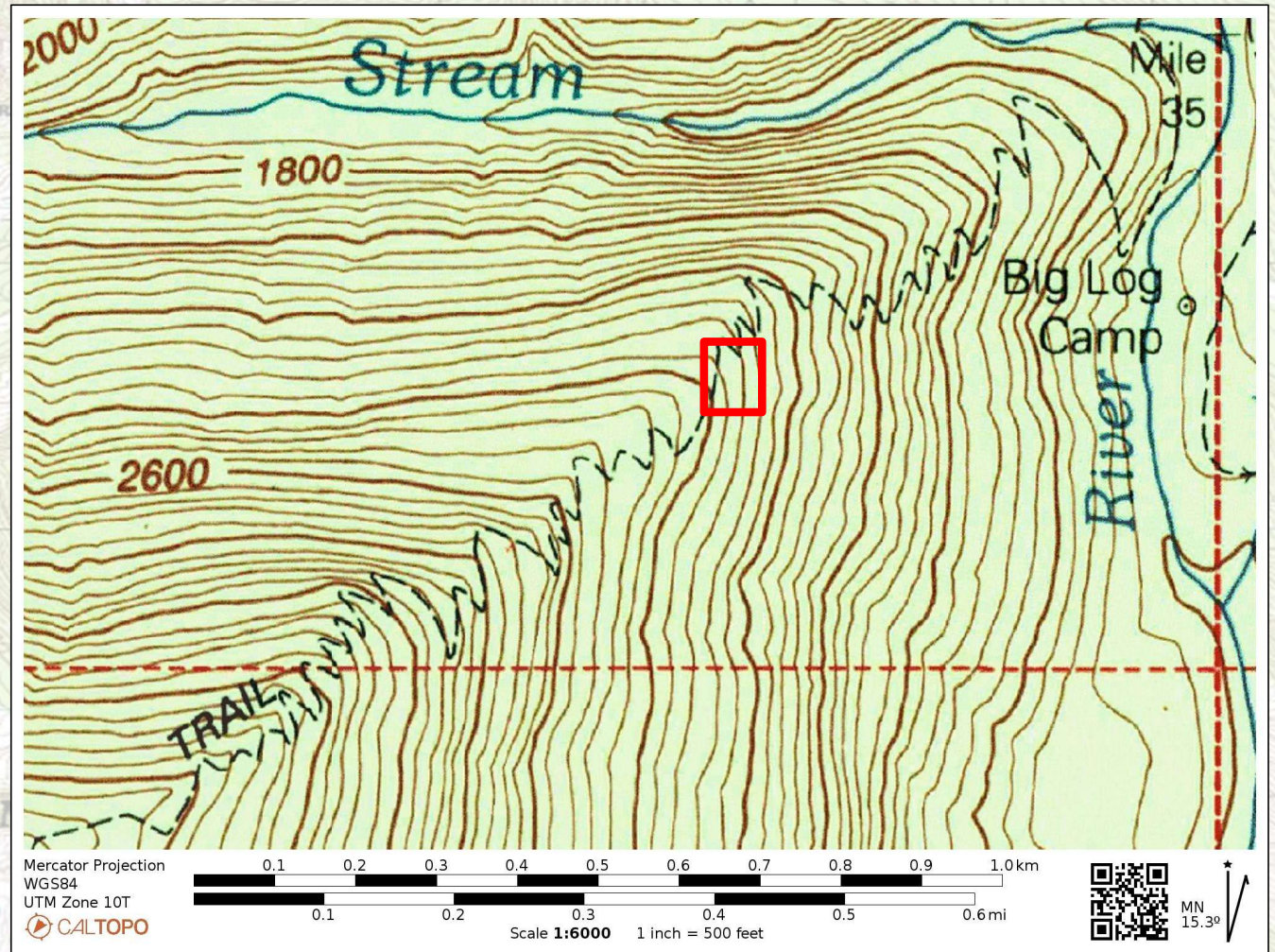
# Contour Lines + Trail $\Rightarrow$ Using Altimeter





# Contour Lines + Trail $\Rightarrow$ Using Altimeter

1. Obtain elevation w/ altimeter = 2400 ft
2. Note where trail crosses that contour
3. This is your approx. location



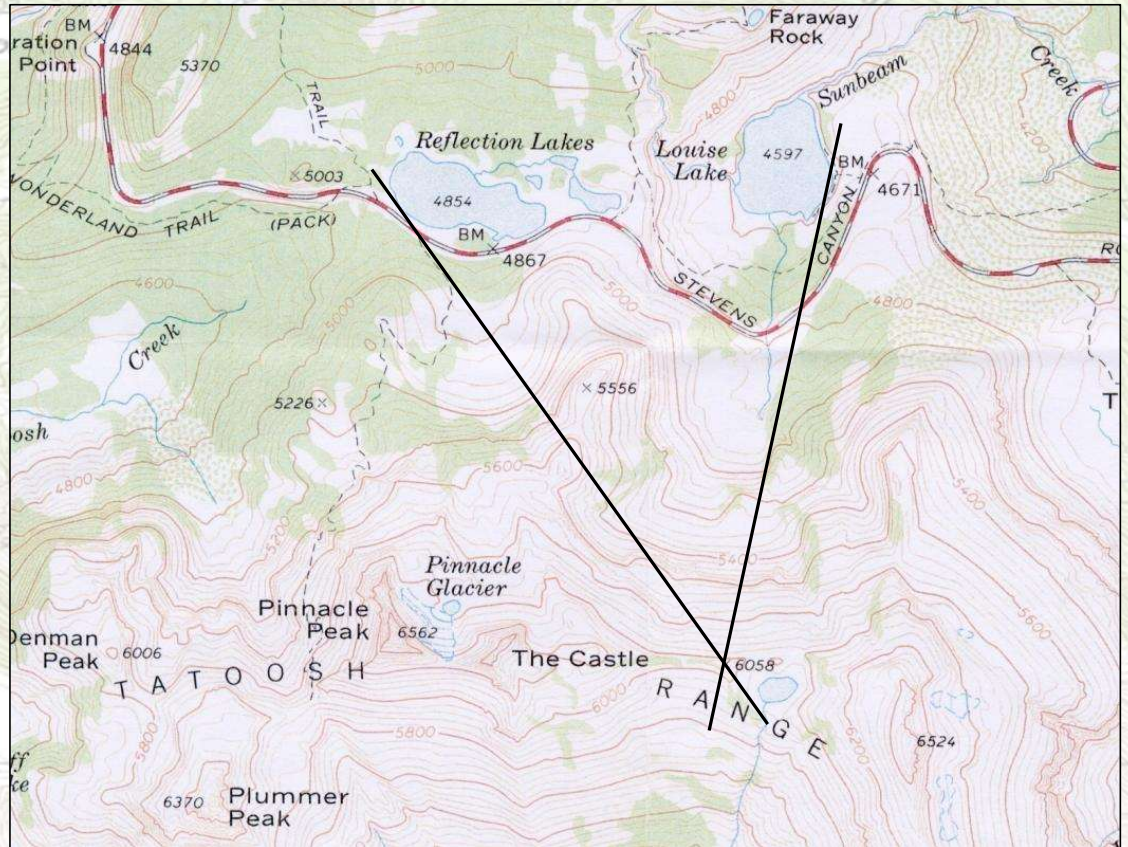
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# Compass: Intersection Exercise

Bearing 1:  $325^\circ$ , to W. Shore Reflection Lakes

Bearing 2:  $12^\circ$ , to E. Shore Louise Lake

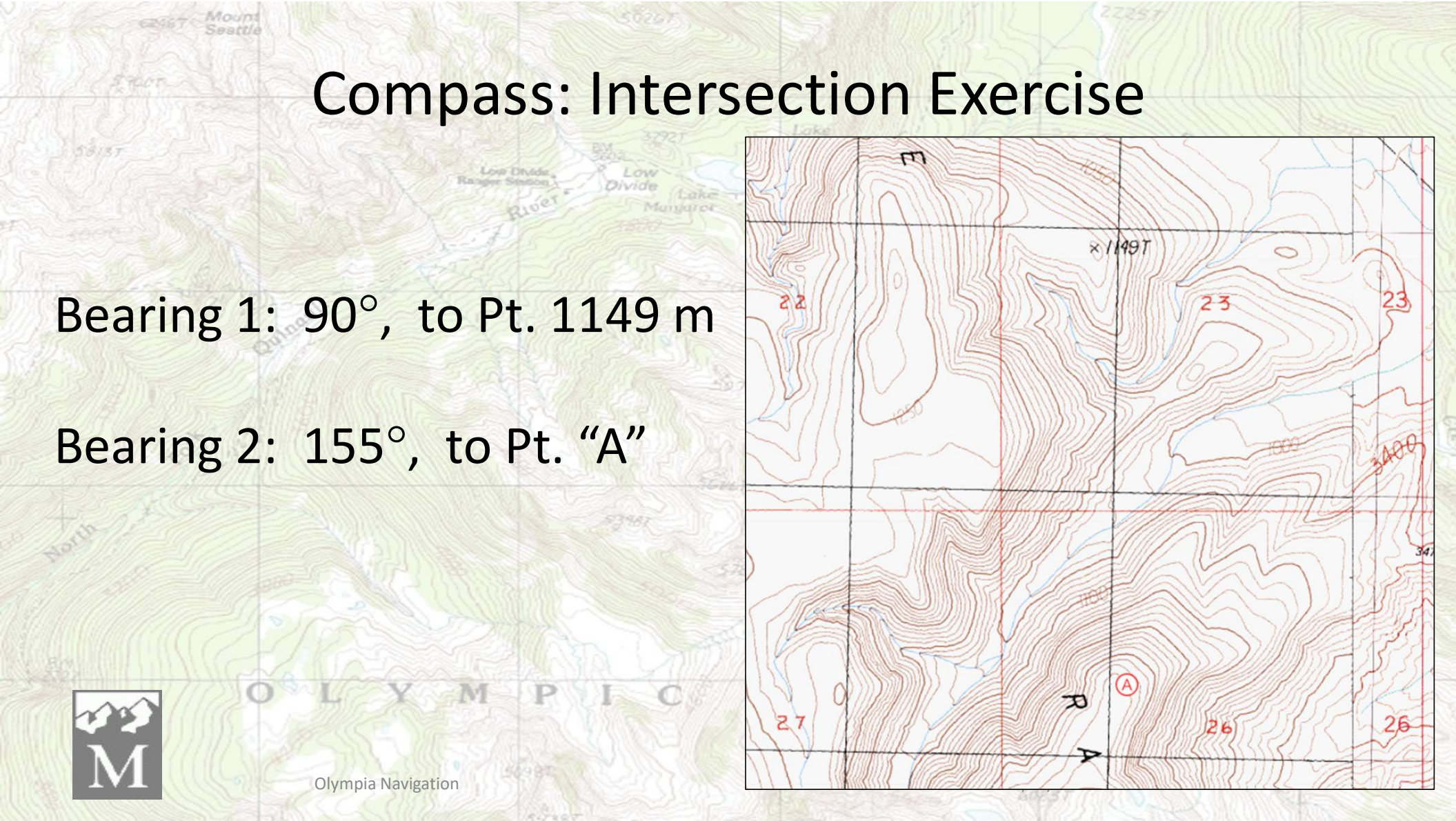





# Compass: Intersection Exercise

Bearing 1:  $90^\circ$ , to Pt. 1149 m

Bearing 2:  $155^\circ$ , to Pt. "A"

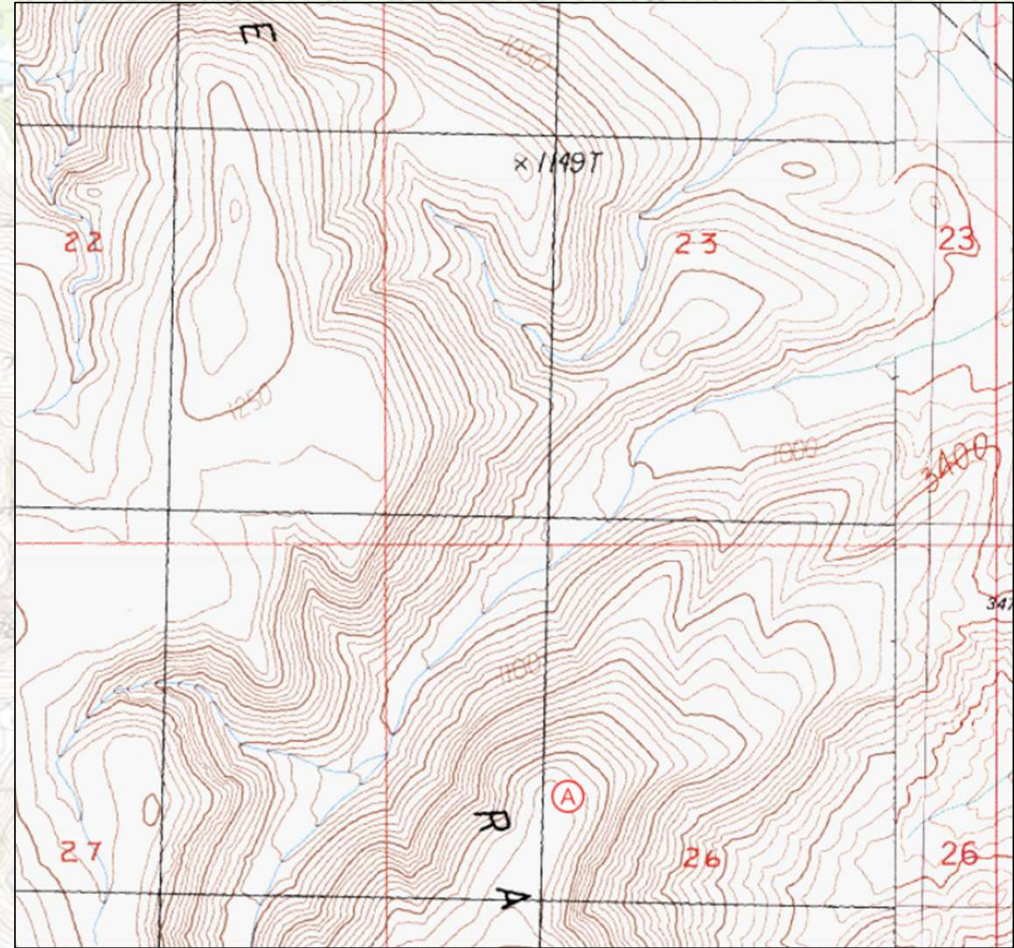


The background is a topographic map of Mount Rainier National Park. The map shows contour lines, rivers, and various landmarks. A specific area is highlighted with a red grid. In the center of the grid, there is a point labeled 'A' in a red circle. To the left of 'A', there is a point labeled 'R'. Above 'A', there is a point labeled 'x 1149T'. The map also shows the 'Low Divide Ranger Station' and 'Lake Mary Jane'. The word 'OLYMPIC' is written across the bottom of the map.



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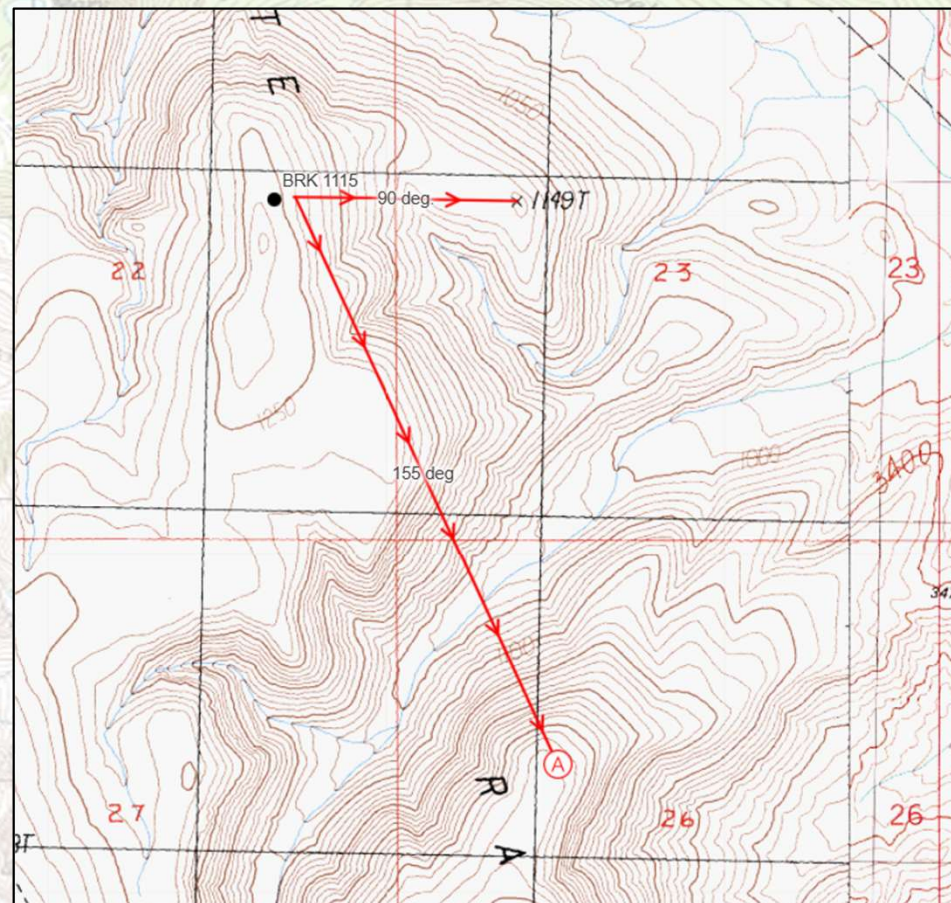
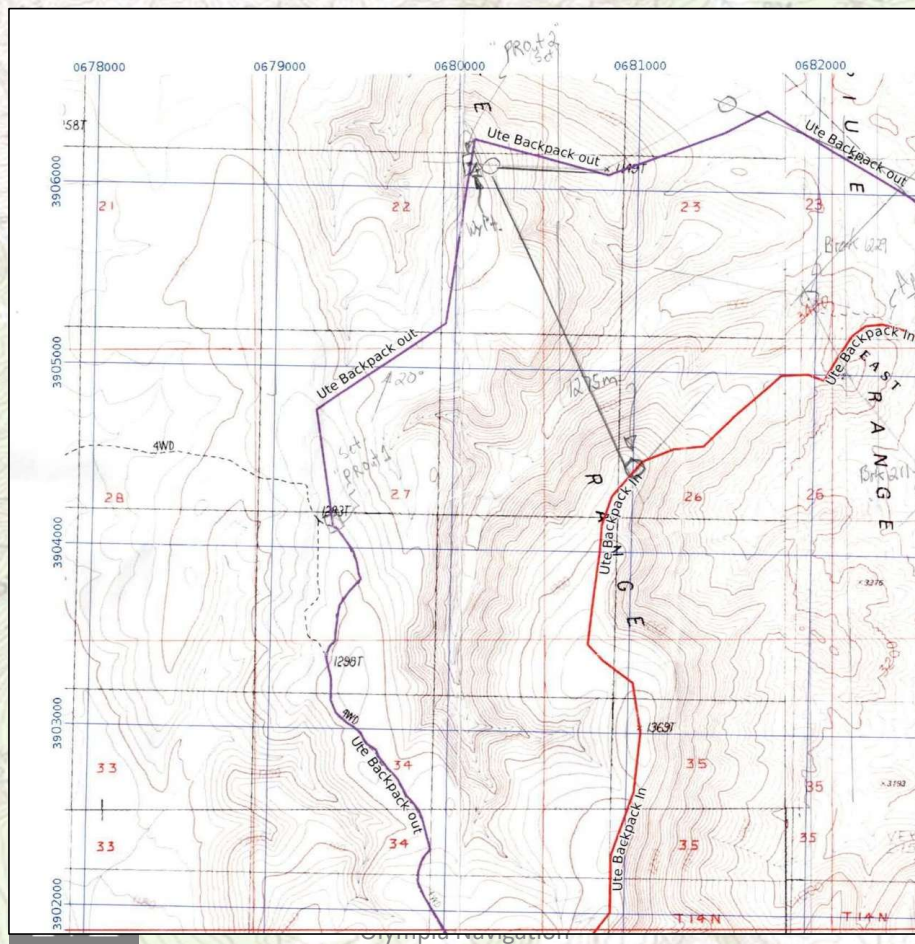
Bearing 2:  $155^{\circ}$ , to Pt. "A"



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# Compass: Intersection Exercise



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