Falcon Focus

- Coal is an important natural resource. Which process contributes most to the formation of coal?

A. the layering of sediments and partially decayed plant matter

B. the decay of algae and microscopic organisms on the seafloor

C. the burning of large forested regions

D. the forcing of water through openings in Earth's crust

Essential Question

- Explain the difference between nonrenewable and renewable resources.

Standard 8-3.9: Identify and illustrate geologic features of South Carolina and other regions of the world through imagery (including aerial photography and satellite imagery) and topographic maps

http://www.blinkx.com/watch-video/topographic-maps-video-notes/gRImv_NDcFHH8darefbjXw

Introduction to Imagery and Topographic Maps

Introduction

- **Geologic features on Earth can be identified through use of aerial photographs, satellite imagery and topographic maps.**

- Whether it is on paper or on a computer screen, a map is the best tool available to record and view the arrangement of things on the Earth's surface. Maps of various kinds—road maps, political maps, land use maps, maps of the world—serve many different purposes.

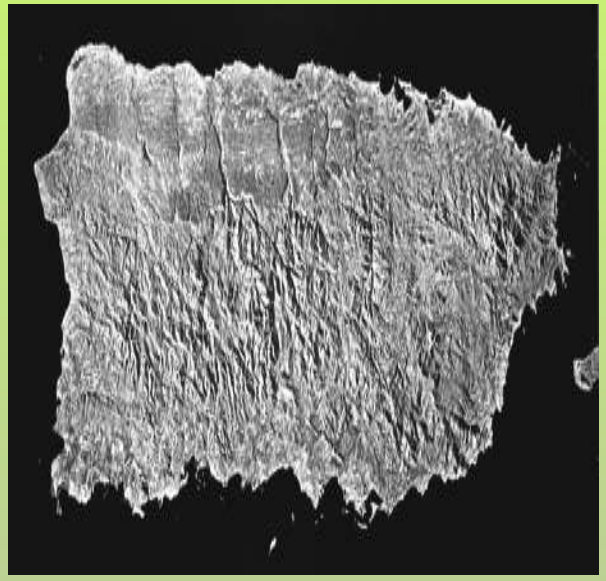
Imagery Maps

- Highflying aircraft and satellites high above Earth use sensors and cameras to gather information about Earth's landforms and resources.
- Computer models translate the satellite data into images and scientists can identify features on the Earth's surface through colors and shapes that features make on the image.

Types of Imagery

▪.

▪**Electronic scanning images:** This method records selected parts of the electromagnetic spectrum. A common example is SLAR (side looking airborne radar), where a radar beam is sent to the ground at a perpendicular angle, which then reflects off the surface, and is recorded by a scanner on the aircraft.



SLAR of Puerto Rico, USGS image

Types of Imagery

▪.

Aerial Photograph images: These photos have been available since the early 1930's, though this method has largely been replaced by satellite imagery. Most photographs were taken by a camera shooting straight down (vertical photographs) from airplanes and because they have low distortion, they were useful for extracting data. Oblique aerial photos are good for illustrations, but are distorted. Typically, one views a set of overlapping aerial photographs with a stereoscope to see it in 3-dimension. Aerial photography was first practiced by the French photographer and balloonist Nadar in 1858 over Paris, France.

Football stadium, NY. USGS image.

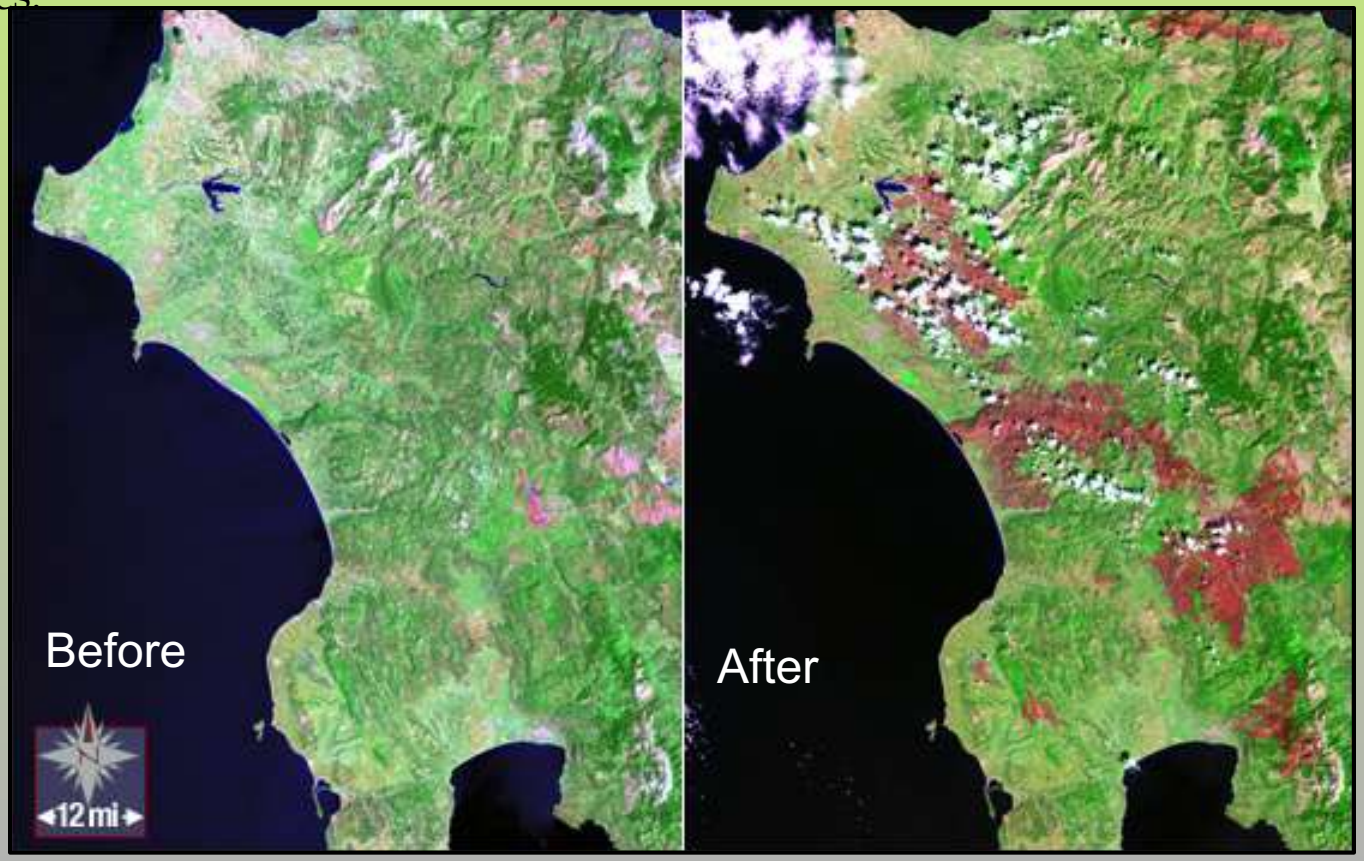
Types of Imagery

- **Satellite Images:** Most common method currently for identifying land features. Black & white, infrared black & white, natural color, infrared color, and various combinations exist in satellite imagery. Colors recorded by color infrared film are not true colors, but false colors. This is because they cut out all or part of the visible spectrum. In false colors, green plants are red and clear water is black.

Honolulu, HI. USGS image

Using imagery to show changes on Earth's surface

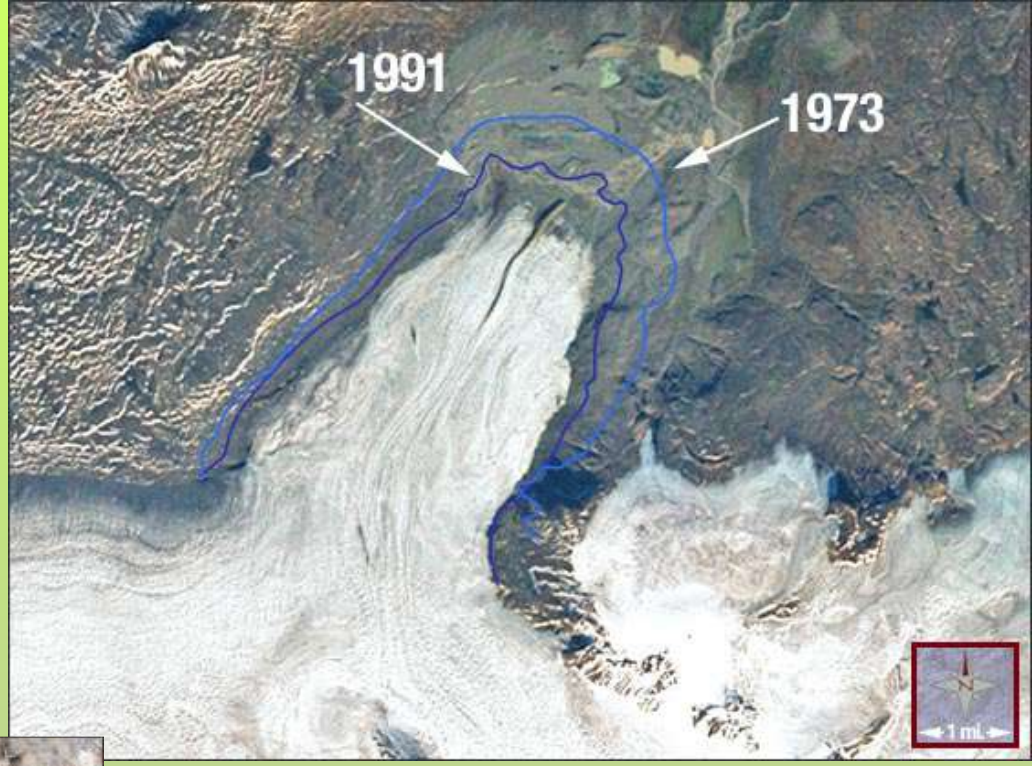
- The most valuable imagery for geologists was gathered by the **LANDSAT satellites** launched from 1972 to 1984. All carried multispectral scanners capable of scanning 185-km wide paths in 4 separate wavelength bands corresponding to green, red, and 2 reflected infrared bands.
- False colors are obtained by projecting the four wavelength bands through filters and combining them to form a false-color composite image.
- Geologic and geographic features can be recognized as well natural events such as floods and fires.



Greece before and after fires of 2007 (NASA image).

Notice the red areas in the photo on the right indicating soil exposure where there was once vegetation.

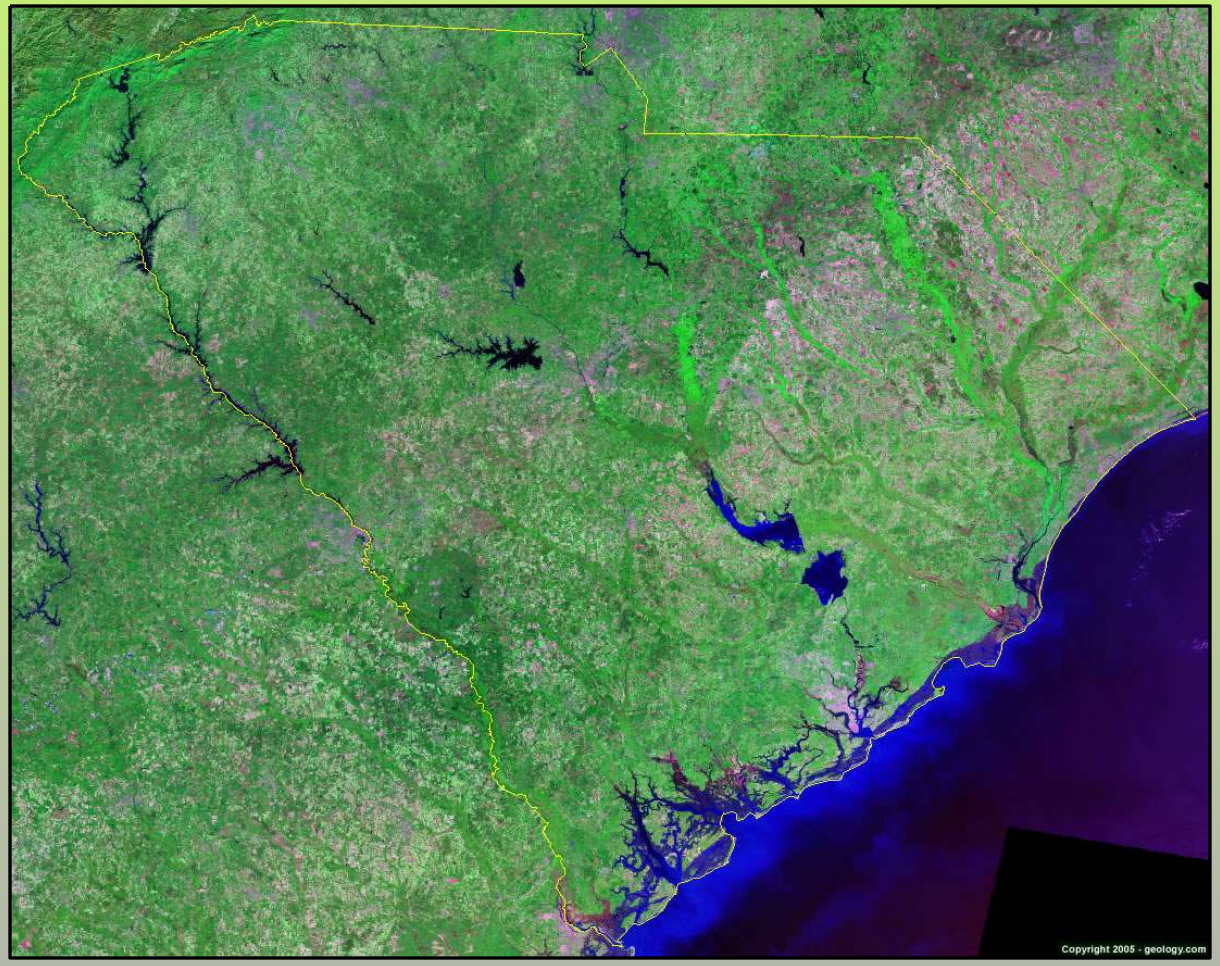
Images from satellites can provide us with changes of the land surface over time. For example, the outlet glacier in Iceland (photo right). The true-color Landsat 7 image to the right shows how much the glacier terminus has moved back in 18 years. The image was taken in 2000, where one can see even more retreat since 1991 (NASA image).



Entire cities can be monitored for wide spread changes. There were noticeable land-mark changes to the New York City landscape after September 11, 2001. To the left is an image of Baghdad, where land surface changes have occurred over recent years (NASA image).

South Carolina is an interesting state because there are a variety of landscape that can be easily identified on many types of maps including mountains and streams of the Piedmont Region and Carolina Bays and swamplands of the Coastal Region.

In addition, **1. coastal features, 2. forested areas, 3. farmlands, 4. tributaries, and 5. lakes** can be observed on imagery maps.



Satellite image of South Carolina. All images used with permission of geology.com

Forest (lush green)

Farmland (red/green patchwork)

Swampland and estuaries

Lakes (light blue to black depending on sediment load)

- **Carolina Bays** are an interesting surface feature located along the Atlantic seaboard. They are elliptical depressions numbering approximately 500,000 clustered in groups from Florida to New Jersey and are usually oriented NW-SE.

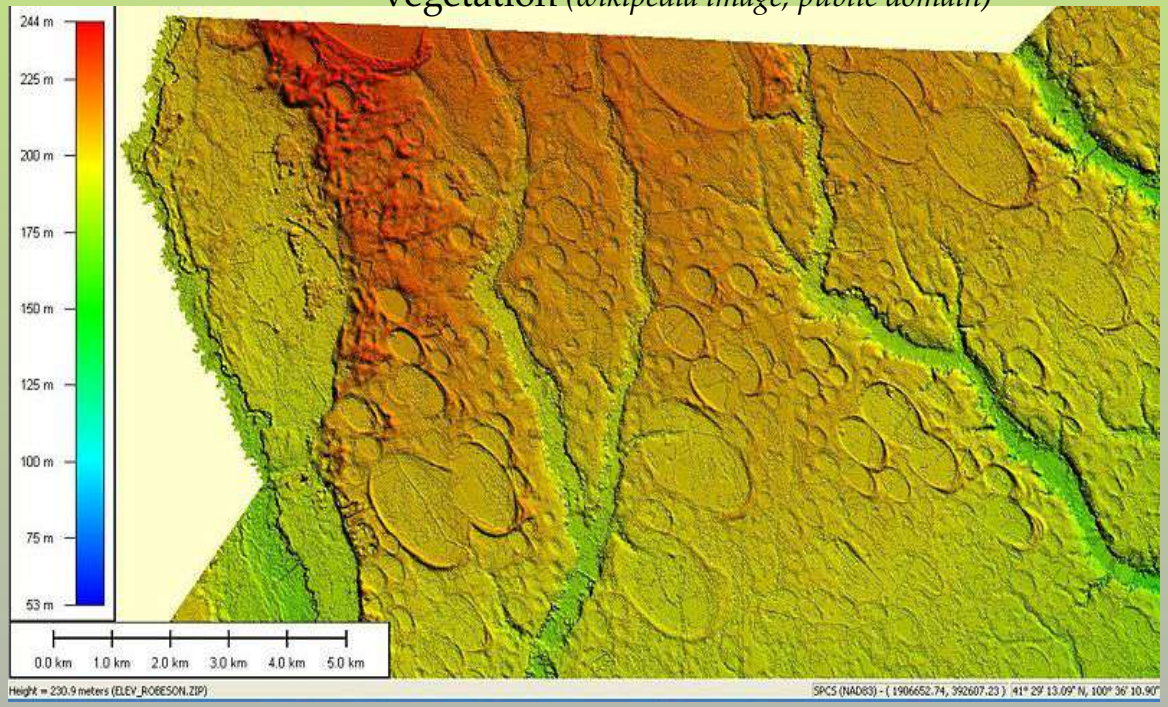
- Most of these bays are marshy wetlands. Some of the larger ones are lakes and they vary in size from one to several thousand acres.

A cluster several of bays filled with vegetation *(wikipedia image, public domain)*

- Radiocarbon and palynology (pollen) dating techniques indicate that the bays are of Pleistocene age.

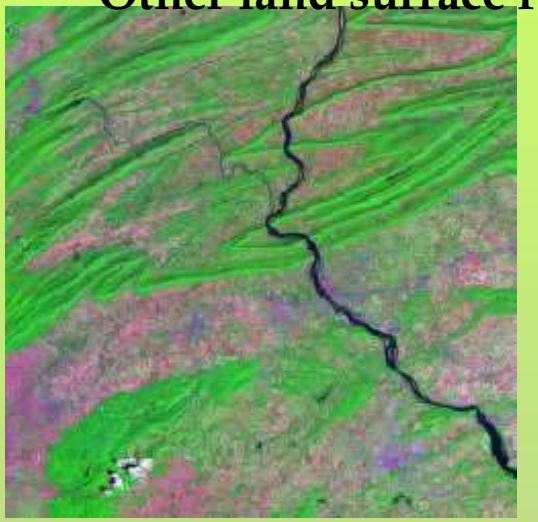
- Bays can be seen clearly on topographic and imagery maps.

- No one theory for origin has been confirmed, and theories include sea currents, upwelling of groundwater, and climate change. Scientists have found that the orientation is consistent with wind patterns during the last glaciation.

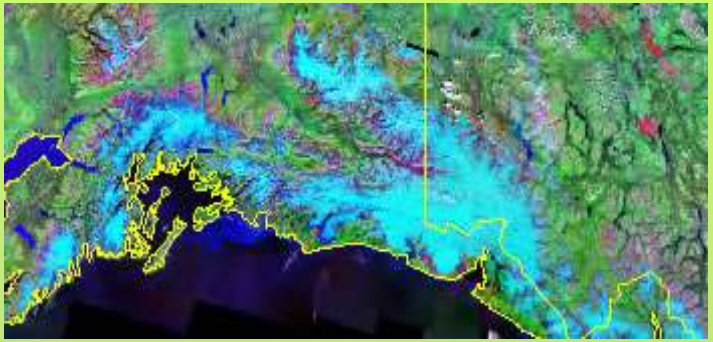


Elliptical Carolina bays of N.C. clearly seen on digital elevation image *(wikipedia image, public domain)*

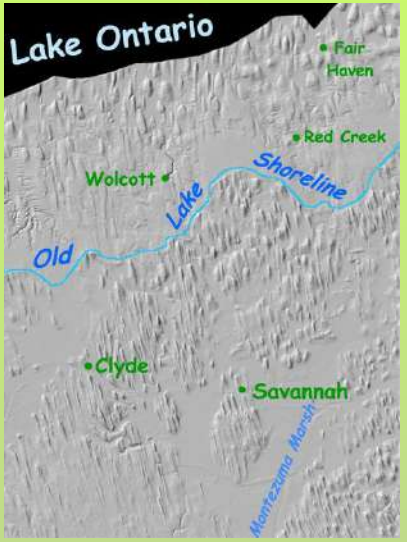
Other land surface features of the world can be seen by studying imagery



Folded mountains of the Appalachians, Penn. *(geology.com image)*



Alaskan glaciers, usually as light blue *(geology.com image)*



Drumlin field, Wayne County N.Y. (USGS image)

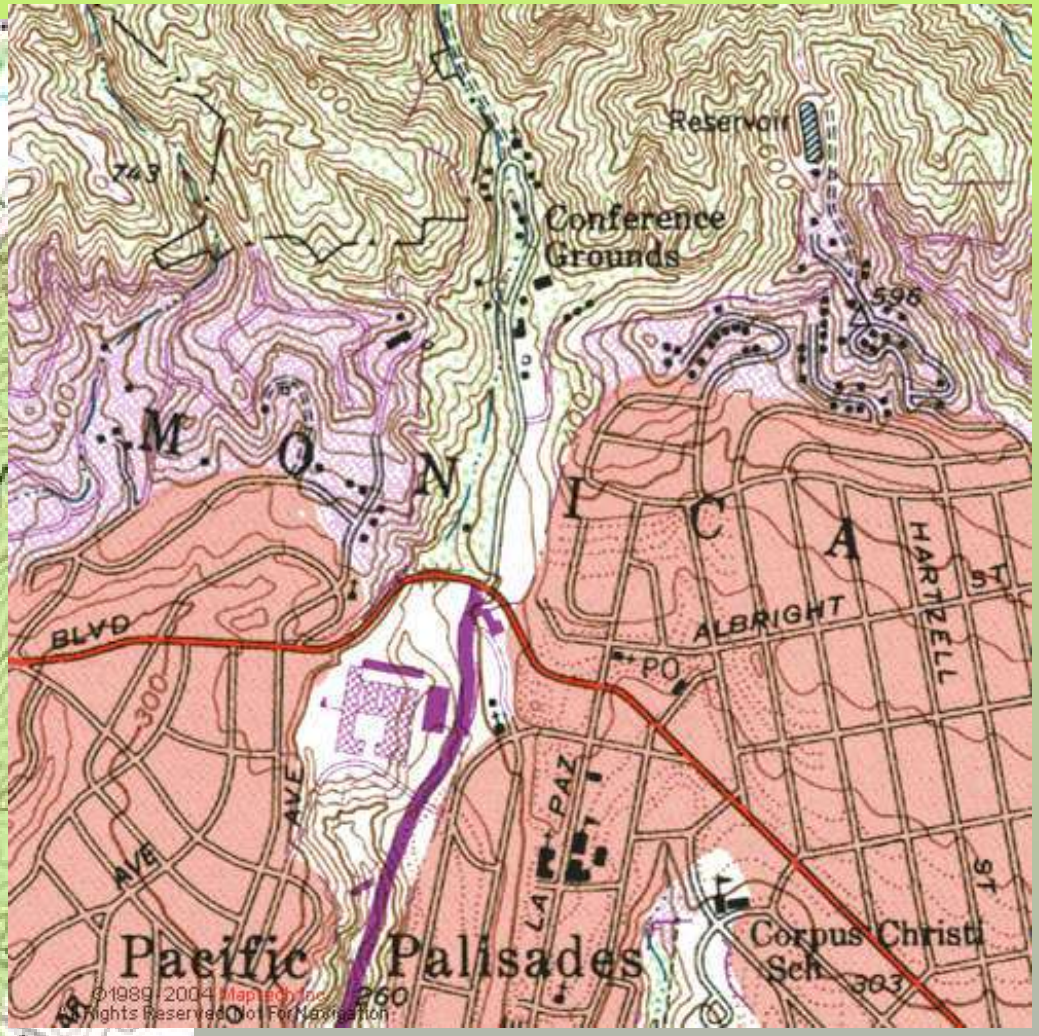
Volcanoes, Wash. *(geology.com image)*

Finger Lakes, N.Y. *(geology.com image)*

Mt. St. Helens (eruption 1980) *(NASA image)*

- Geologic features (for example, mountains, river and tributary flow, lakes, farmland, forests, Carolina bays, or coastal features) can be identified using South Carolina satellite images and aerial photographs, as well as other imagery from regions of the world.

Topographic Maps



Topograhic Maps

- These are maps that use **symbols** to portray the land as if viewed from **above.**
- They provide information on **elevation, relief, and slope** of the ground surface, as well as the location of roads, buildings, swamps, and other features, natural and man-made.
- Along with the scale and symbols, the **contour lines and the contour interval** are critical to understanding the topographic map.

Topographic Maps

- Geologic features can be identified on a topographic map using the **contour lines and interval** spacing as well as the symbols on the map.
- Geologic features can also be illustrated the geologic feature with a **two or three-dimensional** model or profile based on the topographic data.

Topographic Maps:

- Understanding the scale of a map, the symbols used and contour intervals and lines is important. The scale of a map is the relationship between a distance on a map and the corresponding distance on the earth's surface
- Cross-sectional profiles can be easily made using a topographic map, which is helpful when determining the slope of the area.

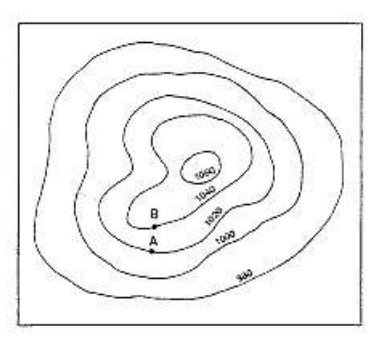
- One of the most widely used of all maps is the **topographic map**. **The feature that most distinguishes topographic maps from maps of other types is the use of contour lines to portray the shape and elevation of the land.**
- The Breakdown:
- Topographic Maps = **contour** lines = **elevation**

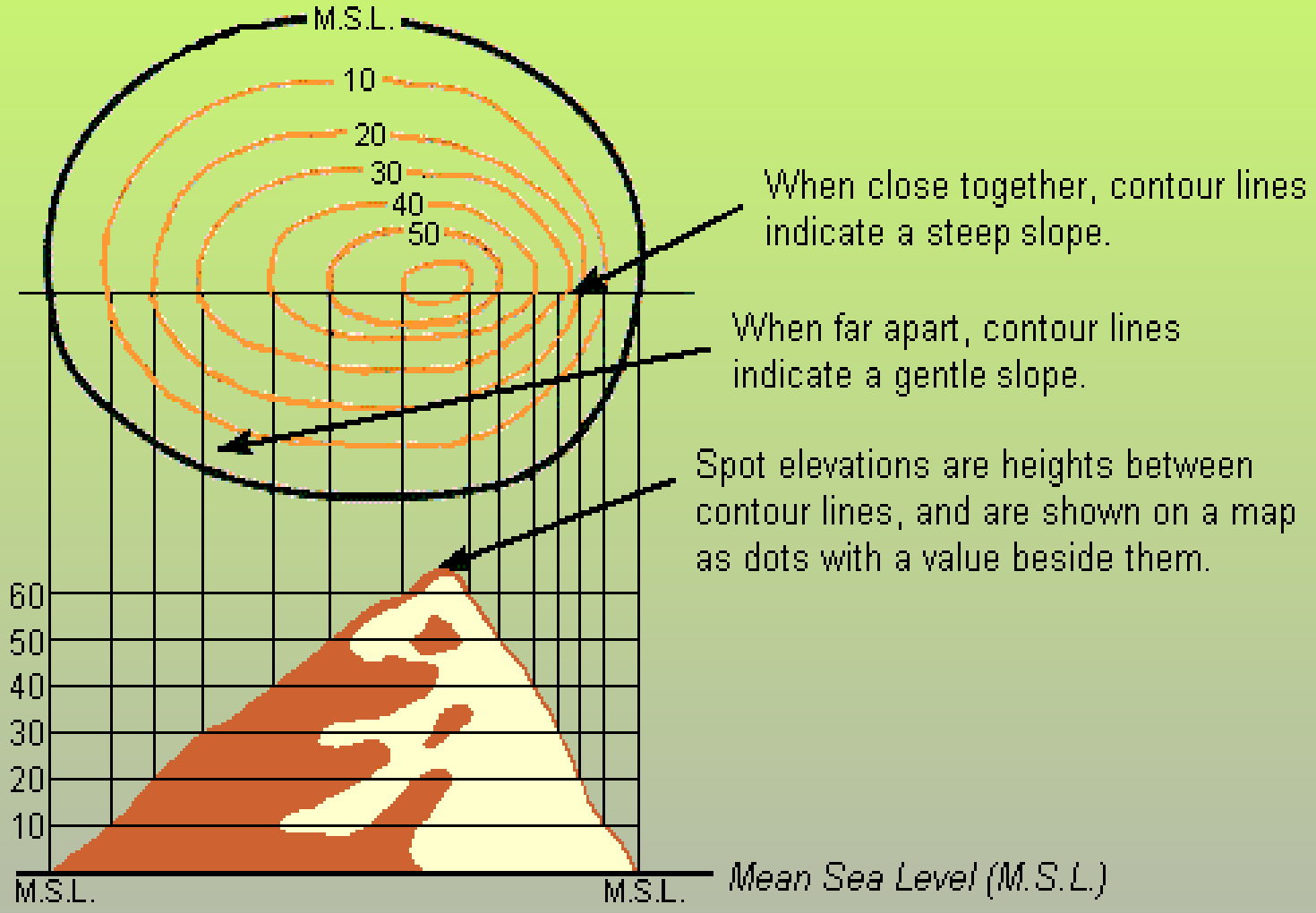
- **Topographic maps usually portray both natural and manmade features.** They show and name works of nature including mountains, valleys, plains, lakes, rivers, and vegetation. They also identify the principal works of man, such as roads, boundaries, transmission lines, and major buildings.

- The **wide range of information provided by topographic maps** make them extremely useful to professional and recreational map users alike. **Topographic maps are used for engineering, energy exploration, natural resource conservation, environmental management, public works design, commercial and residential planning, and outdoor activities like hiking, camping, and fishing.**

What are contour lines?

- Contour lines are lines that connect points that are of the same **elevation**.
- They show the exact **elevation**, the **shape** of the land, and the **steepness** of the land's slope.
- Contour lines **never touch or cross**.




M.S.L.
10
20
30
40
50
When close together, contour lines indicate a steep slope.
When far apart, contour lines indicate a gentle slope.
Spot elevations are heights between contour lines, and are shown on a map as dots with a value beside them.
60
50
40
30
20
10
M.S.L.
M.S.L.
Mean Sea Level (M.S.L.)

Other Topographic Terms

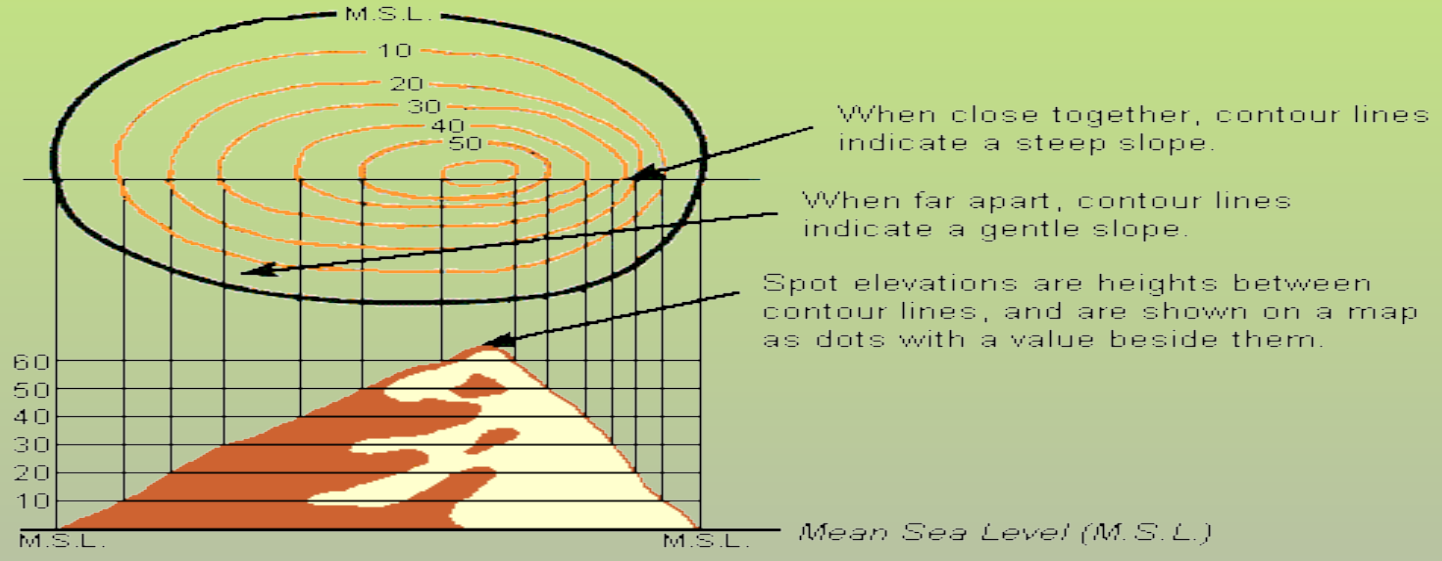
- **Map scale** – compares distances on the map with distances on earth.
- **Legend** – explains symbols used on the map.
- **Index contours** – contour lines that are labeled to help you find the contour interval.

What is a contour interval?

- A **contour interval** is the difference in elevation between two contour lines that are side by side.
- Remember that a contour interval is not the distance between the two lines – to get the distance you need to use the map scale.

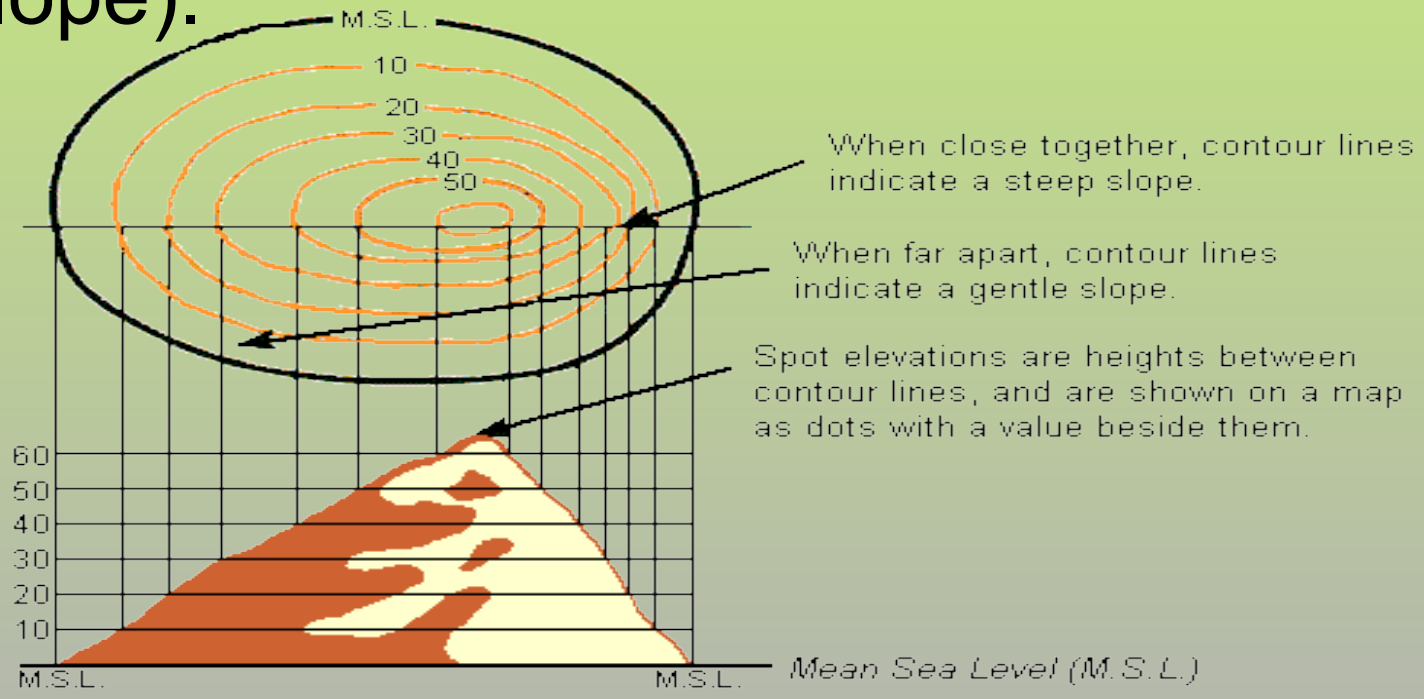
What if my contour lines are close together?

- If the contour lines are close together, then that indicates that area has a **steep** slope.



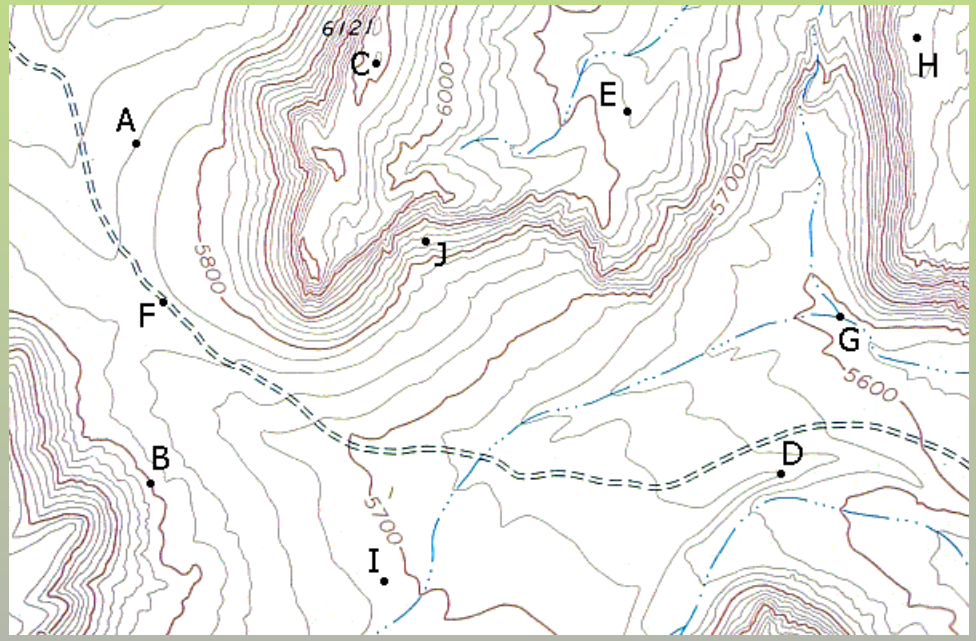
What if my contour lines are far apart?

- If the contour lines are far apart, then that indicates the land has a **gentle** slope (low slope).



What do the dark colored contour lines mean?

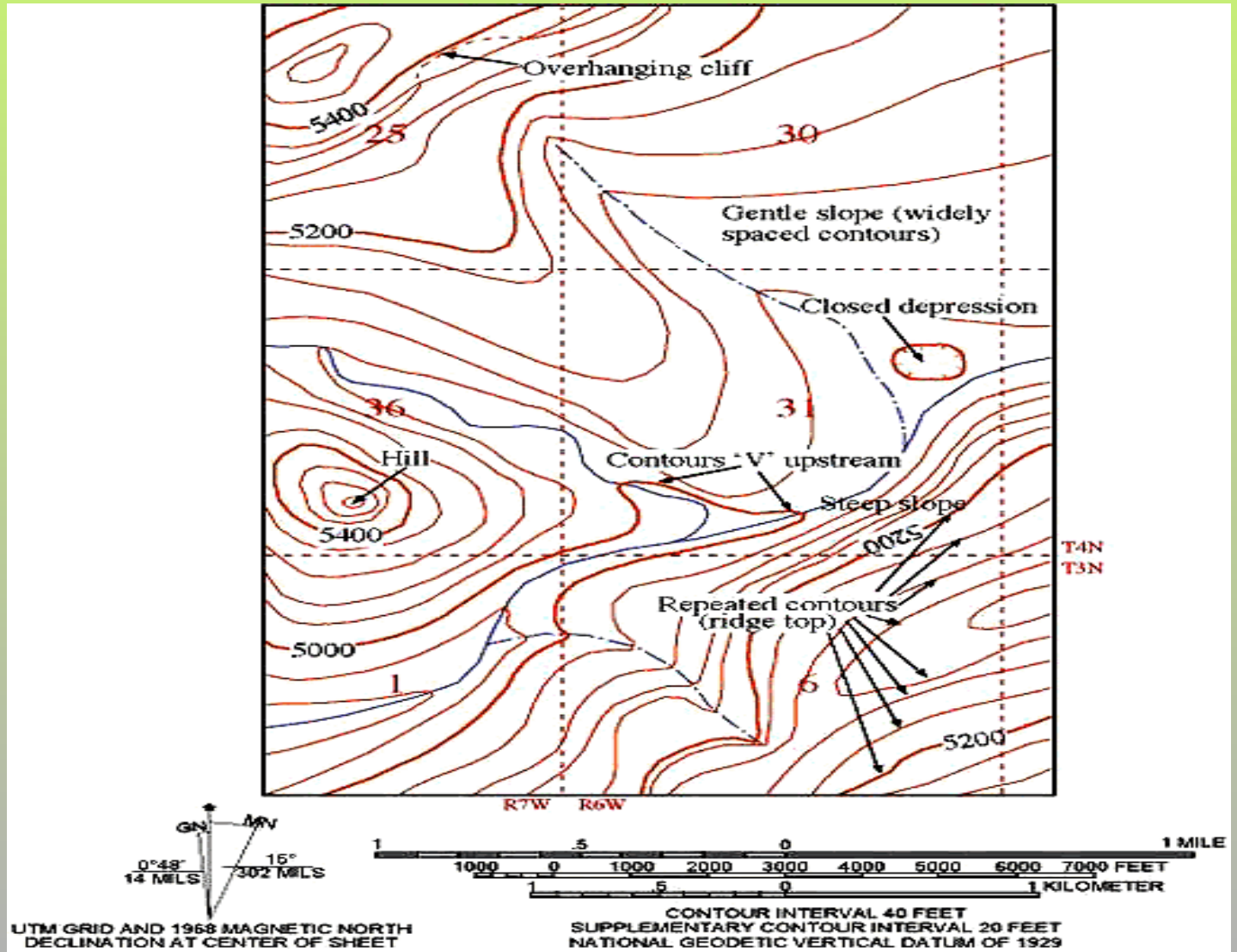
- The dark colored contour lines represent every **<u>fifth</u>** contour line to make it easier to read the map.



What do the colors on the topographic map represent?

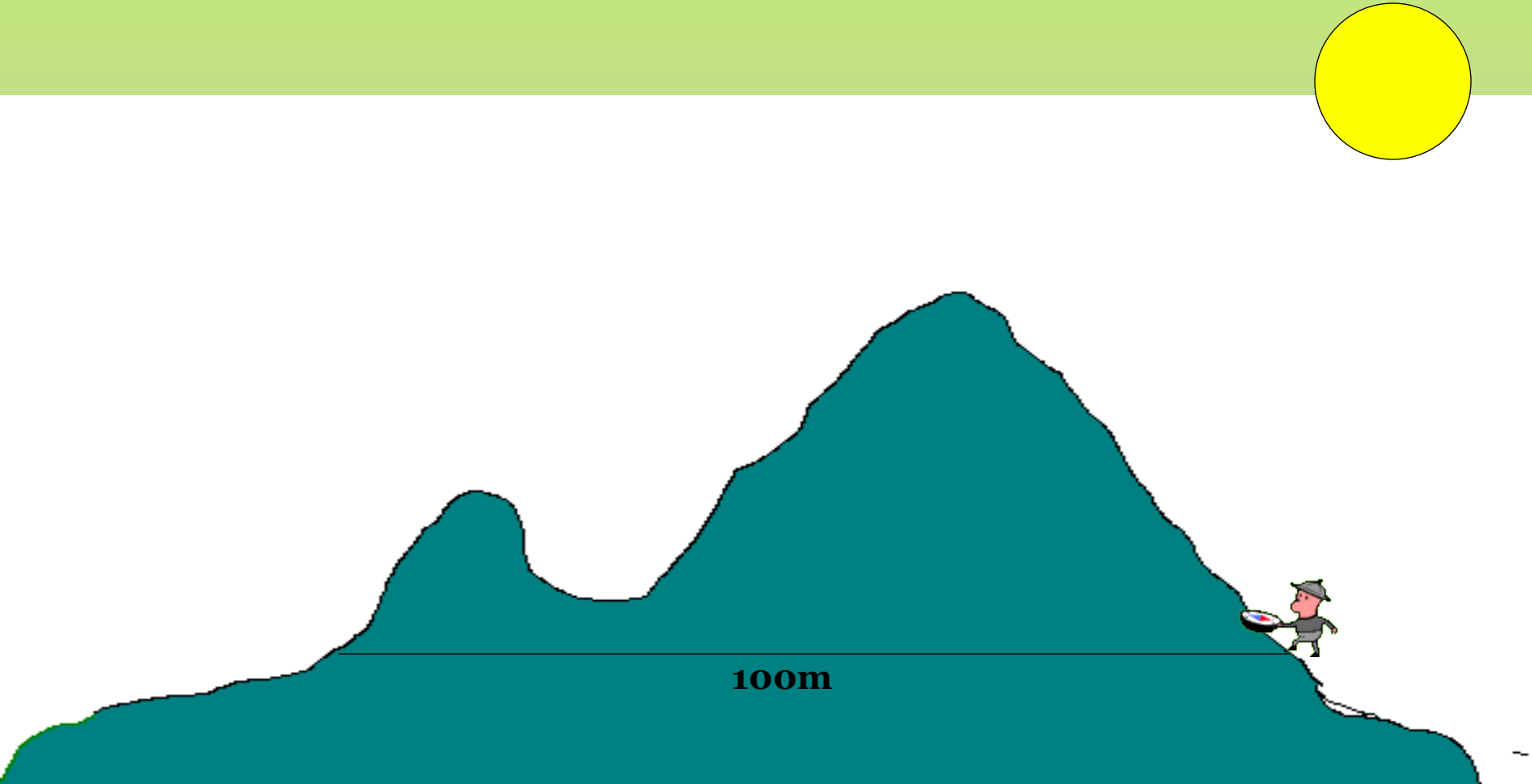
- **Blue** lines/shapes - represent water features, such as streams and lakes.
- **Brown** – contour lines
- **Black** – Roads, buildings, railroads, other man made objects.
- **Green** – Woodland areas
- **Red** - Highways

Topographic Maps

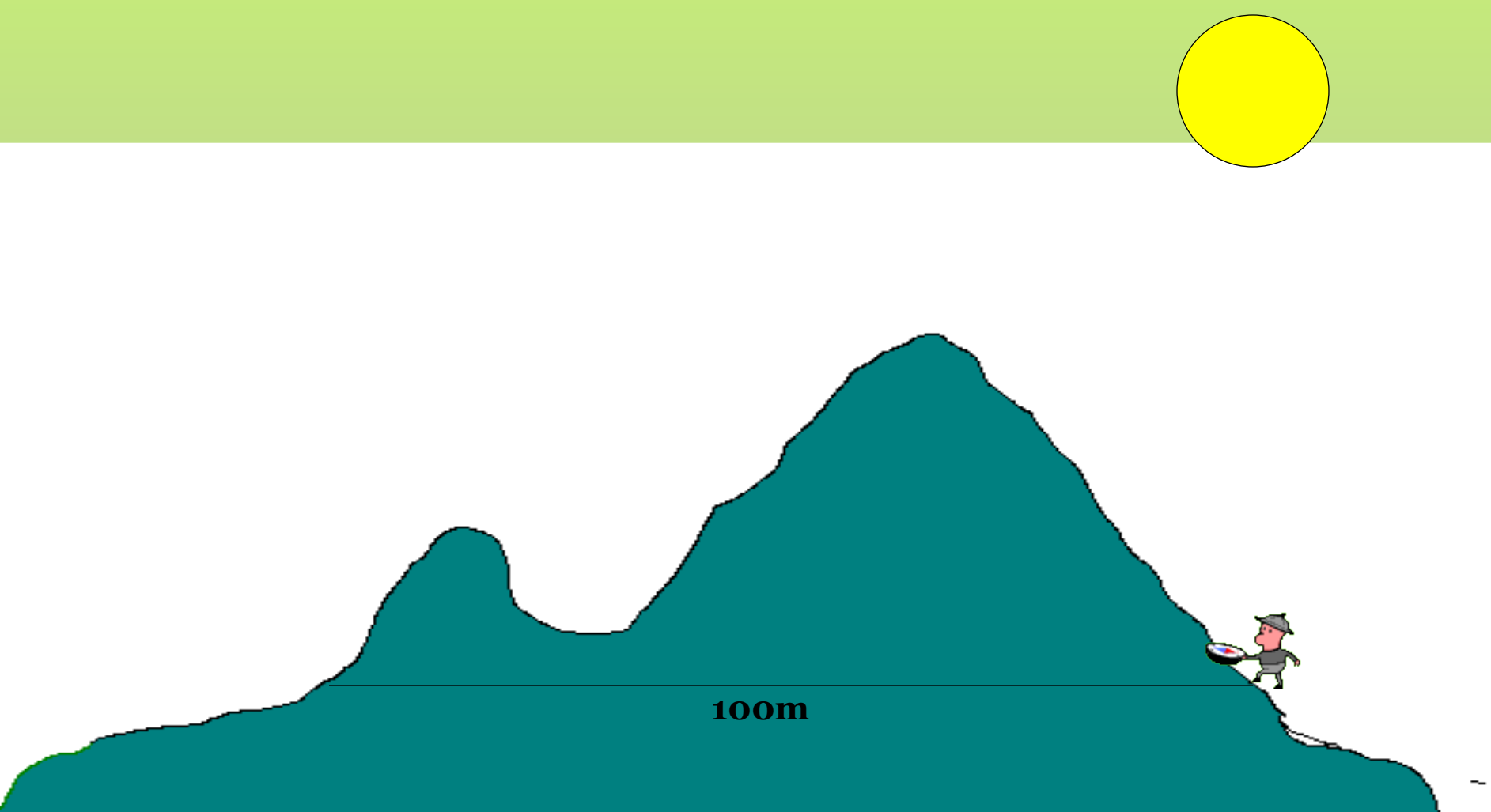


Let’s take a walk up a hill!

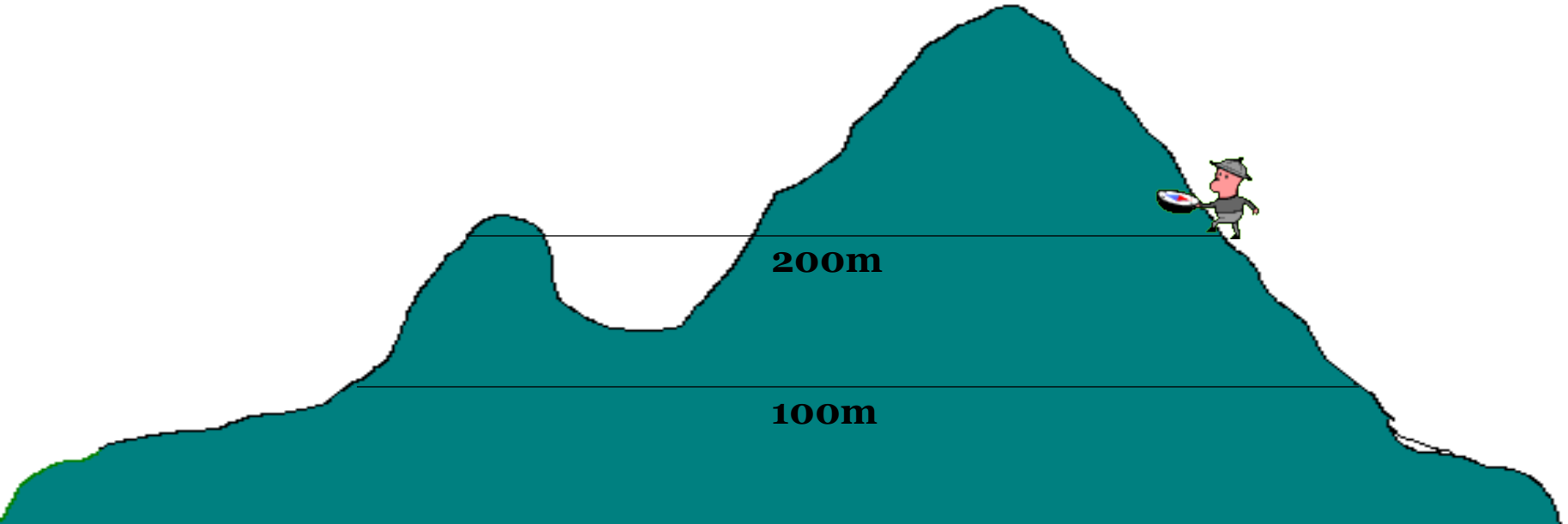
We're now at an elevation of 100 meters.



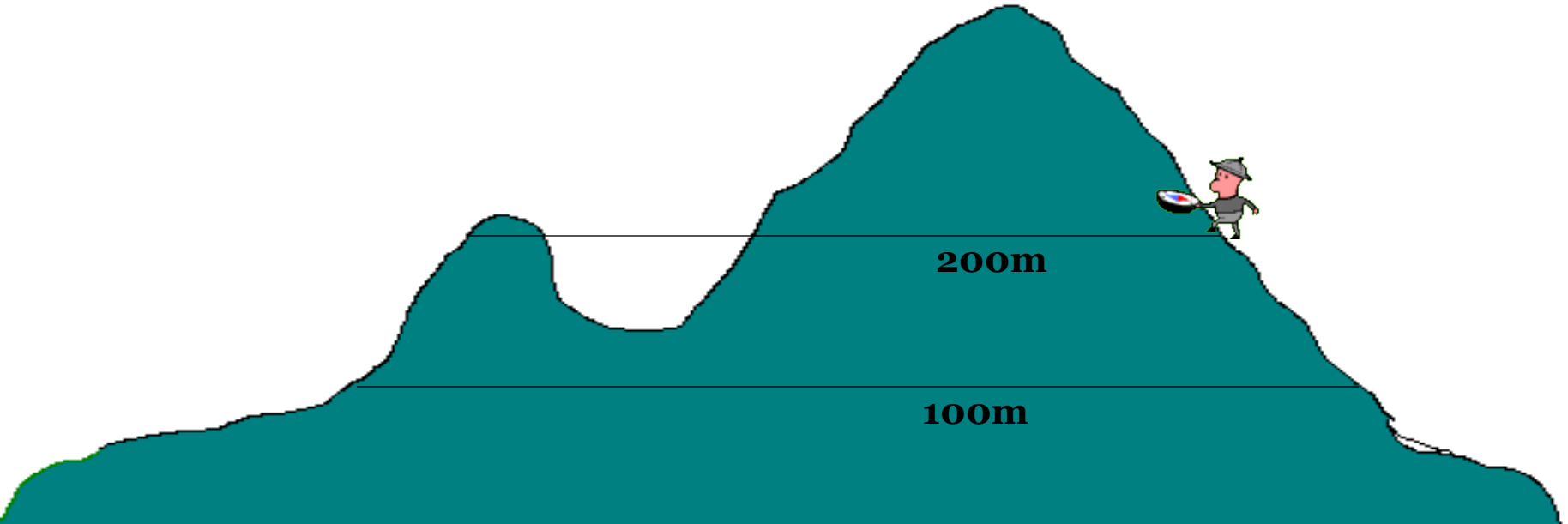
Let's keep going!



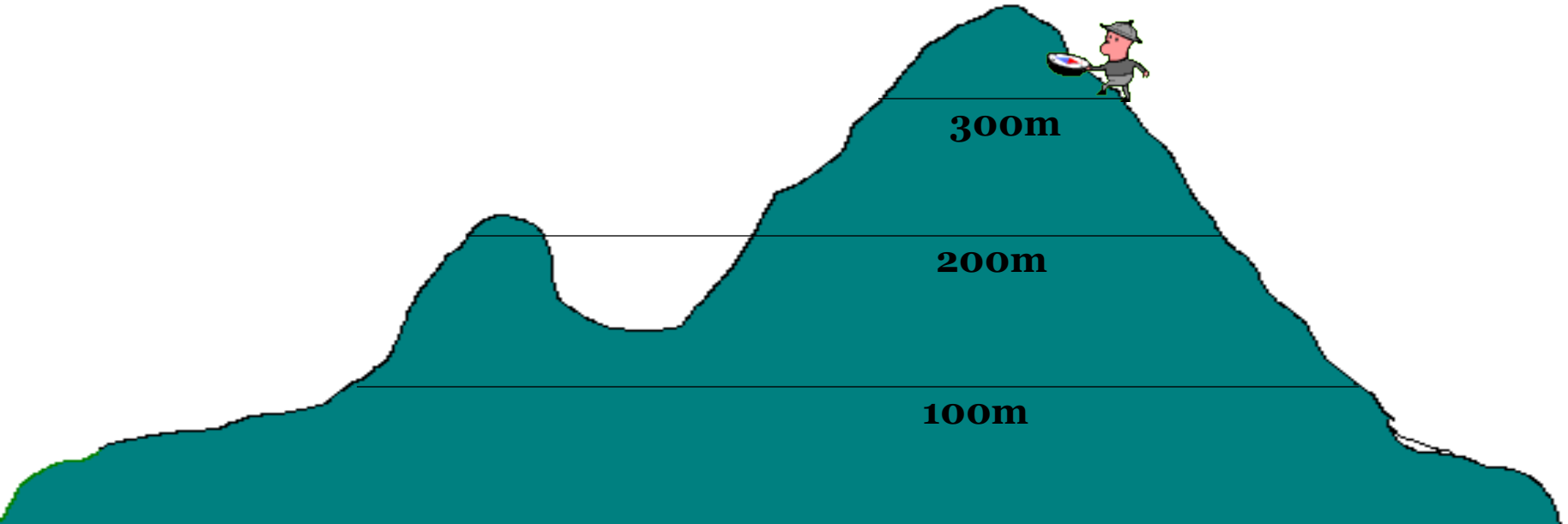
Now we're at 200m.



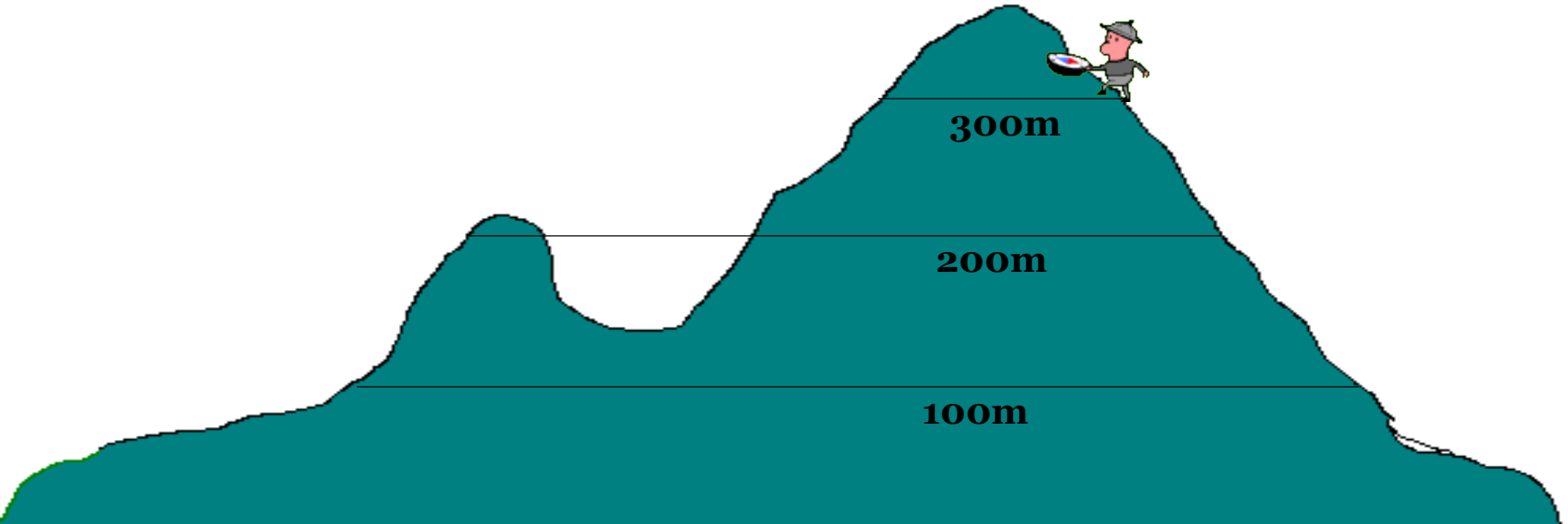
Shall we march on?



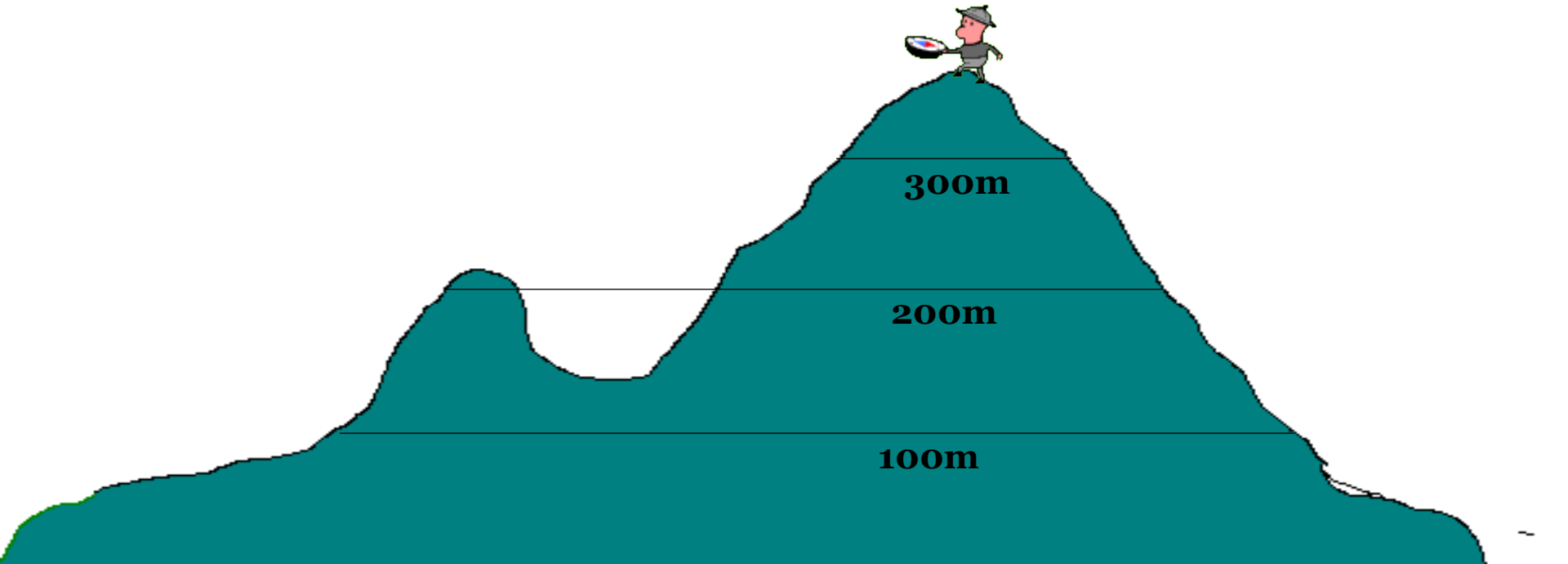
We've made it to 300m!



On to the peak!

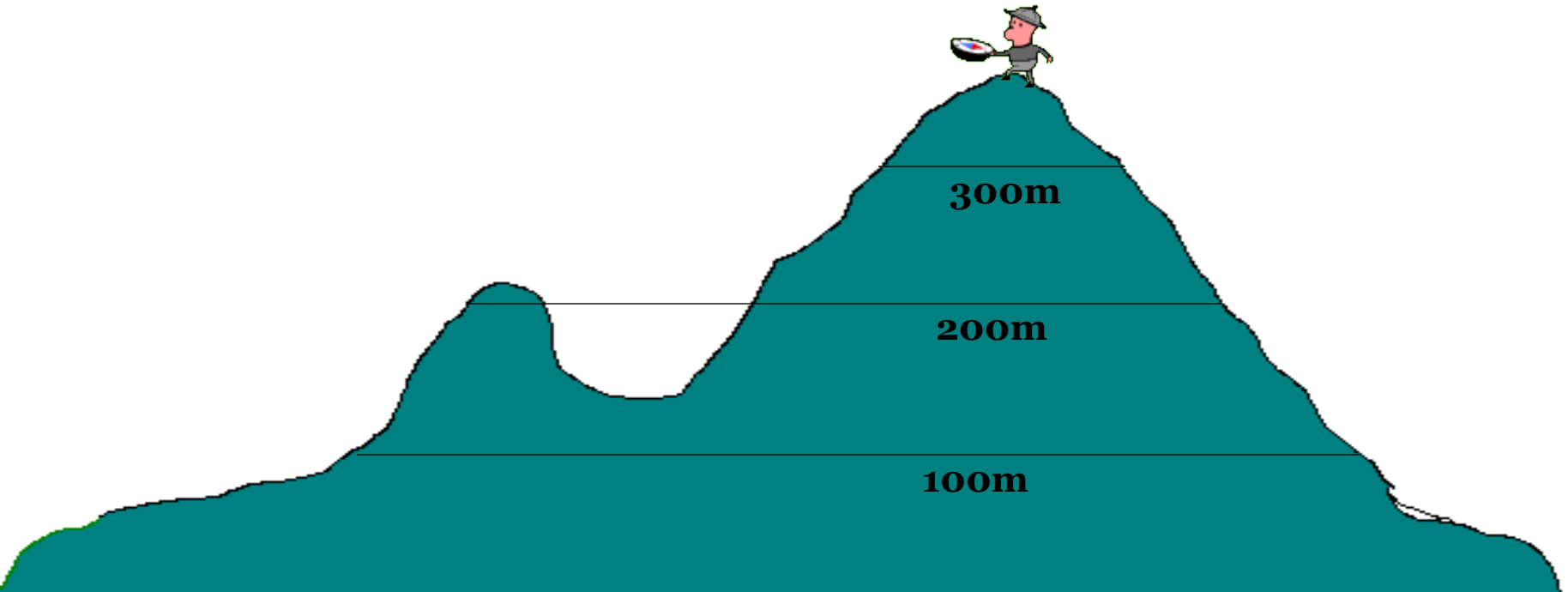


We're on the peak, but what's our elevation?

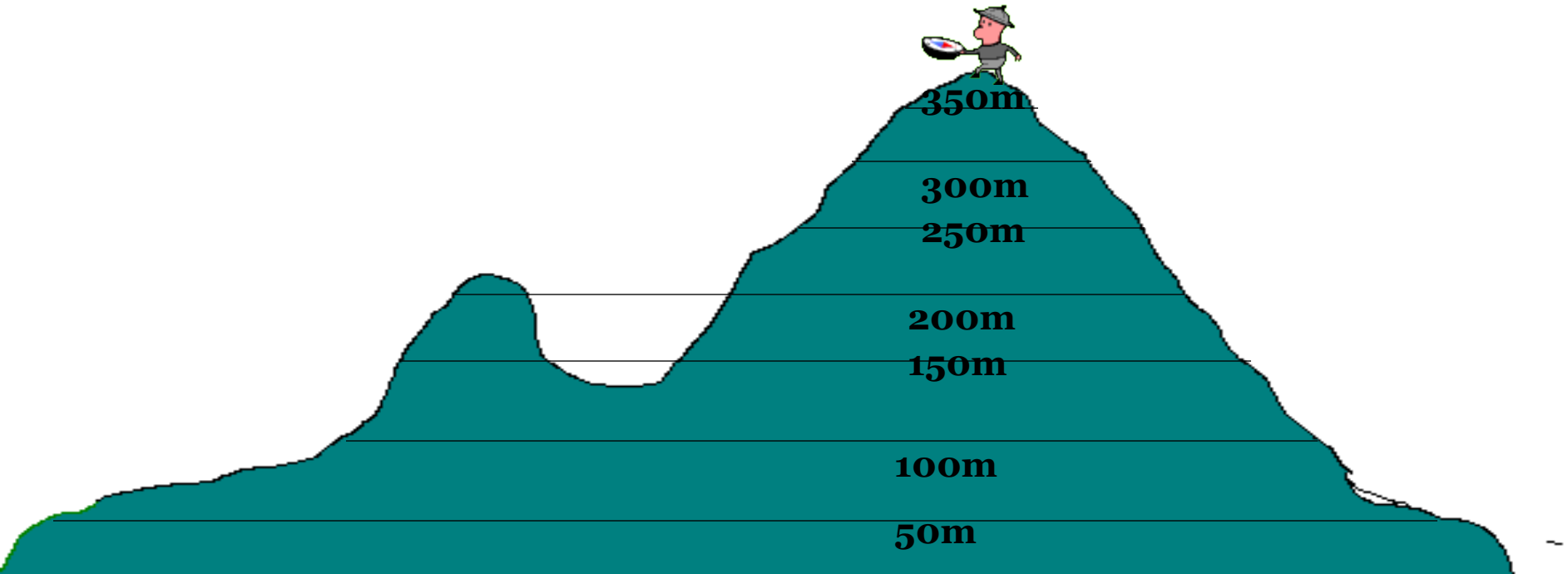


Any ideas?

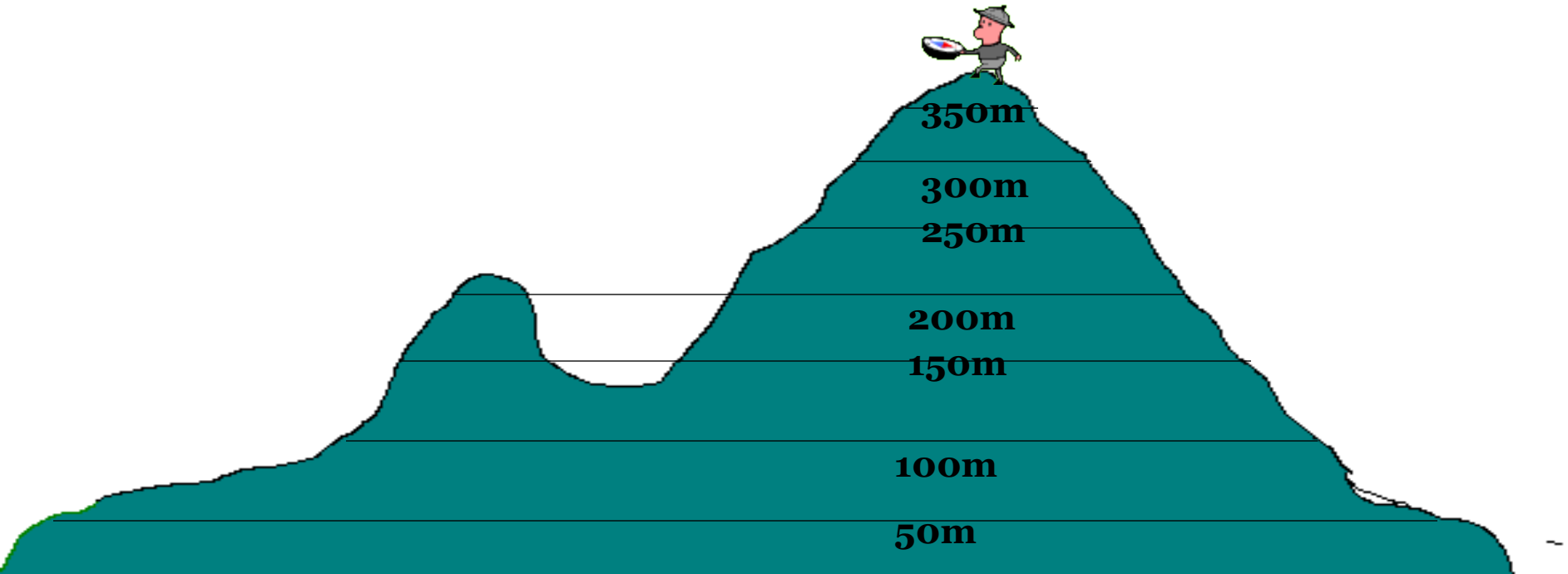
Let's add contour lines for every 50 meters and see if that helps.



We know that we are above 350m, but less than 400m.

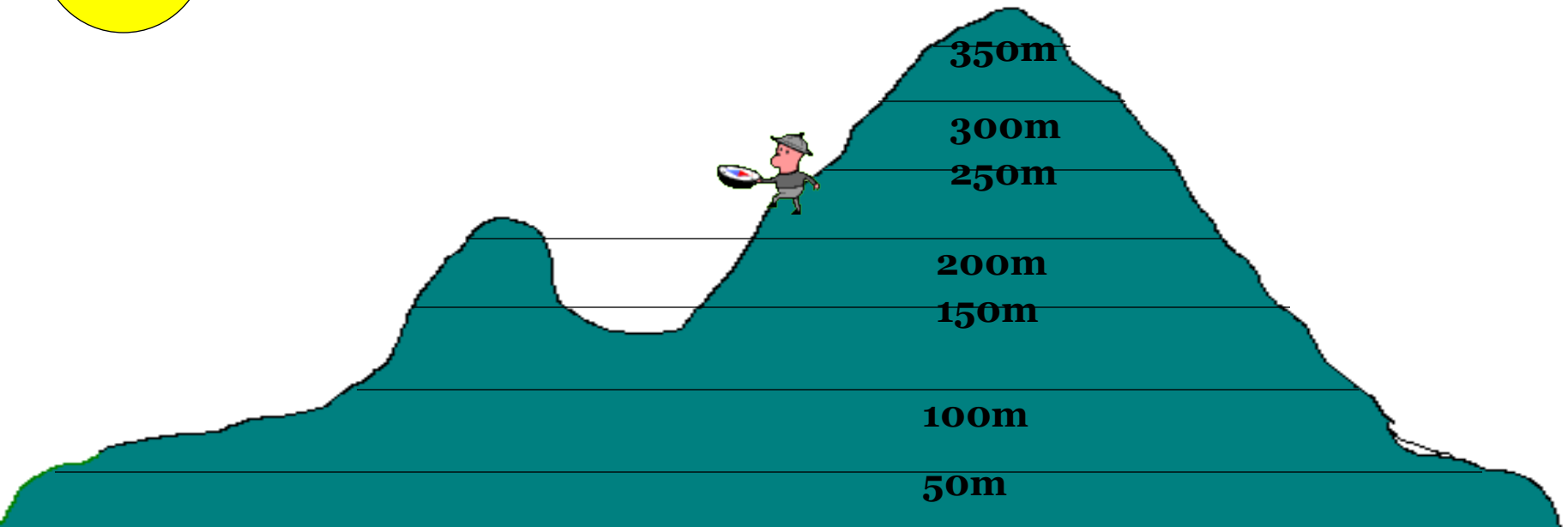


Let’s head down the hill, it’s getting late!

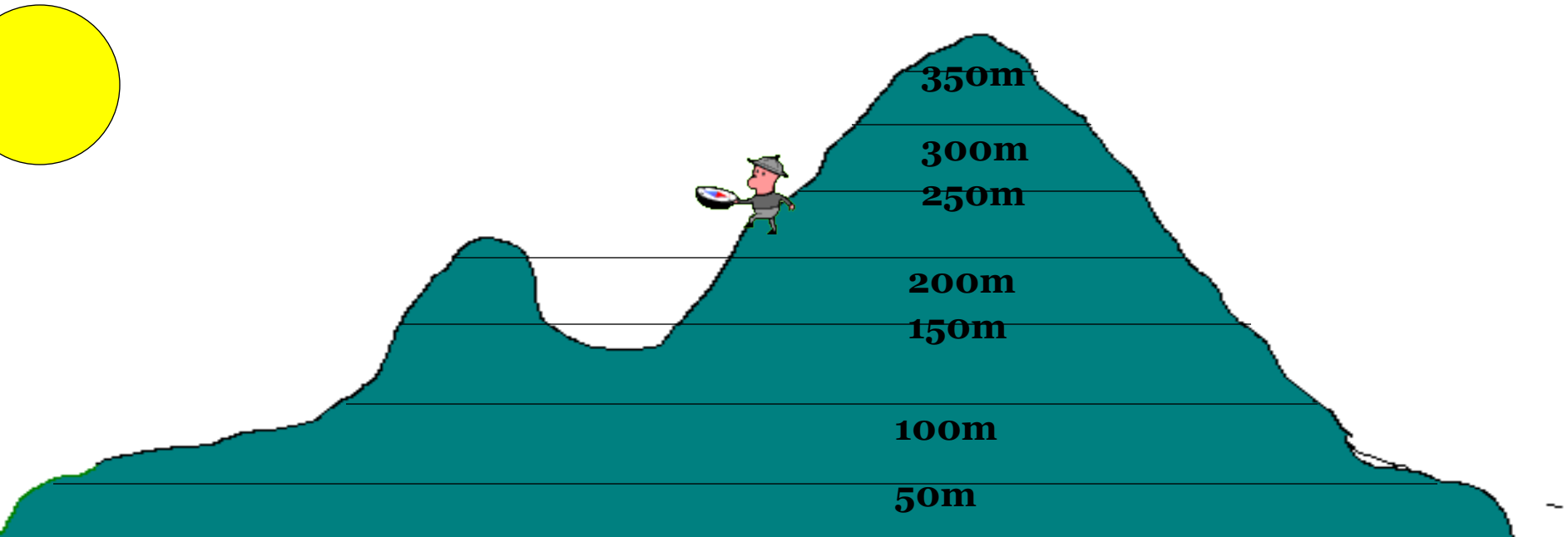


Now what's our elevation?

If you said somewhere between 200m and 250m you are right!

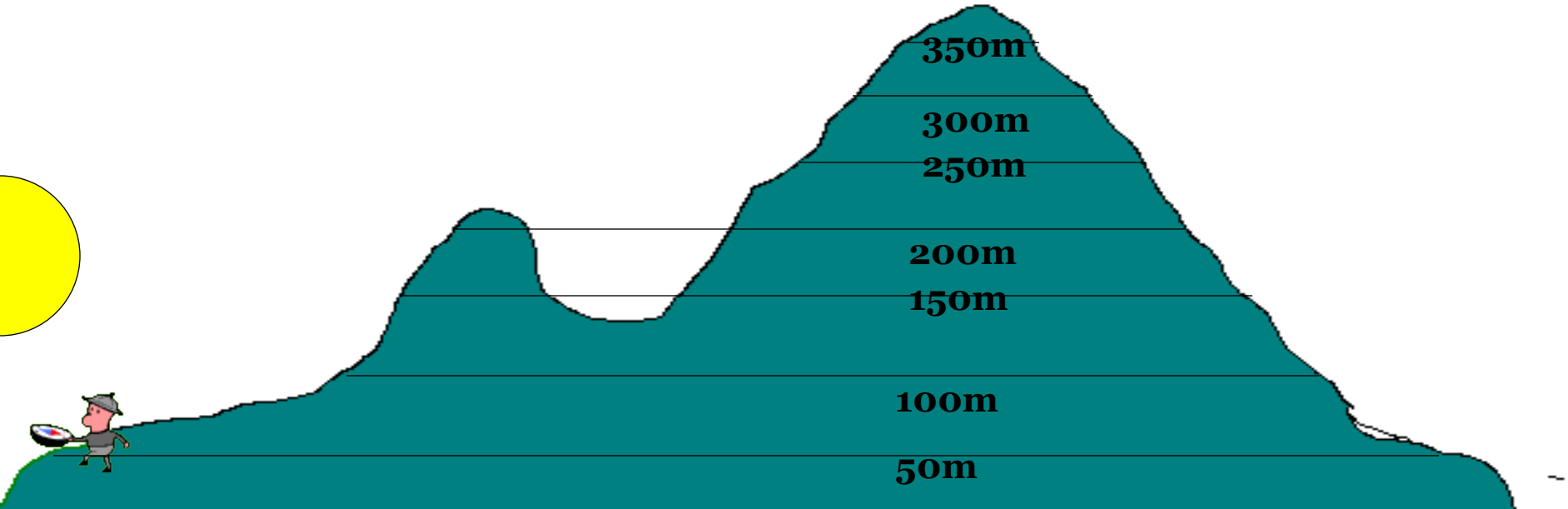


Let’s try this again!



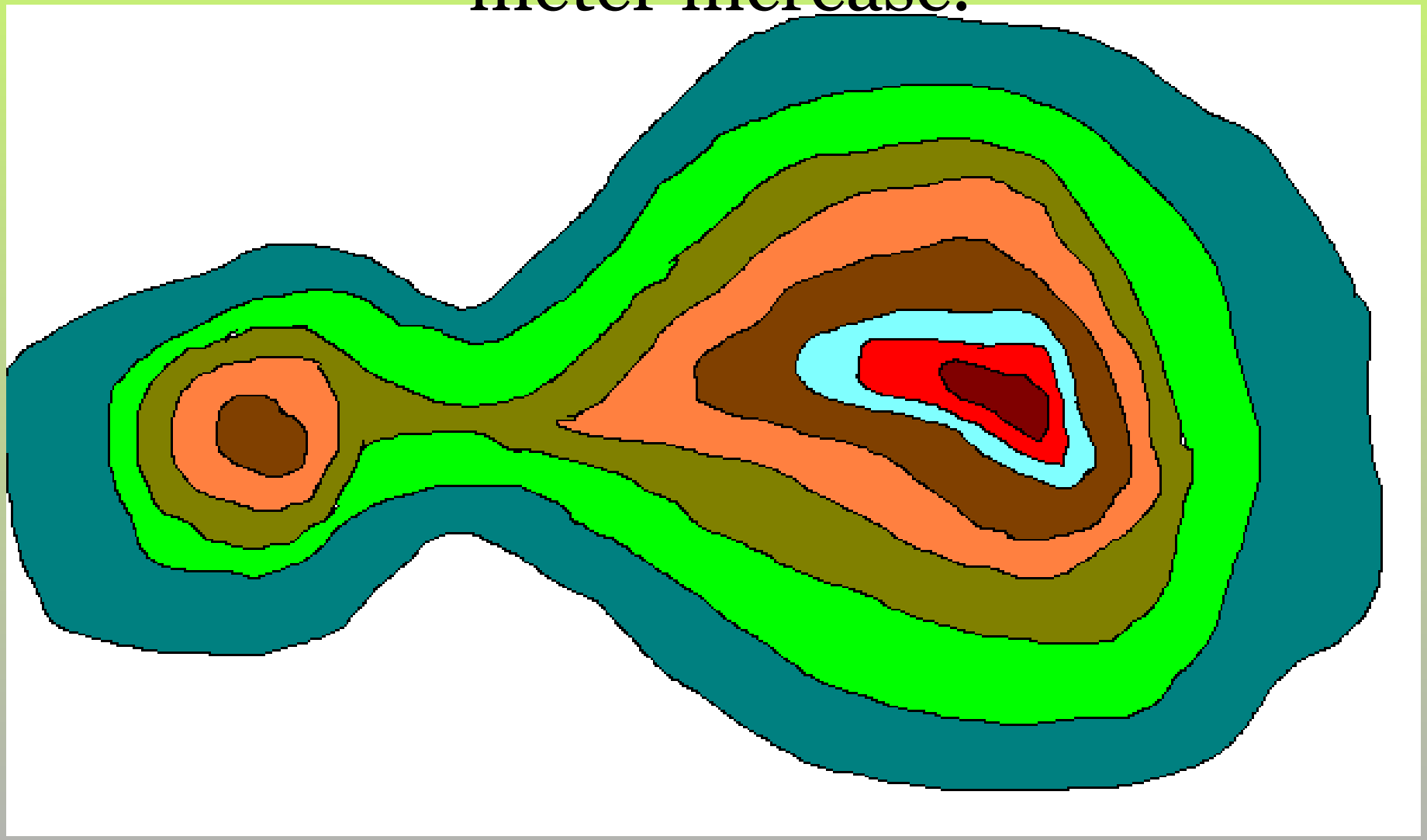
What's our elevation now?

If you said 50m or just under, you're right!

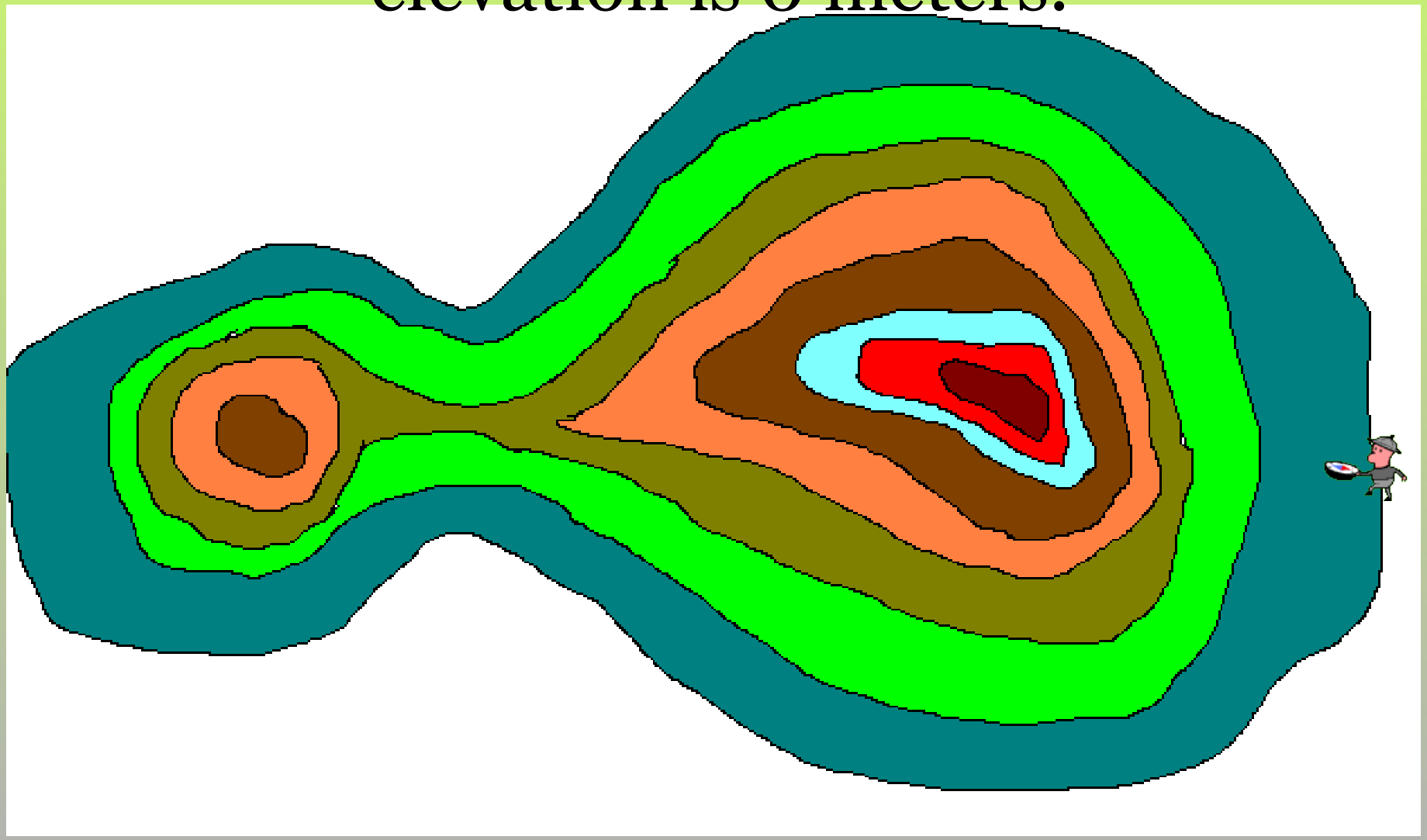


Let's
now look at the
same hill, but the
way we might see it
from an airplane!

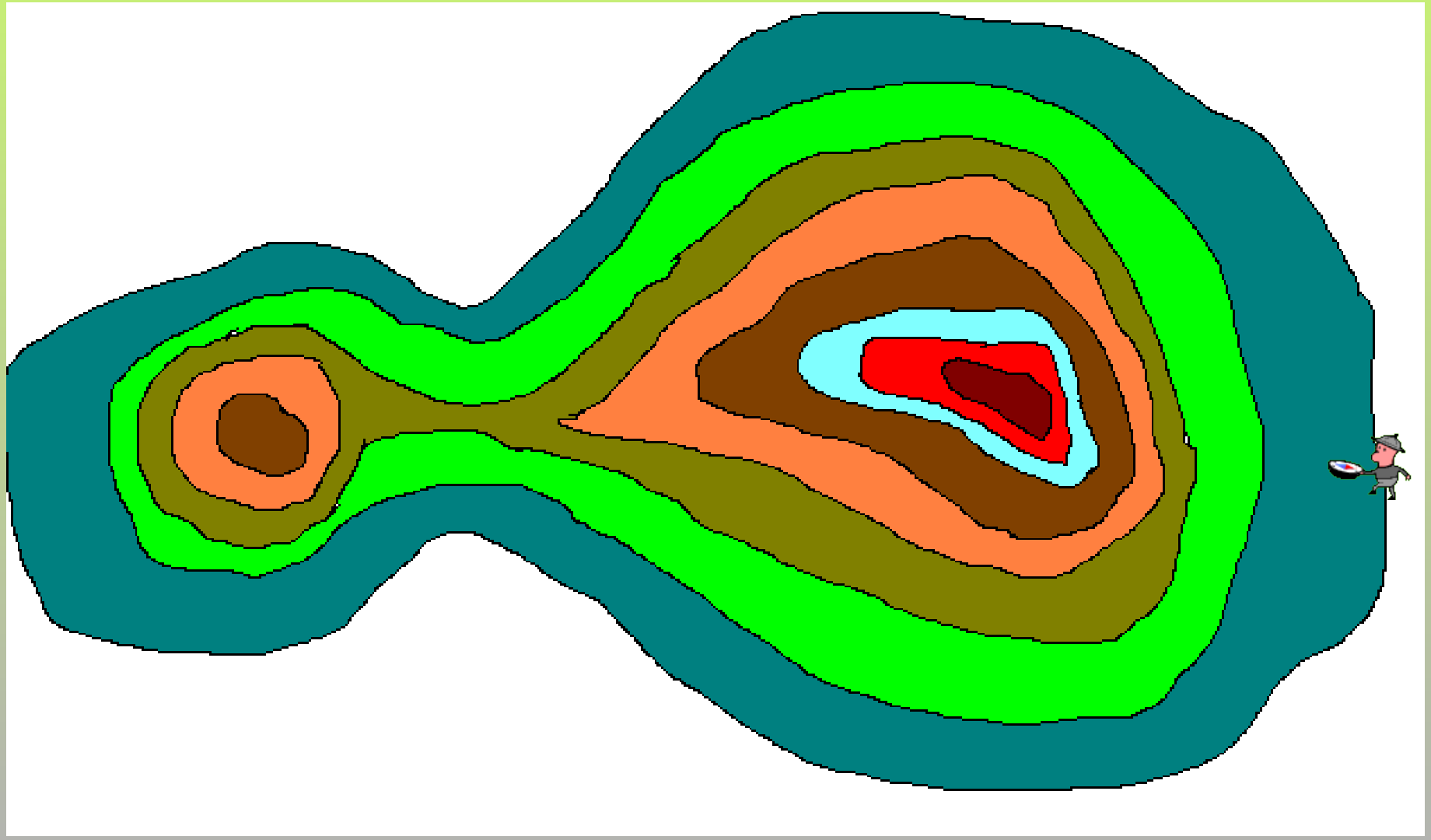
Each color change represents a 50 meter increase.



Now, let's try the same hike! Our elevation is 0 meters.



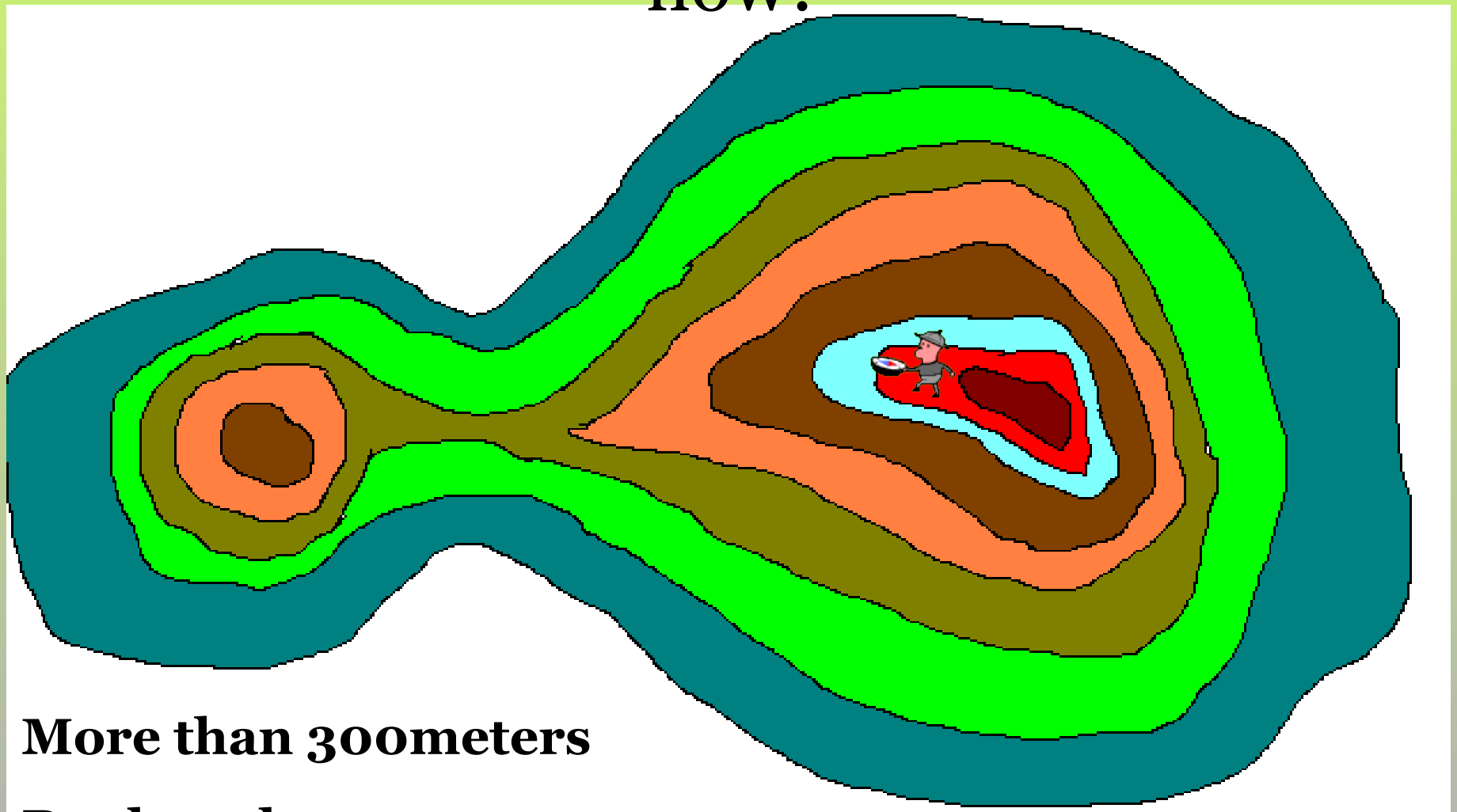
Now what is our elevation?



If you said more than 150 meters, but less than 200 meters your right!

Let’s go a little higher.

Think you know our elevation now?

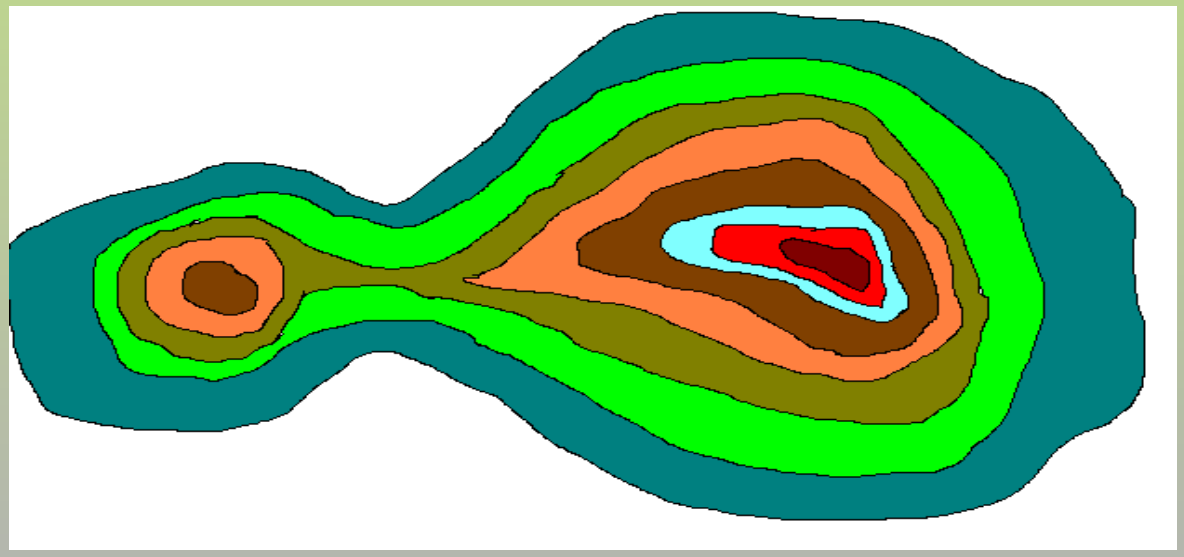


More than 300meters

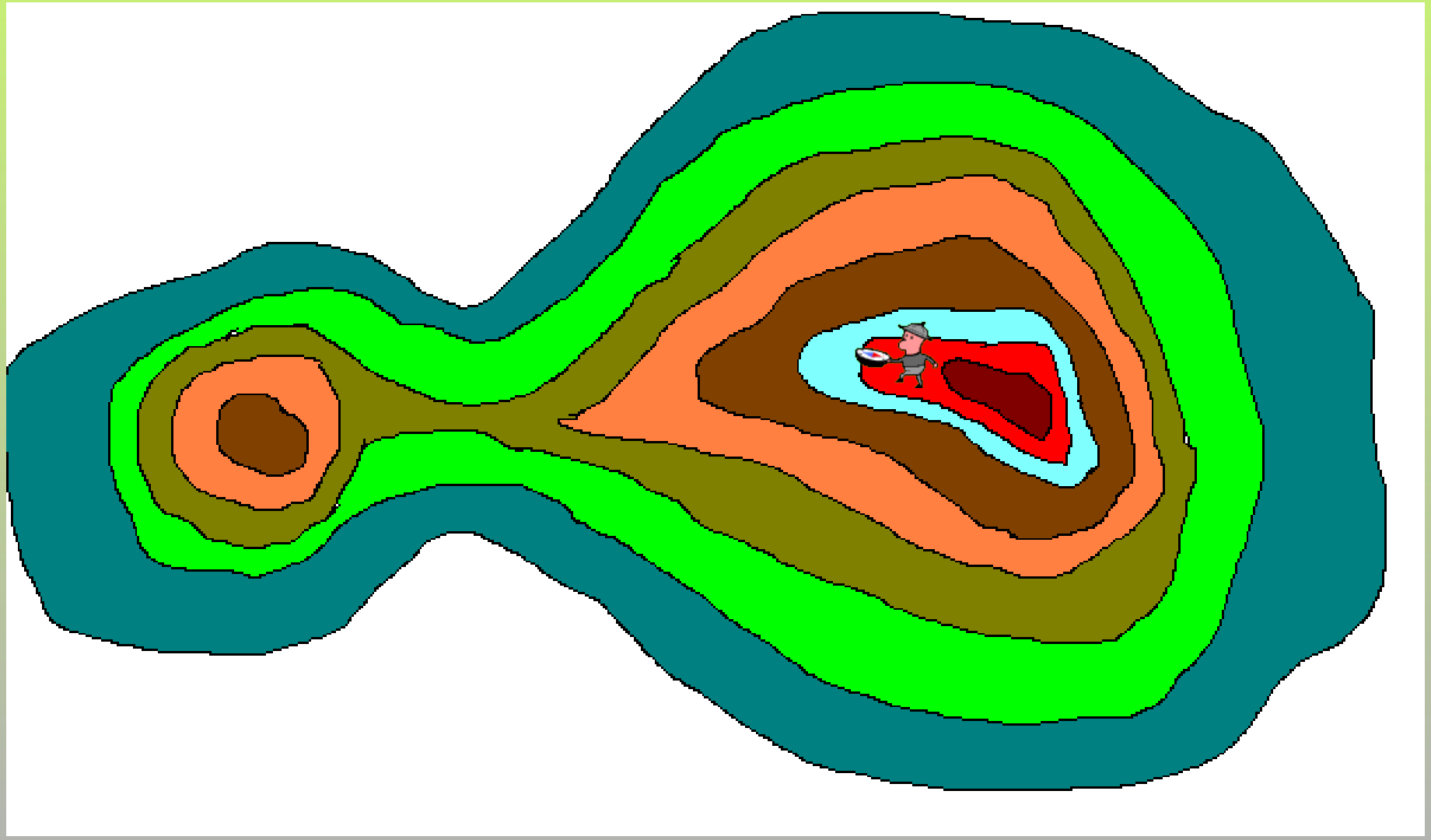
But less than 350meters

If we were standing on the peak, what would be our elevation?

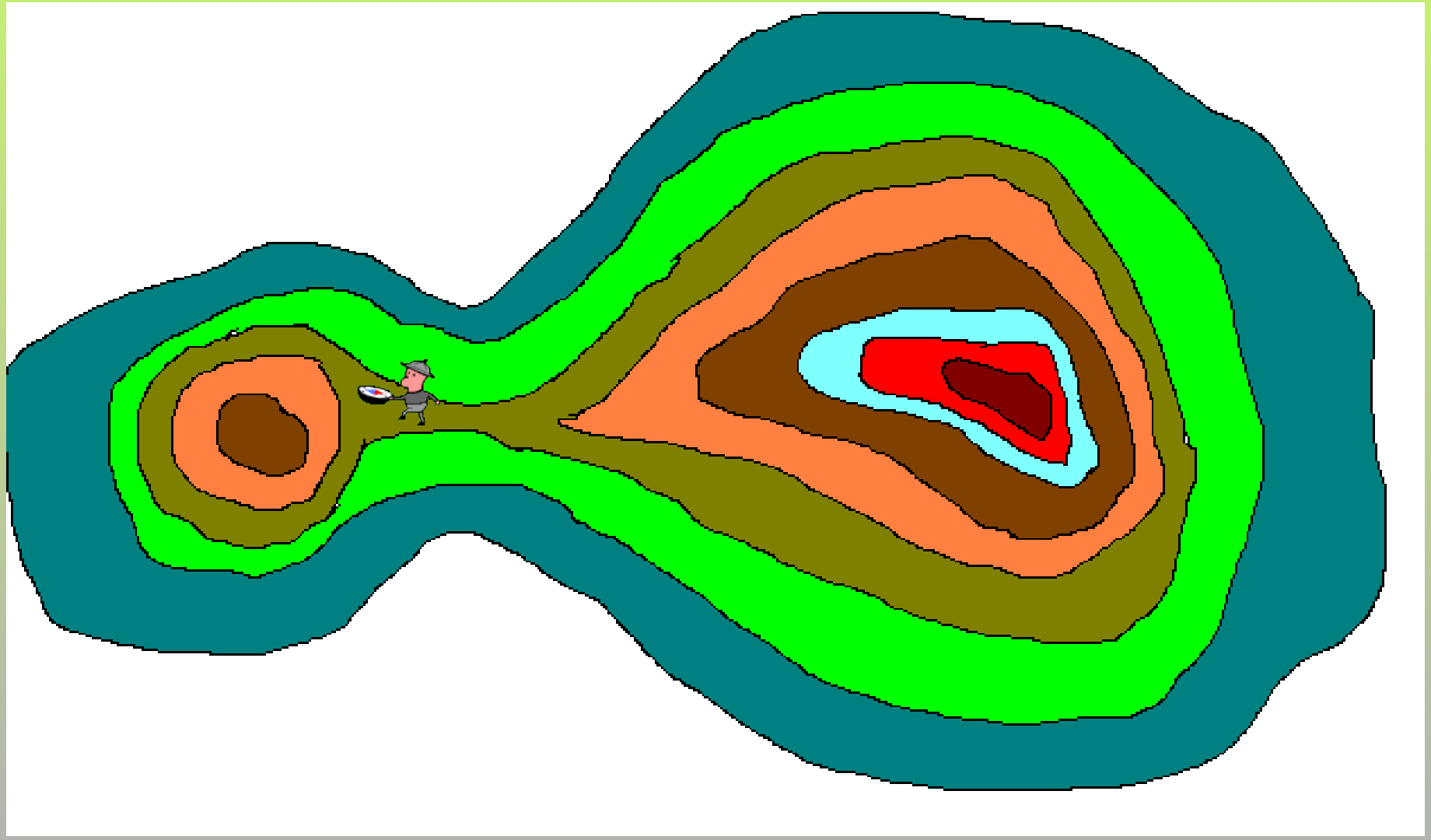
- More than 350 meters, less than 400 meters



Let’s head down hill.

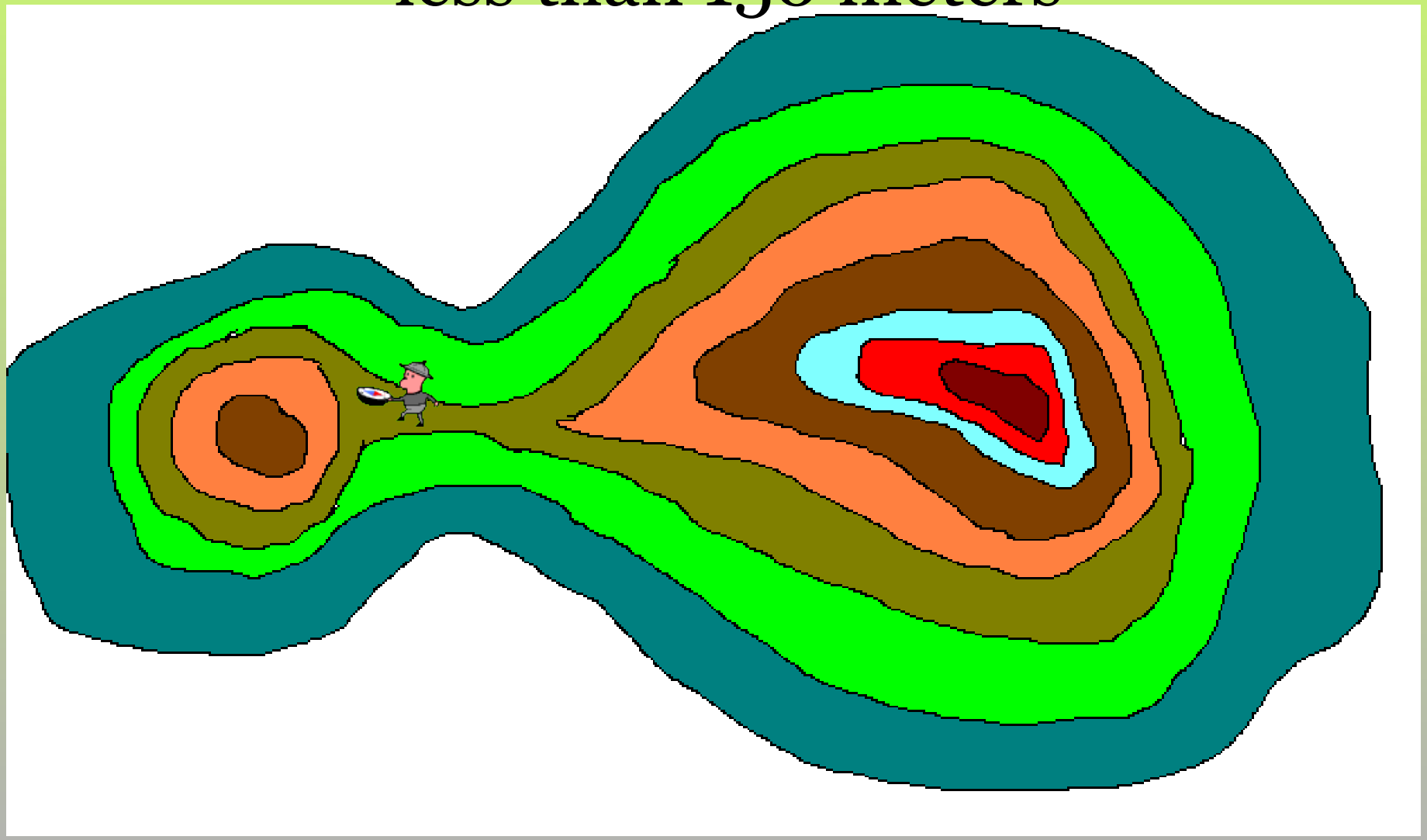


Know our elevation?



More than 100 meters,

less than 150 meters

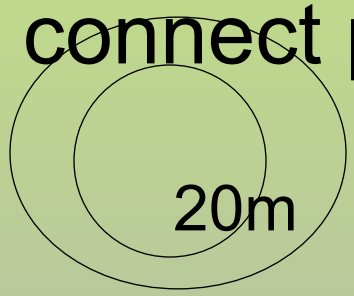


Topographic Vocabulary

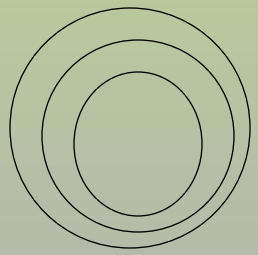
Topo map = shows elevation & land forms

Contour lines = shows vertical distance

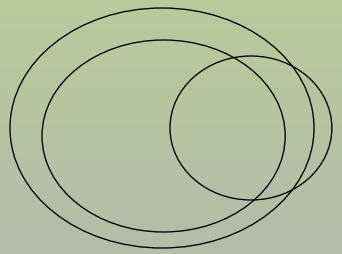
= connect points of equal elevation



rule = they never cross



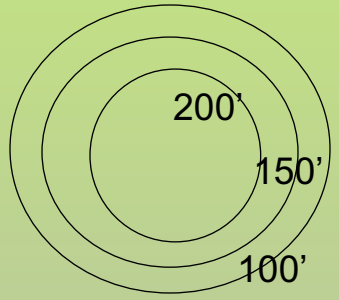
yes



no

Topographic Vocabulary

Contour Interval =
vertical distance between contour lines

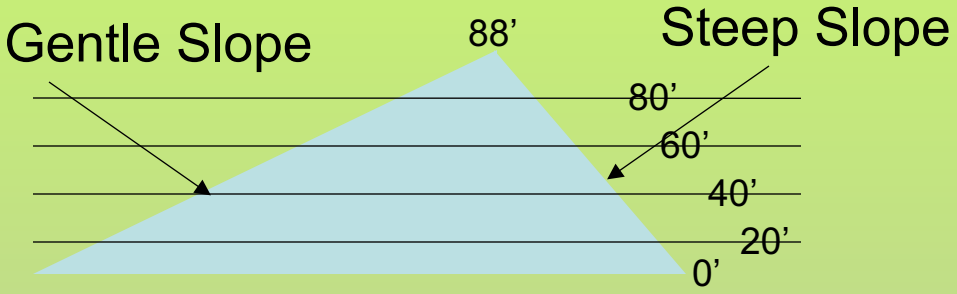


Contour Interval = 50 ft.

rule = consistent for the entire map

Contour Interval Shows Steepness

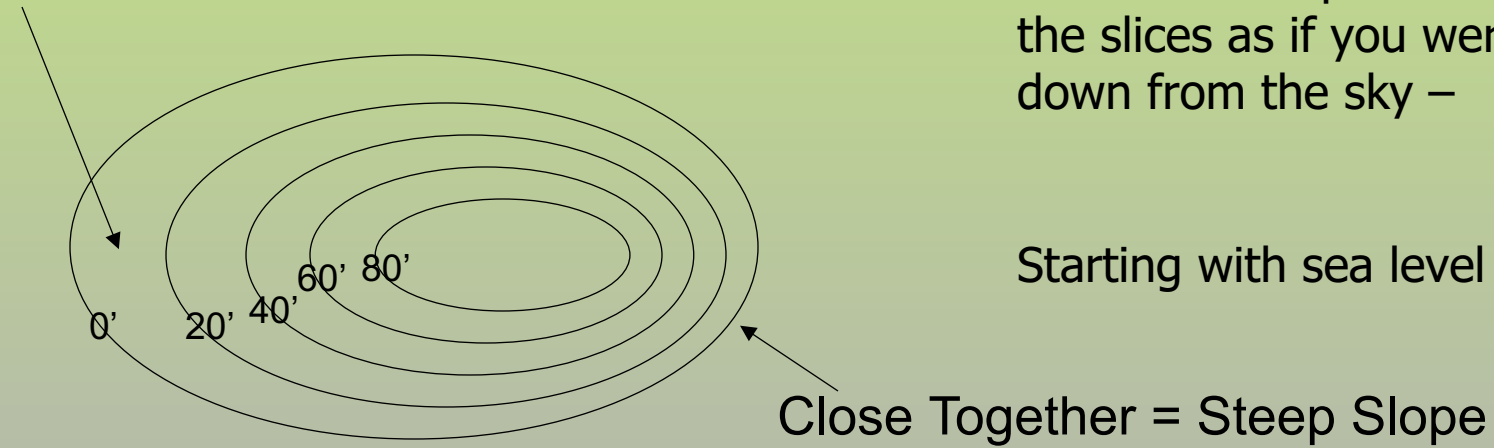
Side View



Suppose we slice the mountain every 20’

Contour Interval = 20’

Lines far apart = Gentle Slope



Draw in the topo lines by tracing the slices as if you were looking down from the sky –

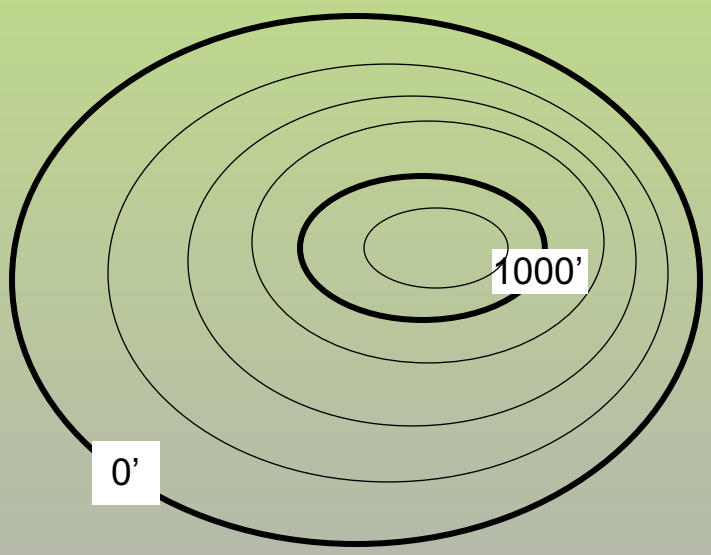
Starting with sea level (0’)

Close Together = Steep Slope

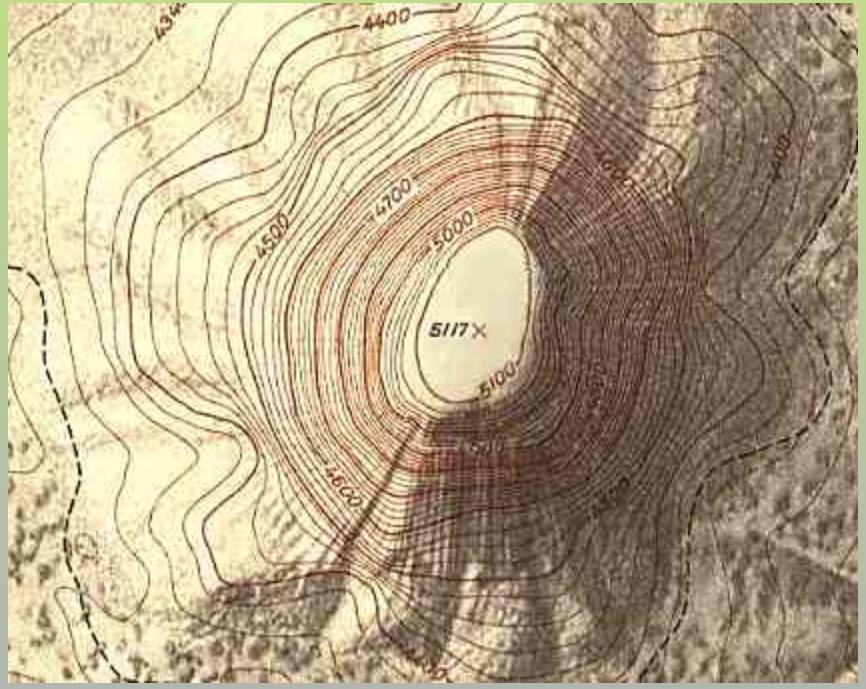
Top View

Topographic Vocabulary

Index Contour = labeled or numbered contour line
Usually shown in bold



Contour Interval = 250 ft.

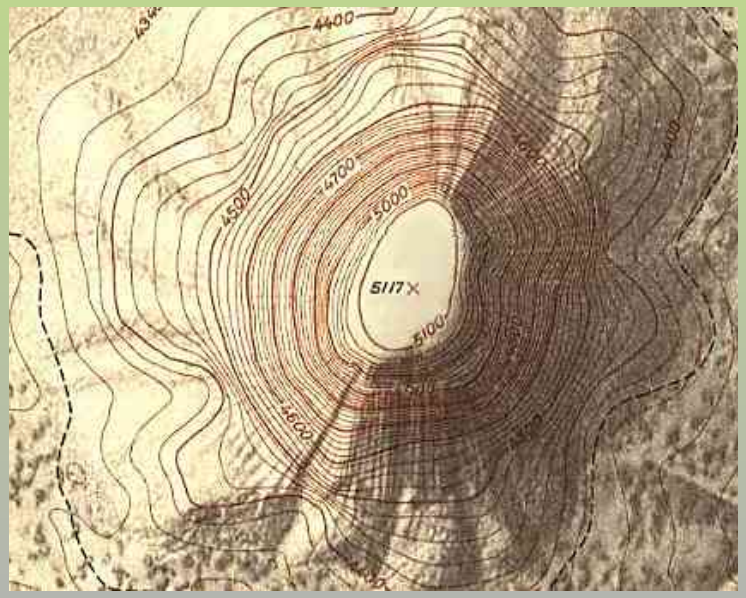


Topo Vocab

Benchmark = spot elevation

on map: “x” to mark exact elevation

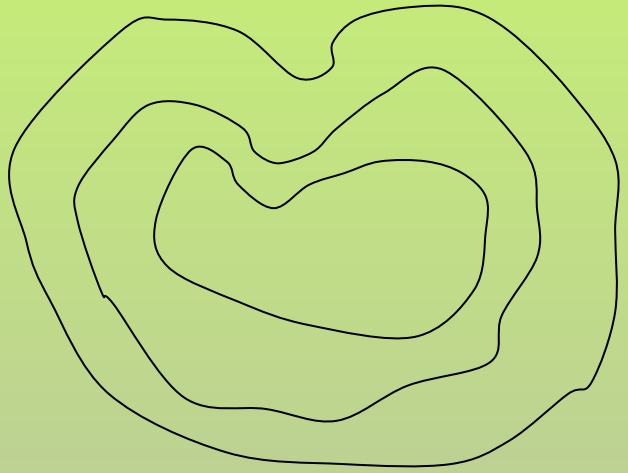
on land: plaque at a certain point

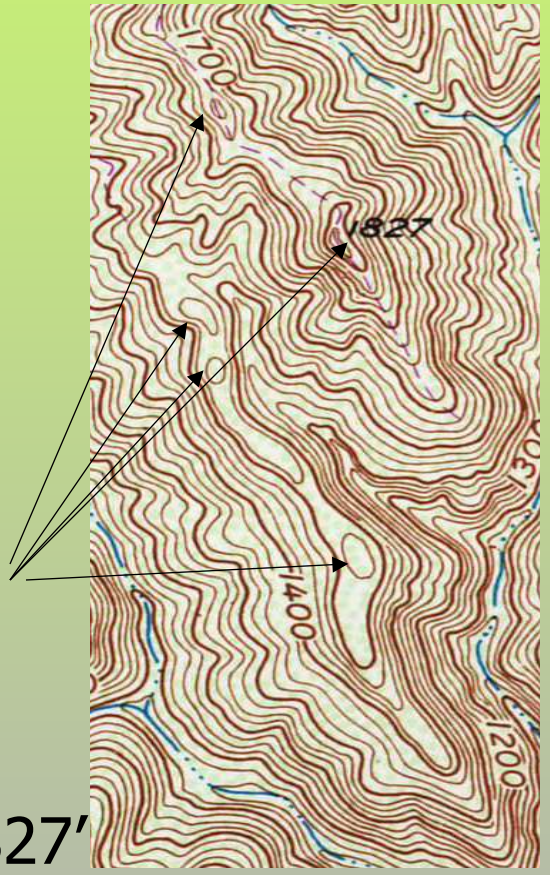


Recognizing landforms

- Mountains look like concentric circles
- Rivers look like “v” with the tip pointing upstream to the source
- Depressions or bowls have hatch marks on their contour lines

Can you see a mountain?





How many peaks can you find?

How tall is the highest peak? 1827’

How can you see a river?

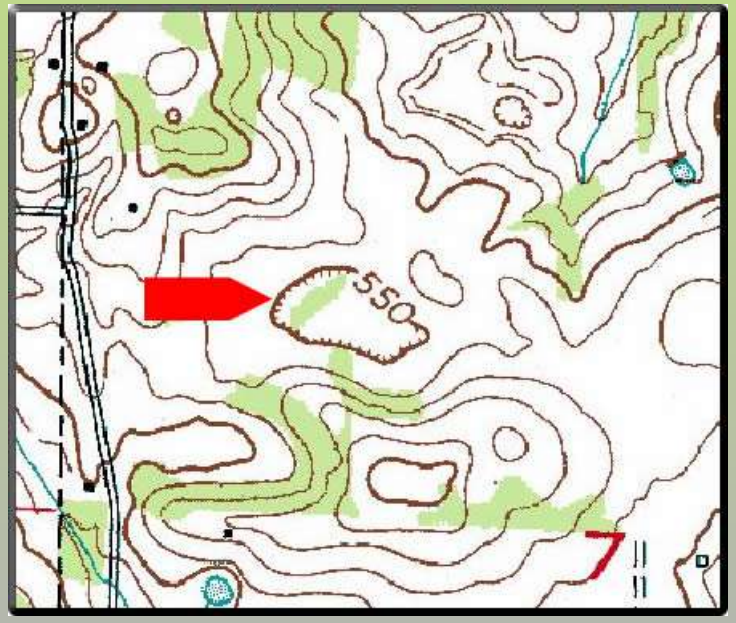
River

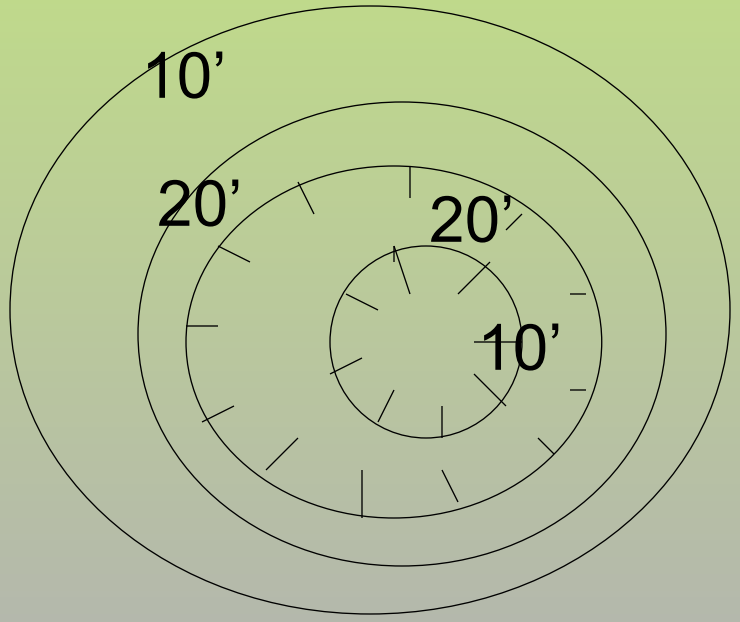
point of the “V” points uphill

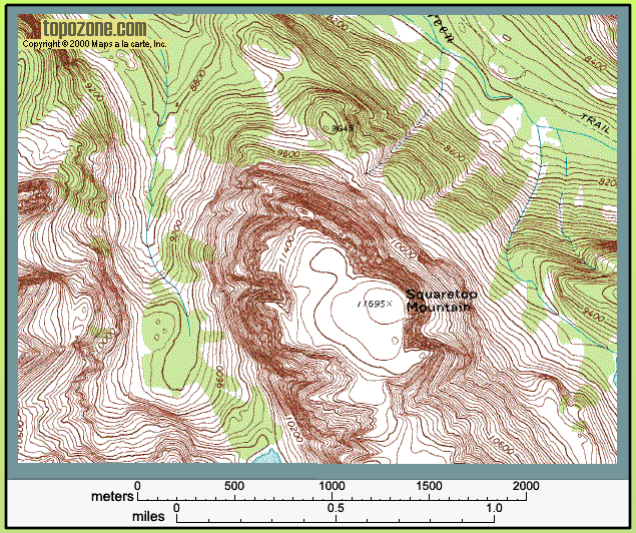
What about a depression or bowl?

Hatch marks pointing inward =

bowl, volcano, depression



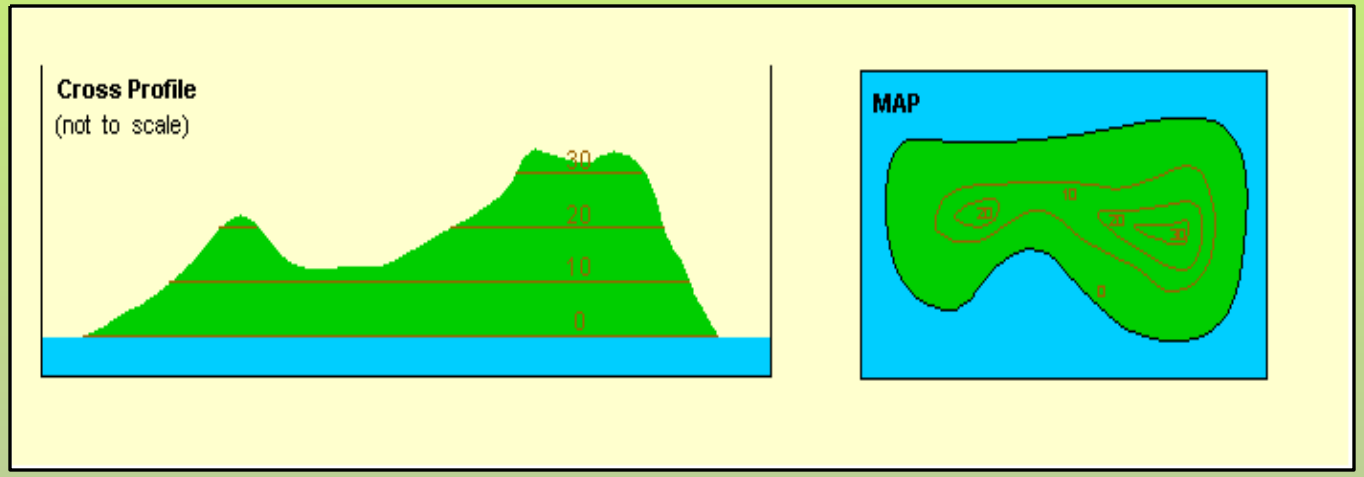




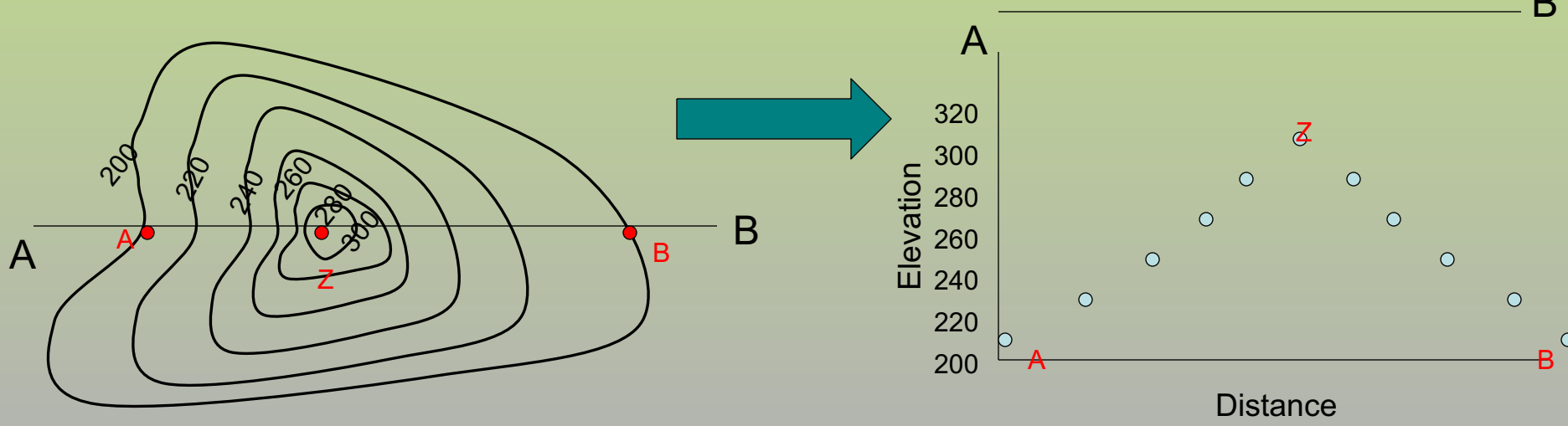
http://raider.muc.edu/~mcnaugma/Topographic%20Maps/topomapindexpage.htm

Topographic maps are a plan view of the land surface. To the left is a photo of a cross-section view of Squaretop Mountain, Wyoming and the topographic map to the right is a plan view of the same mountain. The brown contour lines become very close together indicating the steep mountain sides.

- **Geological features can be identified on a topographic map by the patterns of contour lines and intervals as well as special symbols. Features can also be described by a 3-D profile. Making a topographic profile is a very simple and useful skill. See example below.**



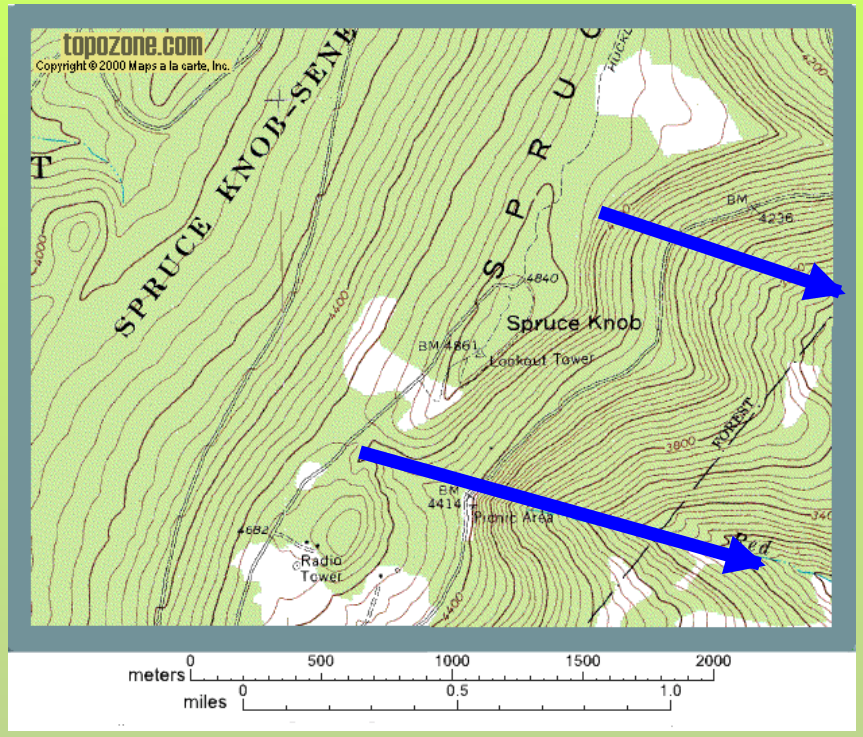
The left figure is a cross-section of an island with elevation lines. The right figure is a plan view of that same island with contour lines. Below is an example of how to draw a profile from a topographic map.



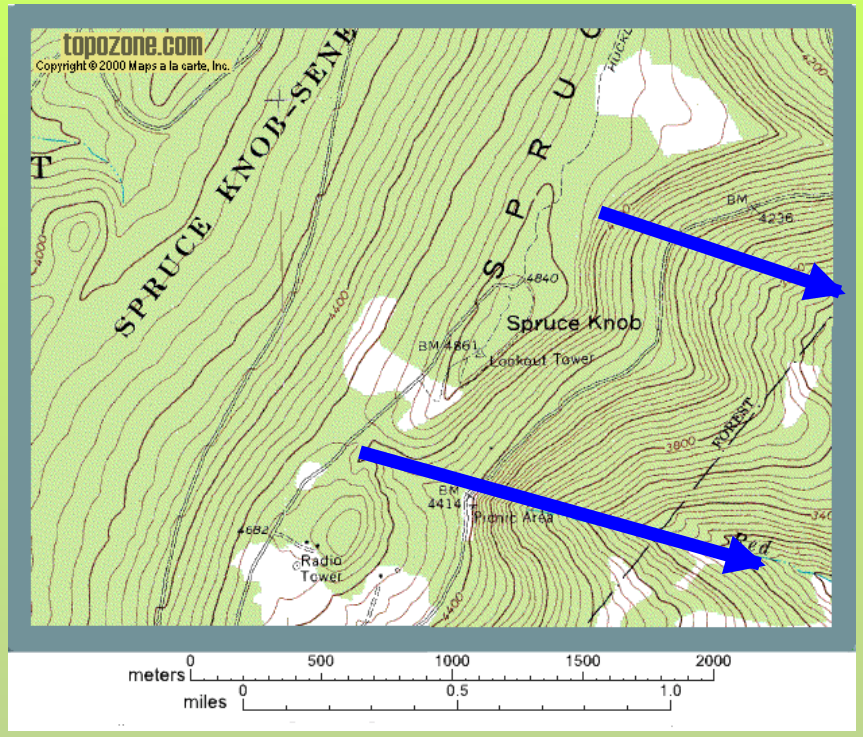
- Features indicated on a topographic map include rivers, marshes, lakes, gravel pits, roads, buildings, domes, and basins (hachures).

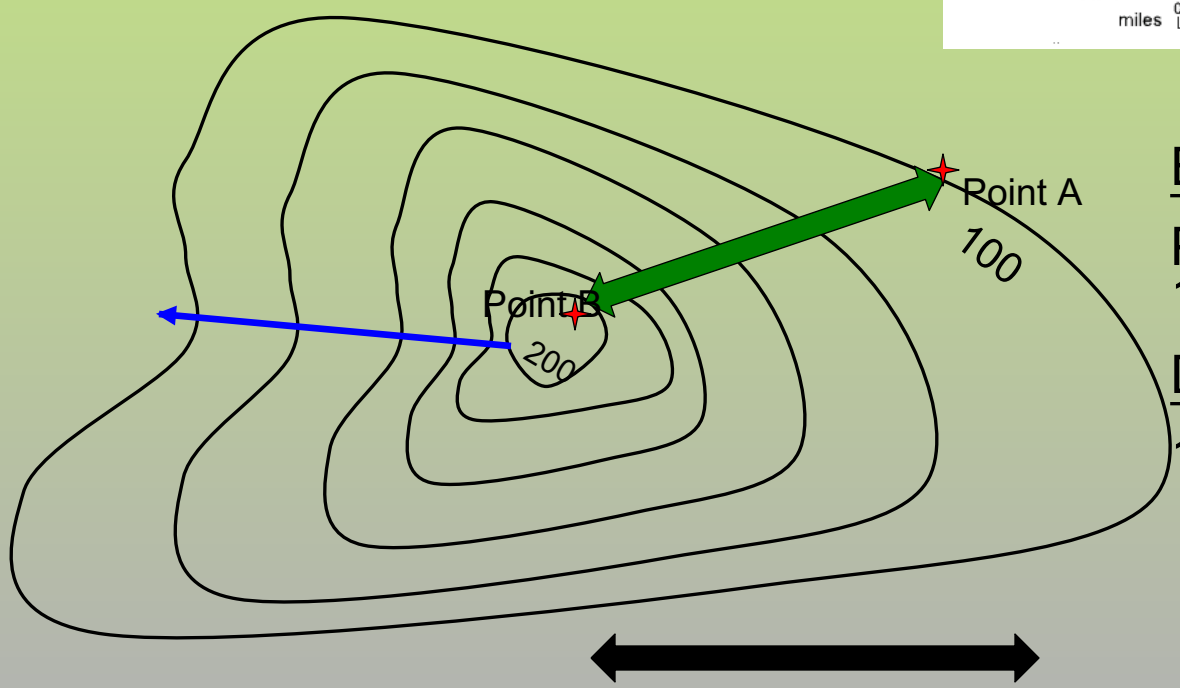
- A series of closed, looped contour lines shows a hill or a depression. A depression is marked by little tick marks on the inside of the closure.

- A V-shape indicates a valley and usually a river is indicated by a blue line. The V will always point upstream.



The gradient, or slope, can be calculated by dividing the change in elevation between two points by the distance between the two points. This gives you a vertical change relative to a path distance.





Elevation:

Point B – Point A = 200 – 100 = 100 ft.

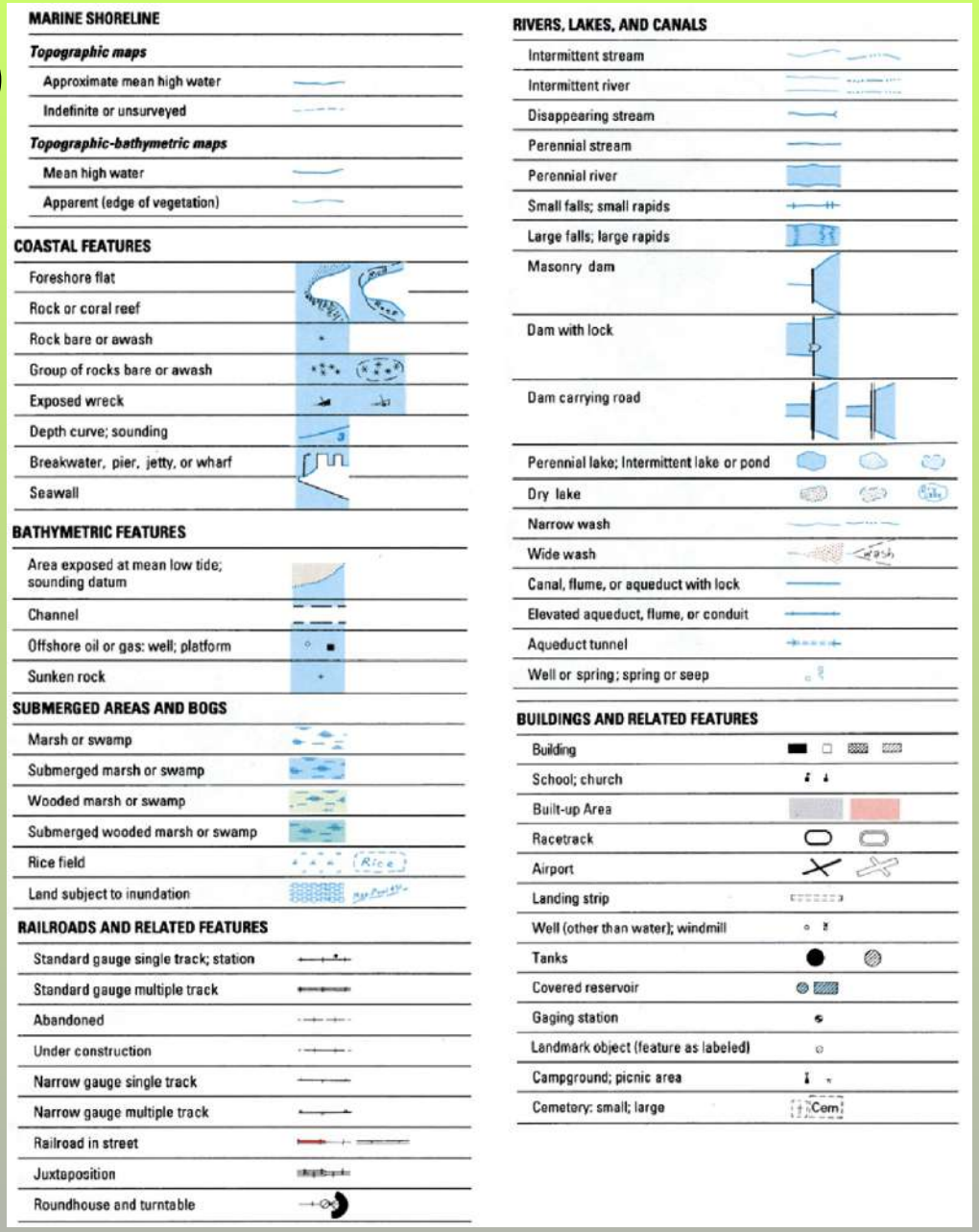
Distance:

1 mile

So the gradient is 100 ft/mile

Map Symbo

- Symbols are used for many features on a map to reduce the amount of words.
- Several standards have been adopted.



MARINE SHORELINE

Topographic maps

- Approximate mean high water
- Indefinite or unsurveyed

Topographic-bathymetric maps

- Mean high water
- Apparent (edge of vegetation)

COASTAL FEATURES

- Foreshore flat
- Rock or coral reef
- Rock bare or awash
- Group of rocks bare or awash
- Exposed wreck
- Depth curve; sounding
- Breakwater, pier, jetty, or wharf
- Seawall

BATHYMETRIC FEATURES

- Area exposed at mean low tide; sounding datum
- Channel
- Offshore oil or gas: well; platform
- Sunken rock

SUBMERGED AREAS AND BOGS

- Marsh or swamp
- Submerged marsh or swamp
- Wooded marsh or swamp
- Submerged wooded marsh or swamp
- Rice field
- Land subject to inundation

RAILROADS AND RELATED FEATURES

- Standard gauge single track; station
- Standard gauge multiple track
- Abandoned
- Under construction
- Narrow gauge single track
- Narrow gauge multiple track
- Railroad in street
- Juxtaposition
- Roundhouse and turntable

RIVERS, LAKES, AND CANALS

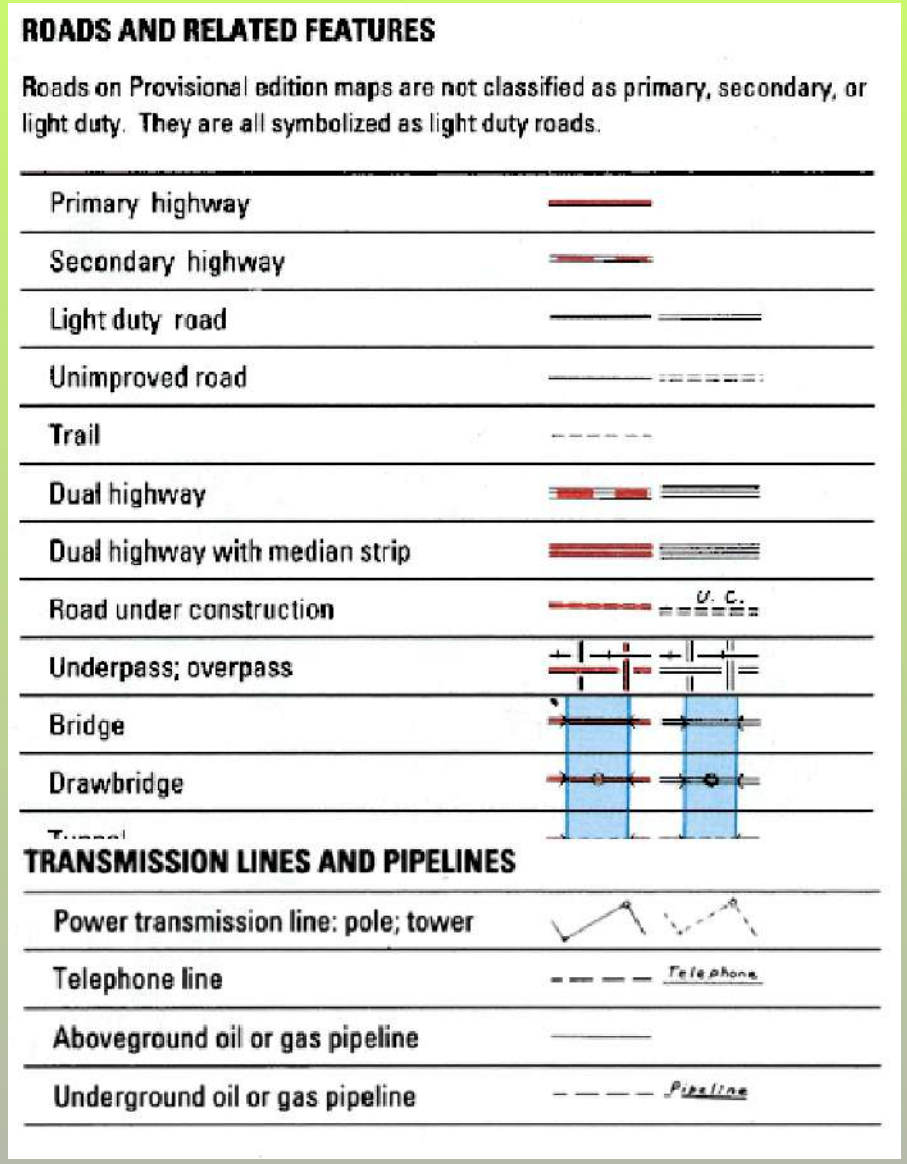
- Intermittent stream
- Intermittent river
- Disappearing stream
- Perennial stream
- Perennial river
- Small falls; small rapids
- Large falls; large rapids
- Masonry dam
- Dam with lock
- Dam carrying road
- Perennial lake; Intermittent lake or pond
- Dry lake
- Narrow wash
- Wide wash
- Canal, flume, or aqueduct with lock
- Elevated aqueduct, flume, or conduit
- Aqueduct tunnel
- Well or spring; spring or seep

BUILDINGS AND RELATED FEATURES

- Building
- School; church
- Built-up Area
- Racetrack
- Airport
- Landing strip
- Well (other than water); windmill
- Tanks
- Covered reservoir
- Gaging station
- Landmark object (feature as labeled)
- Campground; picnic area
- Cemetery: small; large

Topo Symbols--cont.

For more information on topo symbols go to: http://erg.usgs.gov/isb/pubs/booklets/symbols/



ROADS AND RELATED FEATURES

Roads on Provisional edition maps are not classified as primary, secondary, or light duty. They are all symbolized as light duty roads.

Primary highway	
Secondary highway	
Light duty road	
Unimproved road	
Trail	
Dual highway	
Dual highway with median strip	
Road under construction	U. C.
Underpass; overpass	
Bridge	
Drawbridge	

TRANSMISSION LINES AND PIPELINES

Power transmission line: pole; tower	
Telephone line	Telephone
Aboveground oil or gas pipeline	
Underground oil or gas pipeline	Pipeline

Eleven (11) characteristics of contour lines

1. **Contour lines are continuous.**
2. **Contour lines are relatively parallel unless one of two conditions exists.**
3. **A series of V-shape indicates a valley and the V's point to higher elevation.**
4. **A series U shape indicates a ridge. The U shapes will point to lower elevation.**
5. **Evenly spaced lines indicate an area**

Contour Line Characteristics-cont.

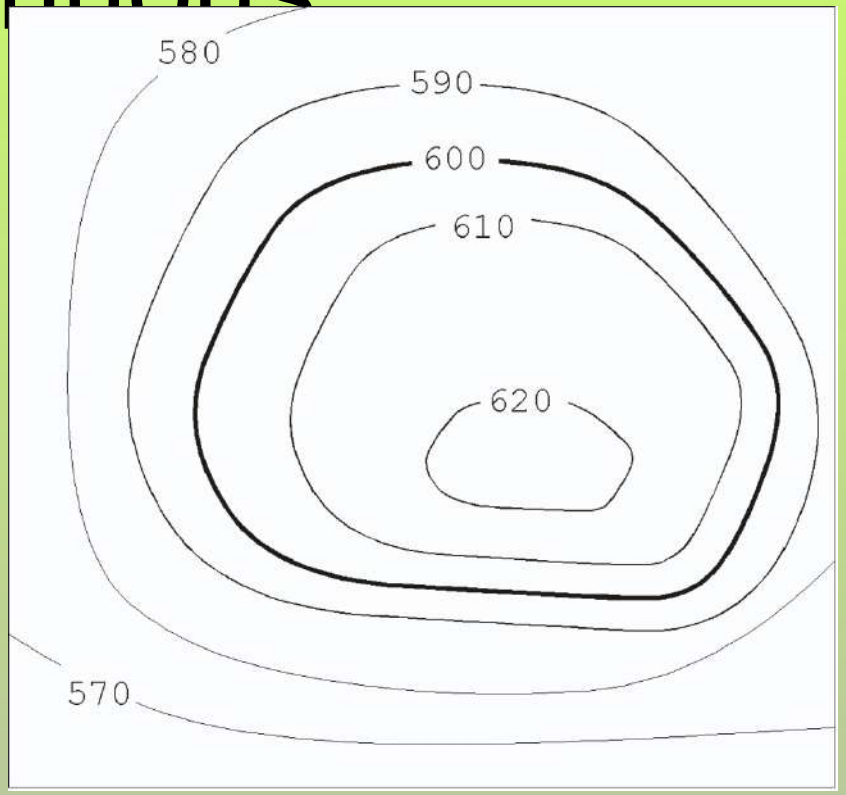
6. **A series of closed contours with increasing elevation indicates a hill and a series of closed contours with decreasing elevation indicates a depression.**
7. **Closed contours may be identified with a +, hill, or -, depression.**
8. **Closed contours may include hachure marks. Hachures are short lines perpendicular to the contour line. They point to lower elevation.**

Contour Line Characteristics-cont.

9. **The distance between contour lines indicates the steepness of the slope. The greater the distance between two contours the less the slope. The opposite is also true.**
10. **Contours are perpendicular to the maximum slope.**
11. **A different type of line should be used for contours of major elevations. For example at 100, 50 and 10 foot intervals. Common practice is to identify the major**

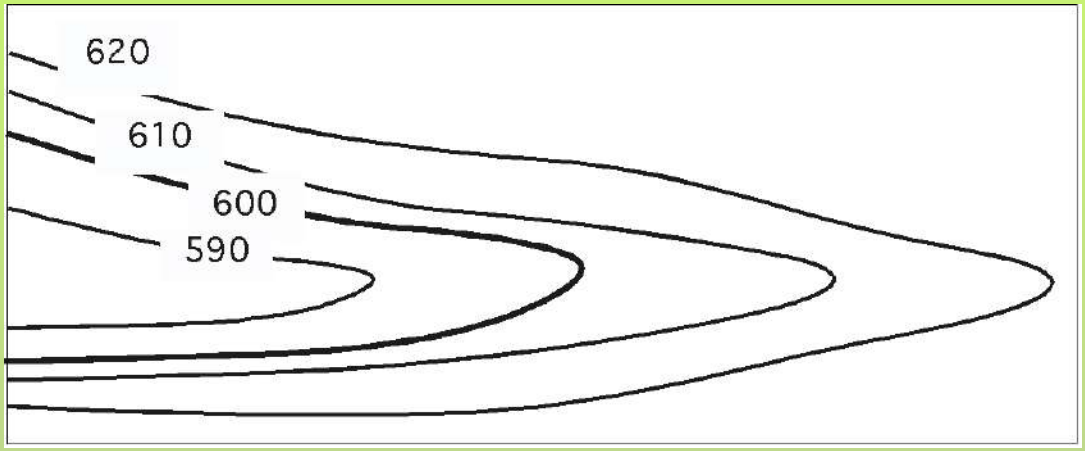
1. Contours are Continuous

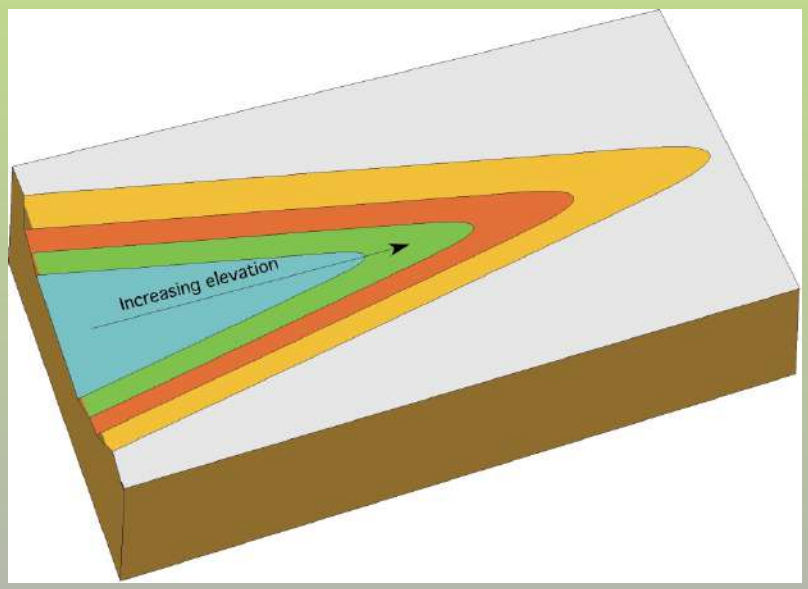
- **Some contour lines may close within the map, but others will not.**
- **In this case, they will start at a boundary line and end at a boundary line.**
- **Contours must**



3. Valleys and higher elevation

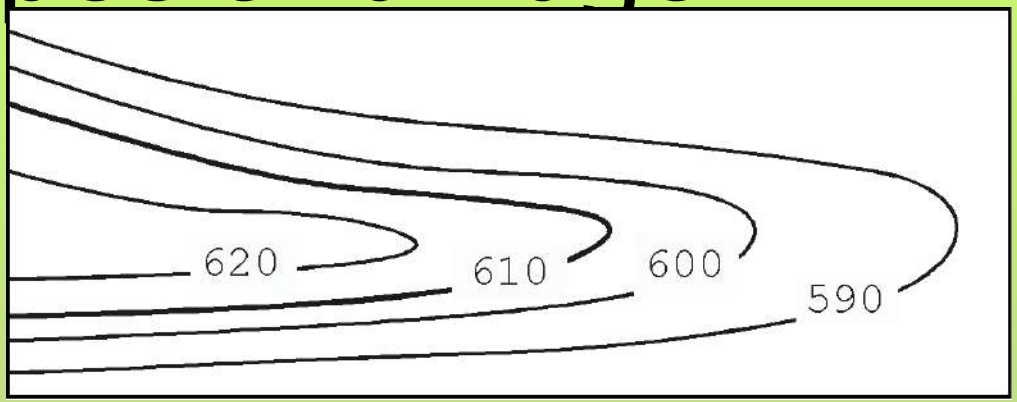
A series of V-shapes indicates a valley and the V's point to higher elevation.

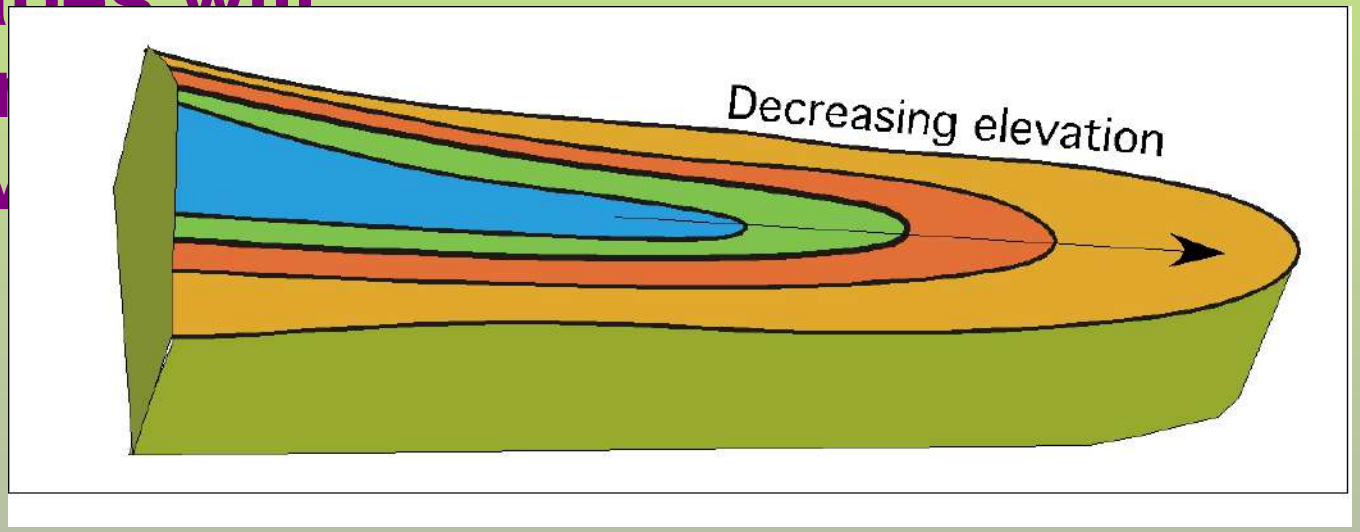




4. U shapes and ridge

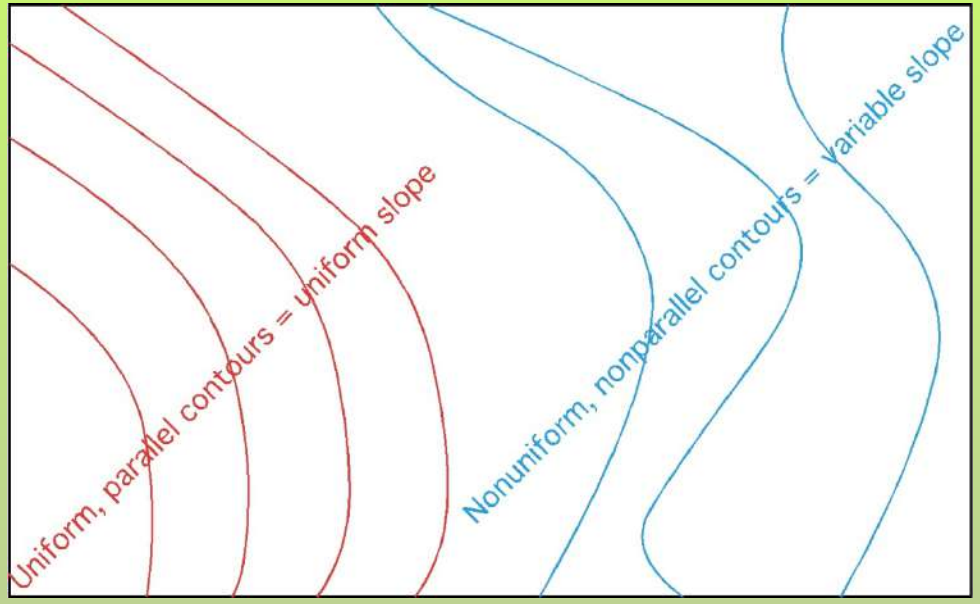
A series of U shapes indicates a ridge. The U shapes will poi elev





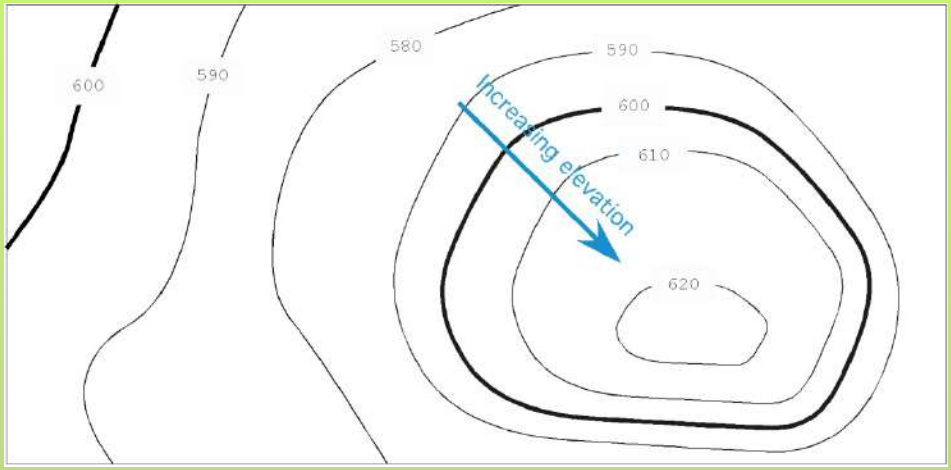
5. Contour Spacing

Evenly spaced contours indicate an area of



Unevenly spaced contours indicates an area with variable slope.

6. Hills and Depressions

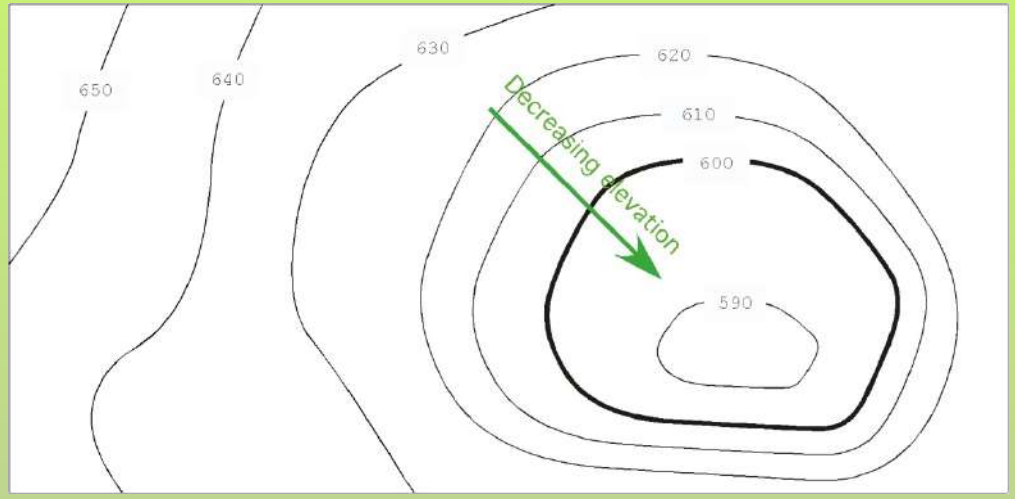


A series of closed contours with increasing elevation indicates a hill.

Hills may be identified with a "+" with the elevations and depressions may be identified with a "-".

6. Hills and Depressions--cont.

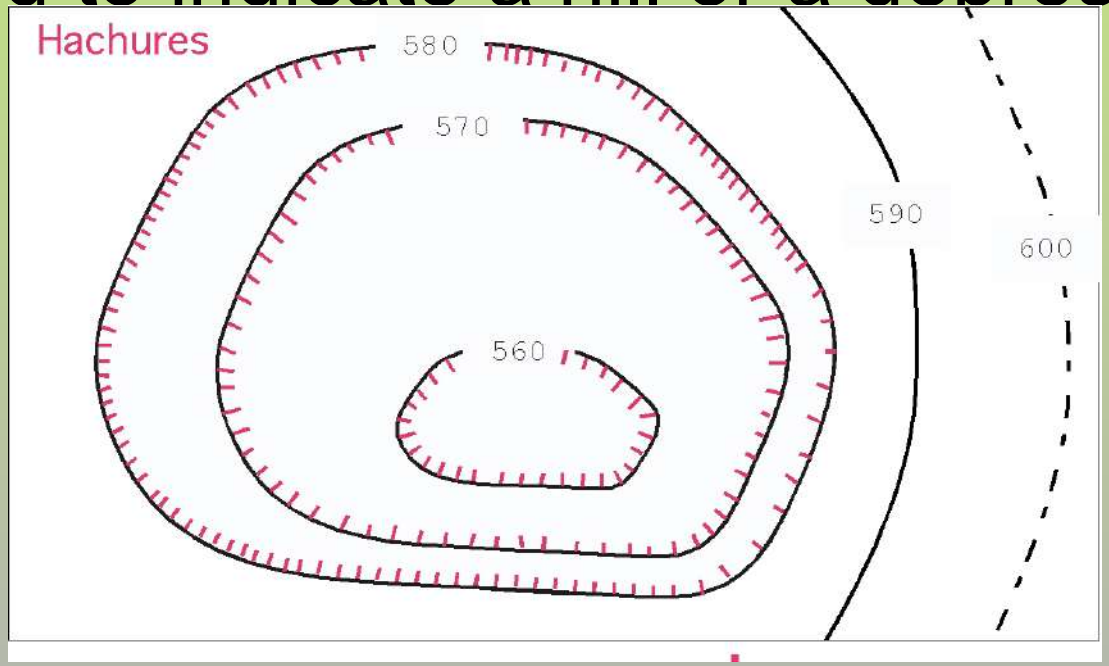
A series of closed contours with decreasing elevation indicates a depression.



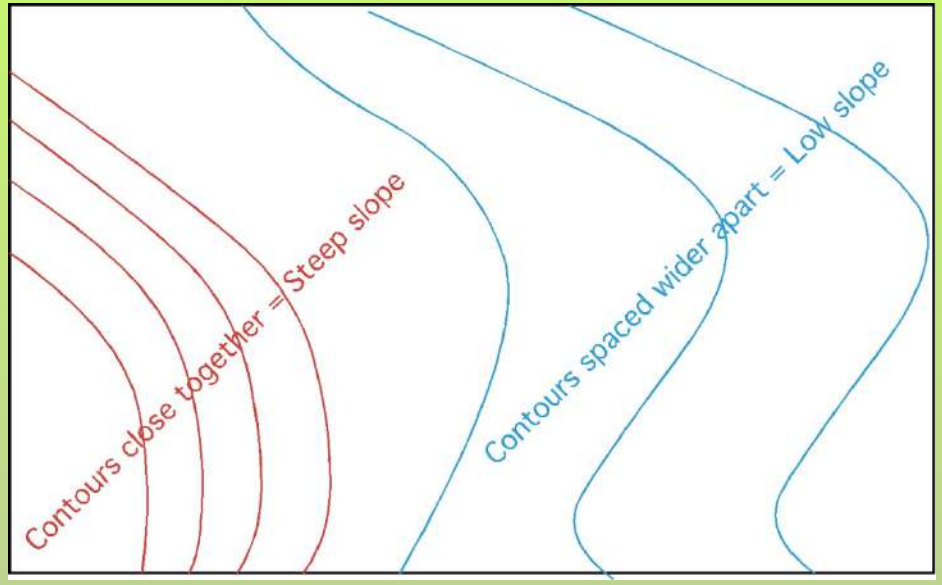
8. Hachures

Hachures are short lines which are perpendicular to the contour line.

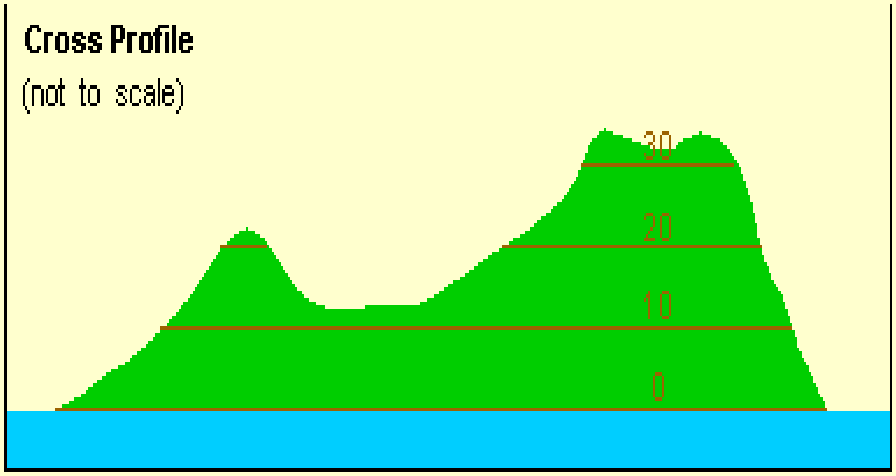
Used to indicate a hill or a depression.

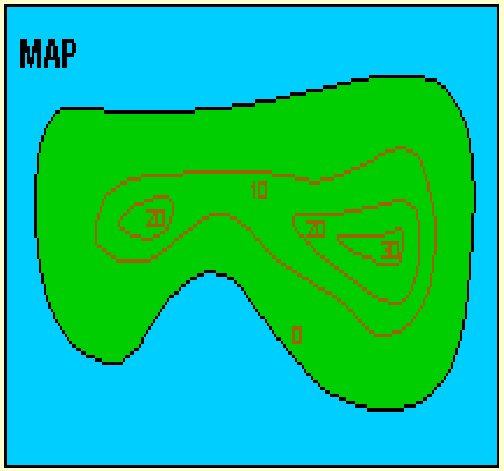


9. Contour Spacing



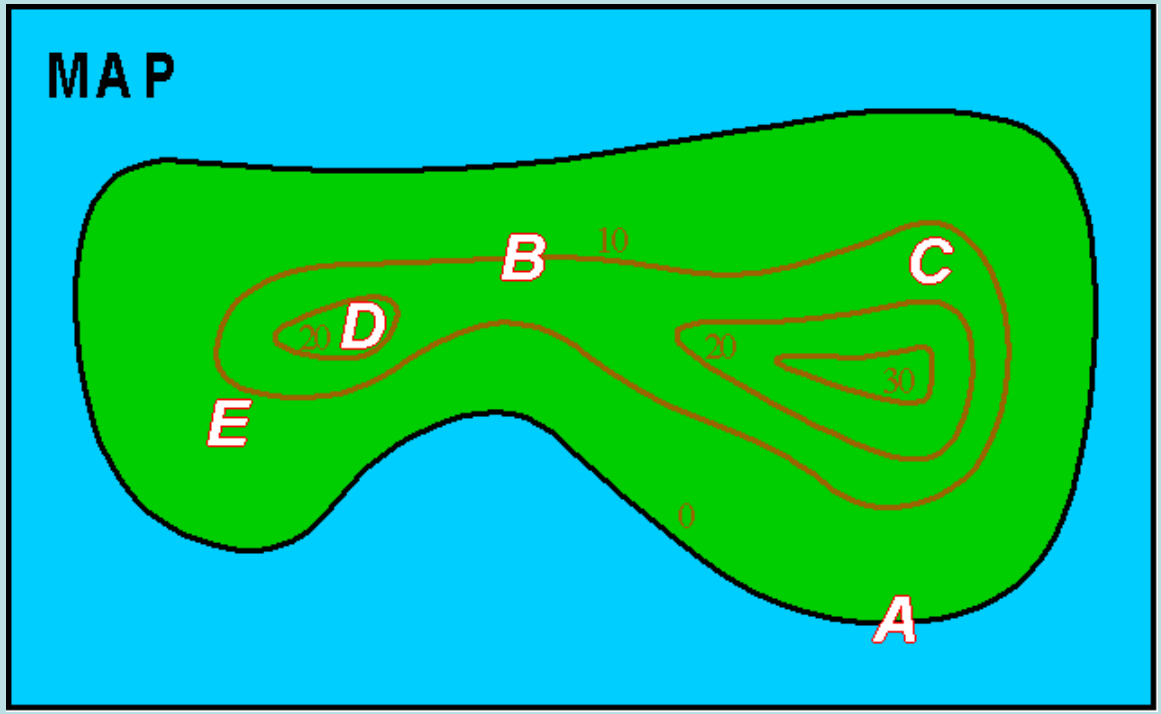
- Contours spaced close together indicate a steep slope.
- Contours spaced wider apart indicate less slope.





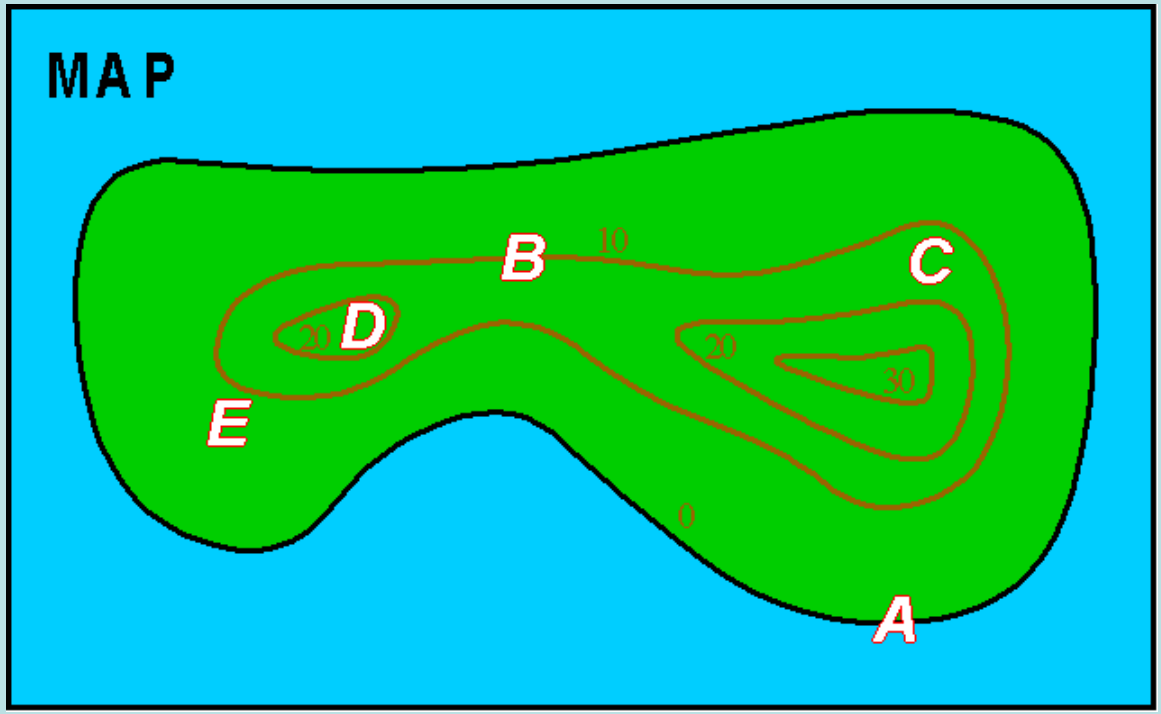
Notice the two high points on the island. What is the elevation of the two high points?

What is the elevation of Point A?



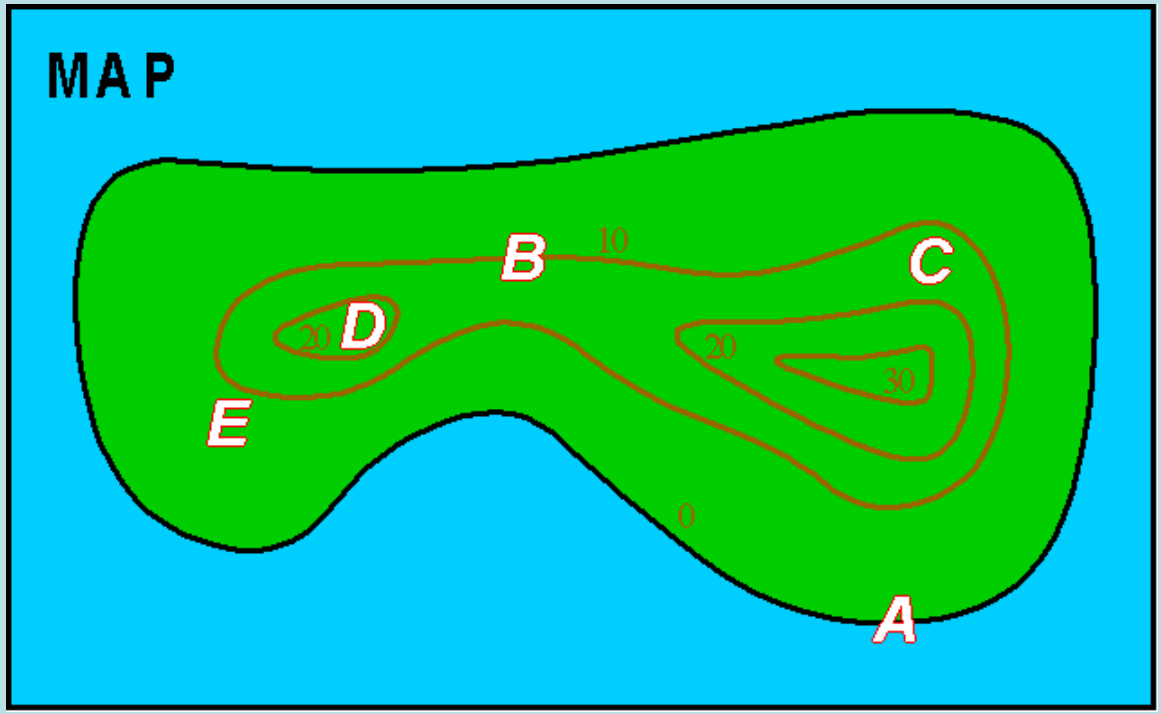
Point A sits right on the 0 ft contour line. Since all points on this line have an elevation of 0 ft, the elevation of point A is zero.

What is the elevation of Point B?



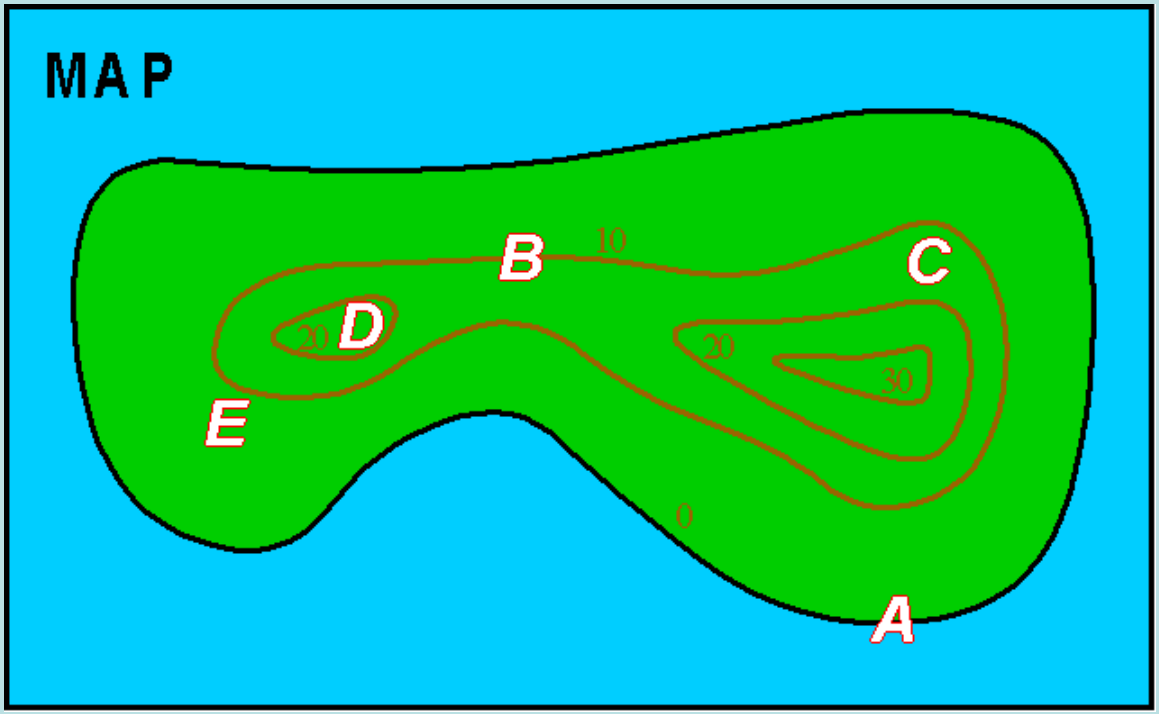
Point B sits right on the 10 ft contour line. Since all points on this line have an elevation of 10 ft, the elevation of point B is 10 ft.

What is the elevation of Point C?



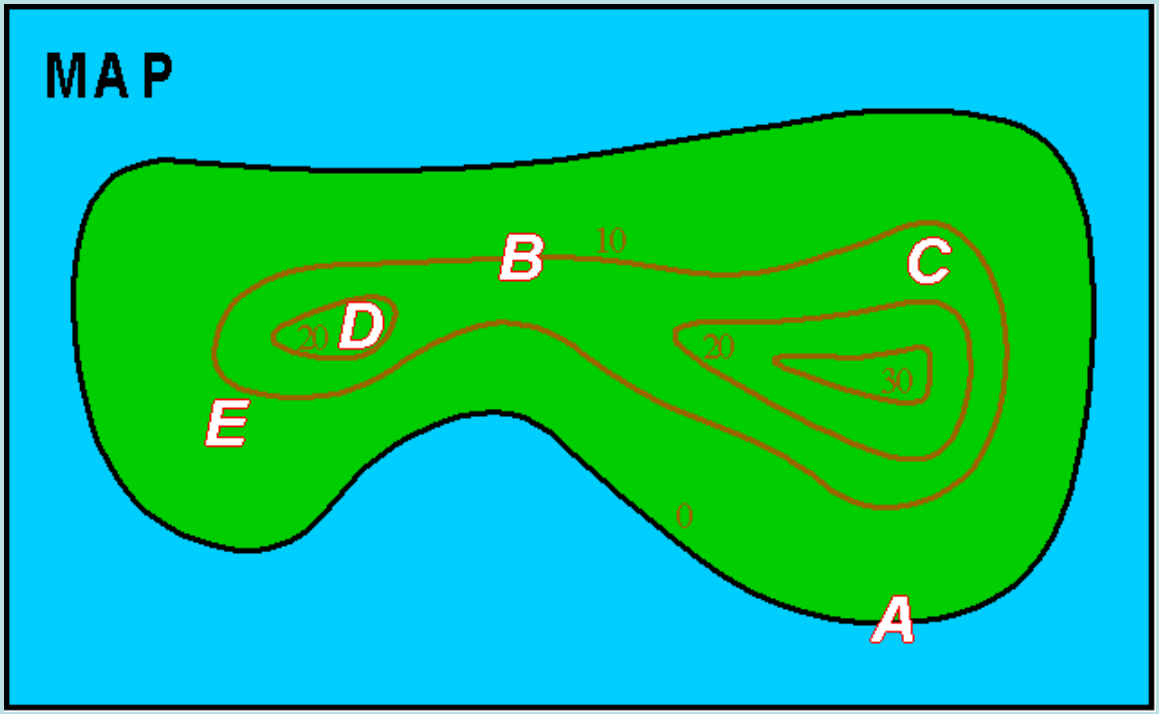
Point C does not sit directly on a contour line so we can not determine the elevation precisely. We do know that point C is between the 10ft and 20 ft contour lines so its elevation must be greater than 10 ft and less than 20 ft. Because point C is midway between these contour lines we can estimate the elevation is about 15 feet (Note this assumes that the slope is constant between the two contour lines, this may not be the case).

What is the elevation of Point D?



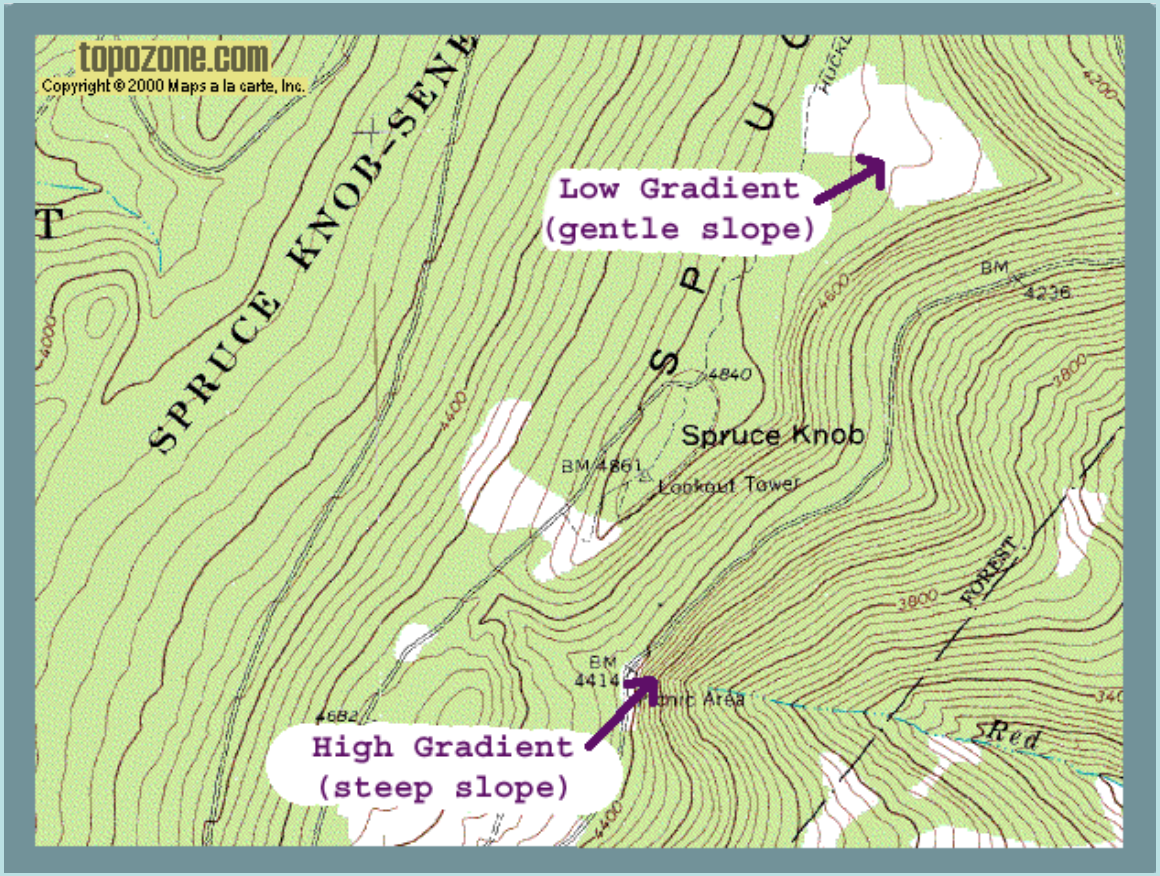
We are even less sure of the elevation of point D than point C. Point D is inside the 20 ft. contour line indicating its elevation is above 20 ft. Its elevation has to be less than 30 ft. because there is no 30 ft. contour line shown. But how much less? There is no way to tell. The elevation could be 21 ft, or it could be 29 ft. There is now way to tell from the map.

What is the elevation of Point E?

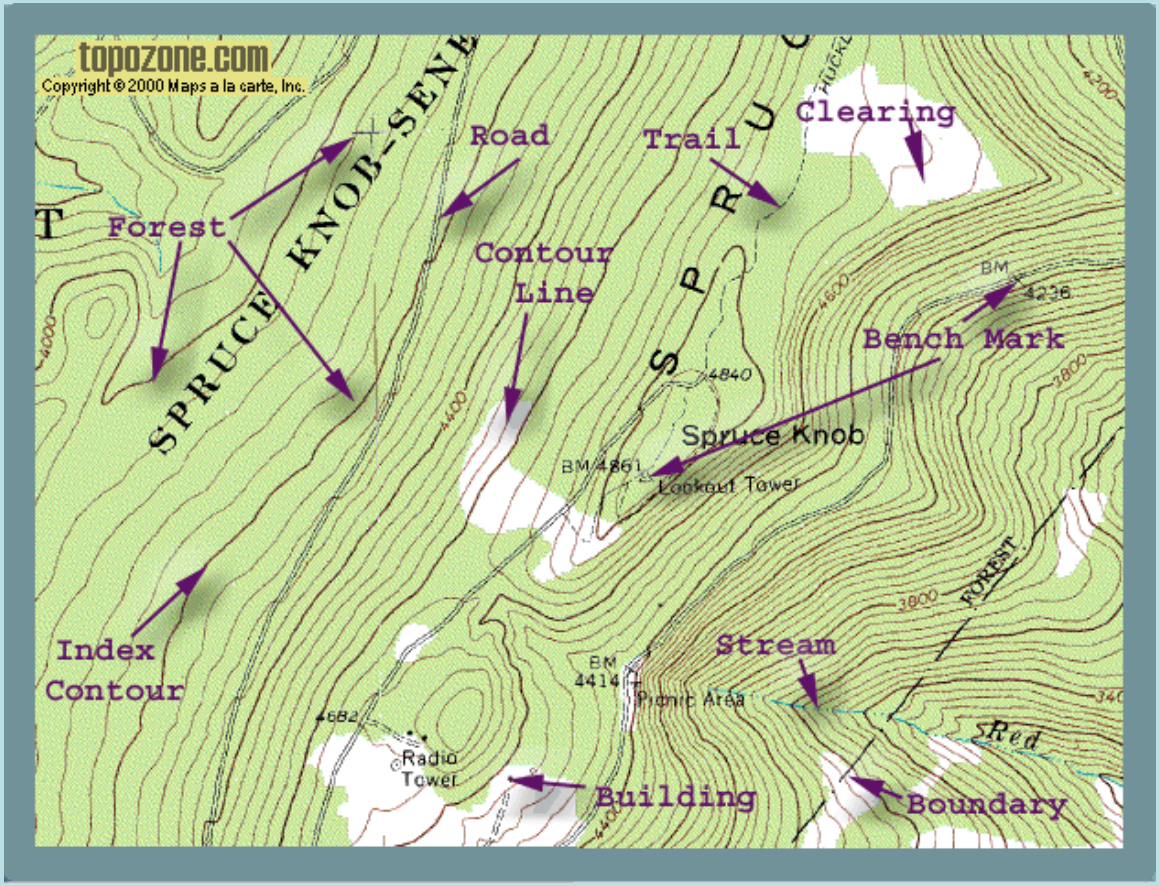


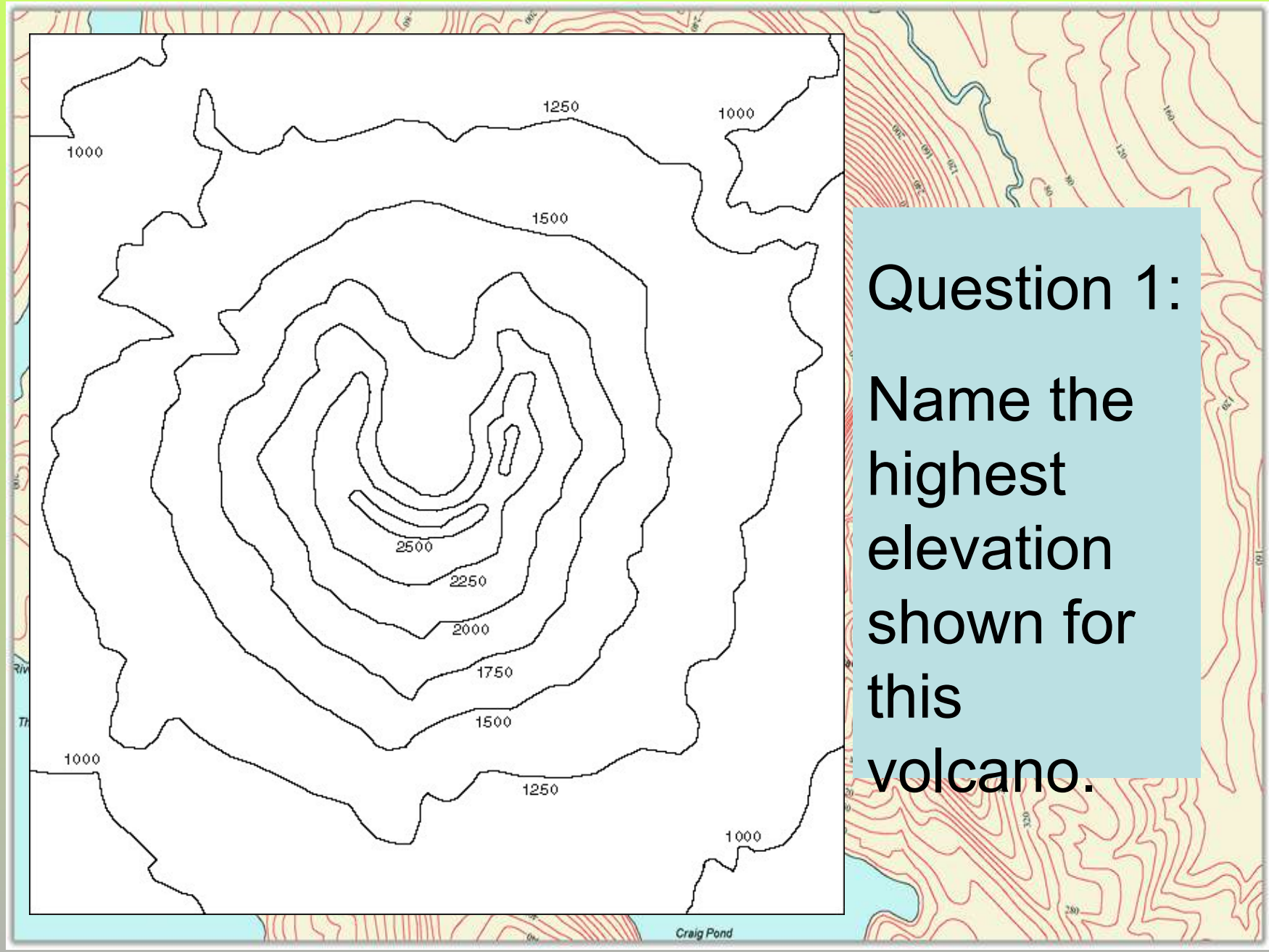
Just as with point C above, we need to estimate the elevation of point E somewhere between the 0 ft and 10 ft contour lines it lies in between. Because this point is closer to the 10 ft line than the 0 ft. line we estimate an elevation closer to 10. In this case 8 ft. seems reasonable. Again this estimation makes the assumption of a constant slope between these two contour lines.

Notice how the contour lines are used to show how gentle or steep the slope is.



Topographic maps also identify natural structures and structures made by man.

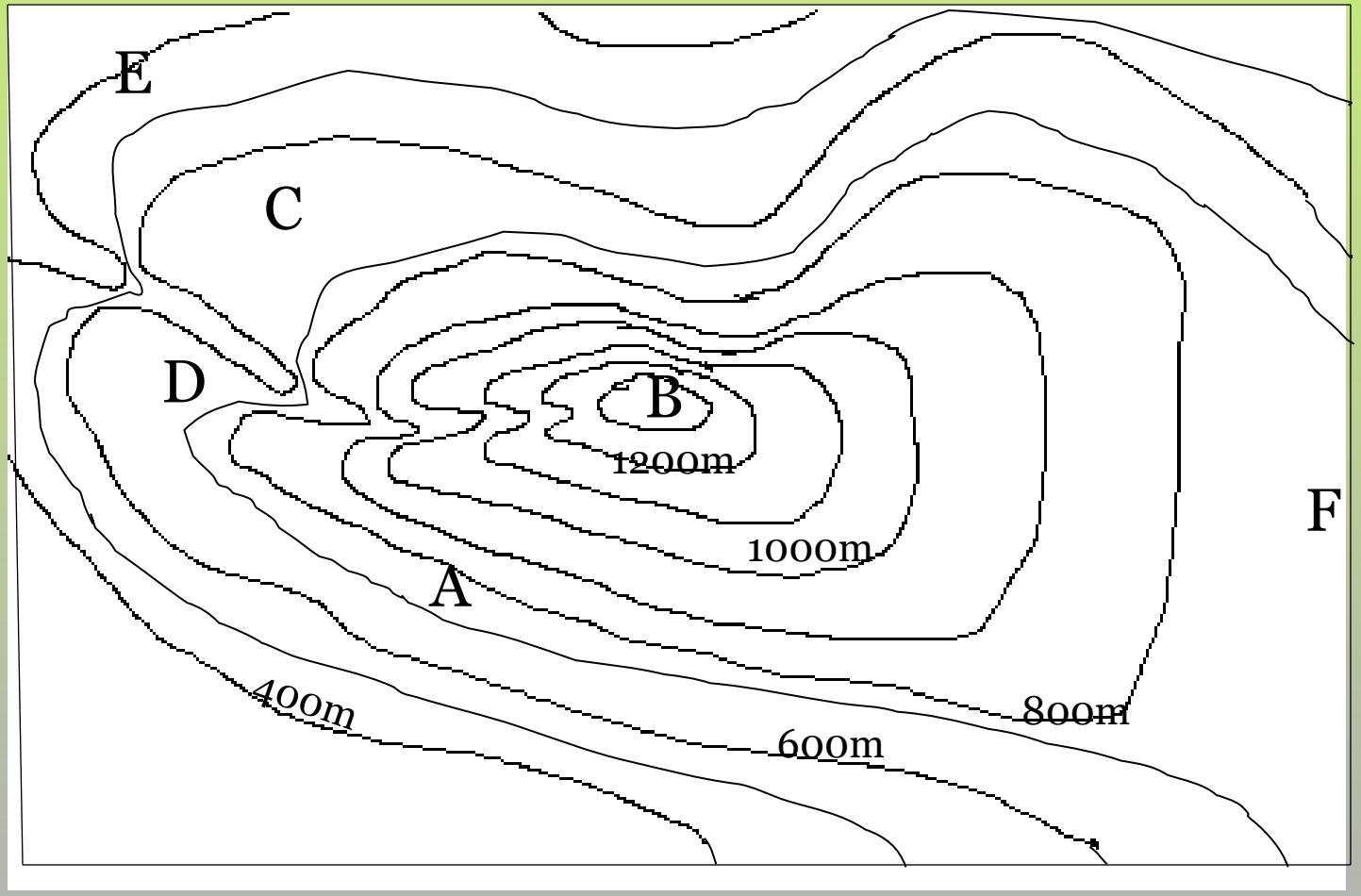




Question 1:

Name the highest elevation shown for this volcano.

Let's see what you know.

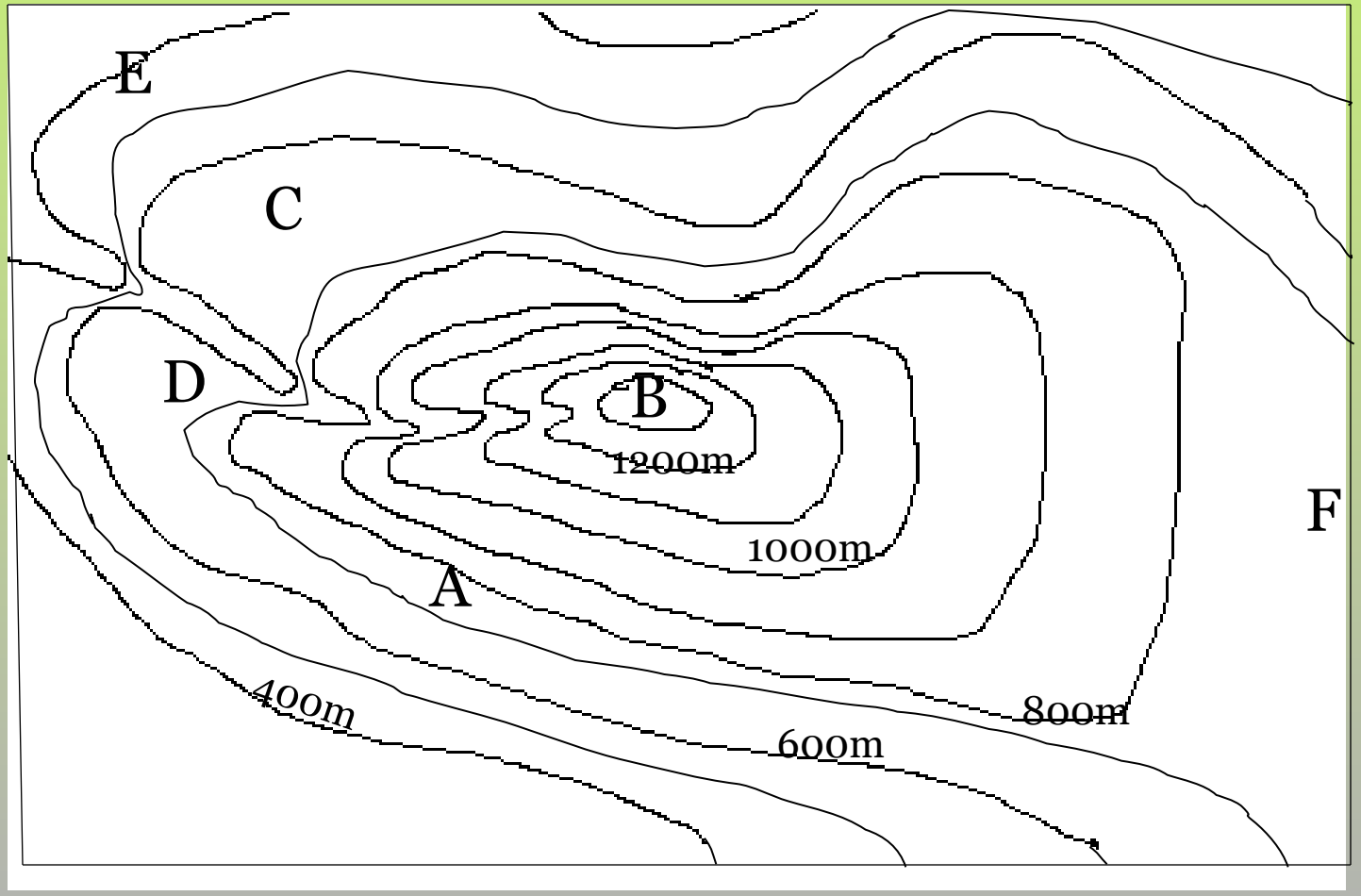


Quiz Time

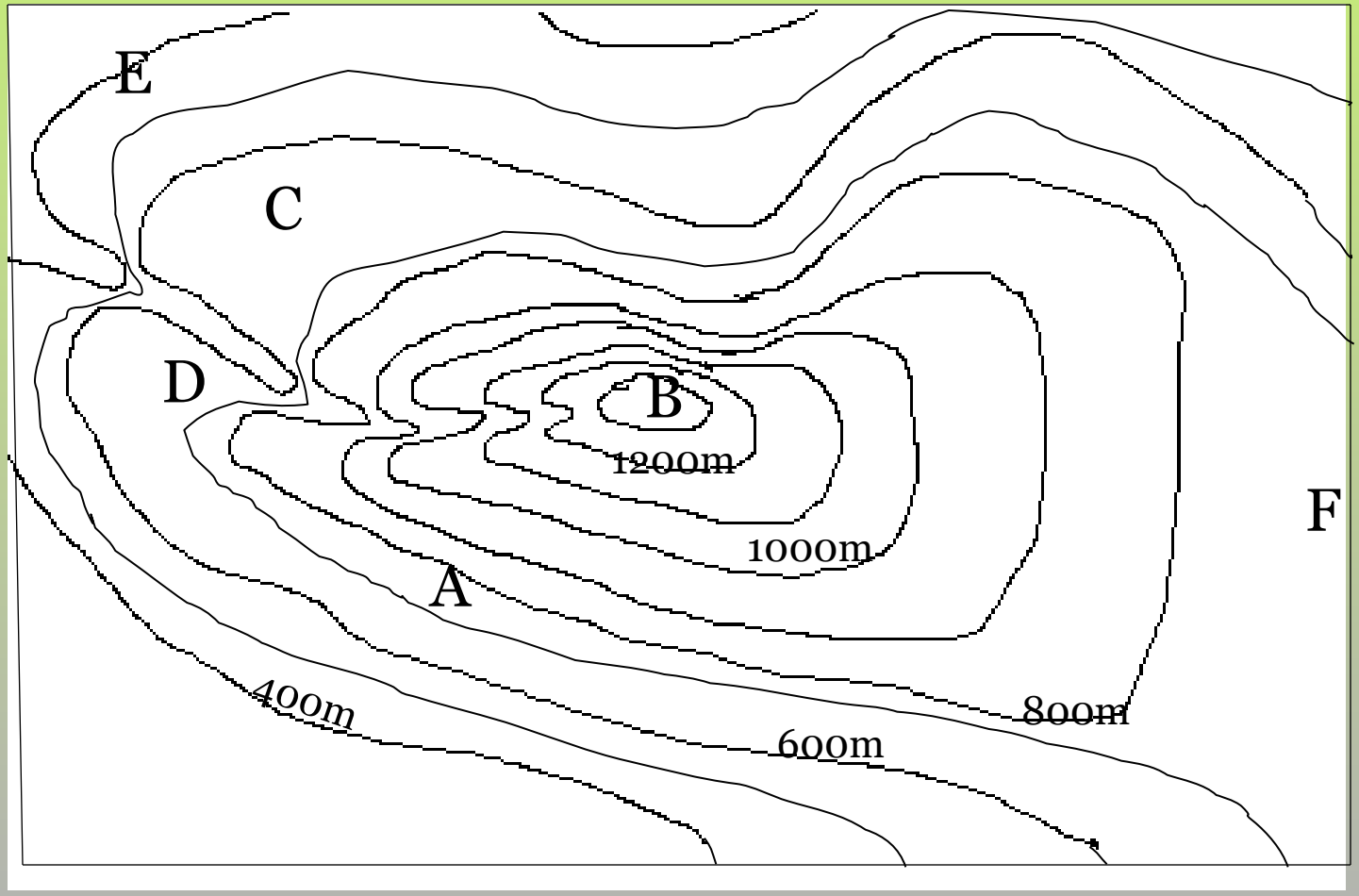
Grab a piece of paper and write your answers to the following questions.

Ready?

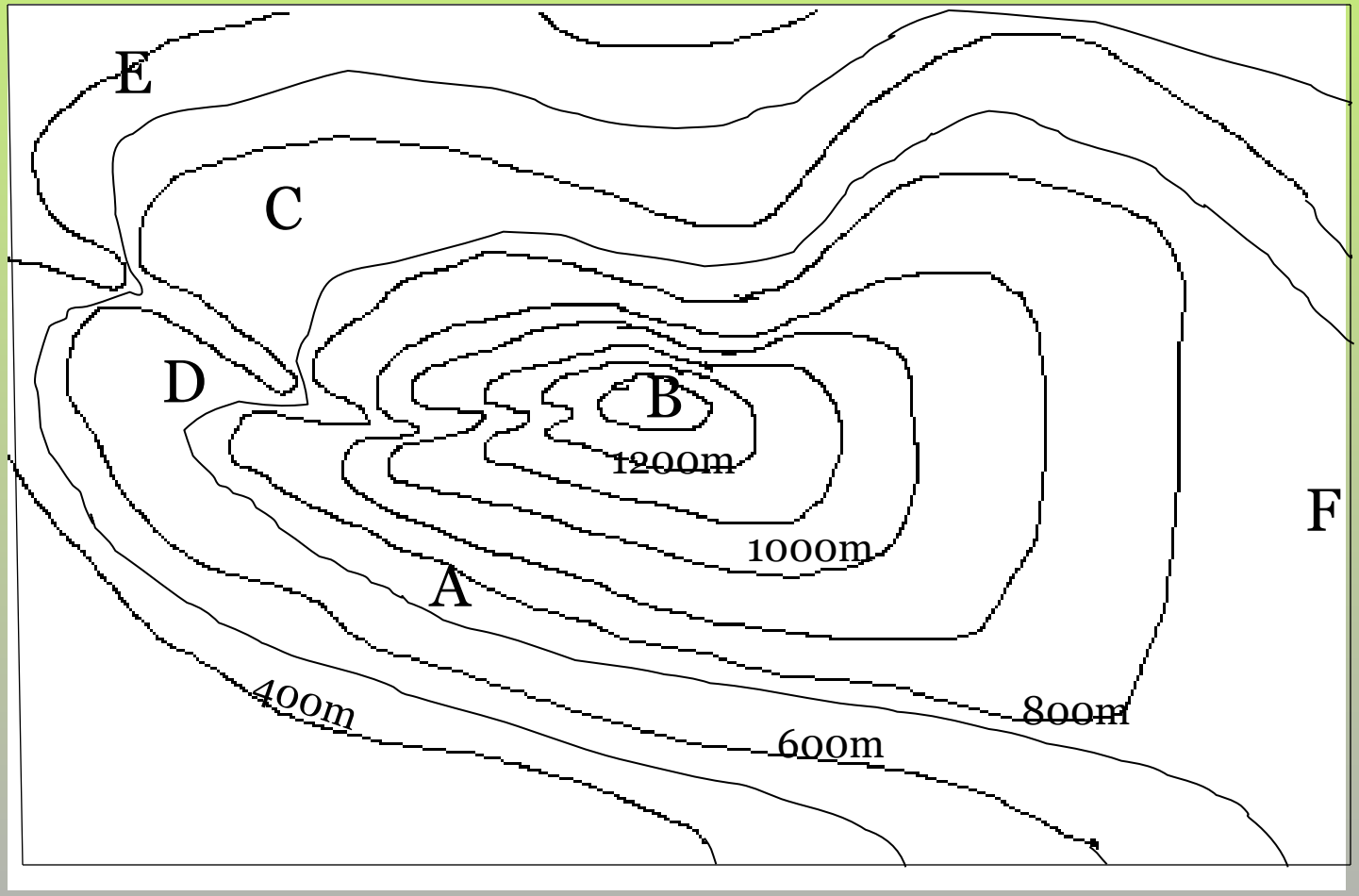
1. Could the elevation at the peak (B) be 1410 meters?



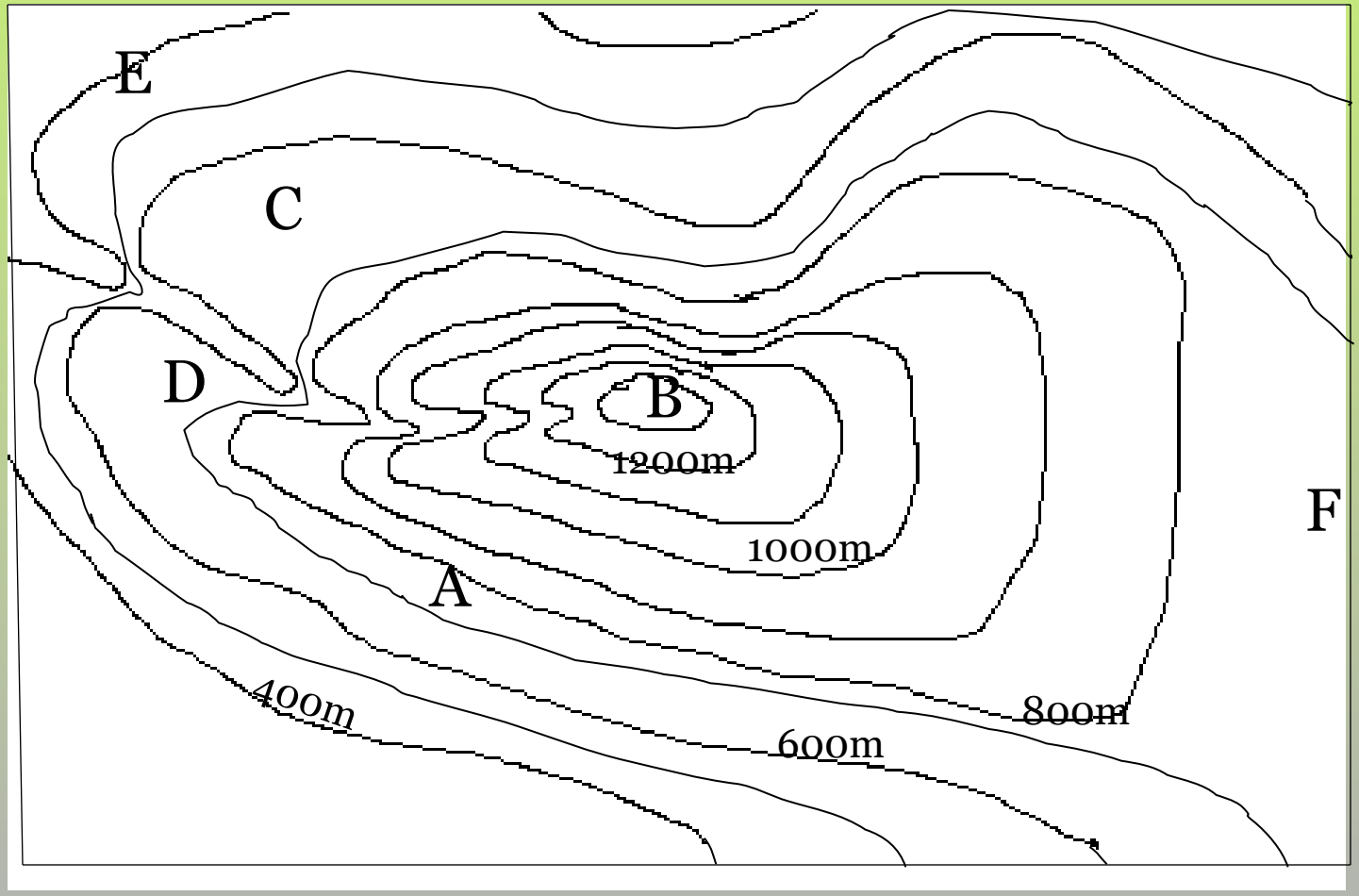
2. What is the elevation at (E)?



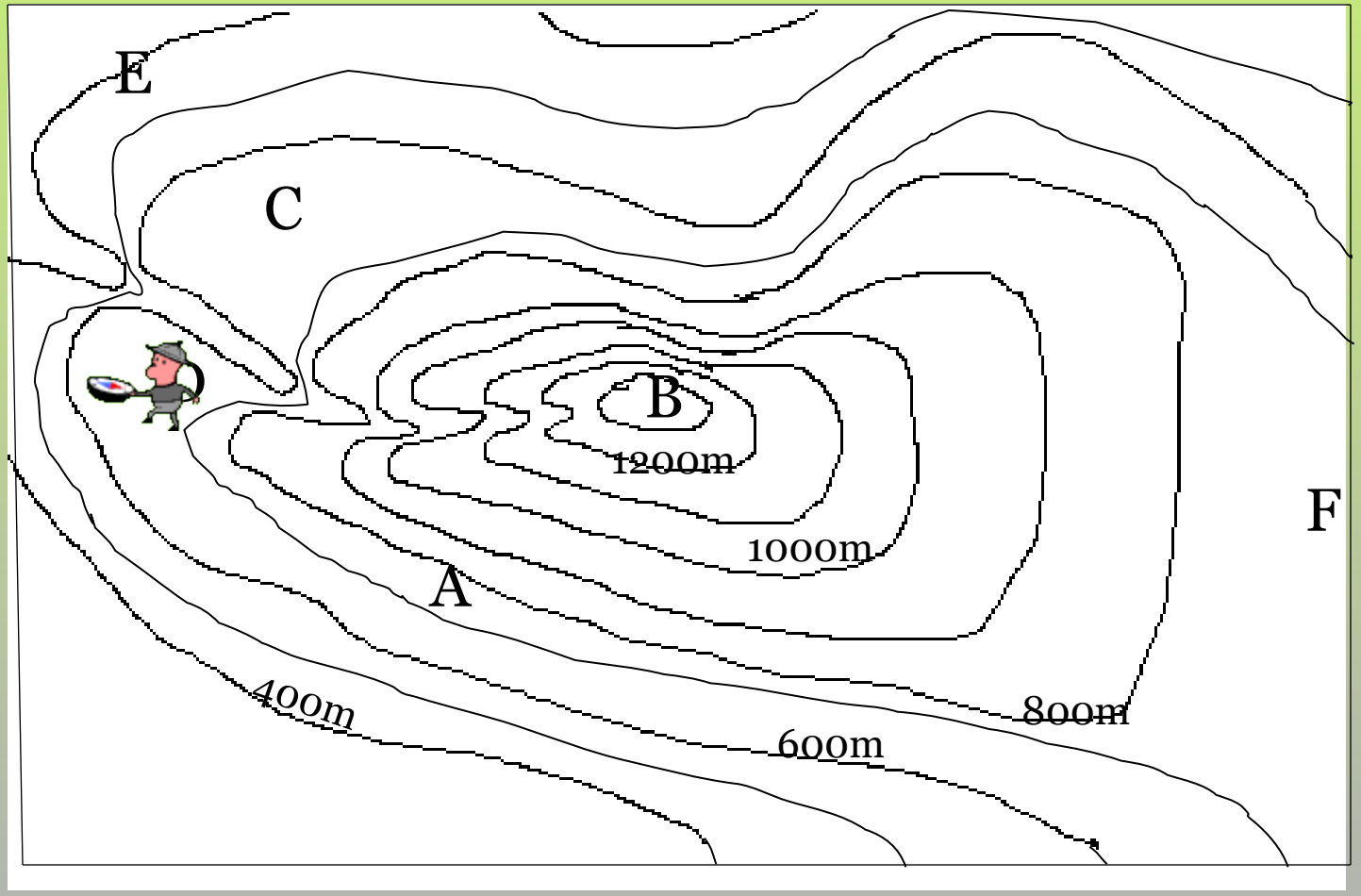
3.What is the elevation difference between (A) and (B)?



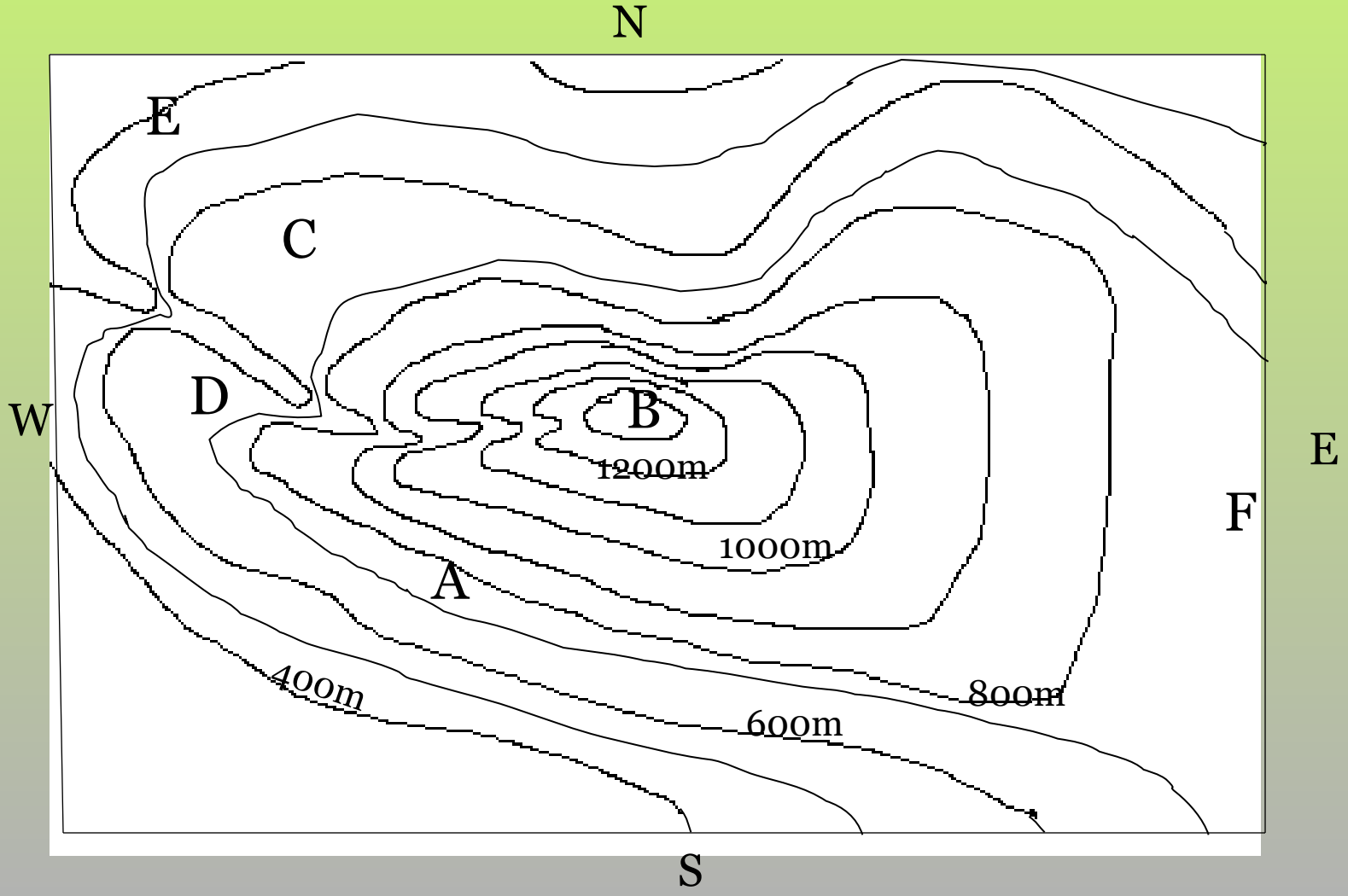
4. Could the elevation at (F) be 417 meters?



5. If you walked a straight line from (D) to (C) would you walk over a ridge or down a valley?



6.Just looking at the map, would it be easier to head down from the peak going East, or going North?



Answers!

- 1. No :The elevation must be under 1400 meters, but over 1300 meters.
- 2. about 400 meters

Answers!

- 3. (A) is probably close to the 750 meter line, (B) is above 1300 meters. The difference between the two would probably be 650 to 700 meters.

Answers!

- 4. No: It must be more than 700 meters and less than 800 meters.
- 5. Down a valley: If the contour lines point up the slope it's a valley, if they point down the slope it's a ridge.

Answers!

- 6. East: When contour lines are close together that means there is a steep slope, the further apart the lines, the more gentile the slope and therefore an easier walk! Go east!

Falcon Focus

- Explain how elevation is shown on a topographic map.

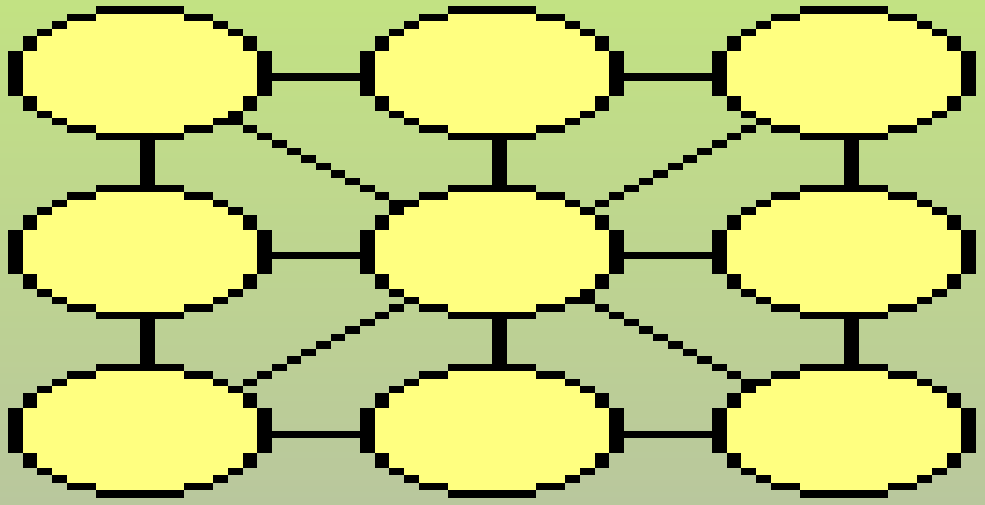
- Contour lines connect points that have the same elevation.

Essential Question

- In what ways might topographic maps be more useful than simple map projections to someone who wants to hike in an area that he or she has never hiked in before?

- In addition to locating rivers and roads, hikers in an unfamiliar area could easily find out where the ground is relatively level or where steep landforms are so they could plan a route.

Introduction: Illustrate this diagram



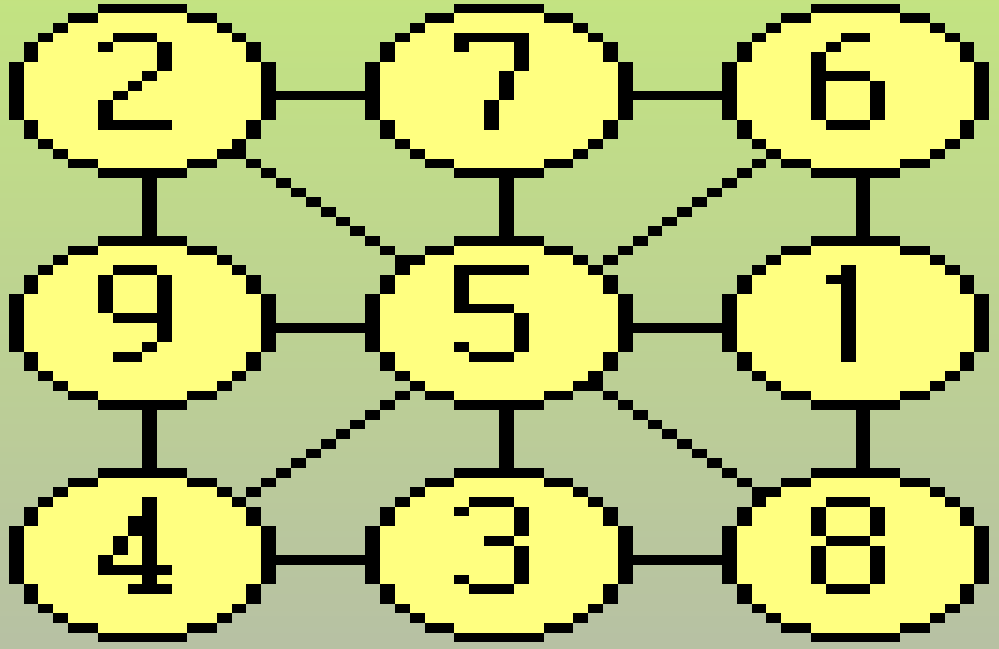
Directions

- The digits 1, 2, 3, 4, 5, 6, 7, 8, and 9 must be put in the depicted square, in such a way that the sums of the numbers in each row, column, and diagonal are equal.
- **The Question**: How should the numbers be arranged in the square**?**

Hint

- The digits 1, 2, 3, 4, 5, 6, 7, 8, and 9 must be put in the depicted square, in such a way that the sums of the numbers in each row, column, and diagonal will equal the number 15.

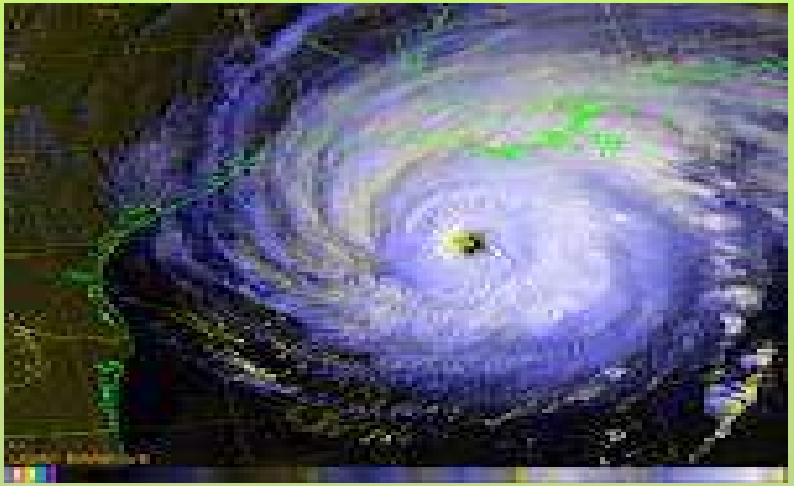
Introduction: Illustrate this diagram

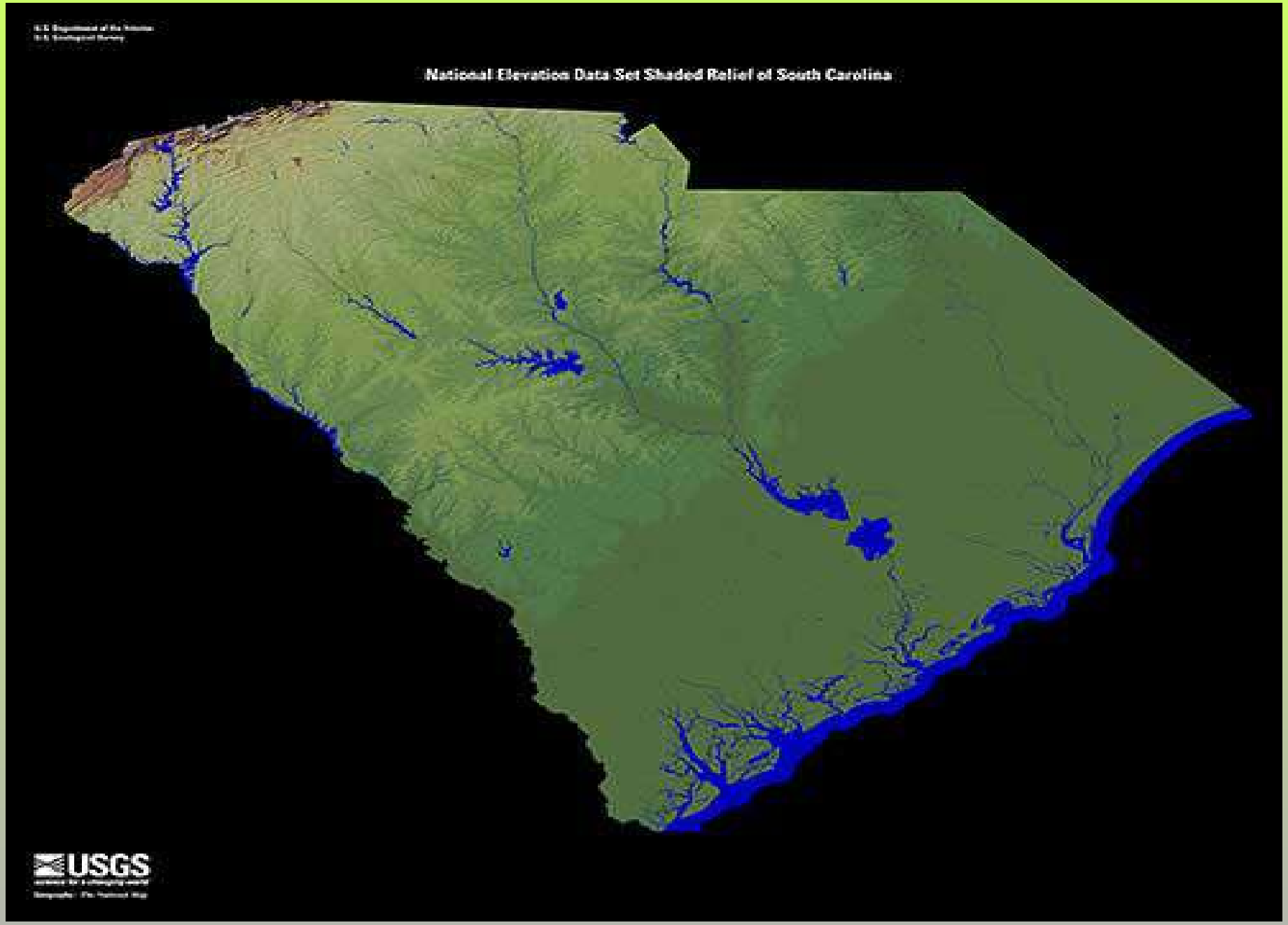


Question

- How does the hint given for the puzzle compare to symbols or legends on maps?

Aerial vs. Satellite Photographs




National Elevation Data Set Shaded Relief of South Carolina
USGS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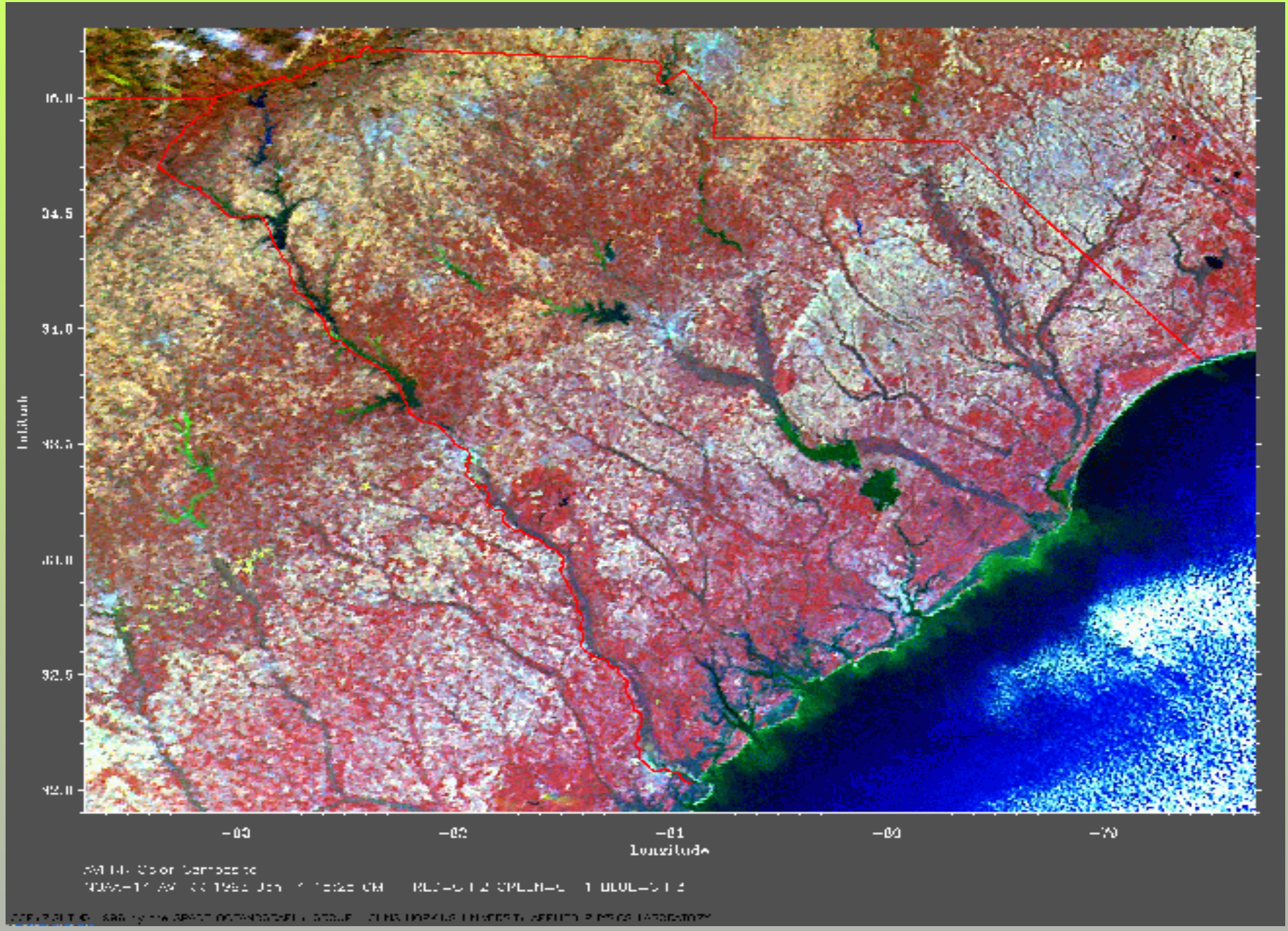
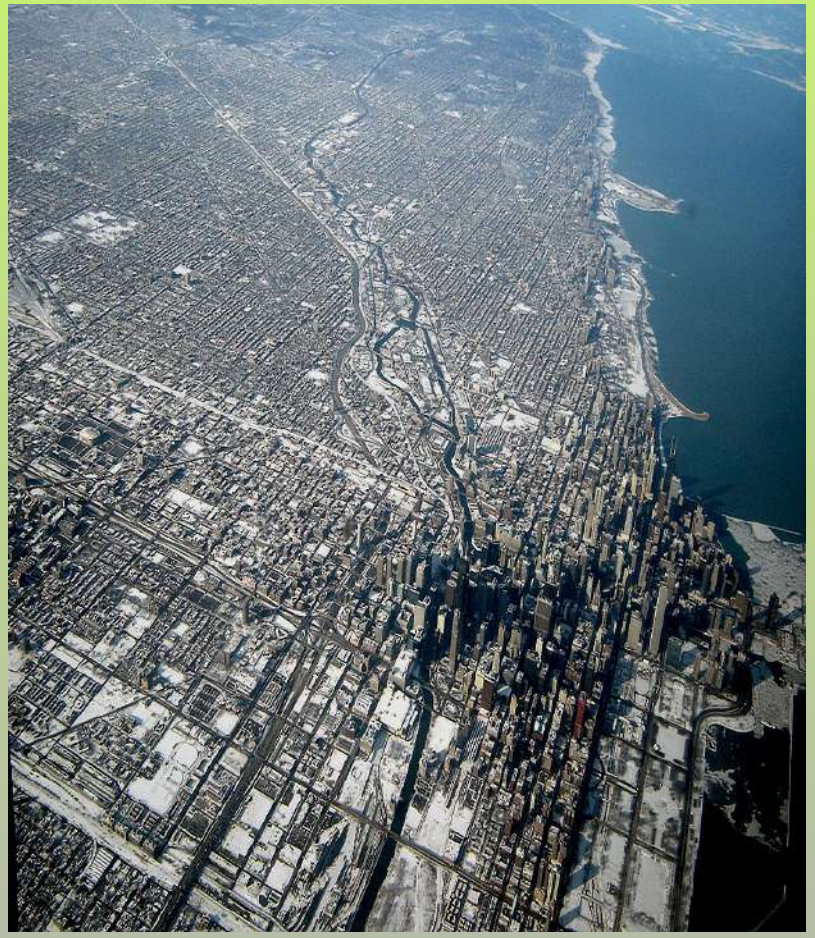
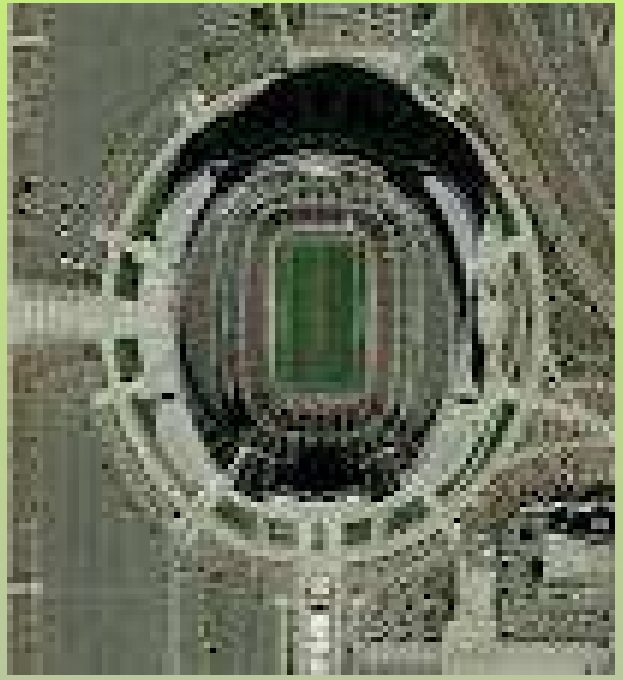

Latitude
Longitude

Google Earth

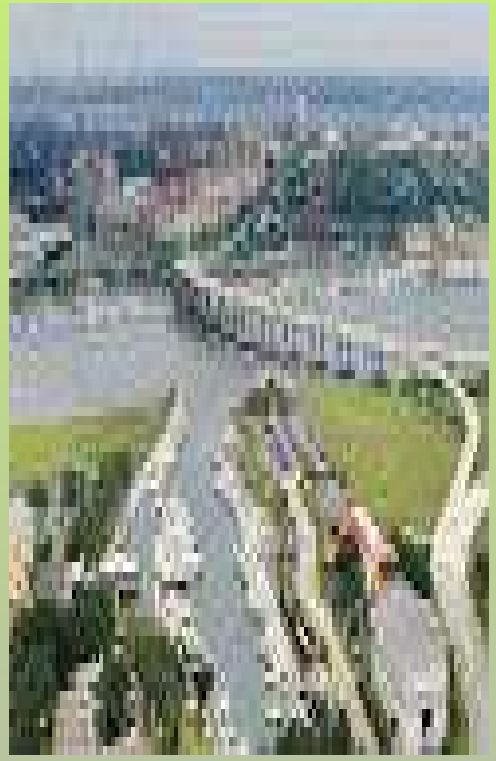
Aerial Images or Photographs



More Aerial Images

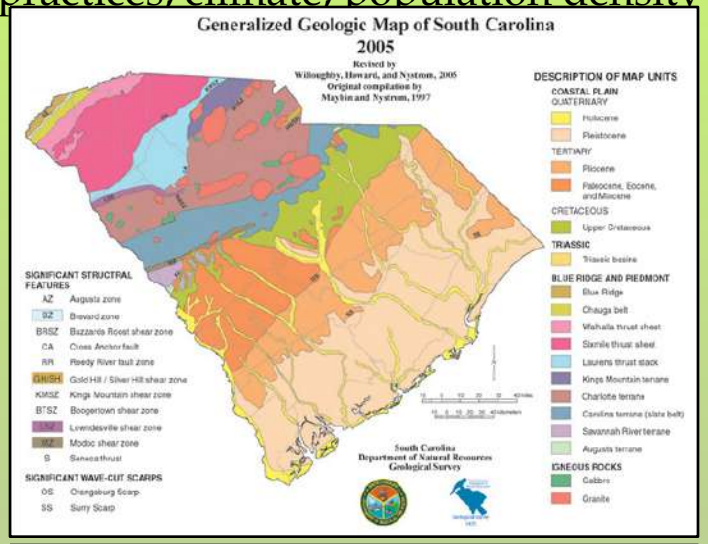


Aerial Images

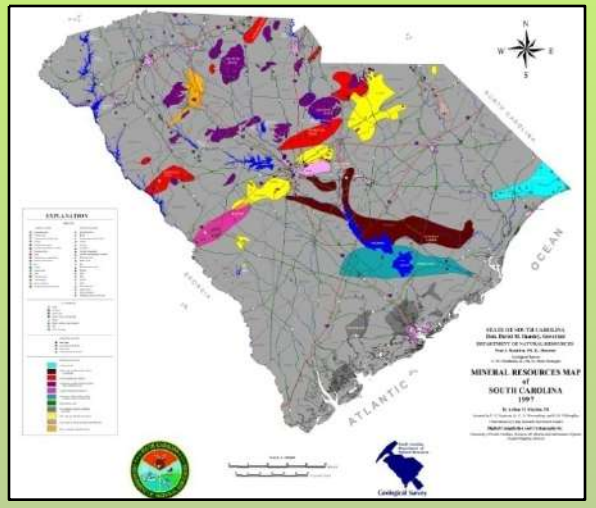


Other types of Maps

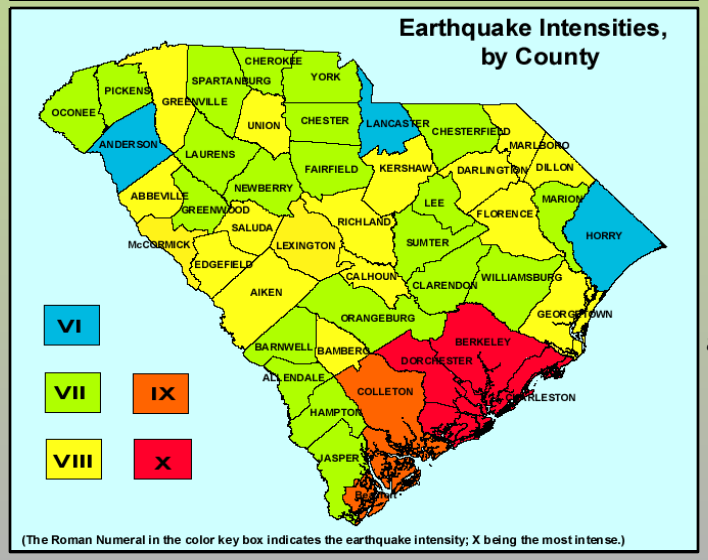
- There are many other types of maps that can be used to identify geologic features, agricultural practices, climate, population density and many other dynamics of the state of South Carolina.



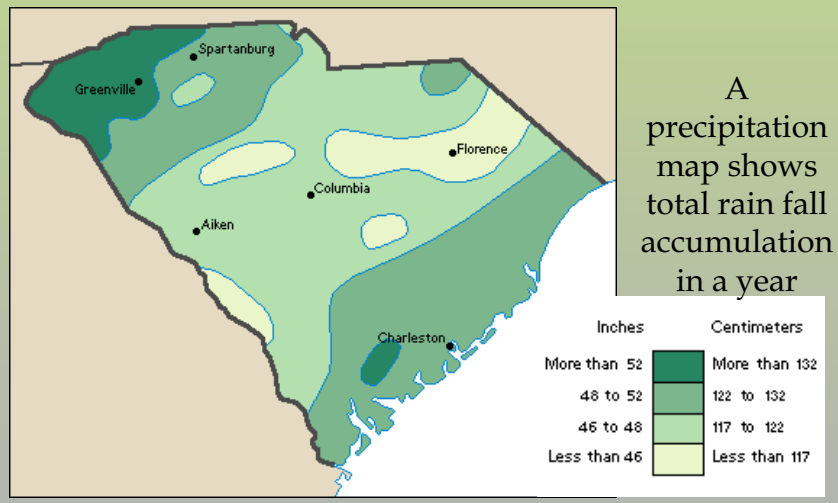
Geologic maps show different types of rock, or lithology, through colors



A natural resources map identifies areas of interest for valuable minerals throughout the state.



An earthquake hazards map shows where past earthquakes have occurred and how strong they were by using the intensity (Mercalli) scale



A precipitation map shows total rain fall accumulation in a year

Activity:

- **Build your own mountain and make a topo map of it!**

Directions

- 1. Put the lump of clay on the cardboard and shape a mountain about 4 inches high. Be sure to make your mountain lop-sided or oddly shaped. The mountain should be flat on the bottom. Draw an initial picture of your mountain in your notebook. Be sure to include a side view and a top view.
- 2. How might you draw the “top view” so you can identify the height and different characteristics?

3. Use the long pencil to poke two holes straight down through the center of the mountain. Make sure your two holes go all the way through the mountain. *You will need to use these holes to line up the slices so you have the same orientation on the paper as the original mountain you created.*

- 4. Use the ruler to measure 1 inch or 2.5 cm from the top of the mountain and make an indention with the pencil. Make two more dent marks lower down on the mountain 1 inch apart. You should have 3 marks to divide your mountain into 4 slices with the same thickness.
- 5. Stretch the dental floss until it is tight by wrapping the ends around your fingers. Use the dental floss to slice through the mountain at the mark at the top. Be sure to hold the floss horizontal as you cut the mountain.

- 6. Remove the clay slice and place it on the paper. Use your pencil to trace around it. Push the pencil through one of the holes in the clay and make a dot on the paper. Do the same thing with the other hole. Take the slice off of the paper. You will need to use it later.
- 7. How does this drawing compare to the mountain you originally created? How is it different? Record your thoughts in your notebooks.

- 8. Cut another slice at your next mark down from the top. Lay the second slice over the tracing of the first one, being careful to line up the holes in the second slice over the dots on the paper. *To line up the holes, poke the two tooth picks through holes in the slice and line them up with the dots on the paper.* Carefully trace around the section slice. Your tracing will form a circle outside the tracing of the first slice. (If you have extensions on your mountain, the second circle could cross into the area of the first circle).
- 9. How is your drawing now compared to the original mountain you created? How is it different? Record your thoughts in your notebooks.

Conclusion

- 10. Cut another slice at the next mark down. Line up the holes with the dots and trace it like you did before. Place the bottom slice on the paper, line up the holes and trace it. Stack the slices back up in order on the cardboard. Be sure the holes line up.
- 11. Restack the slices of your mountain so you can compare the original to the topographical map you just created.

- 12. How is your drawing now compared to the original mountain you created? How is it different? Record your thoughts in your notebooks.
- 13. How does this drawing compare to the topographic maps you studied in the earlier lesson?
- 14. Why are some of the traced lines closer together than others?
- 15. What kind of slope gives you lines that are close together?
- 16. What kind of slope gives lines that are far apart?

- 17. On your topographic map, where are the steepest slopes?
- 18. Where on your topographic map would be the best place to go hiking?
- 19. How are topographic maps used to illustrate Earth's elevation, slope and relief?

- 20. The simulation of creating a topographic map is similar but not exactly the same as how the actual maps are created.

- **Explain:**
- A topographic map, or "topo map," is a way to show mountains and valleys on a flat piece of paper. Topographical maps are handy and necessary for many uses, including building roads and hiking trails in the mountains. The map shows where the hills and valleys are and how steep they are. Although we created our topographical map using a clay model, scientists can now use satellites and aerial photographs to “see” the topography of the land they are studying and creating

Ticket Out the Door

- How can you use information on a topographic map to compare the steepness of slopes on the map?

Answer

- Contour lines that are spaced closely together indicate that the slope is steep, while those that are spaced farther apart indicate that the slope is flatter or gentle.

Homework

- Students will find a picture from a magazine or off the internet and create a topographic map of the picture features using contour lines and indexes.

Falcon Focus

- Study the topographic map on the screen and answer the following questions: How many meters of elevation are there between contour lines on the topographic map?
- Do the mountain consists of a steep or gentle slope? How can you defend your answer? (980, 1000, 1020, 1040, 1060)

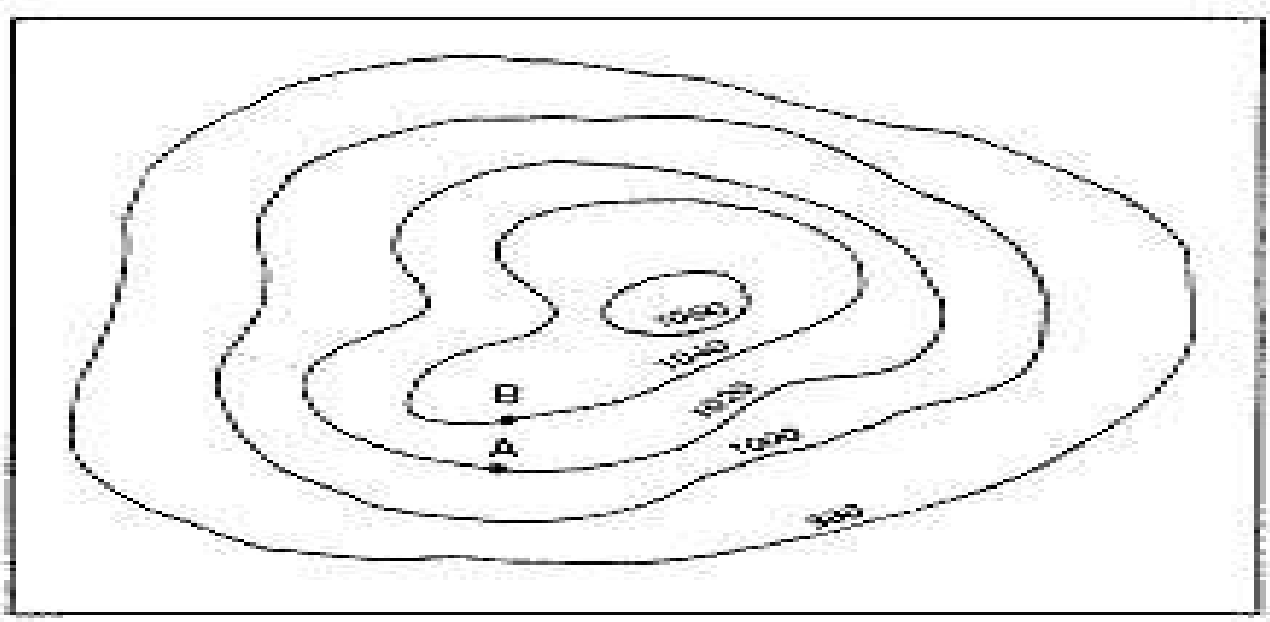


Figure E-1: Isolated Hill

Essential Question

- How can geologic features be identified on aerial photographs, satellite imagery and topographic maps?
-

Introduction

- Illustrate how you think that the actual picture will look like based on the topo map given.

The Race

- Are you Ready, Get Set

The Race Directions

- Students will draw topo maps based on illustrations given to each group or student.

Quiz Review

Homework

- Create a topographic map of the landform that surrounds your house. Your homework should also include a picture or illustration of the land area you have chosen. Study for the Quiz

Falcon Focus

- Melissa slowly heated a few blue crystals in a test tube. After a few minutes, she observed that the crystals had turned white and a film of water had formed on the inside of the test tube. Before conducting the investigation. Melissa most likely _____.
- A. developed a theory
- B. developed a hypothesis
- C. developed a conclusion
- D. developed a data table

Essential Question

- How are features on one topographic map similar or different from another?

Answer

Objective

- Introduction: Brief Review
- Take Quiz
- Go over Quiz
- Start on Rotational Lab

Rotational Lab Stations Set Up

No Homework

Falcon Focus

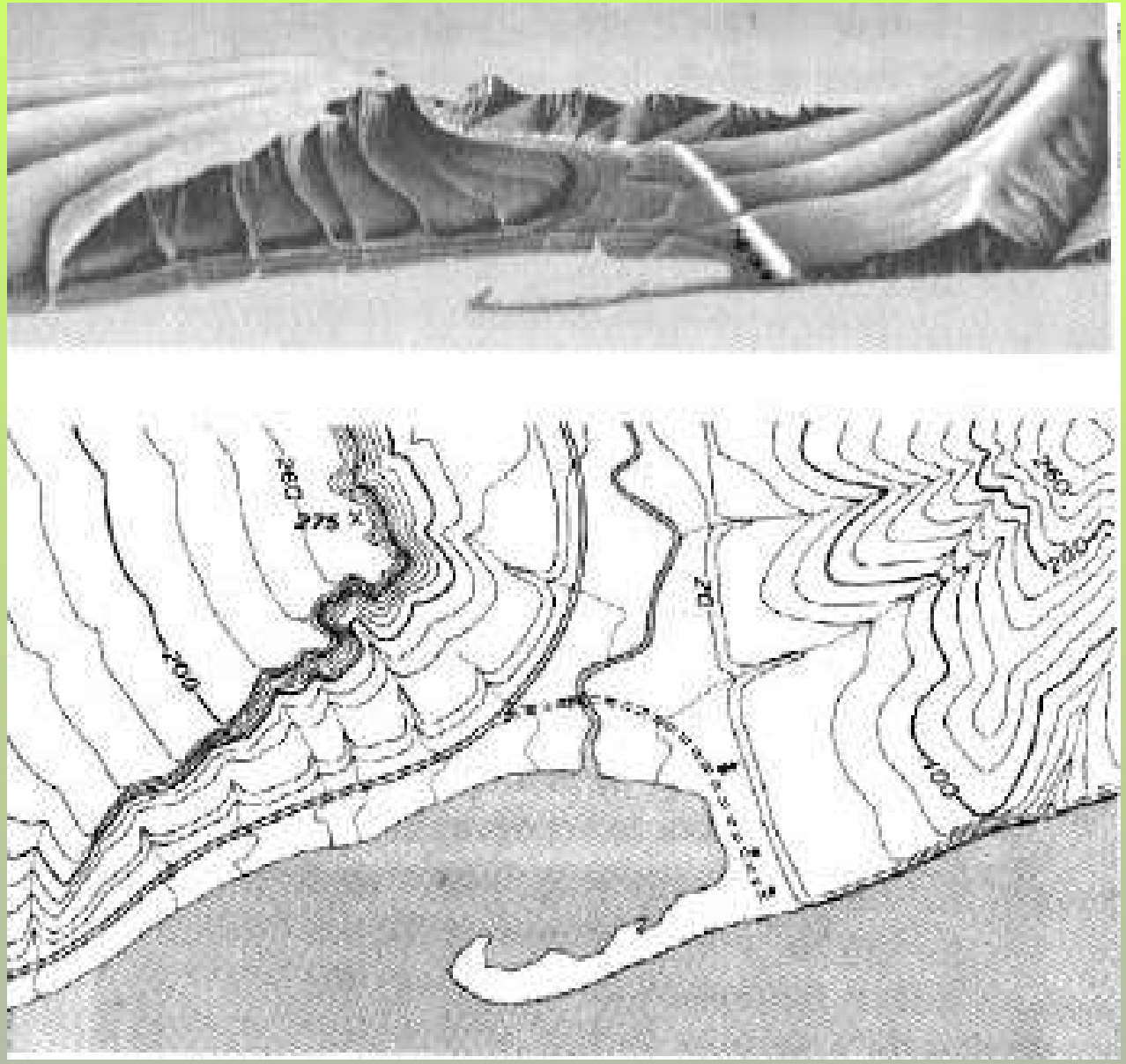
- A topographic map shows two hiking trails. Along trail A, the contour lines are widely spaced. Along trail B, the contour lines are almost touching. Which path would probably be easier and safer to follow? Why?

Answer

- Trail A, because the widely spaced contour lines indicate a gradual slope. The tightly spaced contour lines on Trail B indicate that the slope is very steep, and the path would be more dangerous.

Essential Question

- How could you transfer the information from a satellite image or aerial photograph and create a topographic map?


250
275
200
DZ
250
200
100

Rotational Stations

-
- 1. Inquiry
- 2. Layers of the Earth
- 3. Tectonic Plates (Boundaries, Forces, and Faults)
- 4. Earthquakes
- 5. Volcanoes
- 6. Rock Cycle
- 7. Earth Resources
- 8. Topographic Maps

Homework

- Complete Lab Report

South Carolina Science Academic Standards: Grade 8

Standard 8-3: The student will demonstrate an understanding of materials that determine the structure of Earth and the processes that have altered this structure.

Indicator:

8-3.9: Identify and illustrate geologic features of South Carolina and other regions of the world through imagery (including aerial photography and satellite imagery) and topographic maps