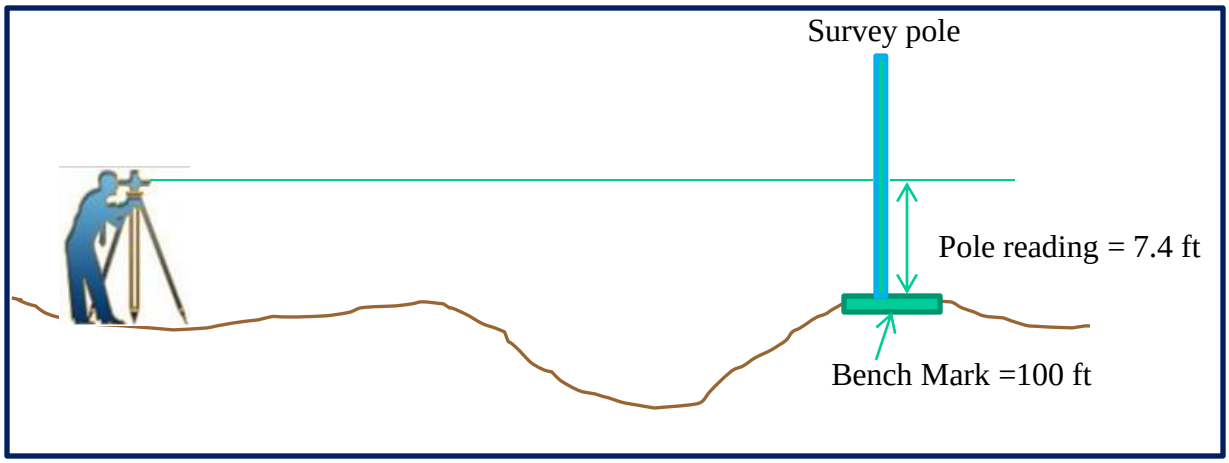
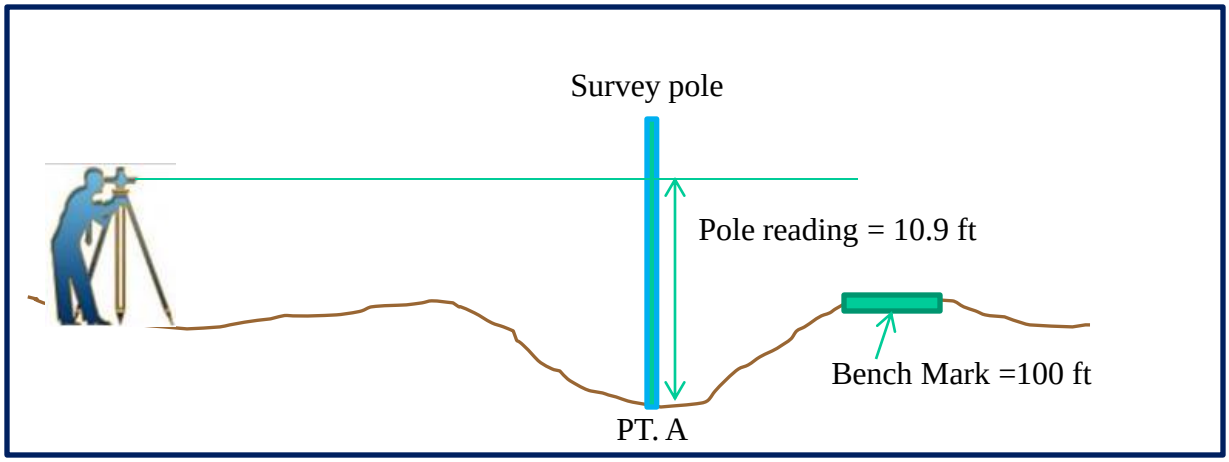
Elevations – The basics

1. **Elevation are all relative to known benchmarks.**
2. **So from below, the bench mark is known to be at 100ft**
3. **When surveyed the pole reading at the benchmark is 7.4ft**
4. **So the elevation line of sight is 100ft + 7.4ft = 107.4 ft**



5. **Now obtain the new reading at point A below, the pole reading = 10.9**



5. **So the elevation at PT. A = Line of sight elevation – Pole reading at PT. A**
   = 107.4 ft – 10.9 ft = 96.5 ft

→**Differential Leveling:** A surveying process in which a horizontal line of sight of known elevation is intercepted by a graduated standard, or rod, held vertically on the point being checked.

→**Key Terms:**

Bench Mark (BM) = A permanent point of known elevation.
Temporary Bench Mark (TBM) = A point of known elevation.
Turning Point (TP) = An intervening point between BMs or TBMs upon which a backsight and a foresight are taken.
Backsight (BS) = A rod reading taken by "looking back" at a point of known elevation such as a BM or TP.
Foresight (FS) = A rod reading taken when "looking ahead" at a point where you want to determine its elevation, such as a TP, TBM or BM.
Height of Instrument (HI) = The elevation of the line of sight in the telescope of the level.

Key Equations:
Height of Instrument (HI) = Known elevation + Backsight (BS)
Turning Point (TP) = Height of Instrument (HI) – Foresight (FS)

Trigonometric Leveling:

When you know the vertical angle and either the horizontal or slope distance between two points, you can apply the fundamentals of trigonometry to calculate the difference in elevation between the points. This method of indirect leveling is particularly adaptable to rough, uneven terrain where direct leveling methods are impracticable or too time consuming.

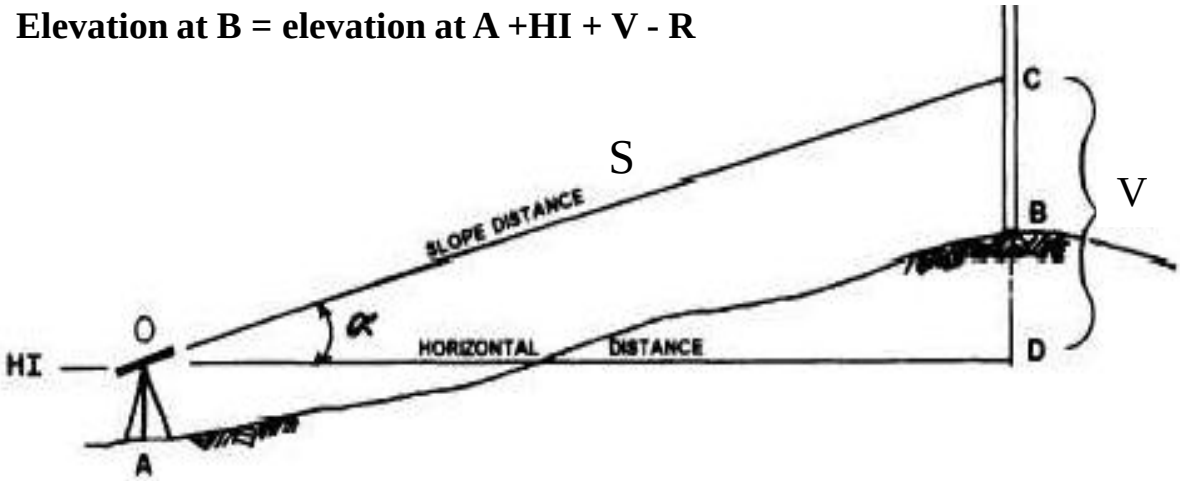
Key Equations:

$V = S \sin \alpha$

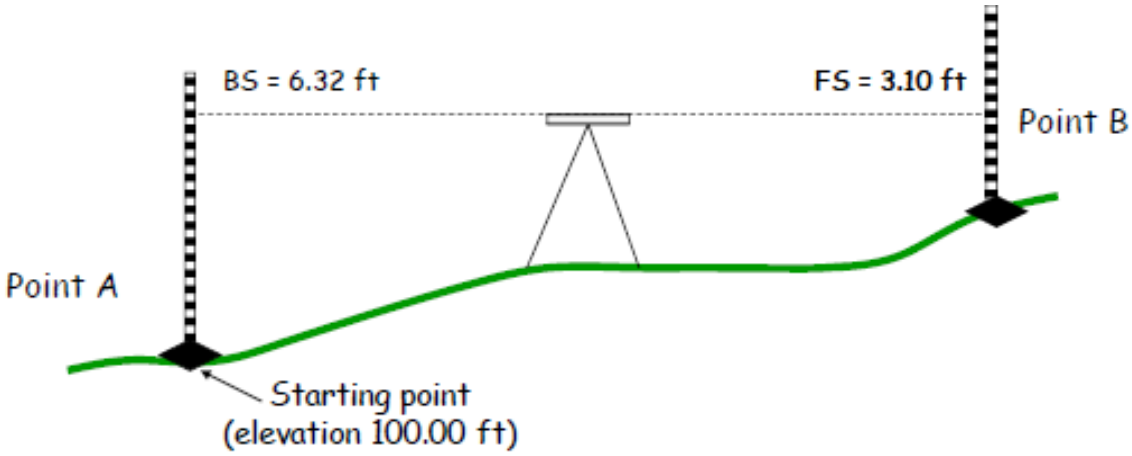
HI = distance from AO

R= distance from BC

Elevation at B = elevation at A +HI + V - R



Example: What is the elevation at point B?



Solution:

Height of Instrument (HI) = Known elevation + Back sight (BS)

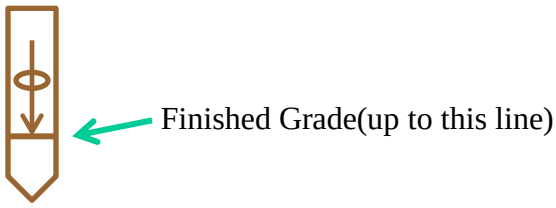
HI = 100ft + 6.32 FT = 106.32 ft

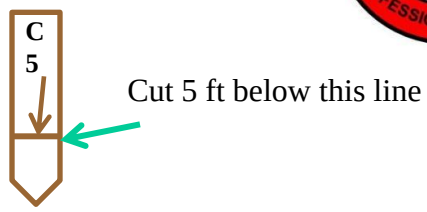
Turning Point (TP) = Height of Instruction (HI) – Foresight (FS)

Point B = 106.32ft – 3.10 = 103.22

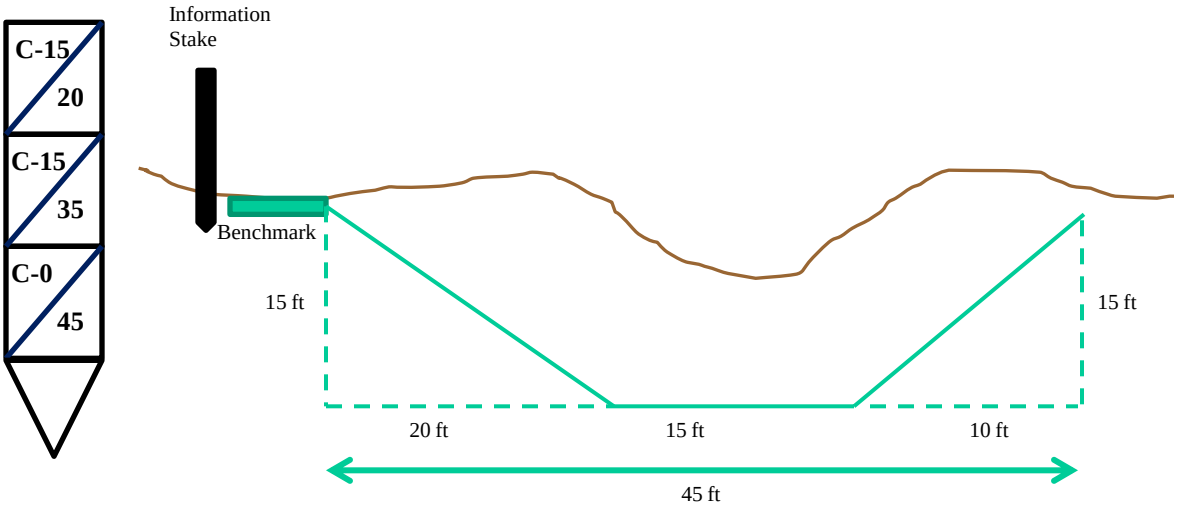
SITE LAYOUT AND CONTROL

Construction Stakes – The basics

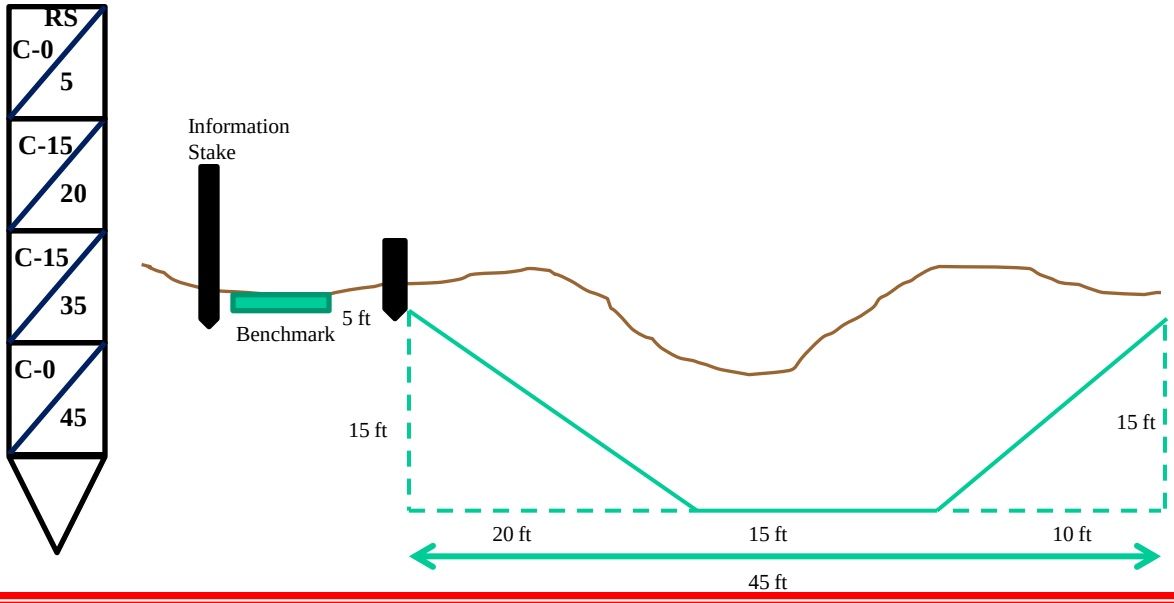




1. **Stakes are used to provide information and are all relative to the benchmark**
2. **There are different way to mark stakes**
3. **Stakes are usually marked with a C for Cut or F for Fill**
4. **Then two numbers 15/30 . Meaning cut 15 feet at the distance of 30 ft hortizontal.**
5. **Remember all directions are from the benchmark**



Note: Usually instead of cutting right up against the benchmark the information stake has the first info about where to place a reference stake to cut from so you disturb the soil next the important benchmark.



Site Layout and Control
Problem 1

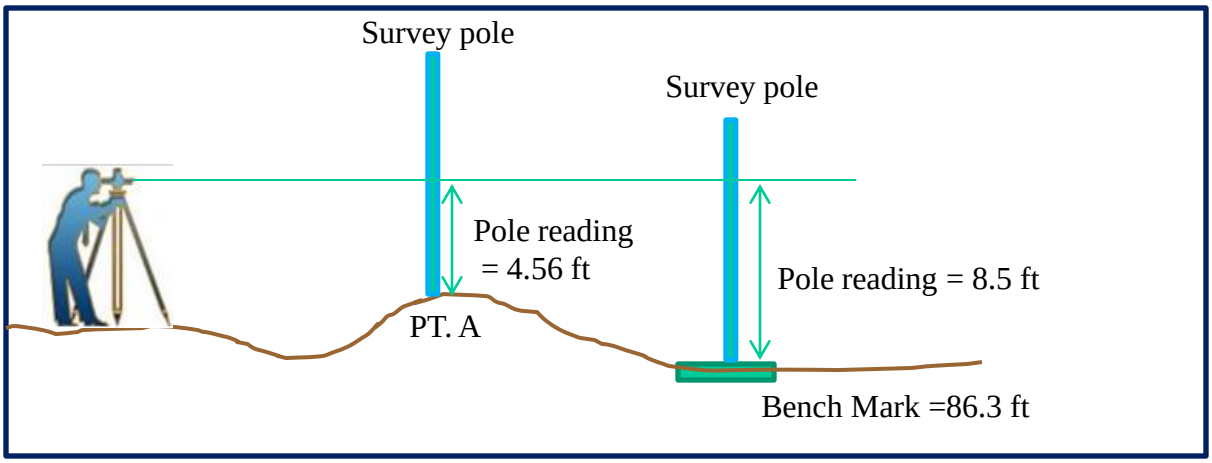
Problem 1. If the known benchmark elevation is known to be 86.3 ft. When surveying you find the rod reading at PT. A is 4.56 ft and the rod reading at the benchmark is 8.5 ft.

What is the elevation at PT A.

a. 81.74 ft
b. 77.8 ft
c. 90.24 ft
d. 99.36 ft

Site Layout and Control Solution #1

Step 1: Draw a quick sketch



Step 2: Find Elevation of Line of Sight, 86.3 ft + 8.5ft = 94.8 ft

Step 3: Find Elevation at Point A, 94.8 ft – 4.56ft = 90.24 ft