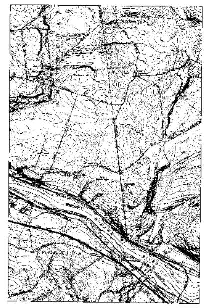
Topographic Survey

Introduction

- ***Topography*** - defined as the shape or configuration or relief or three-dimensional quality of a surface
- Topography maps are very useful for engineers when planning and locating a structure



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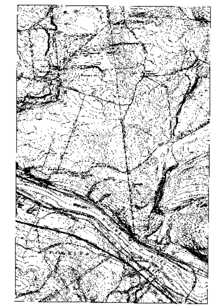
Introduction

- U.S. Geological Survey (USGS) has developed maps for a large part of the US
- Napoleon Bonaparte received his first promotion because of ability to make and use maps



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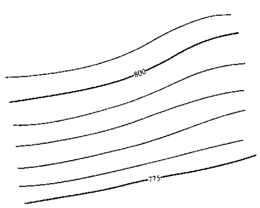
Contours

- The most common method of representing the topography of an area is to use ***contour lines***



- A ***contour line*** is an imaginary level line that connects points of equal elevation

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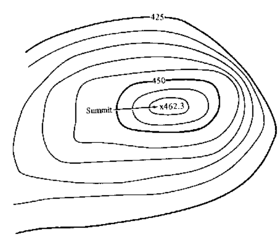
Contours



- Imagine a hill that has its top sliced off with a really big knife

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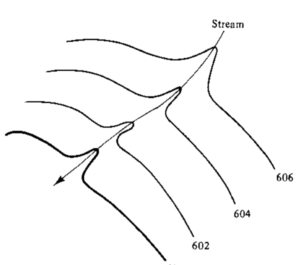
Contours



- Contours that point up hill can indicate a valley or stream

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Contours

- The selection of the contour is important
- The contour interval should be small enough to give the desired topographic detail while remaining economic
- Usually every fifth contour line is shown in a heavy, wider line, this is called a ***index line***

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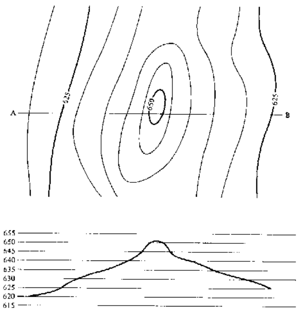
Contours



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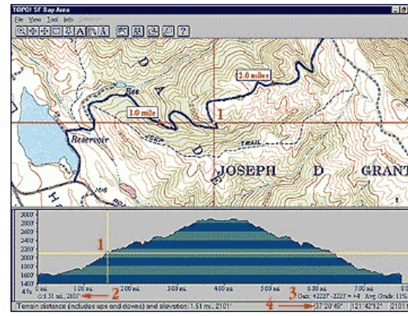
Contours



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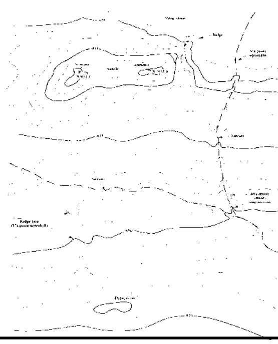
Contours



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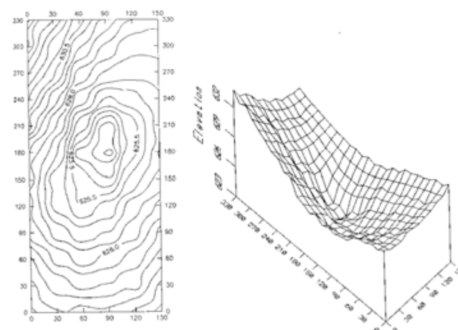
Contours



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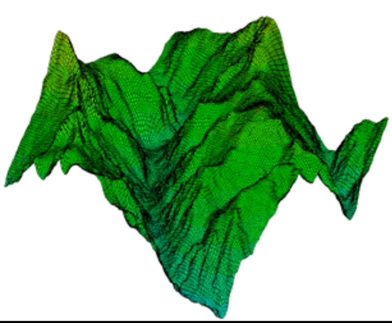
Contours



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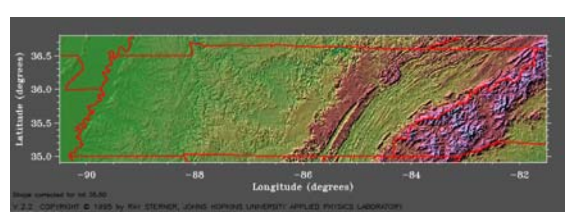
Contours



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Contours

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Contours

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Characteristics of Contours

- Closely spaced contours indicate steep slopes
- Widely spaced contours indicate moderate slopes
- Contours should be labeled to the elevation value
- Contours are not shown going through buildings
- Contour line do not cross

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Characteristics of Contours

- Contour lines do begin or end on the plan
- Depression and hill look the same; note the contour value to distinguish the terrain
- Important points can be further defined by including a "spot" elevation
- Contour lines tend to parallel each other on uniform slopes

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Construction of Contours

- The first step in developing a contour map is measuring the elevations of a group of points
- It will be easier for us to establish a rectangular grid of points (marked with flags) and measure the elevation
- The location of the flag points can be established by taping and checked by pacing or the odometer

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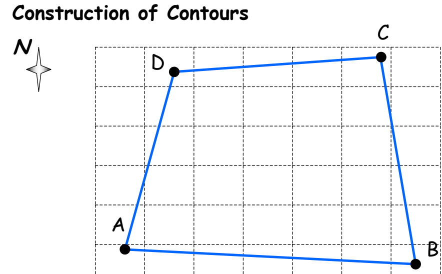
Construction of Contours



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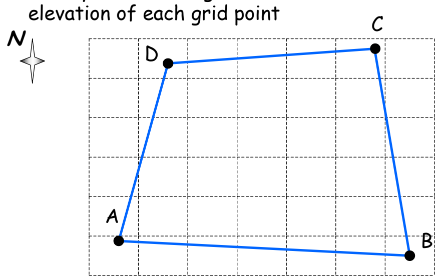
- Once your contour grid is established, measure the elevation of each grid point



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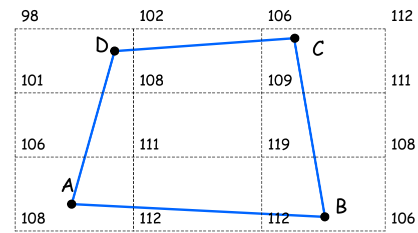

- We want a contour map on 5 ft intervals
- The grid is rectangular, the dimensions of the sides are 80 ft (north) and 100 ft (east)

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Construction of Contours

- The basic method for estimating contour is applied to each grid cell individually
- Use linear interpolation to find the location of the desired contour interval
- Let consider the cell in the upper left-hand corner - remember the contour interval is 5 ft

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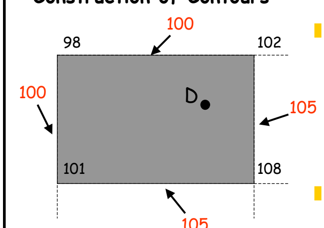
Construction of Contours



- First see if a contour interval exist between nodes of the grid cell; if so, estimate where along the side the contour interval would be located
- Apply simple linear interpolation to each side to locate the contour interval

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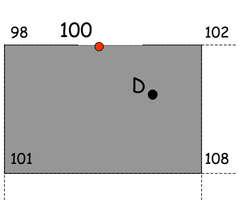
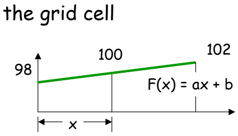
- Let's look at the top edge of the grid cell





$$a = slope = \frac{102-98}{100}$$

$$b = \text{intercept} = 98$$

$$x = \frac{2(100)}{4} = \boxed{50ft} \quad \Leftarrow \quad 100 = \frac{4}{100}x + 98$$

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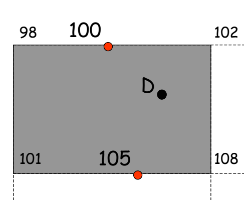
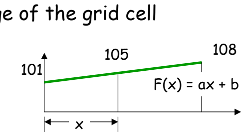
- Let's look at the bottom edge of the grid cell





$$a = slope = \frac{108-101}{100}$$

$$b = \text{intercept} = 101$$

$$x = \frac{4(100)}{7} = \boxed{57ft} \quad \Leftarrow \quad 105 = \frac{7}{100}x + 101$$

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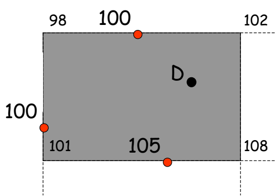
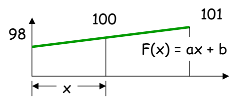
- Let's look at the left edge of the grid cell





$$a = slope = \frac{101-98}{80}$$

$$b = \text{intercept} = 98$$

$$100 = \frac{3}{80}x + 98$$

$$x = \frac{2(80)}{3} = \boxed{53ft}$$

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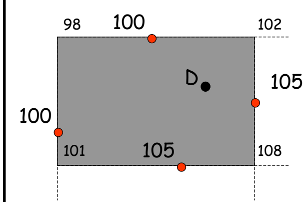
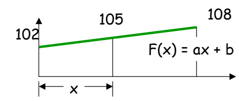
- Let's look at the right edge of the grid cell





$$a = slope = \frac{108-102}{80}$$

$$b = \text{intercept} = 102$$

$$105 = \frac{6}{80}x + 102$$

$$x = \frac{3(80)}{6} = \boxed{40ft}$$

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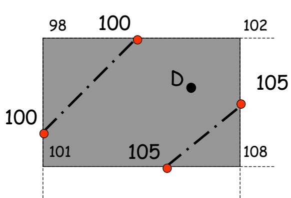
- Locate the contour intervals locations on the grid cell



- Next, simply connect points of equal contour intervals
- One grid cell down, eight to go . . .

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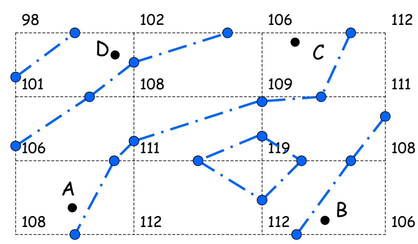
- Repeating the linear interpolation for each of the remaining grid cell gives:



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End of Topographic Surveying