

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.

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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.

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Any Questions?

LAND NAVIGATION

PRESENTATION

PART 2

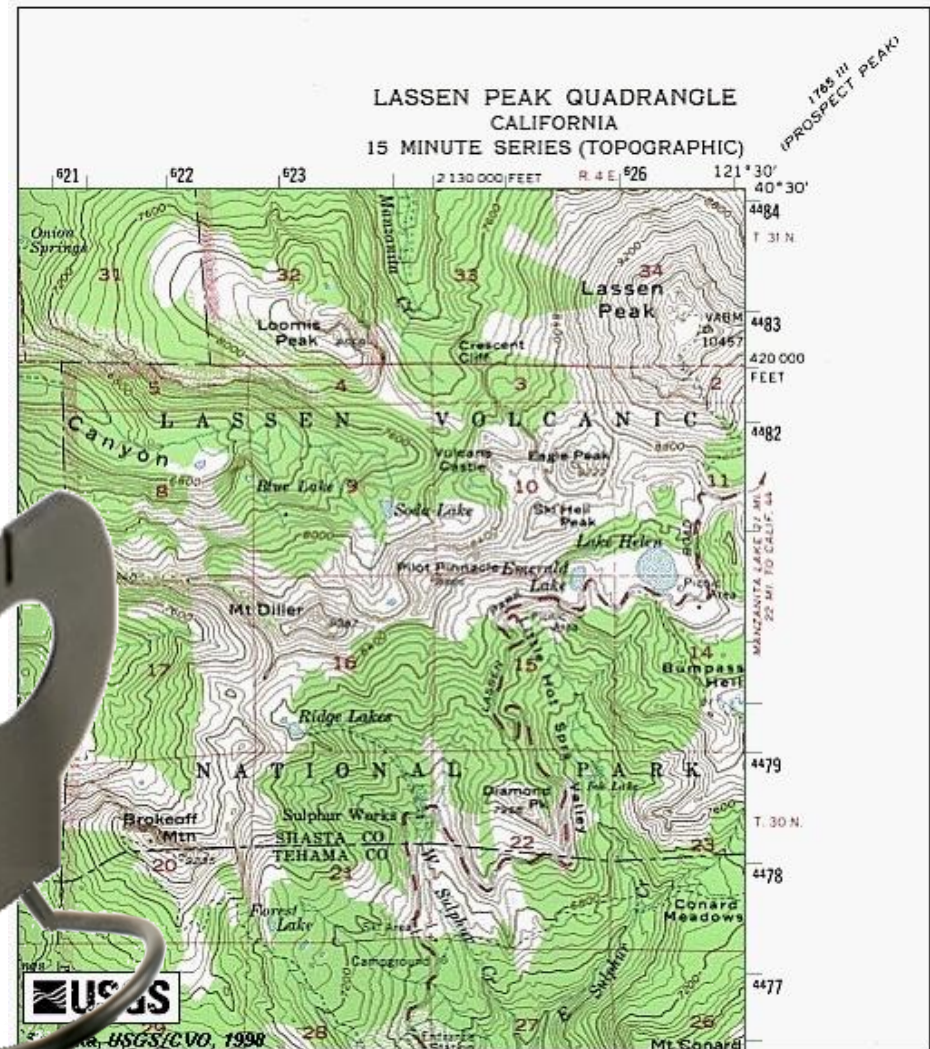
Module 12

Measure Route Distance

... 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 module 1
- The Topographic Map modules 2, 3, 4,
- The Land and Map Association modules 5, 6

PART 2 Intermediate Land Navigation

- Making Sense of Direction module 7
- Tracking Present Location modules 8, 9, 10, 11
- Determining Travel Distance modules 12, 13, 14

PART 3 Advance Land Navigation

- Navigation Methods to Stay On Course module 15
- Additional Skills of Land Navigation module 16
- Planning to Navigate module 17

PART 4 Expert Land Navigation

- Navigation in different types of Terrain module 18
- Night Navigation module 19
- Sustainment module 20

THESE ARE THE TRAINING MODULES

- Module 1 Lensatic Compass – *parts and features, and how to sight the compass by two different methods.*
- Module 2 Topo Map Margin – *what map margin data represents, map care, and how to properly fold a map.*
- Module 3 Topo Map Scale – *map sizes and how it affects amount of detail that will be shown.*
- Module 4 Topo Map Symbols – *you must understand them; to read and speak map language to others.*
- Module 5 Terrain Relief – *shows elevation, indicates terrain features and heights of natural features.*
- Module 6 Map Information – *what a protractor is for and how a map provides four kinds of information.*
- Module 7 Sense of Direction – *lateral drift, current bearing, obstacles, back azimuth, deliberate offset.*
- Module 8 Resection – *locate position with map only. Modified resection is with a map or compass.*
- Module 9 Intersection & Triangulation – *two methods to locate position by compass.*
- Module 10 Map Speaks Compass Language - *there is no need to orient the map to find your position.*
- Module 11 Plotting Position Coordinates – *exact positioning, used to communicate to others with a map.*
- Module 12 Route Measure – *mapping straight-line distance, curvature distance, and slope distance.*
- Module 13 Pace Count – *using ranger pacing beads and estimating hiking speed.*
- Module 14 Travel Distance Estimation – *estimating by 100 meter rule, rule-of-thumb, and by time.*
- Module 15 Plan to Navigate – *in a group or alone, equipment, safety, responsibilities, route selection.*
- Module 16 Stay on Course – *advance reference points and advance baselines.*
- Module 17 Additional Land Navigation Skills – *estimate daylight, conserve energy, blisters, weather insight.*
- Module 18 Navigating Different Terrain – *special environments, featureless terrain, visibility, dense foliage.*
- Module 19 Night Navigation – *night adaptation, protecting night vision, navigate with lensatic compass.*
- Module 20 Sustainment – *maintaining skills, training others, setting up a land navigation course.*

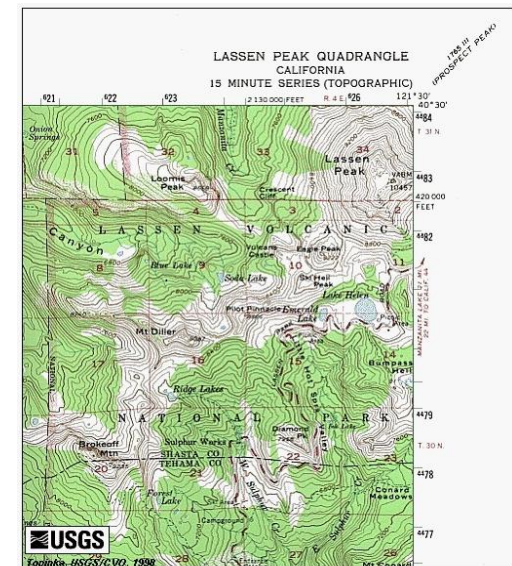
Any Questions?

PART 2

INTERMEDIATE LAND NAVIGATION

MODULE 12

- **Determine Travel Distance**
 - Measuring Route Distance



DETERMINING TRAVEL DISTANCE

DESCRIPTION



Determining travel distance is the most common error encountered while moving. There may be circumstances where you are unable to determine travel distance using your map. It is therefore essential to learn methods by which you can accurately measure, pace, or estimate distances on the ground.

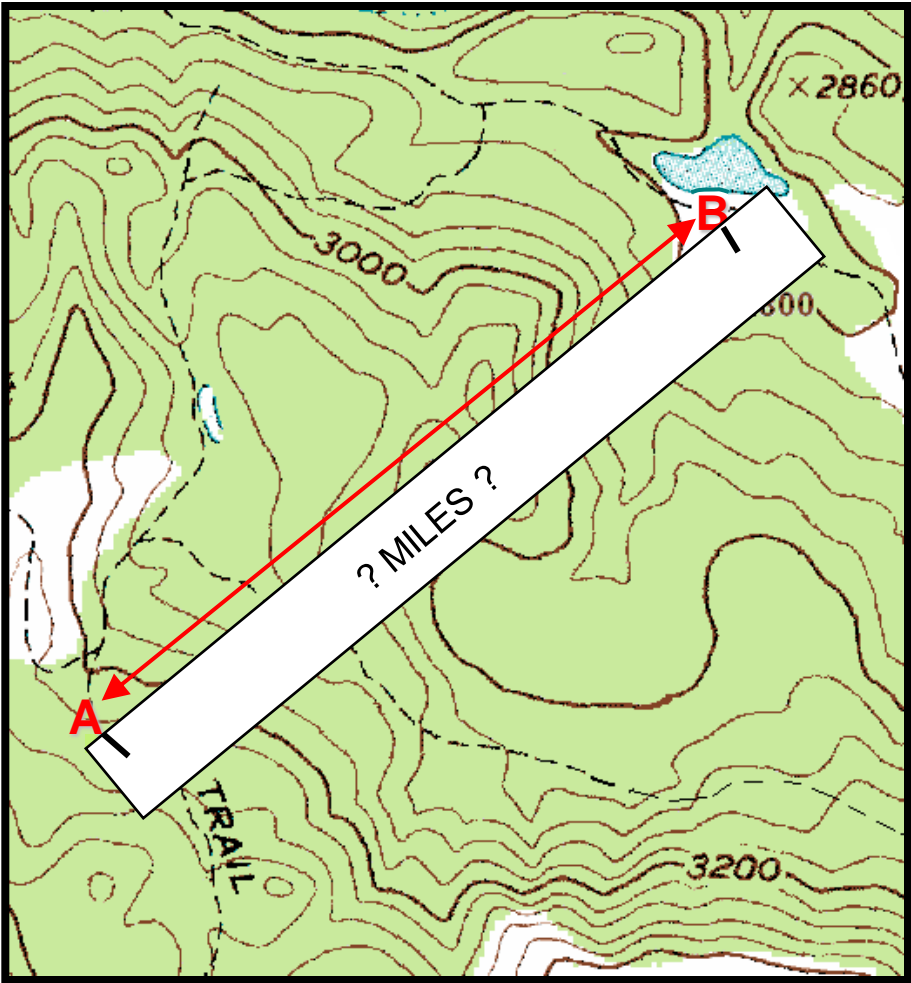
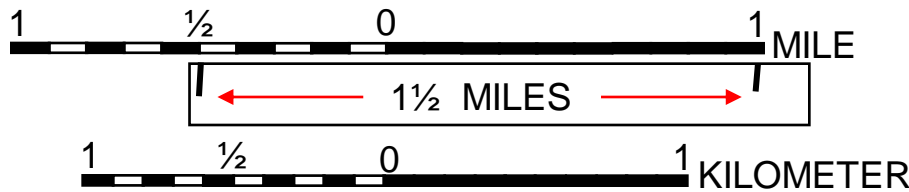
How far is that mountain? An ability to judge distances accurately is not a natural gift, but it is a skill worth developing. Judging distances accurately can help to identify features and avoid wrong assumptions that could lead to **trouble**; (“We should have reached camp by now... that’s got to be Eagle Mountain, I think?”)

- There are several techniques to measure distance on a map.
 - STRAIGHT LINE DISTANCE – measuring from point A to point B on a map (horizontal distance).
 - CURVATURE DISTANCE – measuring a trail or other curved line on a map (horizontal distance).
 - SLOPE DISTANCE – measuring the planned route terrain slope on a map (vertical distance).
- There are several techniques to determine distance on the ground.
 - SPEED – estimating your travel speed, how many miles per hour.
 - PACE COUNT – count the number of steps you have taken and translate to ground distance.
 - ESTIMATION – visualizing a set ground distance.
 - TIME – Make it a habit of keeping your map and compass handy and refer to them every hour or so to locate your position (more often in low visibility). Keep track of your starting time, rest breaks and hiking pace. This will also give you an idea of how far you have traveled over a period of time.

DETERMINING TRAVEL DISTANCE

MEASURE STRAIGHT LINE DISTANCE

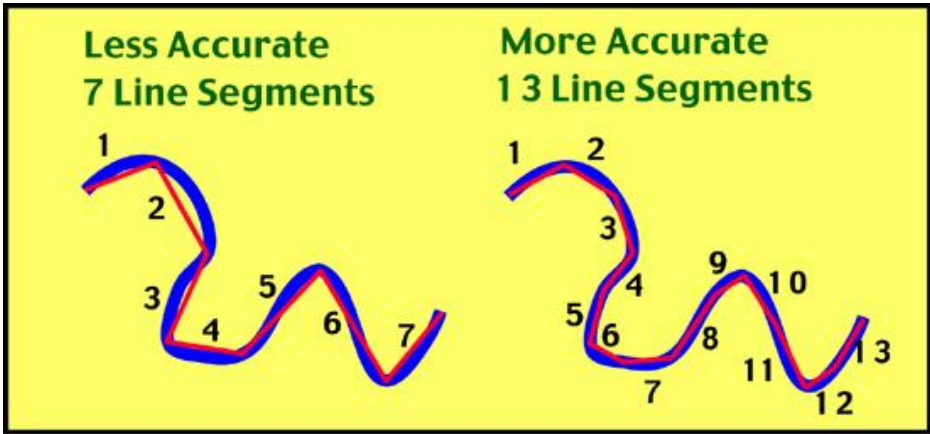
1. To determine straight-line distance between two points on a map, lay a straight-edged piece of paper on the map so that the edge of the paper touches both points and extends past them. Make a tick mark on the edge of the paper at each point.
2. To convert the map distance to ground distance, move the paper down to the graphic bar scale, and align the right tick mark with a printed number in the primary scale so that the left tick mark is in the extension scale.
3. Measure (add) the bar scale miles or kilometers.



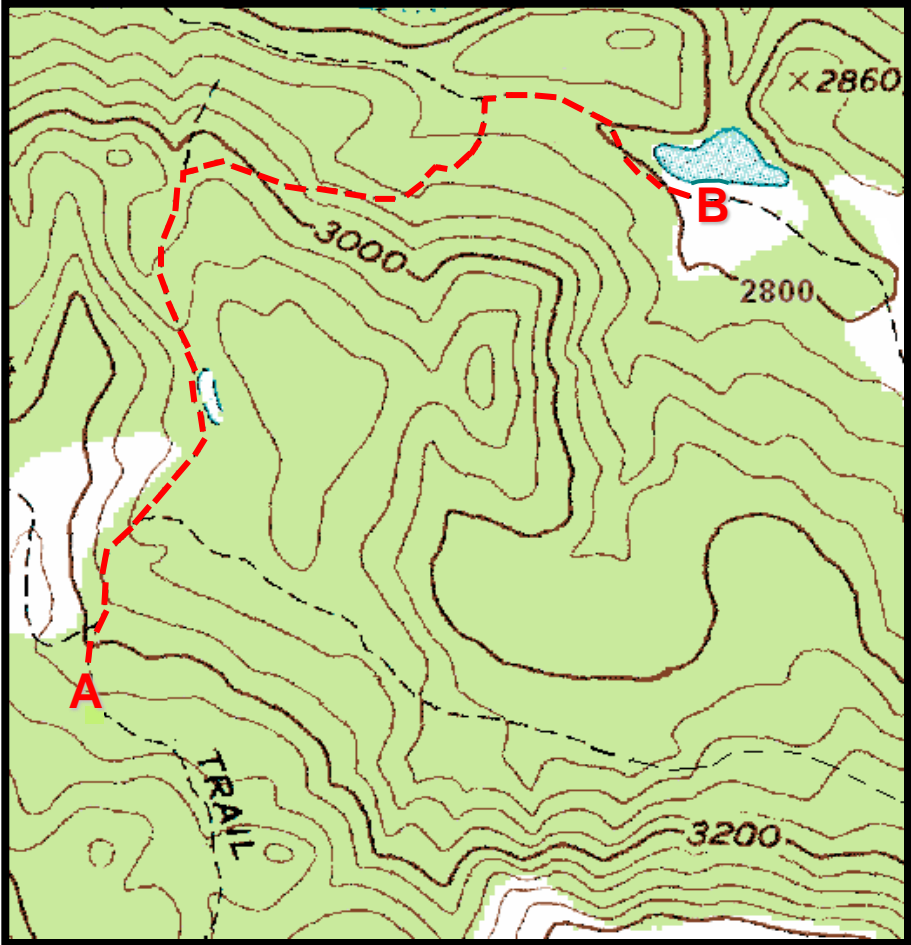
DETERMINING TRAVEL DISTANCE

MEASURE CURVATURE DISTANCE

Measuring distance along map features that are not straight is a little more difficult. One technique that can be employed for this task is to use a number of straight-line segments. The accuracy of this method is dependent on the number of straight-line segments used.



Another method for measuring curvature map distances is to use a device called a map wheel. This device uses a small rotating wheel that records the distance traveled. The distance is measured by placing the device wheel directly on the map and tracing the trail or planned route with the wheel, it measures either in centimeters or inches.

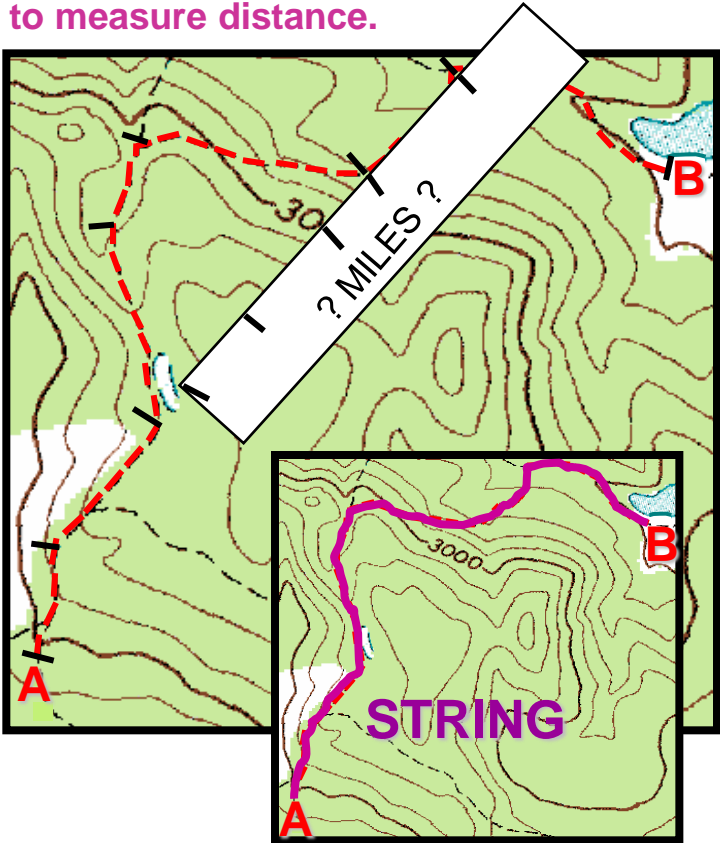
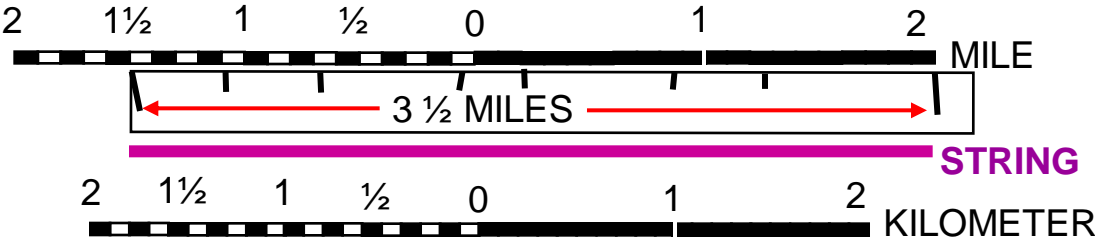
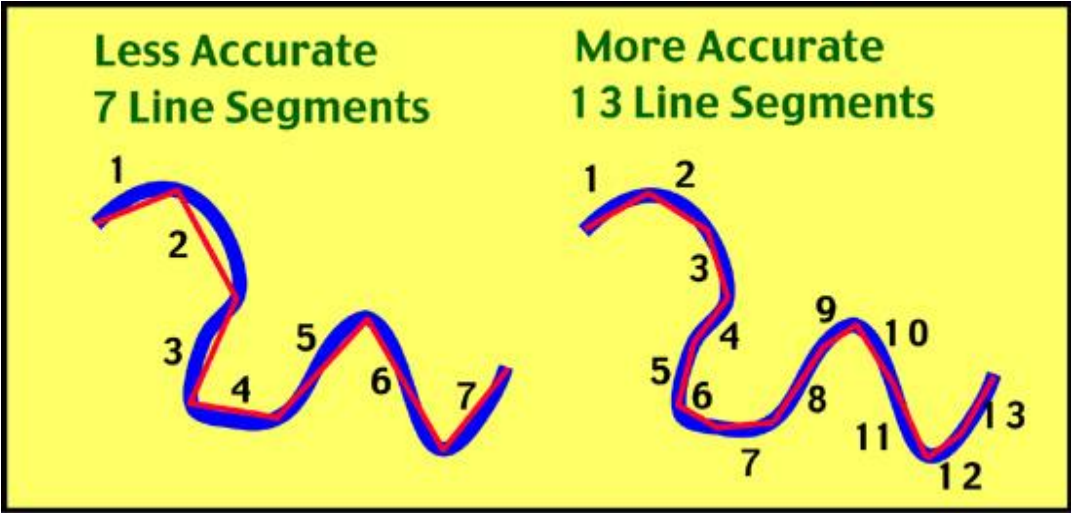


DETERMINING TRAVEL DISTANCE

MEASURE CURVATURE DISTANCE

To measure distance along a road, stream, or other curved line, the straight edge of a piece of paper is used. Place a tick mark on the paper and map at the beginning point from which the curved line is to be measured. Align the edge of the paper along a straight portion and make a tick mark on both map and paper where the edge of the paper leaves the straight portion of the line being measured. Repeat for each straight segment of the road, stream, or other curved line. When completed, measure distance from first tick mark to last tick mark on map scale.

NOTE – you can also use a string laid out on the planned route to measure distance.



DETERMINING TRAVEL DISTANCE

MEASURE SLOPE DISTANCE (percentage or degree)

- 1. Determine elevation of point (A) (3240 feet) and (B) (2800 feet).
- 2. Vertical Distance (VD) is subtracting the lowest slope point (B) from the highest point (A), (440 feet) is VD.
- 3. Measure Horizontal Distance (HD) between points (A) and (B).
- 4. Compute the slope percentage by using the formula below. (HD) + (Slope%) = total distance

Example 5280ft (1mile) + 25% slope = 5280ft + 1320ft (25% of 5280) = 6600ft (1¼ mile)

** 25% slope (14°)= every 100ft traveled forward is 25ft traveled up (4ft forward is 1ft up) **

NOTE: the higher the **percentage %** or **degree°**, the steeper the slope and the longer the distance.

Slope % percent = $\frac{VD \times 100}{HD}$ = % percent

Slope degree° = $\frac{VD \times 57.3}{HD}$ = slope degree°

Slopes above 12% is a concern for a hiker.
Slopes above 25% and a hiker is climbing.

CURVATURE DISTANCE IS 3½ MILES = 18480 FEET

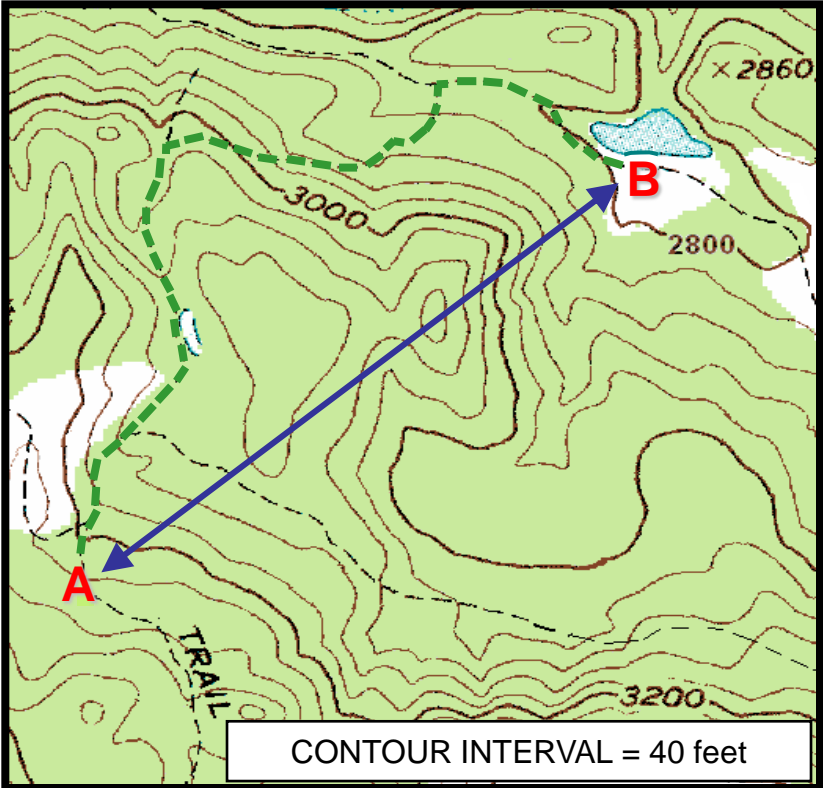
Slope % = $\frac{440 \text{ ft} \times 100}{18480}$ = 2 % (+ 370 ft) [1° slope]

Total distance 18480 + 370 = 18850 feet

STRAIGHT LINE DISTANCE IS ¾ MILE = 3960 FEET

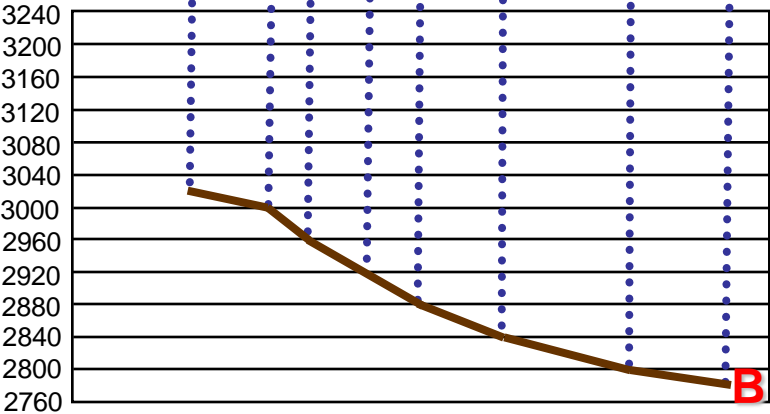
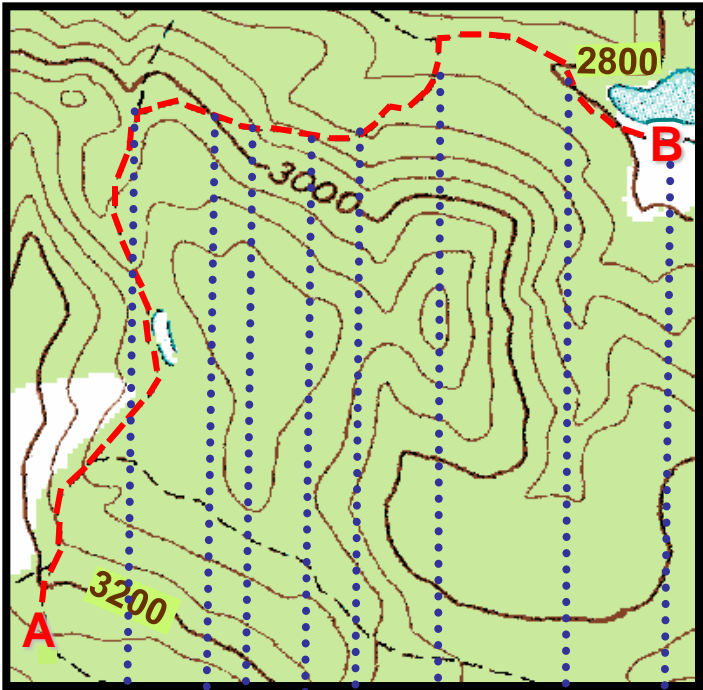
Slope%= $\frac{440 \text{ ft} \times 100}{3960}$ = 12 % (+ 443 ft) [6° slope]

Total distance 3960 + 443 = 4403 feet



DETERMINING TRAVEL DISTANCE

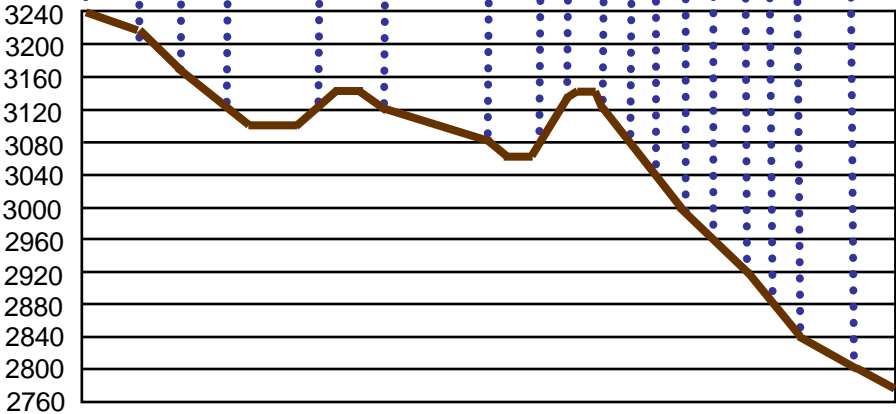
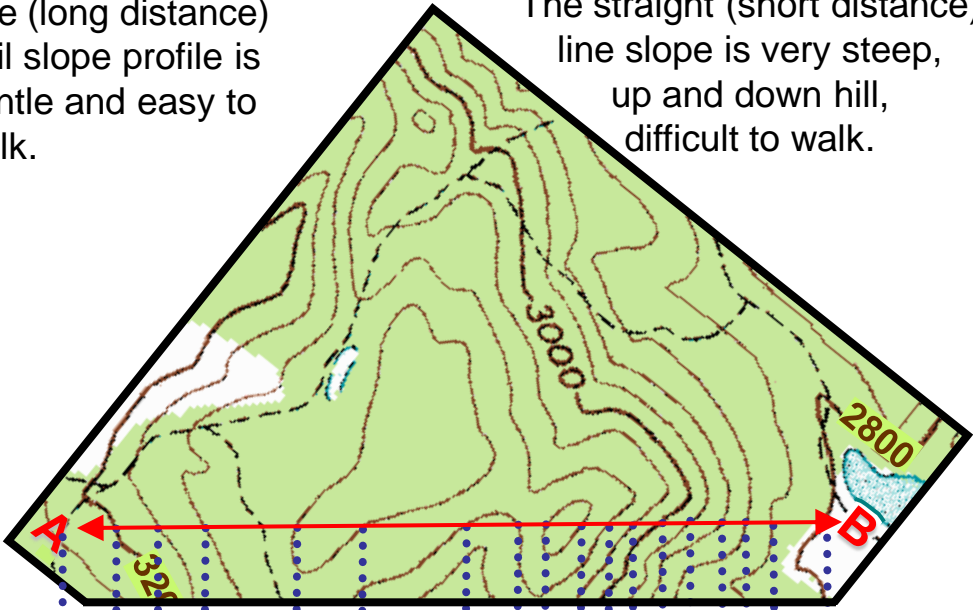
MEASURE SLOPE DISTANCE (slope profile)



Curvature Trail route vs. Straight Line route.

The (long distance) trail slope profile is gentle and easy to walk.

The straight (short distance) line slope is very steep, up and down hill, difficult to walk.

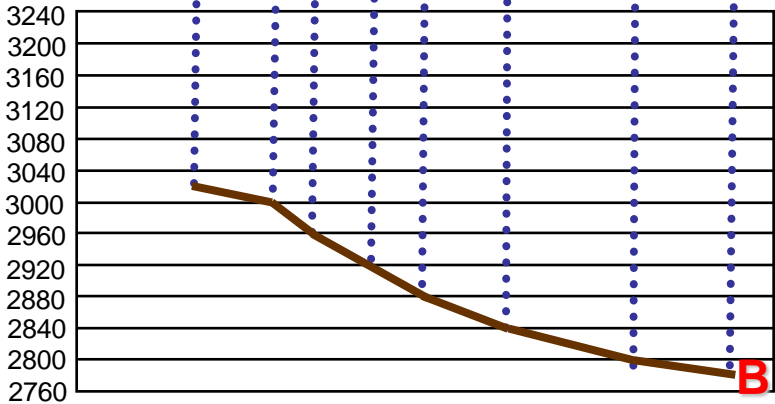
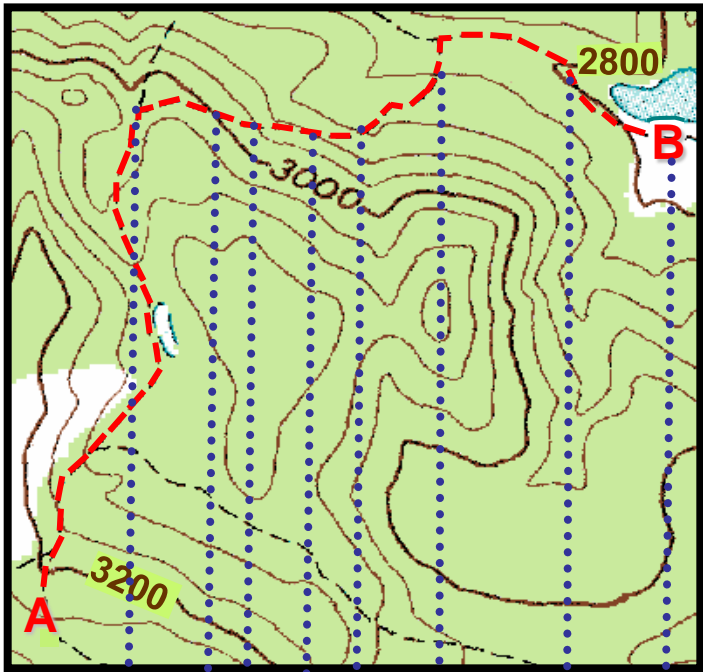
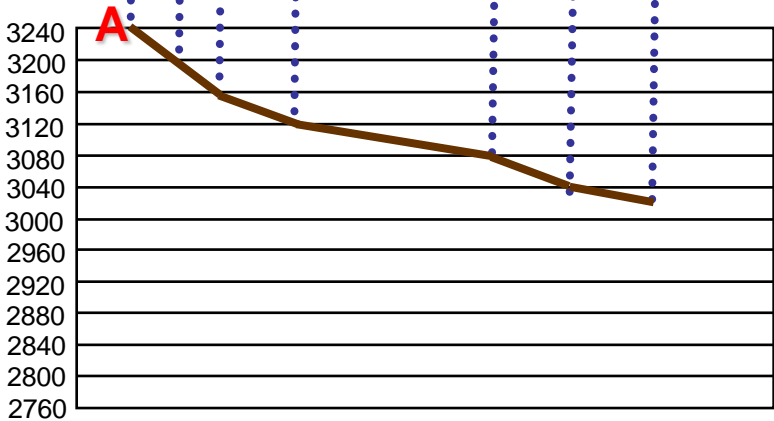
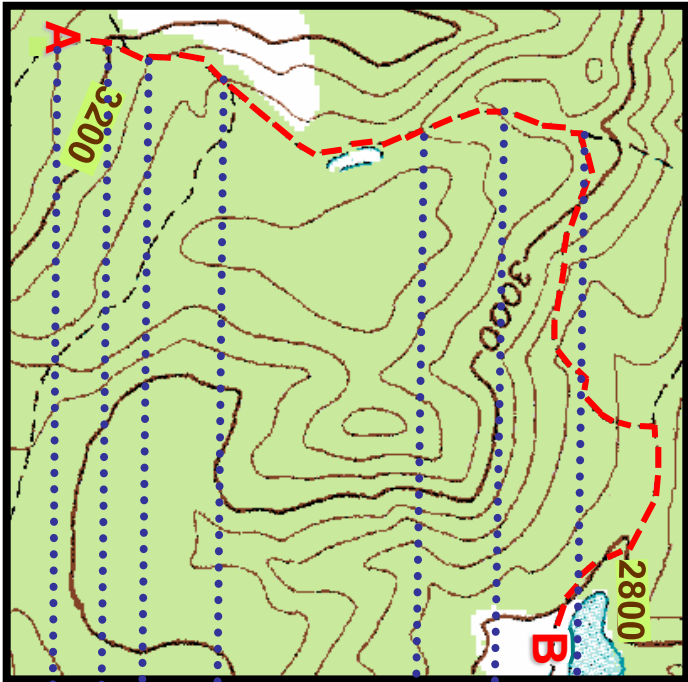


DETERMINING TRAVEL DISTANCE

SLOPE DISTANCE (slope profile)

Curvature Trail route and slope steepness.

Even though this route is longer, it is obvious that this is a gentle and easy route to walk.



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TESTING

Now it is time for the following . . .

- Written exam
- Hands-on / Outdoors exam

THE END OF
LAND NAVIGATION
PRESENTATION
PART 2

Module 12

Measure Route Distance