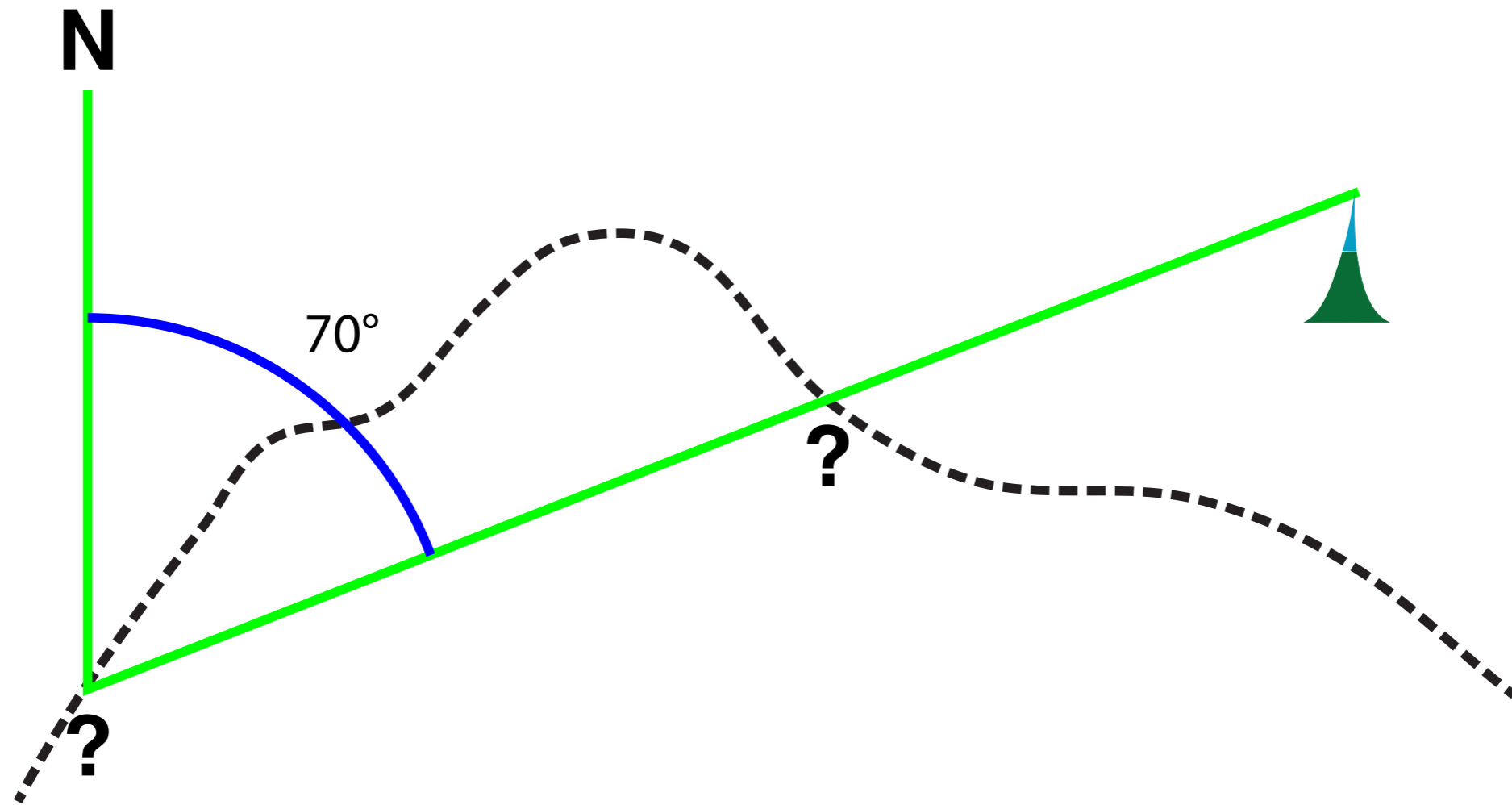


Plotting a Bearing onto your map

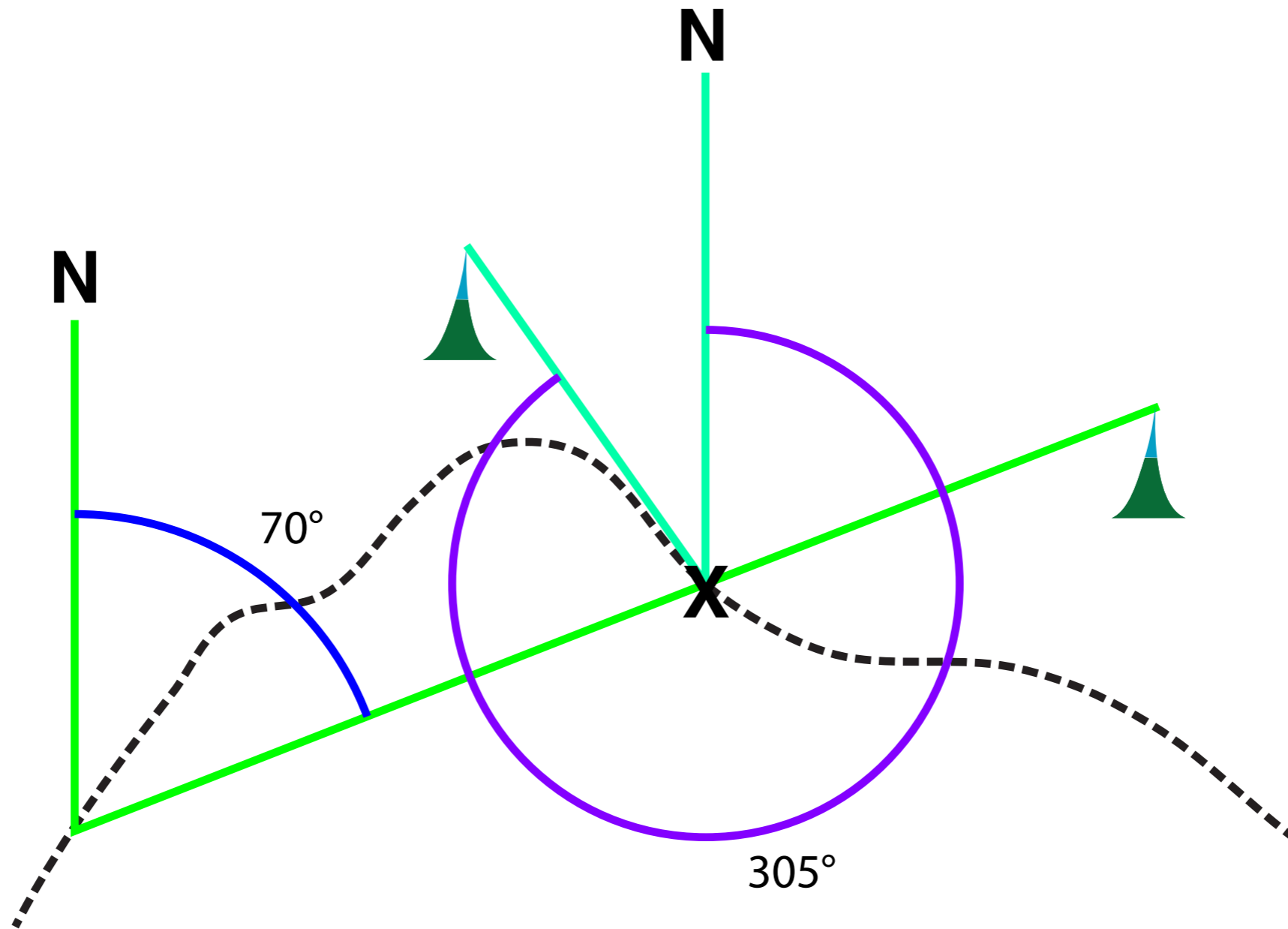
- Why we plot bearings
 - Where am I?
 - Location by resectioning
 - Where is the _____ I can see in the distance?
 - Location by intersection
- Using straight line course legs

Location by Resectioning a.k.a Triangulation



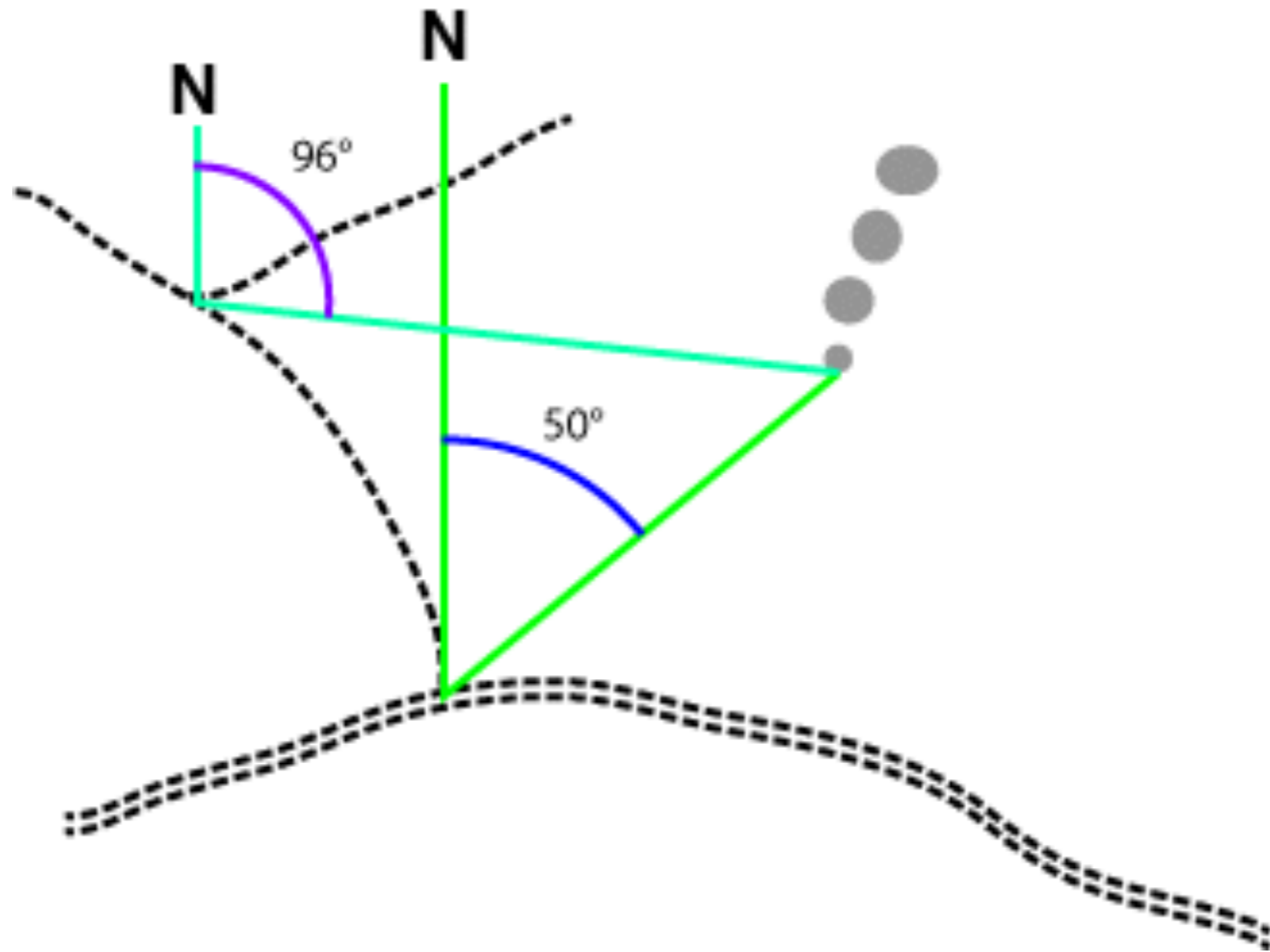
A single bearing, sighted to a peak,
resulting in two possible locations along a trail.

Location by Resectioning



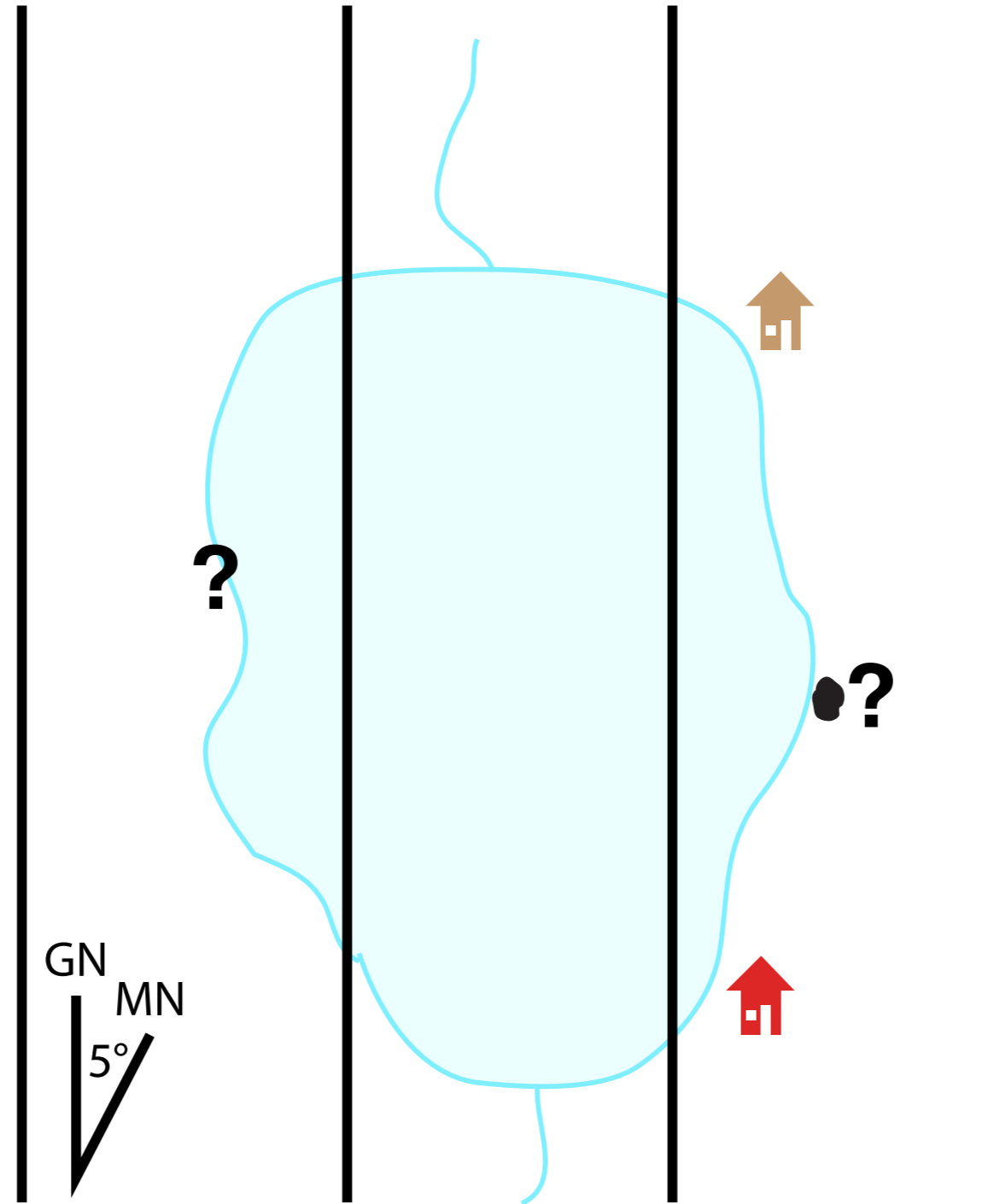
A bearing to a second peak confirms the location on the trail.

Location by intersection

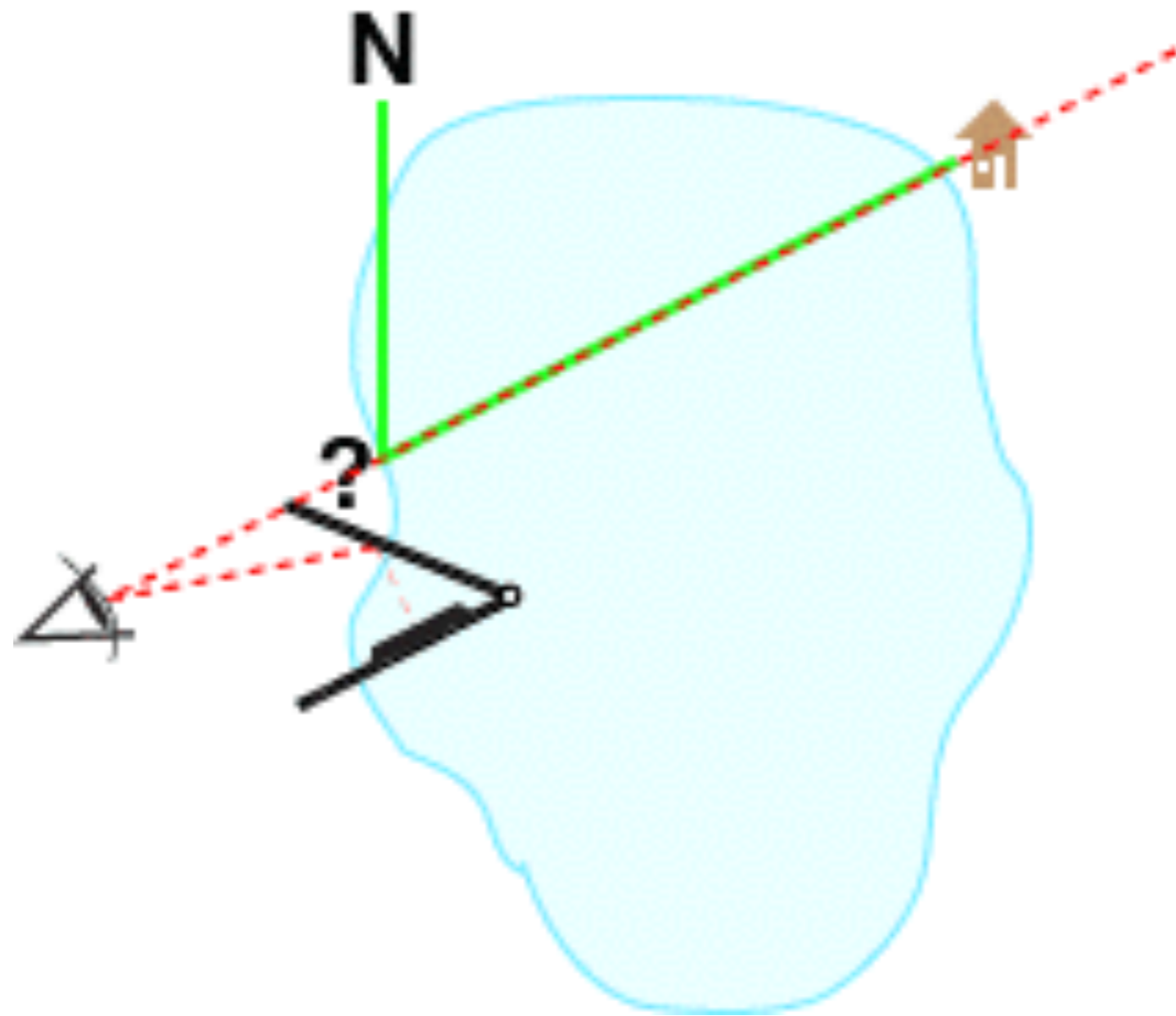


Using bearings sighted from two or more known locations, to find an unknown location.

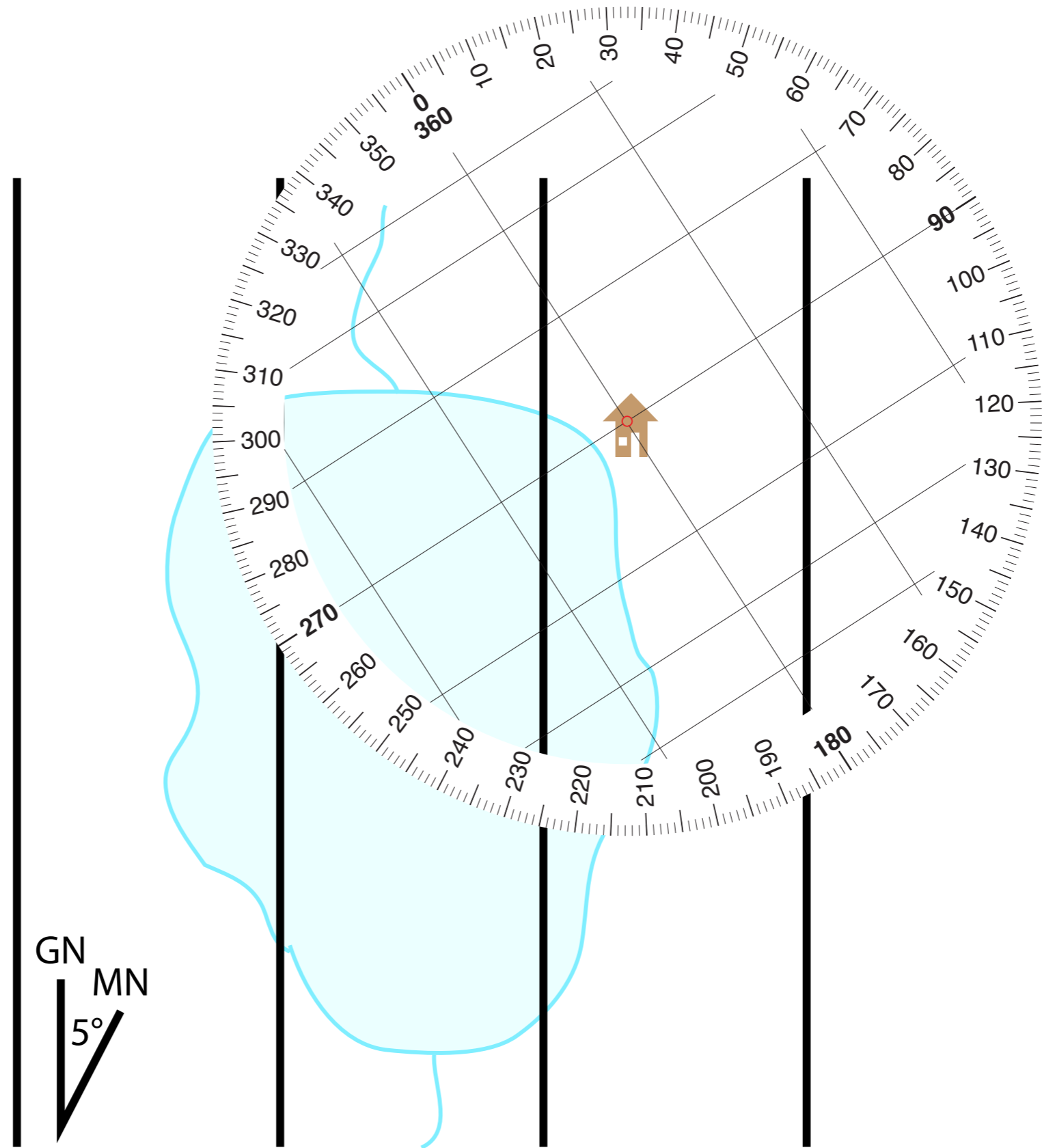
An example



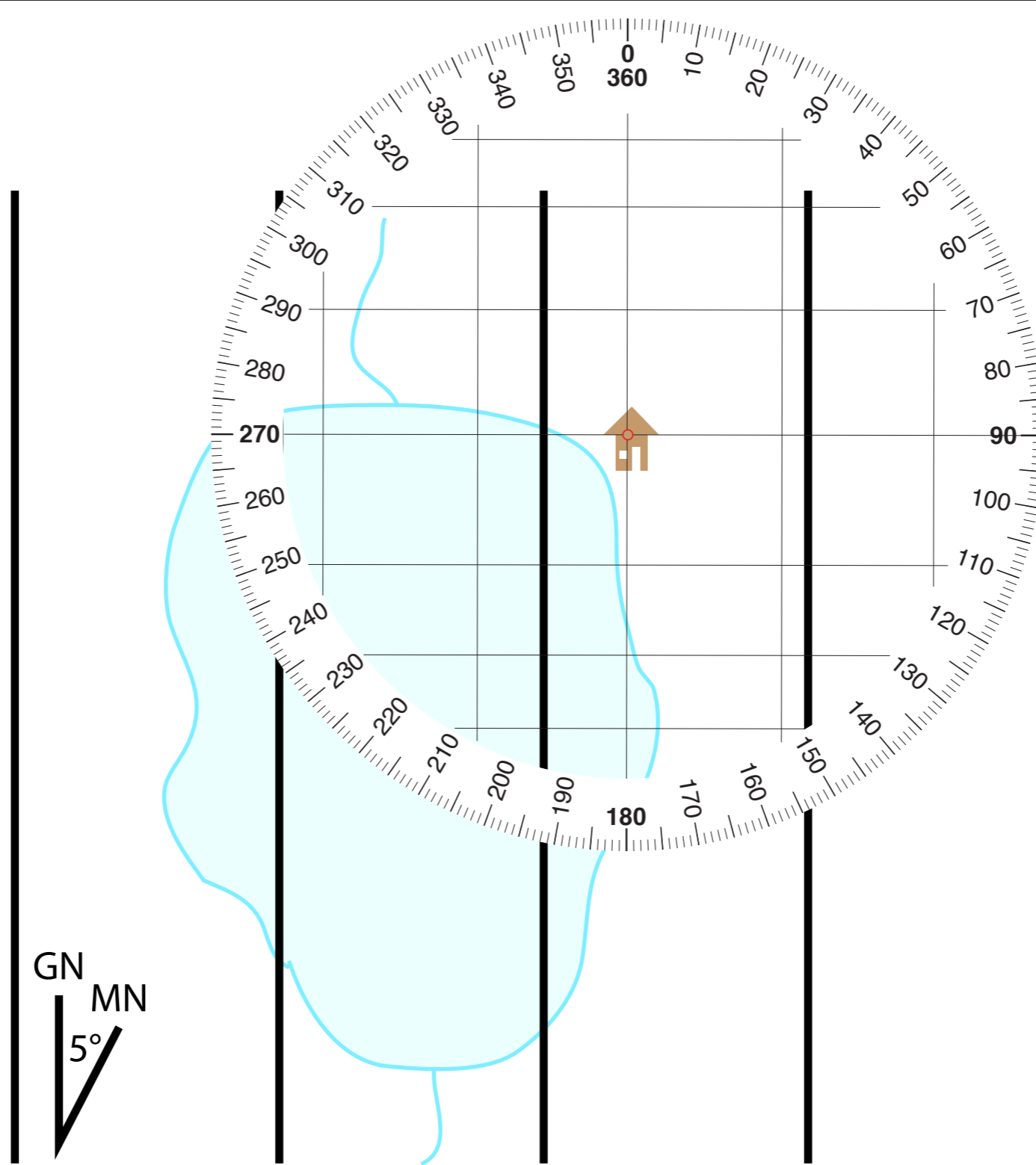
Where are we along the shoreline?
Where is the cave we can see across the lake?



We sight a bearing to a known cabin on the map,
with a result of 60° M
It's NE of our location.

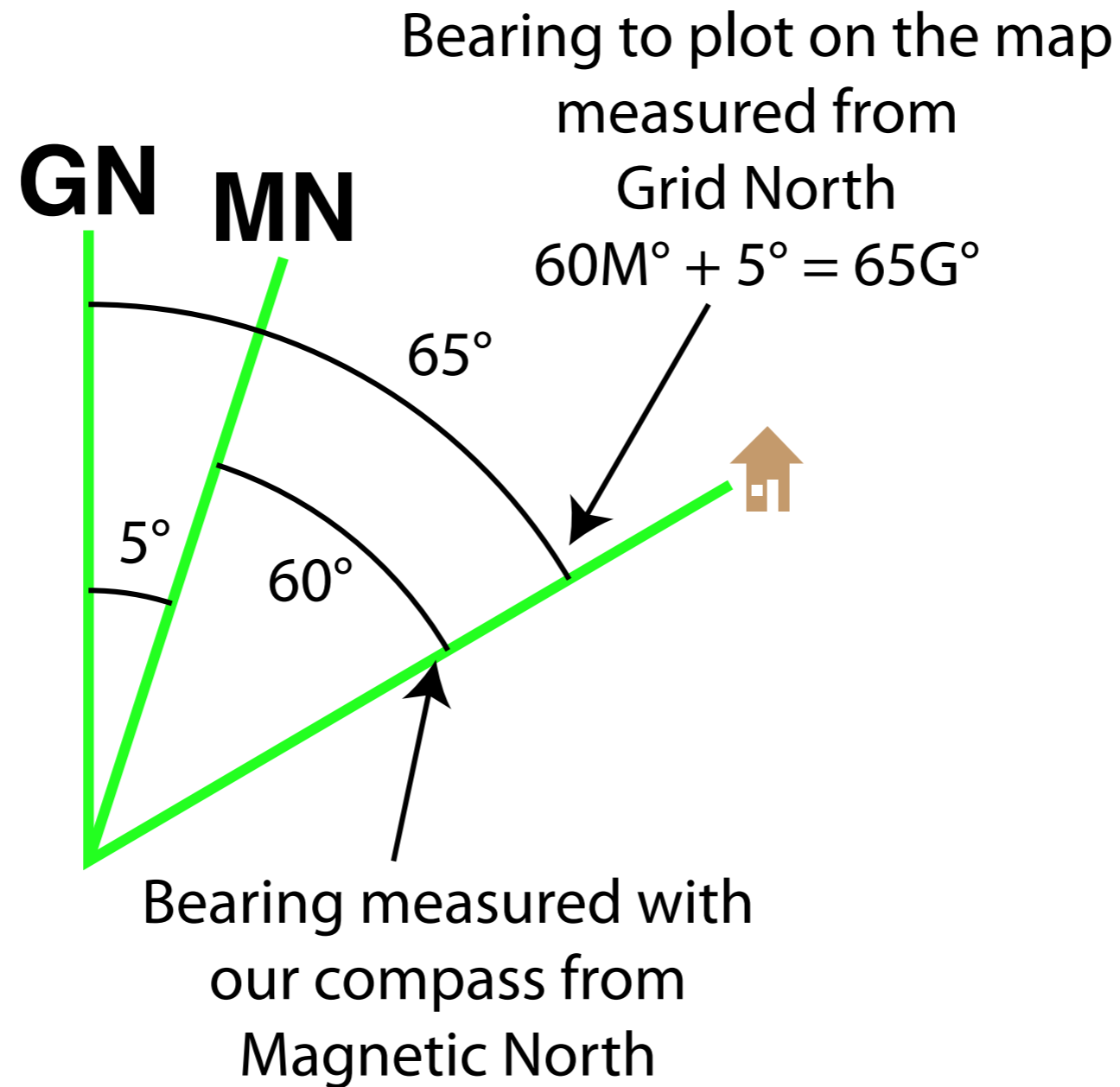


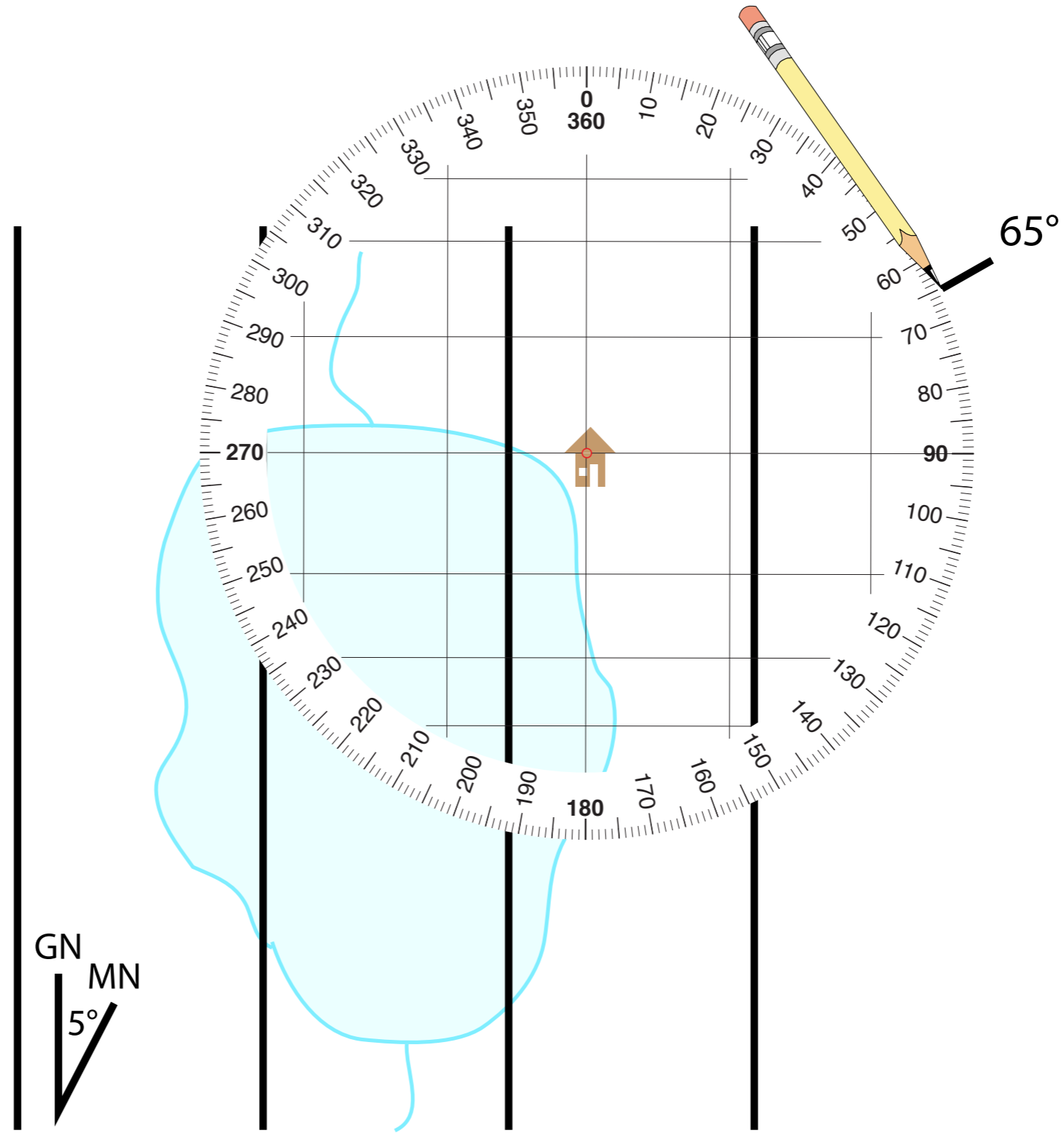
Center your protractor on the known location.



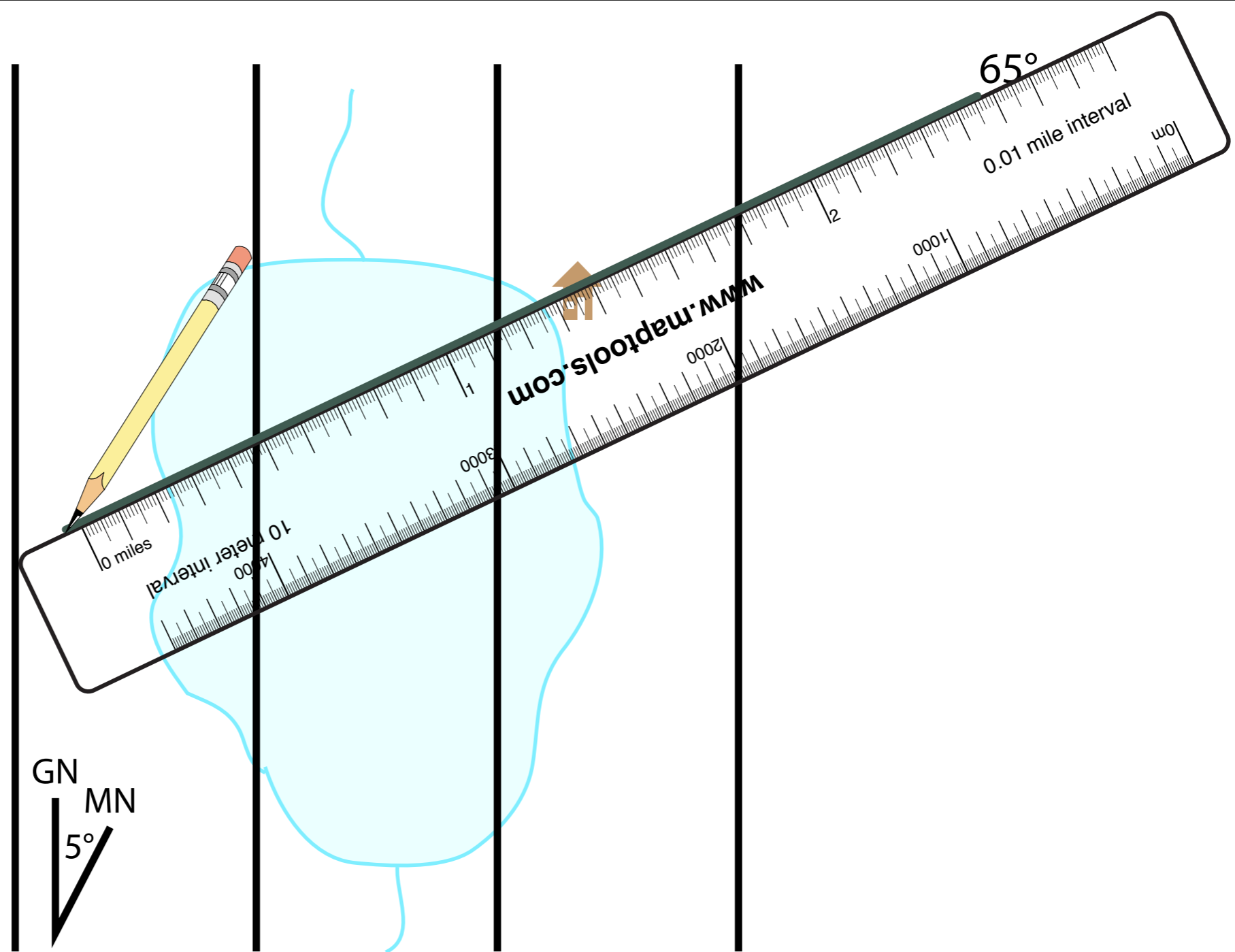
Align the protractor with Grid North.

**Our bearing was sighted relative to Magnetic North.
We want to plot it relative to Grid North.
We need to convert it.**

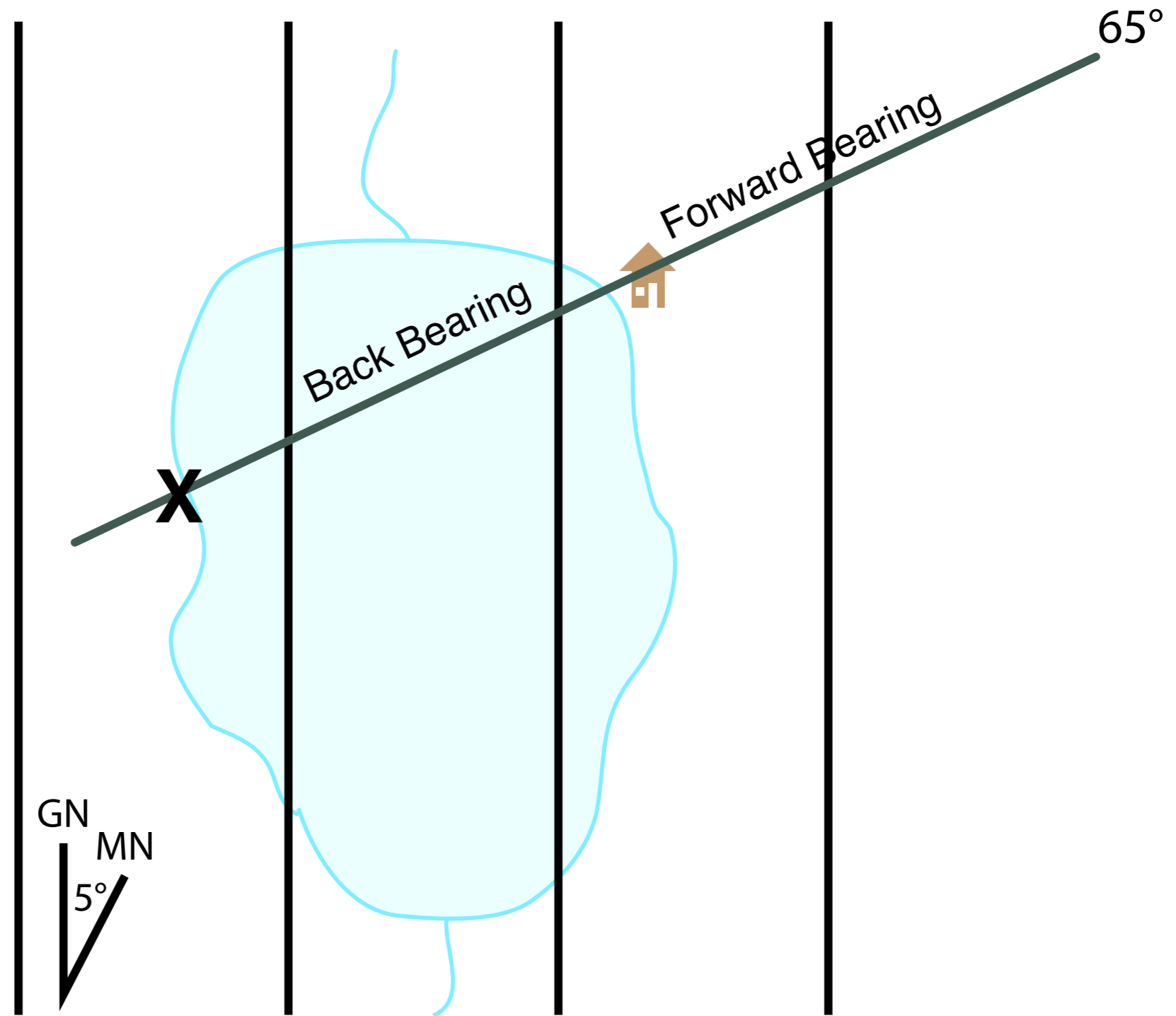




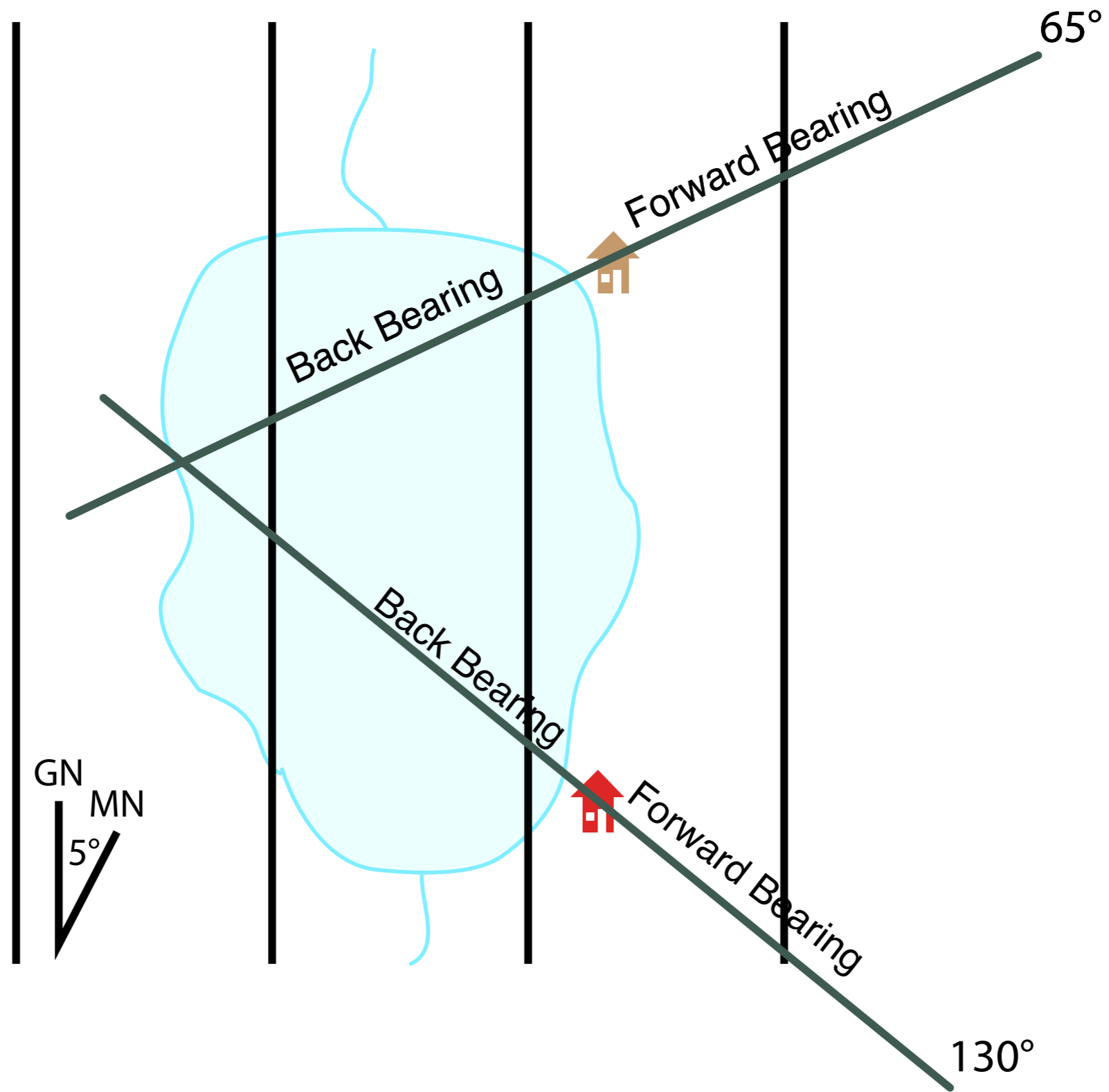
Mark the converted bearing at the edge of the protractor.



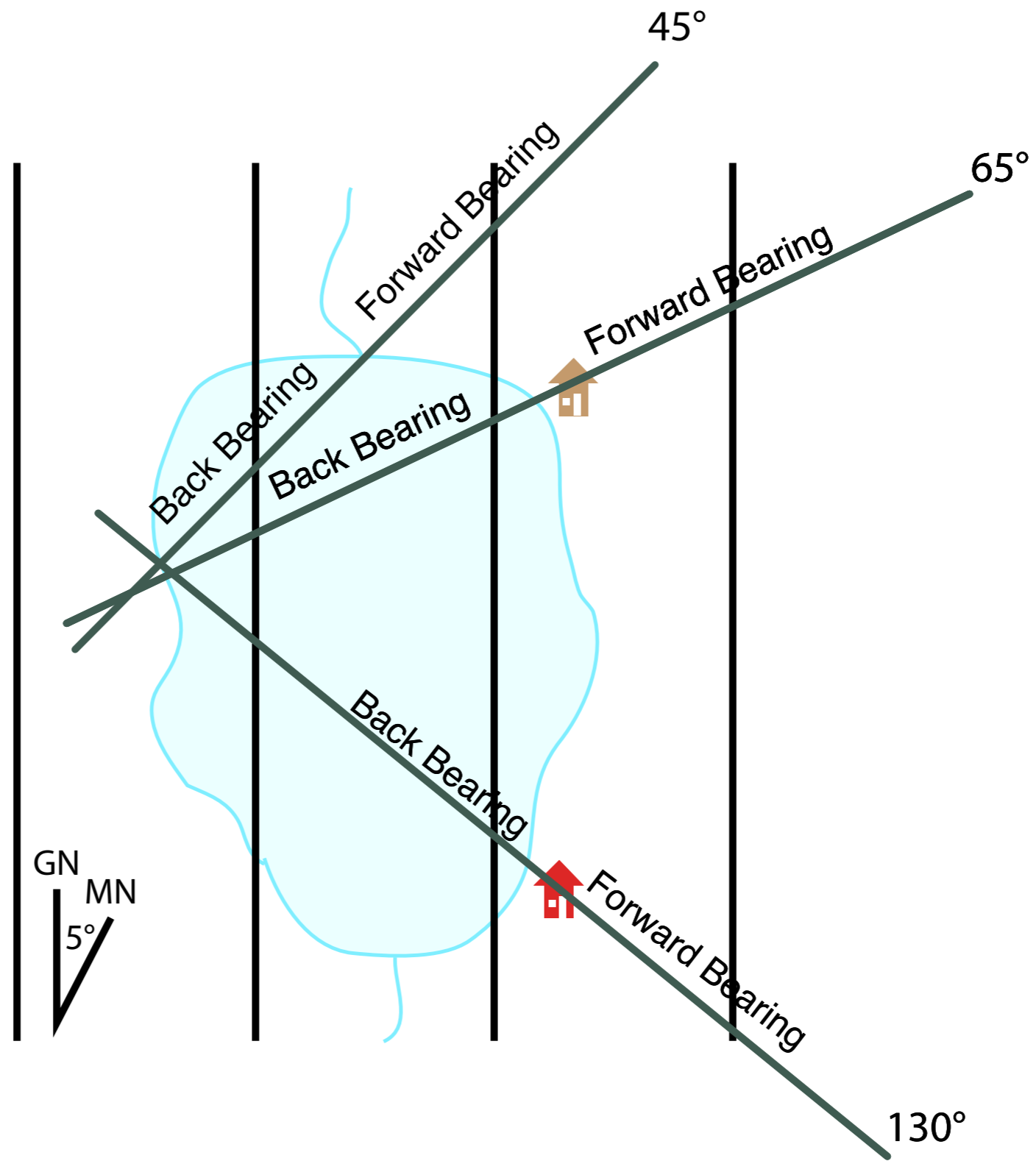
Use a straight edge to draw the bearing line.
Remember the cabin was NW of us,
so we want the line to the SW of the cabin.



The bearing plotted back towards our location defines our location where it crosses the lakeshore.

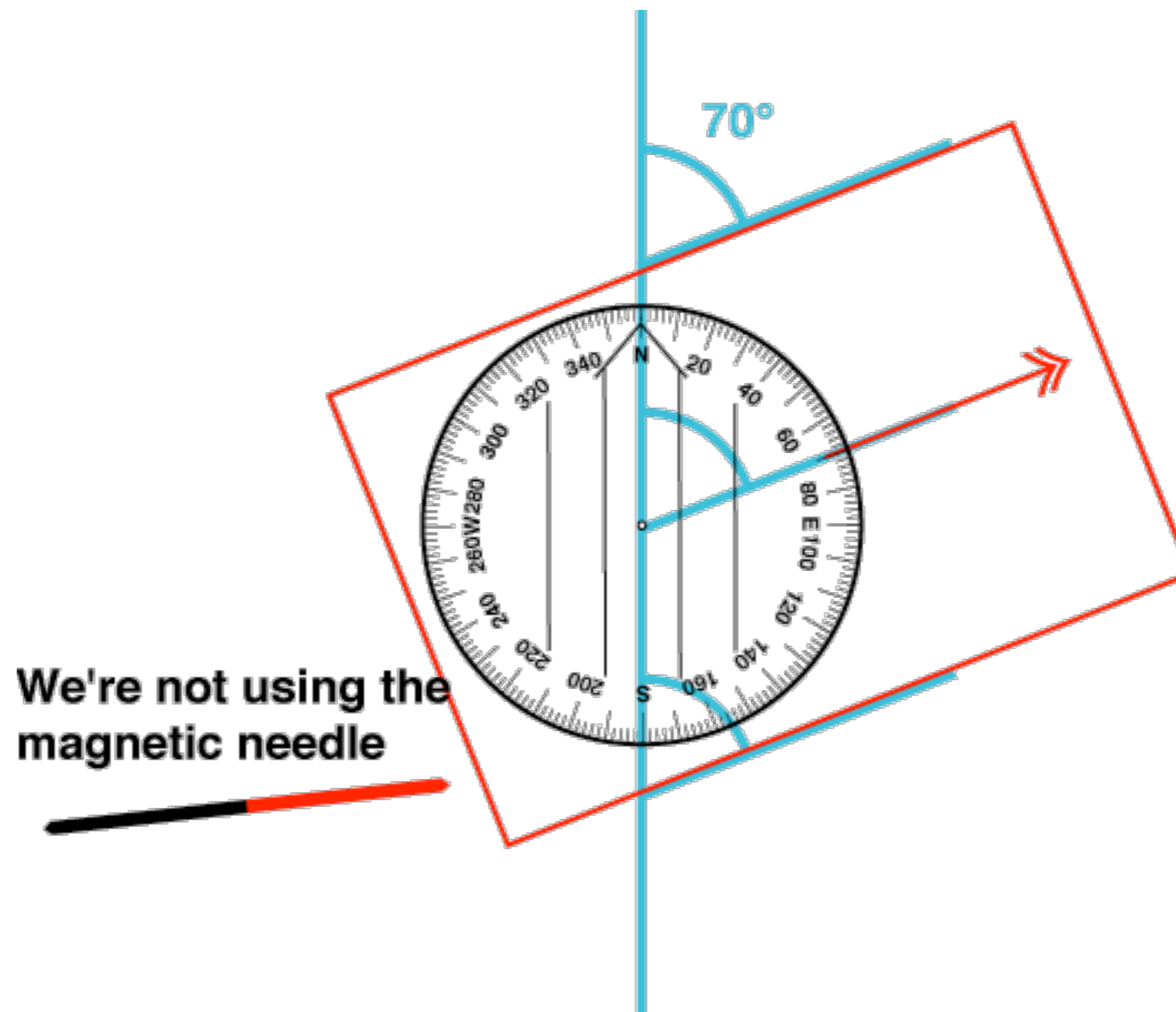


A bearing to a second cabin helps confirm our location.
But it also shows us standing in the lake!

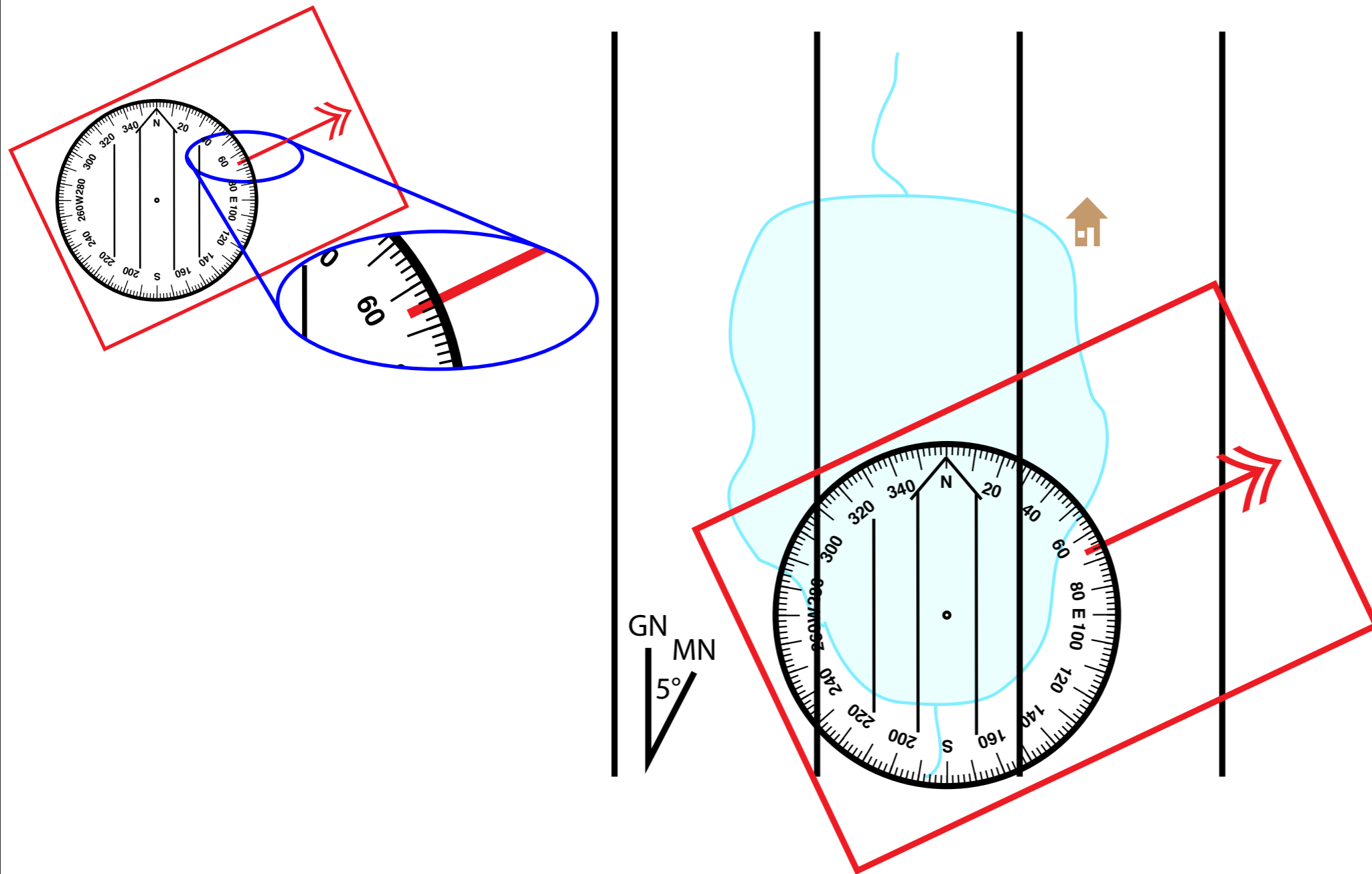


A third bearing reveals an “uncertainty triangle.”
 Some of our bearing have small errors.

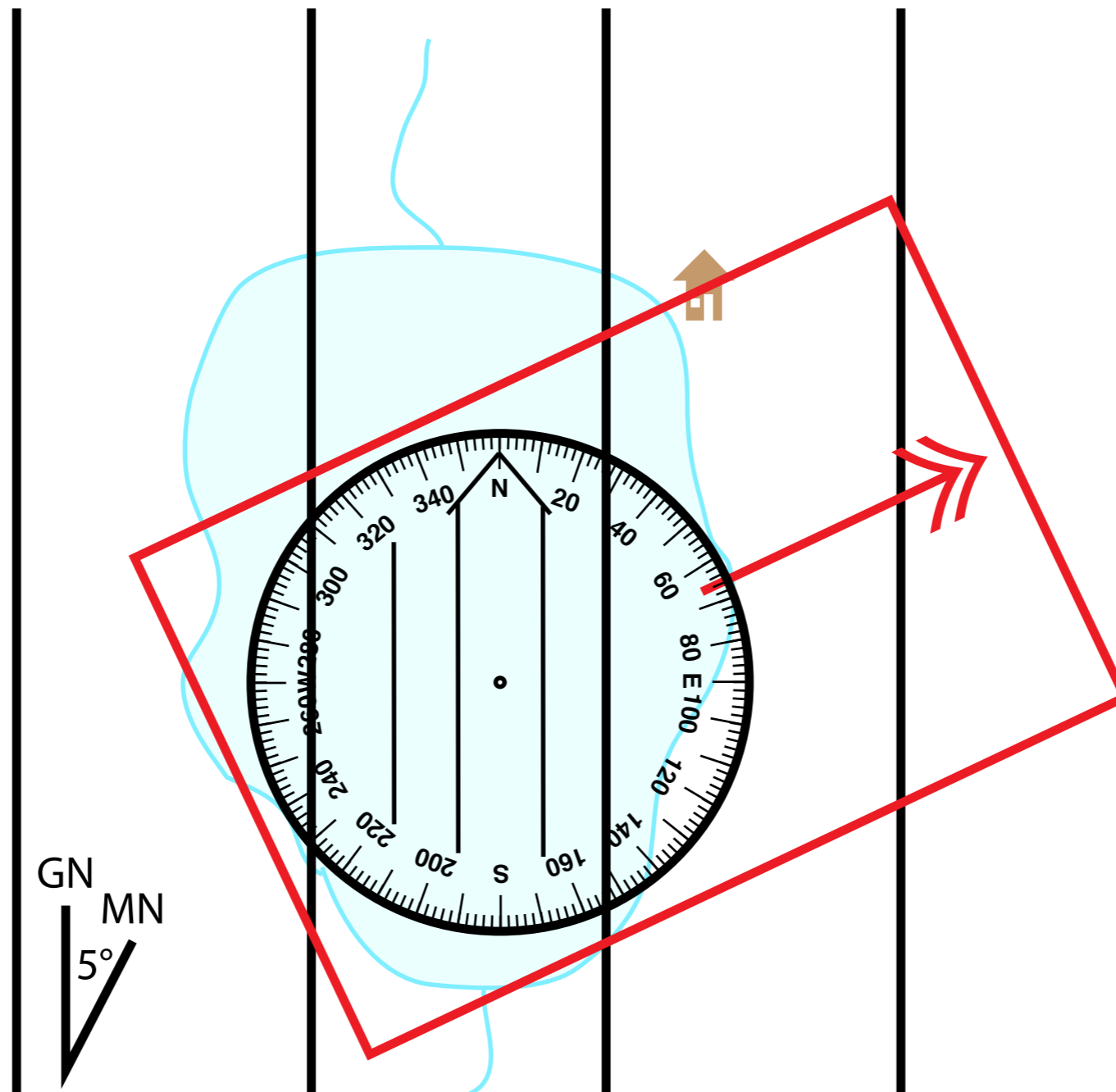
You can use your compass as a protractor



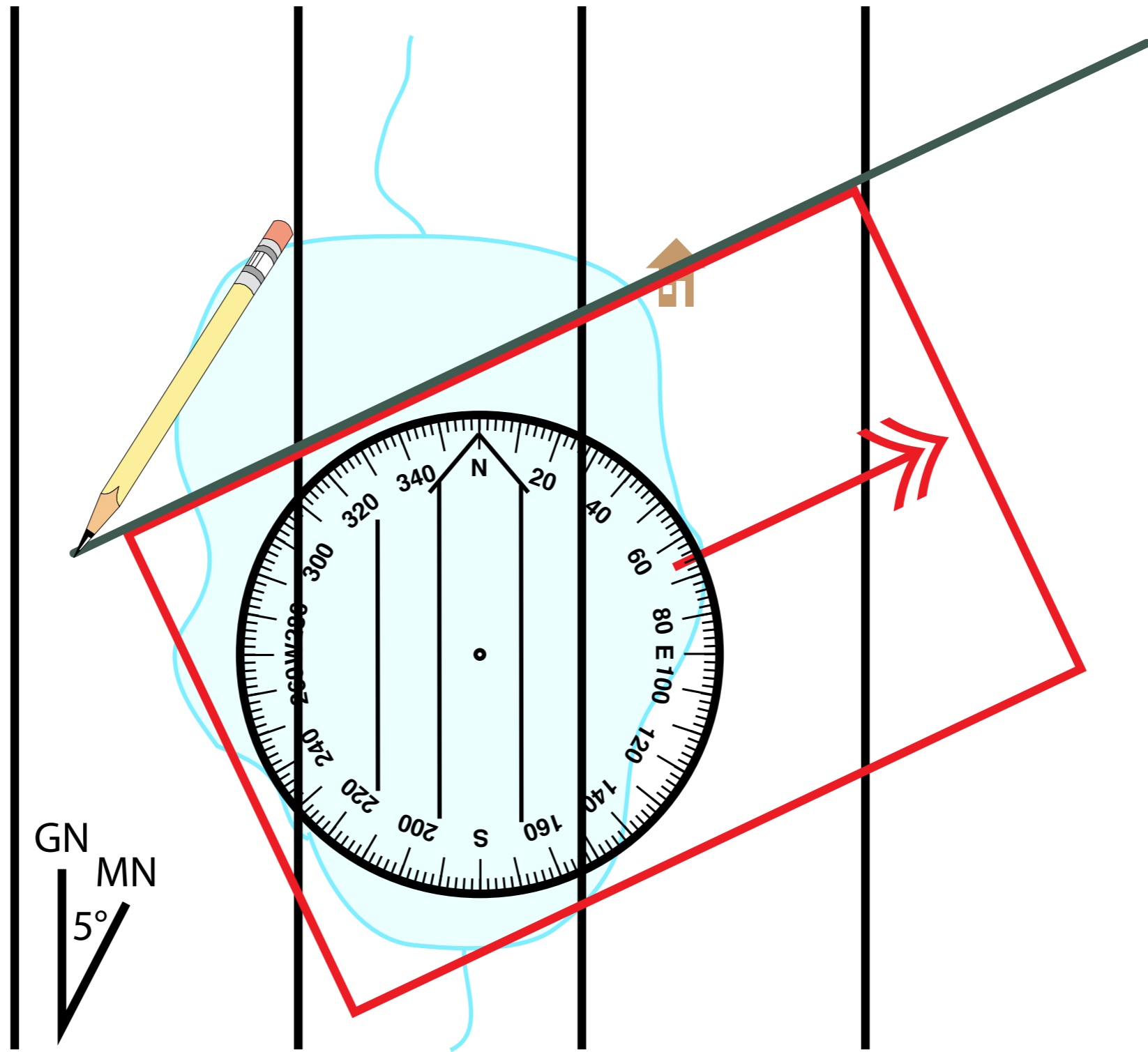
Plotting a bearing with a baseplate compass



Set the dial to the desired bearing
(using the map's north reference)
Align the compass with the north reference lines.

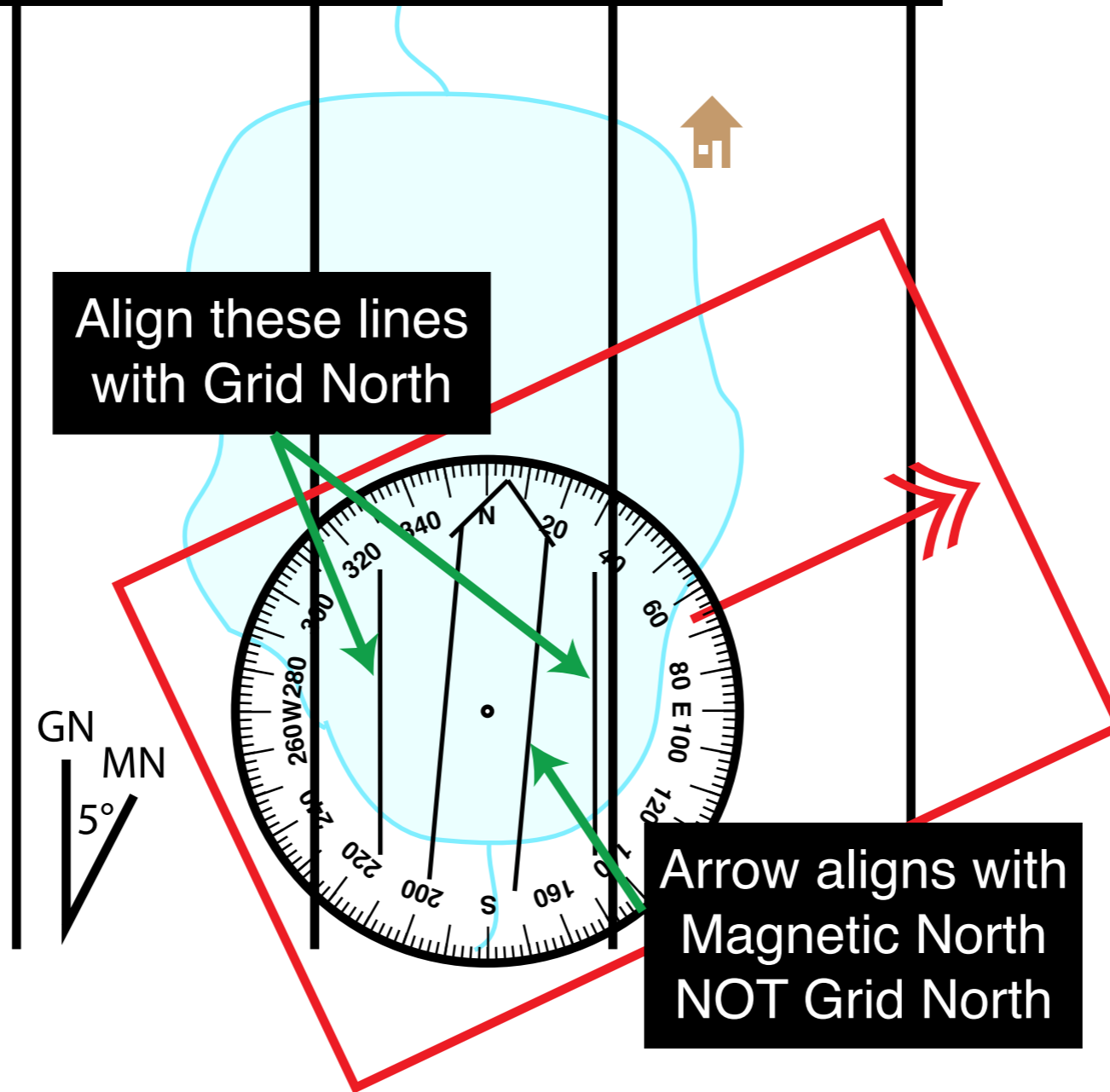


Keeping the compass aligned with the Grid North lines, move it until an edge touches the know point.



Draw the bearing line along the edge of the compass.

Compass Adjusted to Read Grid North
with Magnetic North 5° to the East



This compass, adjusted 5°E. declination, would provide bearings relative to Grid North. No conversion necessary.

Plotting Compass Bearings near Sharktooth Peak



Sharktooth Peak Map

You are hiking along a trail, north of Coyote Lake. You are not exactly sure of your location, and decide to sight some compass bearings determine your location.

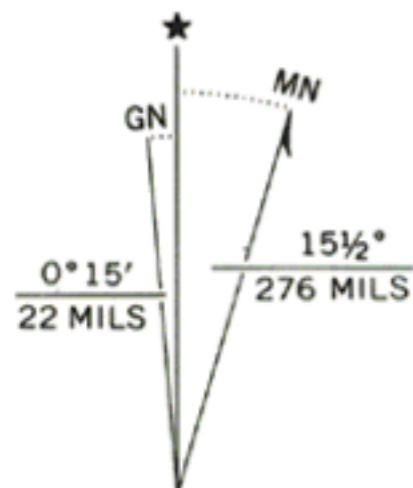
Sharktooth Peak	59°M
Silver Peak	87°M
Cockscomb	136°M

First let's get our north reference sorted out.

USGS provides us a declination diagram dated 1982.
Probably too old to be accurate today.

Google “declination calculator”, and find the current magnetic declination for this map.

Hint: Use the lat/lon from one of the map's corners.



UTM GRID AND 1982 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

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

Calculate Declination

Location

* Latitude: S N

* Longitude: W E

Model

* Model: IGRF 11 WMM 2010

Date

* Date: Year Month Day

Result

* Result format: HTML XML CSV PDF

Calculate

Lookup I

If you are entering y
U.S. Gaze

Location

Zip Code

Country

City

Get Loca

E

Declination

Latitude: 37.5° N

Longitude: 119° W

Date Declination

2014-03-15 13.2° E changing by 0.11° W per year

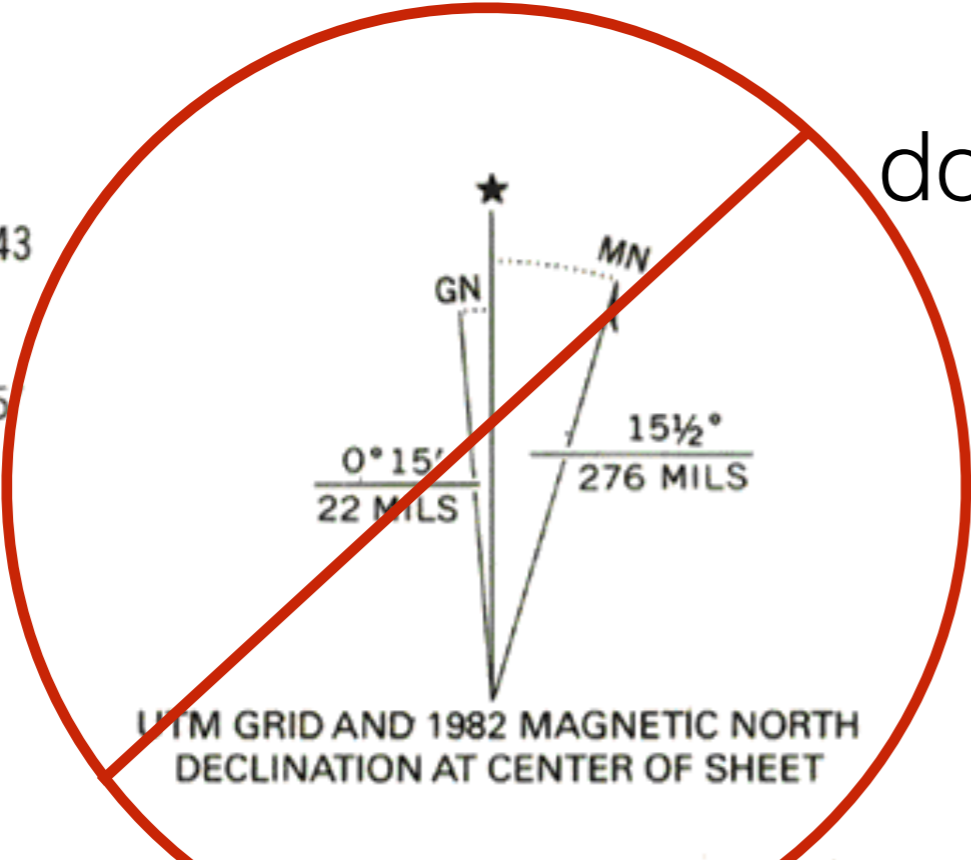


Now let's look at the Grid North lines on the map

Grid North varies with location.
But it doesn't change over time
So the Grid North information
in the 1982 declination diagram
should still be correct.

I measured
1.4°
between
True and Grid
North

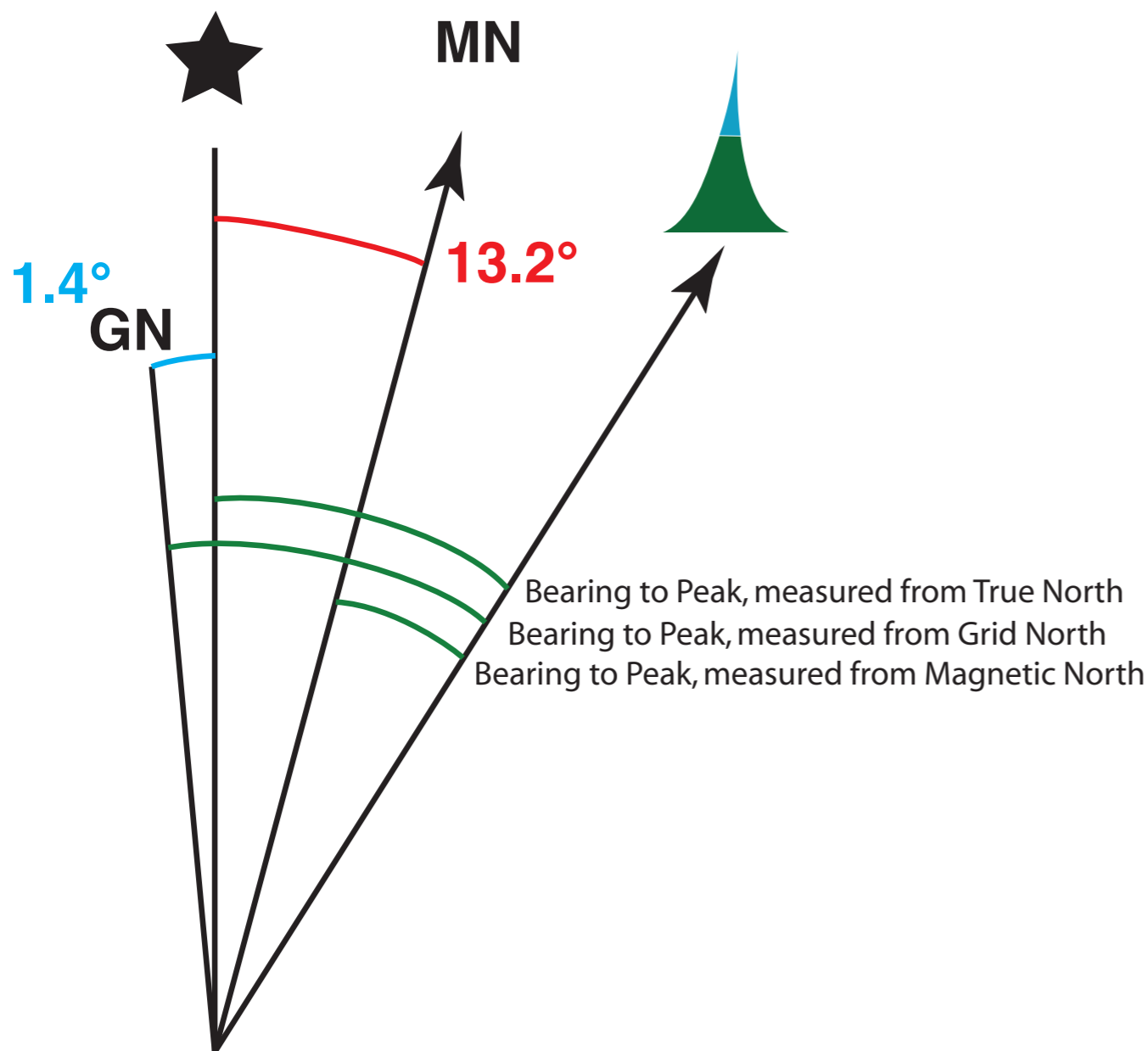
But the angle it makes with True North
(the edge of the map)
doesn't look like a 1/4° to me!



**I don't think this kind of error
is common. But it's a good idea
to check your maps
when you first get them.**

UTM GRID AND 1982 MAGNETIC NORTH
DECLINATION AT CENTER OF SHEET

Our compass bearings are measured from Magnetic North.
We want to plot on the map, measuring from Grid North.



To convert
from a Magnetic bearing
to a True bearing...

$$\text{Mag.} + 13.2 + 1.4 = \text{Grid}$$

or

$$\text{Mag.} + 14.6 = \text{Grid}$$

round to

$$\text{Mag} + 15 = \text{Grid}$$

Convert your bearings to work from Grid North. Plot them on the map.

You are hiking along a trail, north of Coyote Lake. You are not exactly sure of your location, and decide to sight some compass bearings determine your location.

Sharktooth Peak	59°M
Silver Peak	87°M
Cockscomb	136°M

**Sharktooth
Peak
59°M**

**Silver
Peak
87°M**

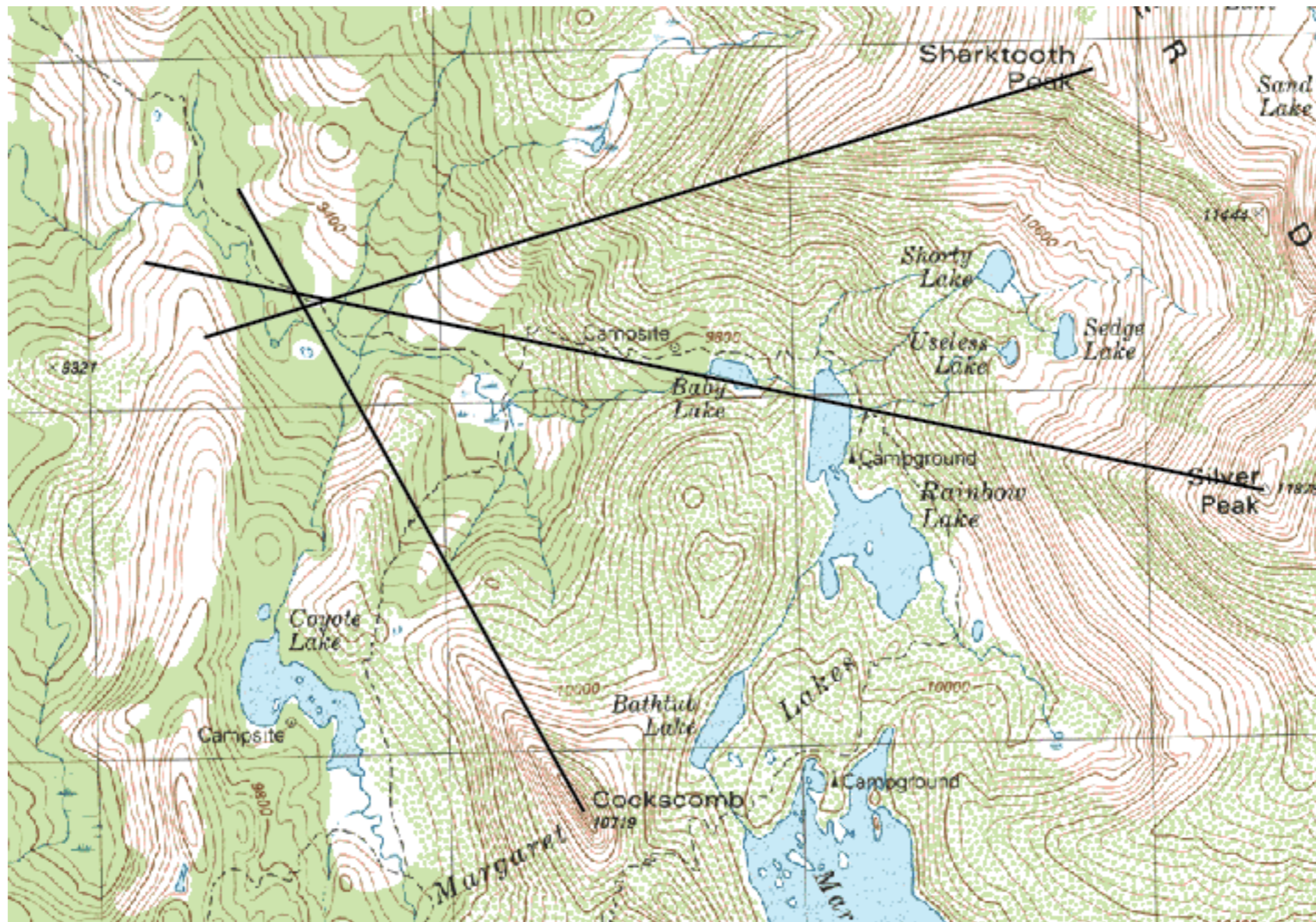
**Cockscomb
136°M**



Image Landsat

Google earth

1999ery Date: 9/14/2013 11 S 320497.04 m E 4148907.97 m N elev 3136 m eye alt 3.30 km

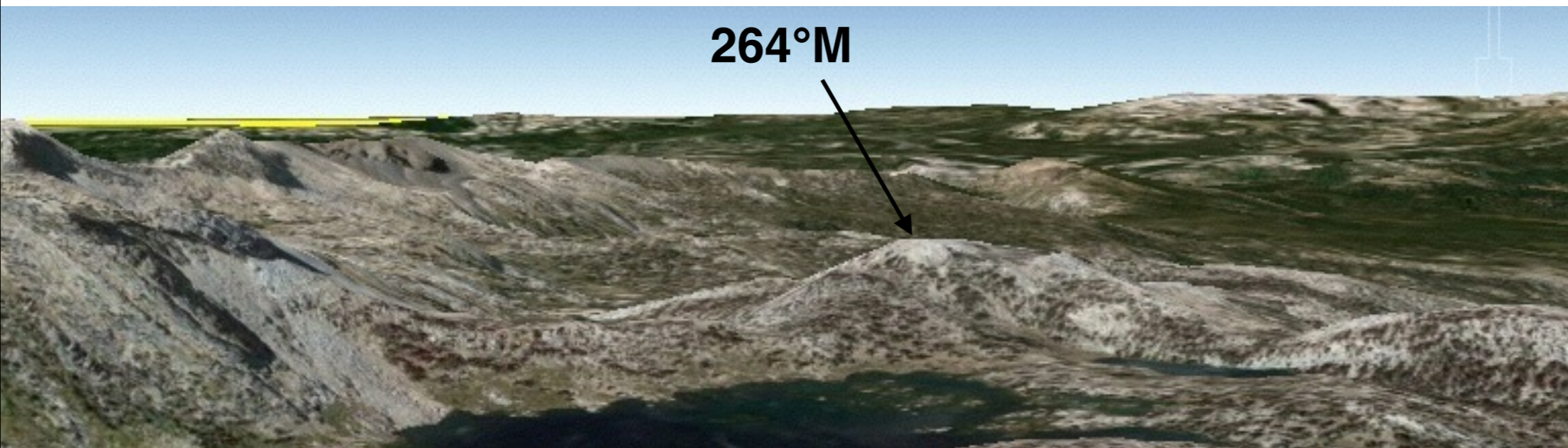


You are somewhere east of Big Margaret Lake. Plot some bearings to find your exact location

View North

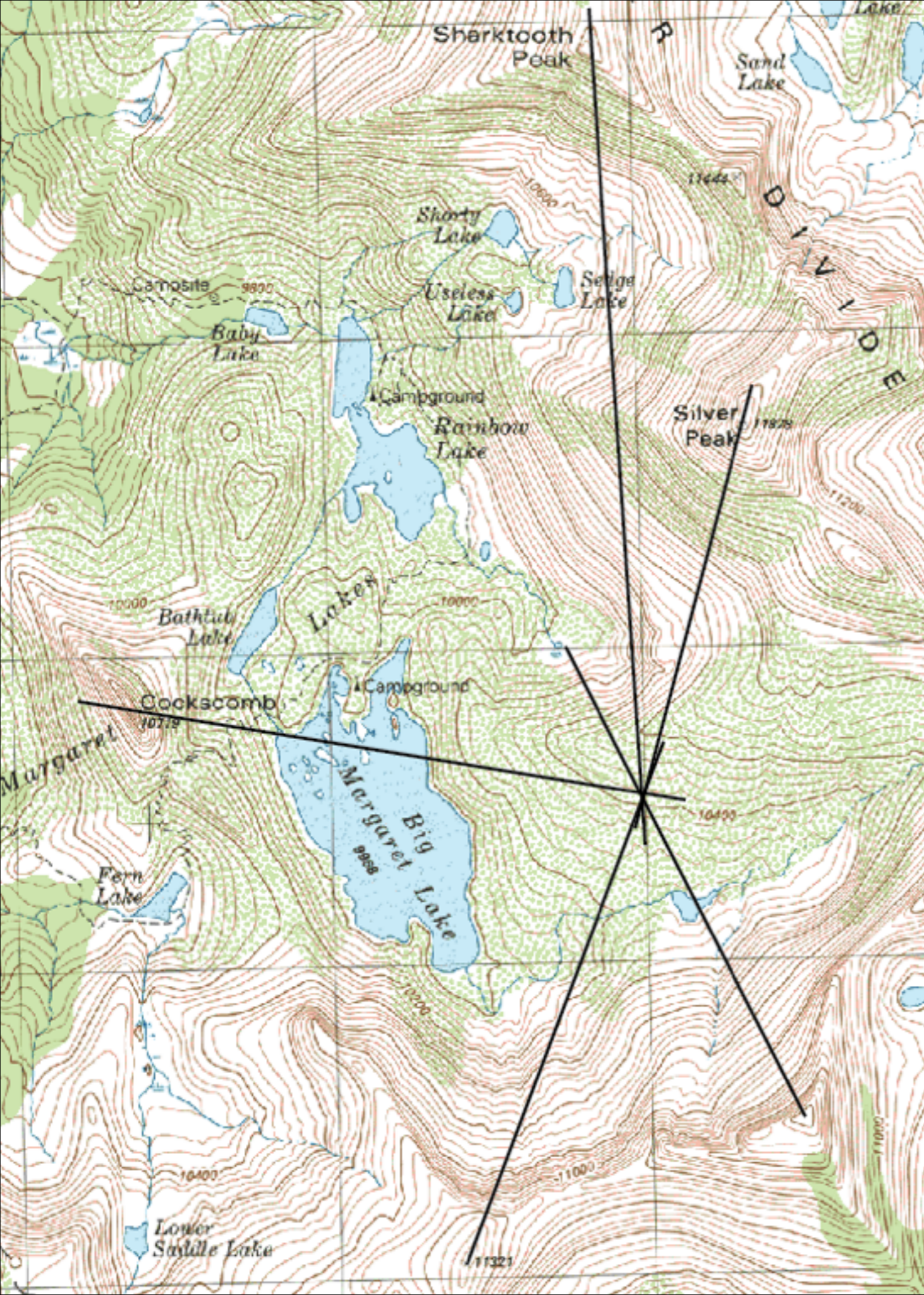


View West



View South





Note that small errors change the location where the bearings intersect when the bearings are either very close to each other or when they are about 180° apart.

Ideal targets are separated by $45^\circ - 135^\circ$

From your campsite at Frog Lake you can see what looks like an old mining cabin in the distance.

Curious about its location, you take a bearing with your compass.

345°M

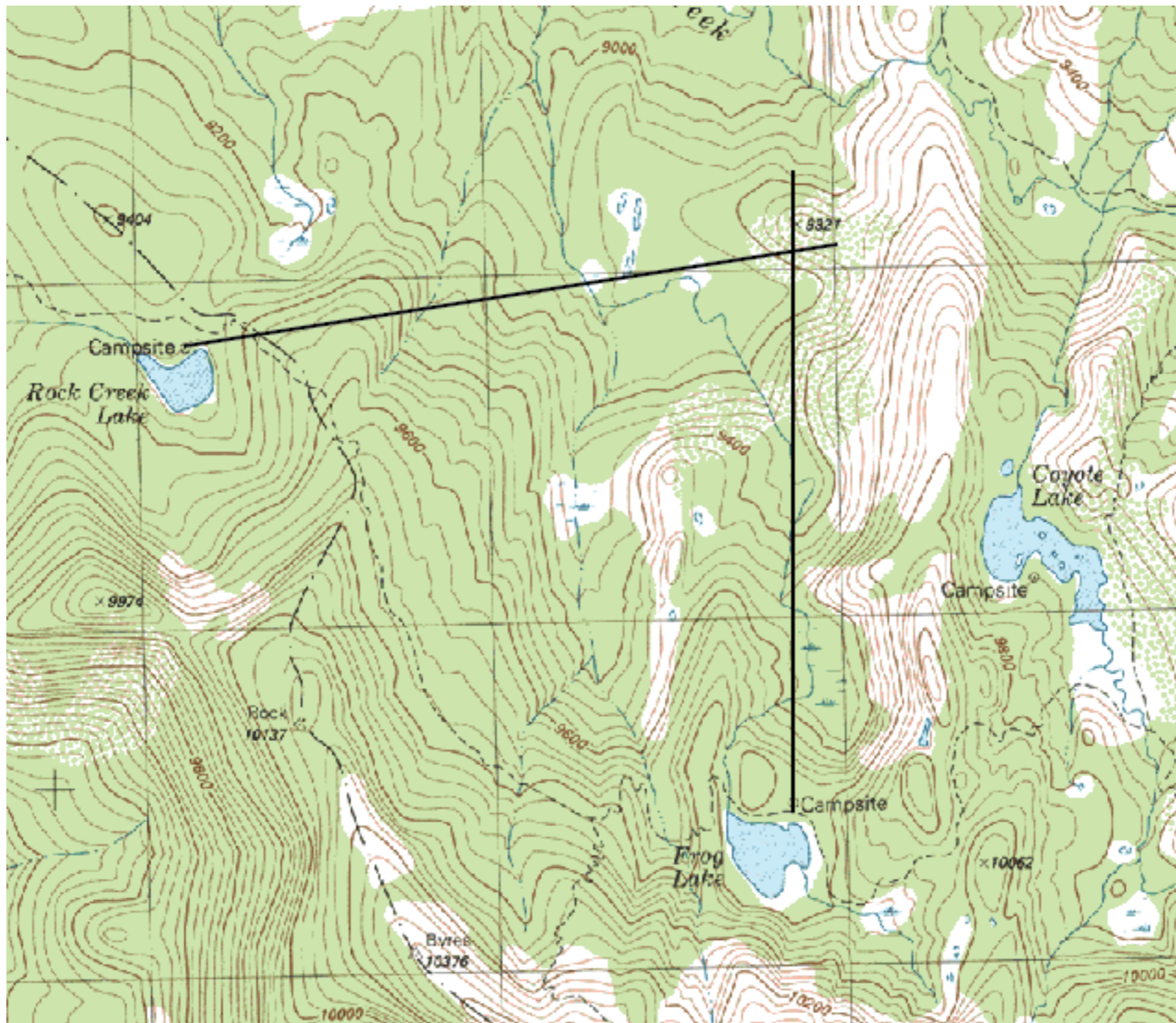
The next day you camp at Rock Creek Lake.

Again you can see the cabin and take a compass bearing.

66°M

Where is the cabin?

Should you take another bearing before you hike to the cabin?



Location by resectioning is often taught, but is seldom used in the field

It's rare to find 3 identifiable features
all of which are on your map sheet.

It's more common to use just one bearing
and combine it with other information,
like being located on a trail
or other identifiable feature.

Often you do not have
enough information
to detect errors in plotting.