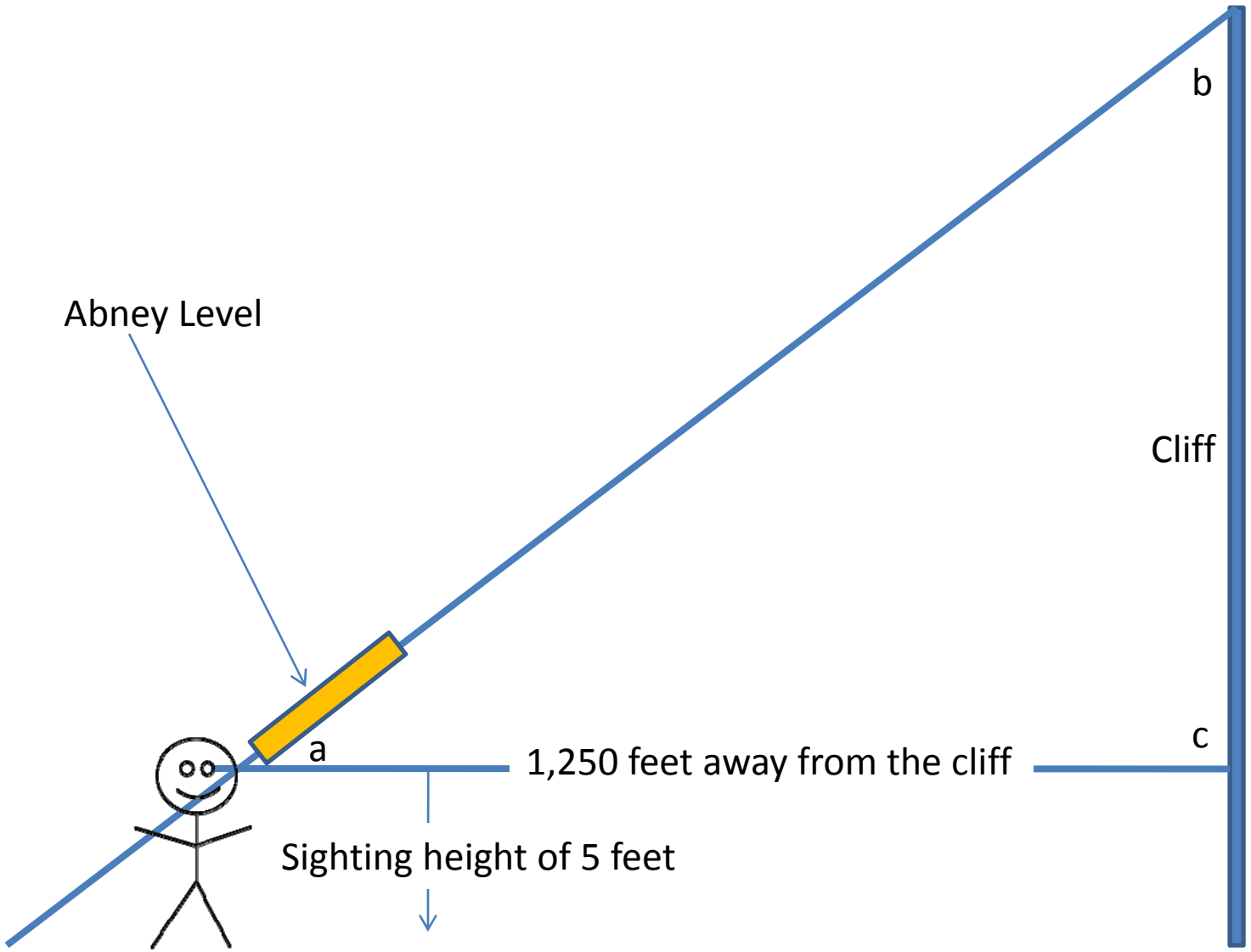
Trig in the Field

Angles and Distance

When you want to know:

- How tall is that tree?
- How high is that cliff wall?
- How wide is that dangerous river?

- All of these examples prohibit you from taking a direct measurement.


b
Abney Level
Cliff
a
c
1,250 feet away from the cliff
Sighting height of 5 feet

Assumptions

- Angle c is 90°
- The ground is relatively level from the cliff wall to the point where you measure angle a.
- Angle a is known as theta θ

Goal: Height of Cliff

- Side BC is opposite theta
- In trig, when you have a right triangle (one angle is 90 °), the length of the opposite side = Tanθ x Adjacent Side
- In common terms:
- Height of the cliff is Tan angle b times the distance from the wall. (don’t forget to add your sighting height)

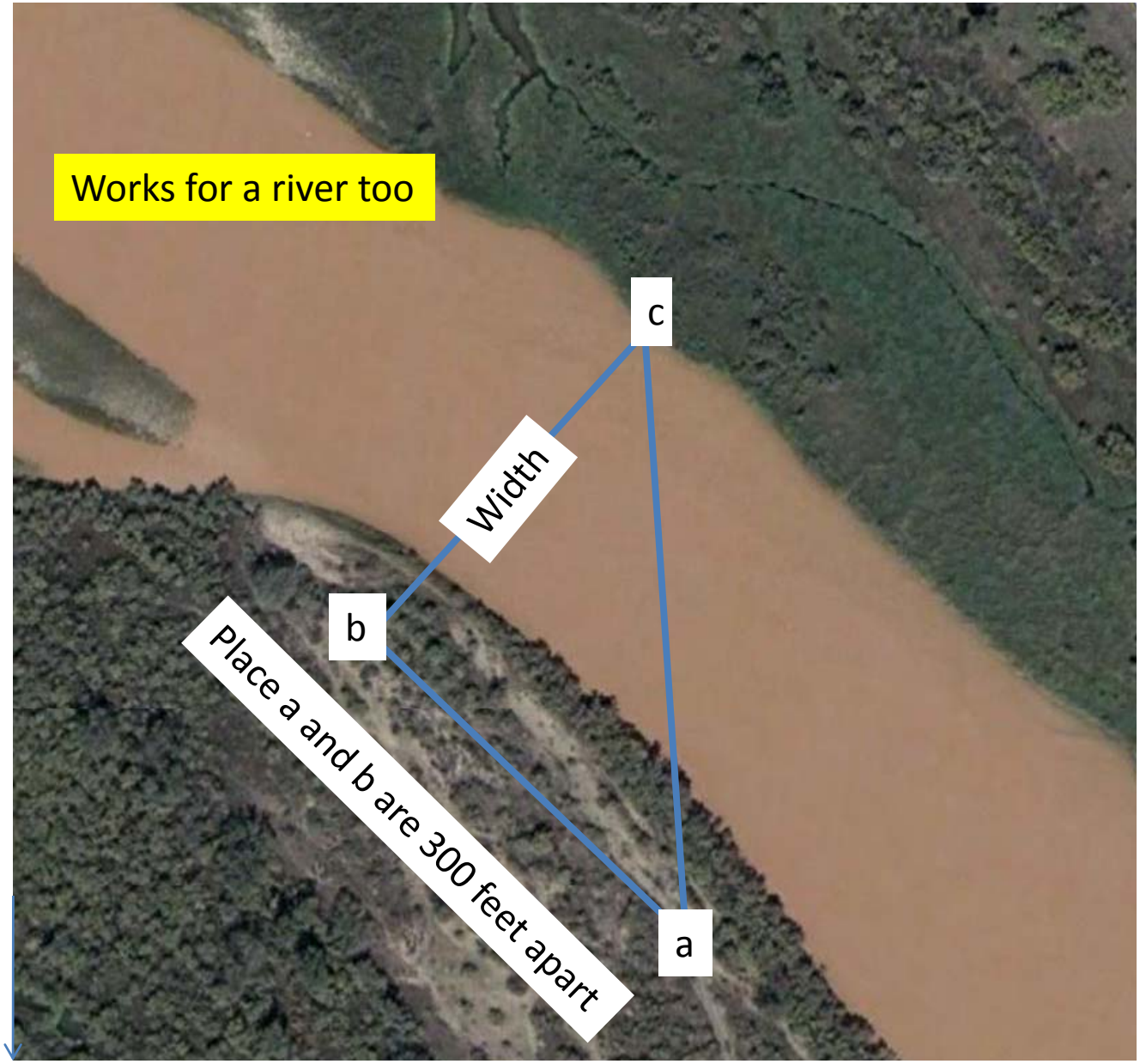
Example:
Your eyes are 5 feet off the ground.
You stand 1,250 feet from a cliff and measure 19° for angle b.

How high is the cliff?

Tan 19 x 1,250 = cliff height

.344 x 1,250 = 430 feet

Plus 5 feet for your sighting height: total is 435 feet

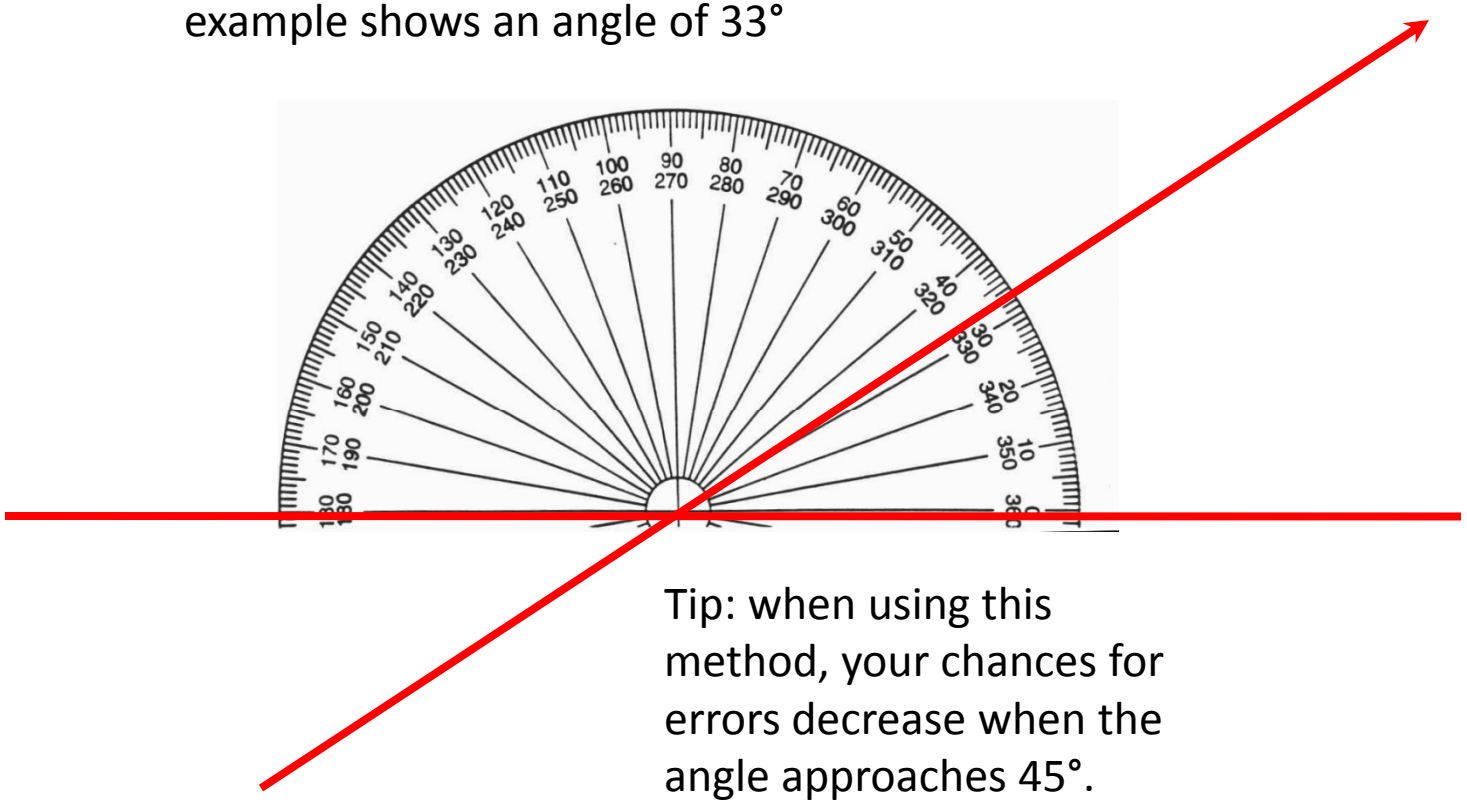


Angle “a” is 54°
Angle “b” is 90 °

Measuring Angles on the Ground

Use a protractor instead of an Abney Level

Draw strings very tightly across the baseline of the protractor and towards the object. This example shows an angle of 33°



Tip: when using this method, your chances for errors decrease when the angle approaches 45°.

How wide is the river? (assume that you are 10 feet from point b to the river edge)

Try it now; I'll show you the answer in a minute.

Answer:

(Tan 54 x 300) – Dist “b” to shore = river width

(1.376 x 300) – 10 feet = width

413 – 10 = 403 feet