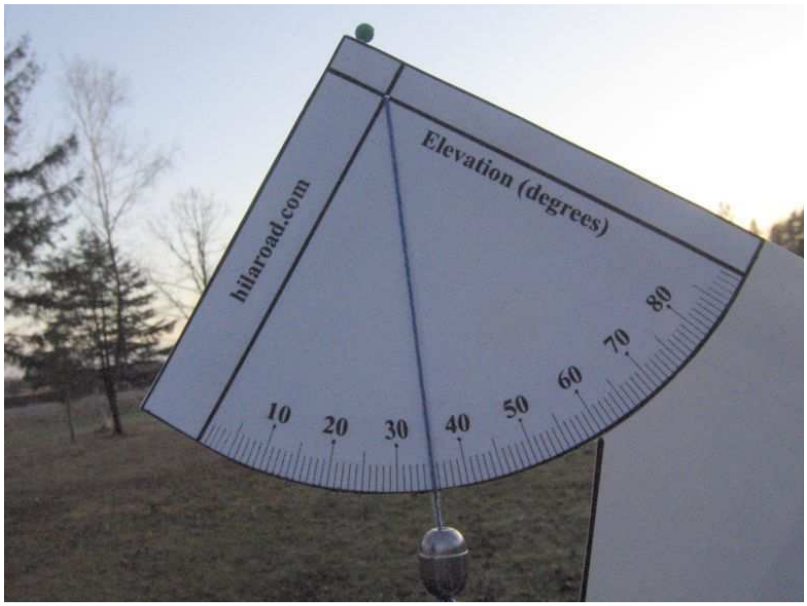
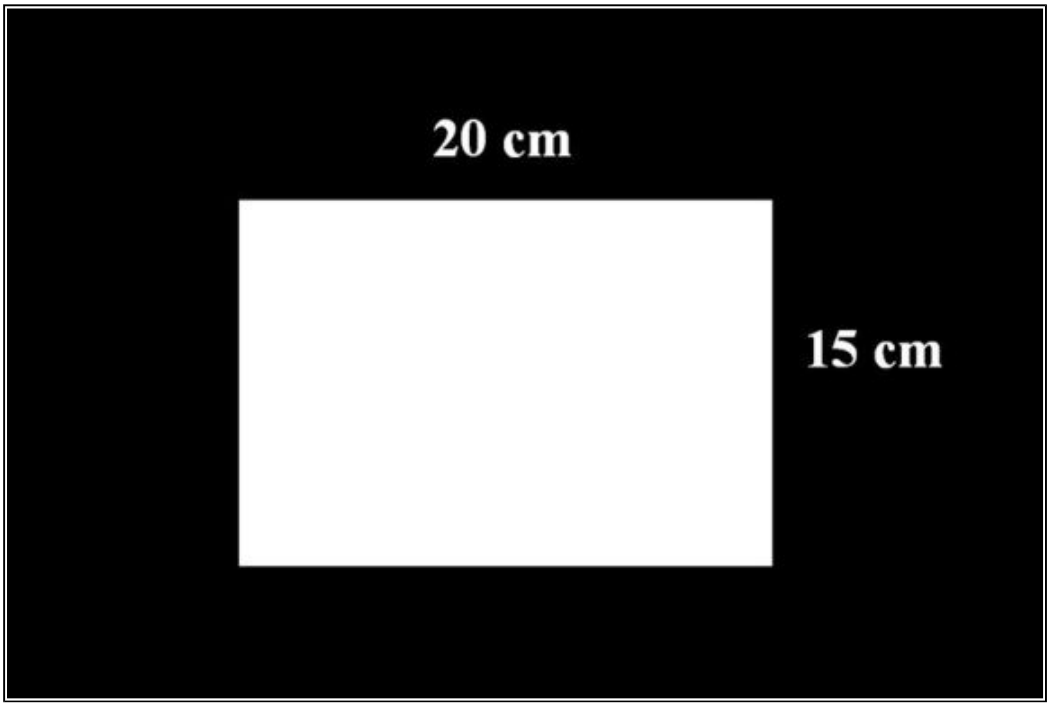
Inclinometer

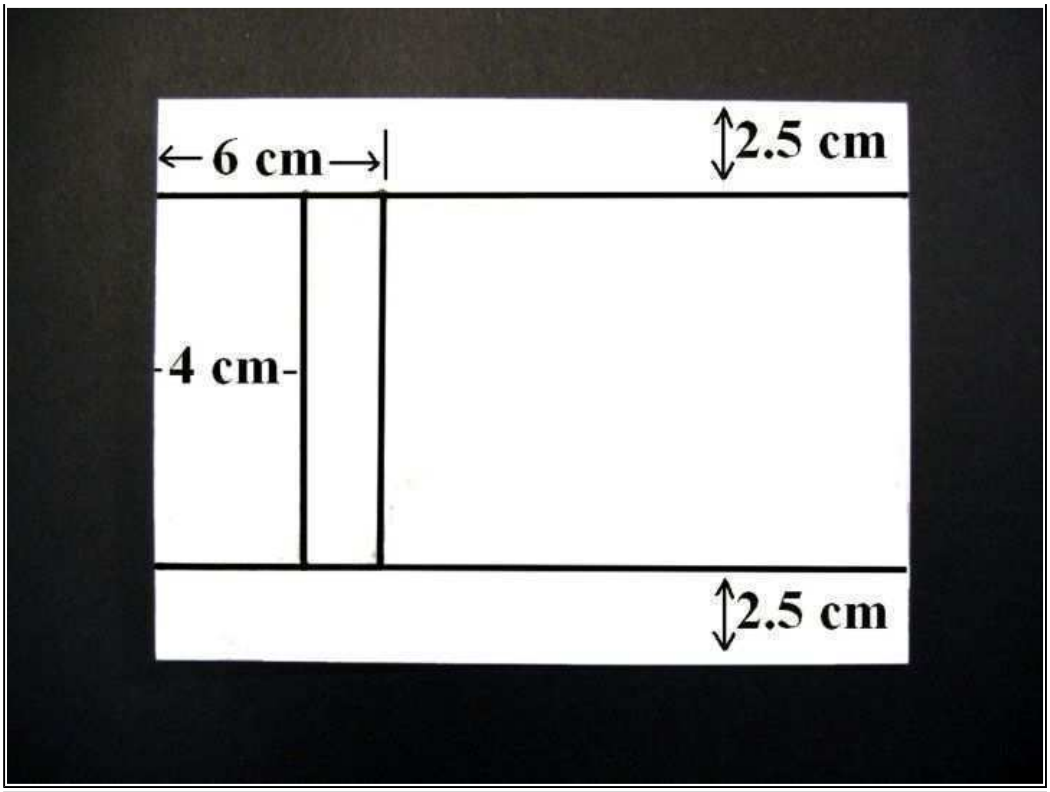


This simple device determines the angle of elevation of any object. With some simple math you can use it to determine the height of a building, the altitude of a model rocket even your latitude.

This activity is contained in 5 separate pages, follow the links at the bottom of each page.

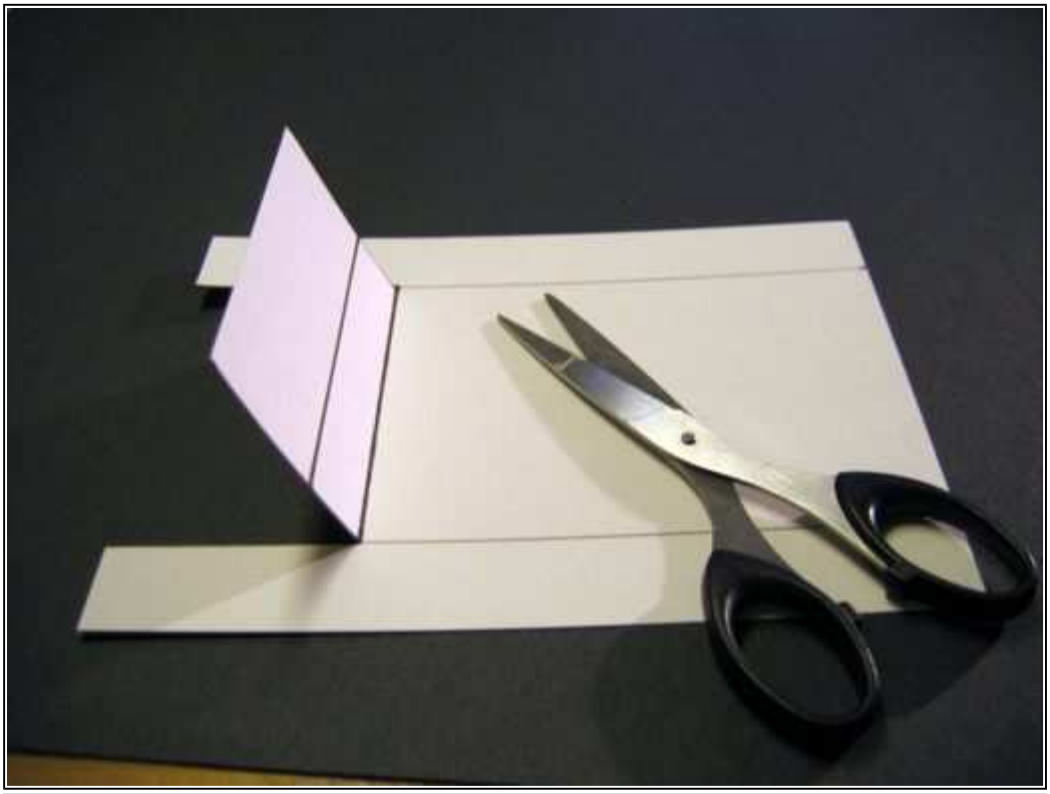
Construction:

	Cut a rectangular piece of Bristol board or stiff card 15 cm X 20 cm

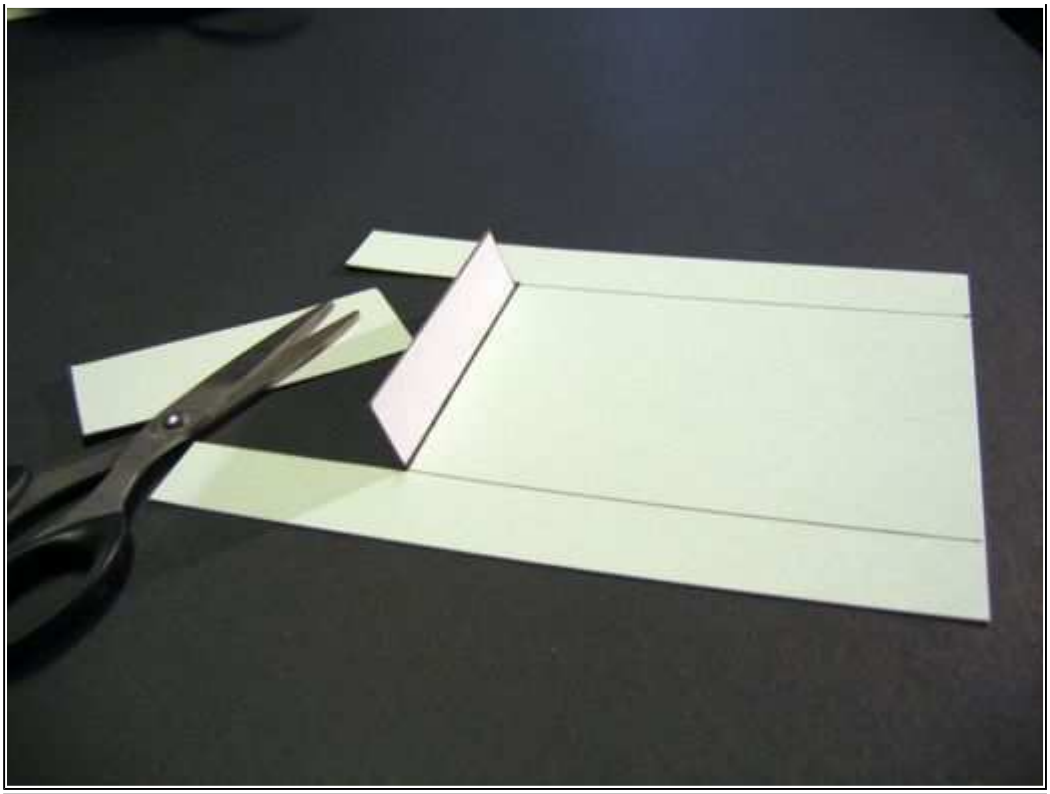


Draw lines on the card as indicated.

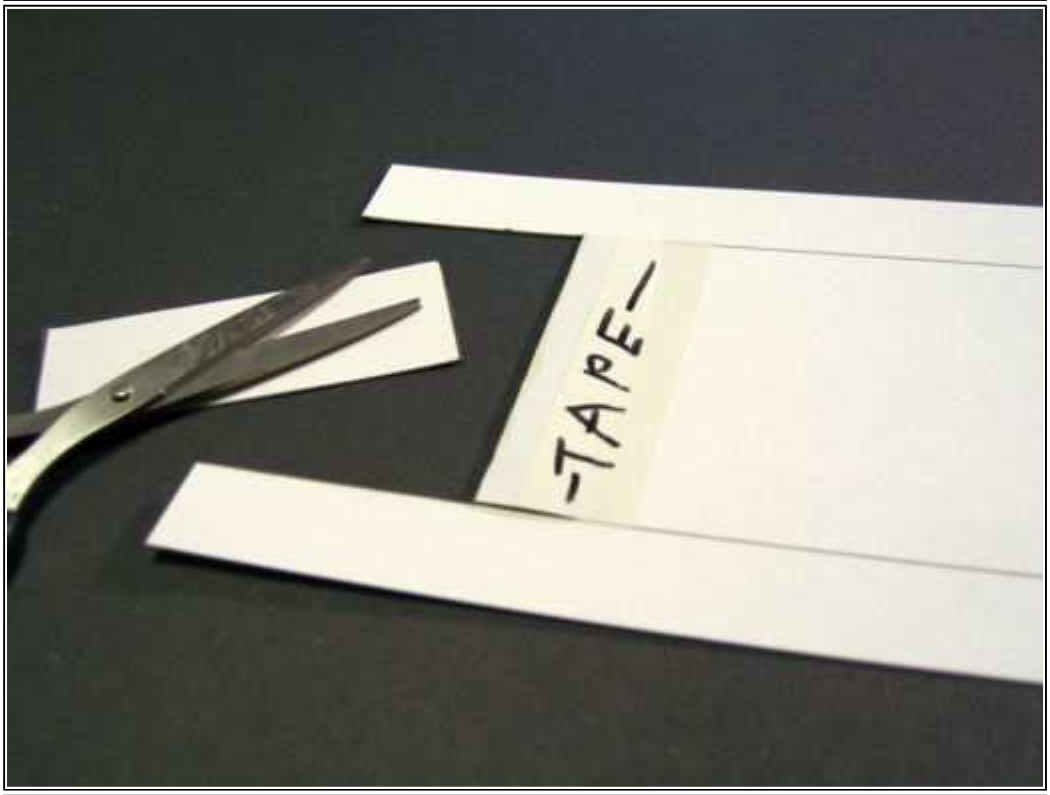
Classroom Support Images of ruler positions.



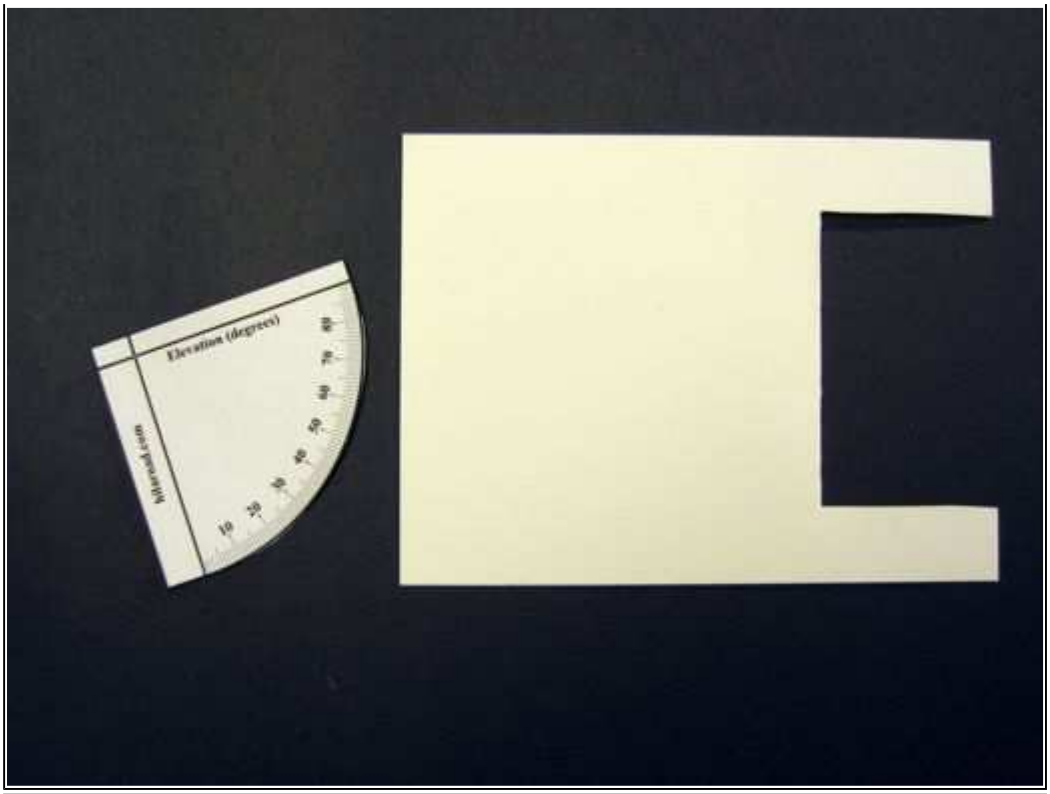
Cut as shown.



Remove piece as shown.



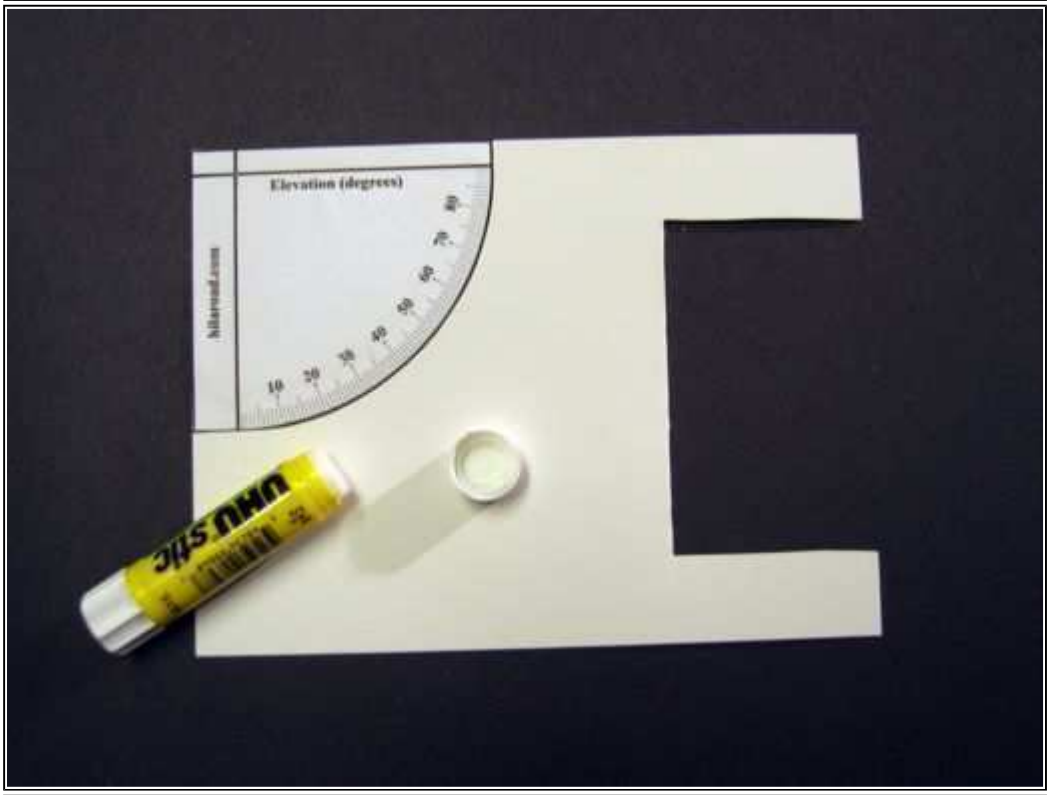
Fold remaining piece over and tape in place.



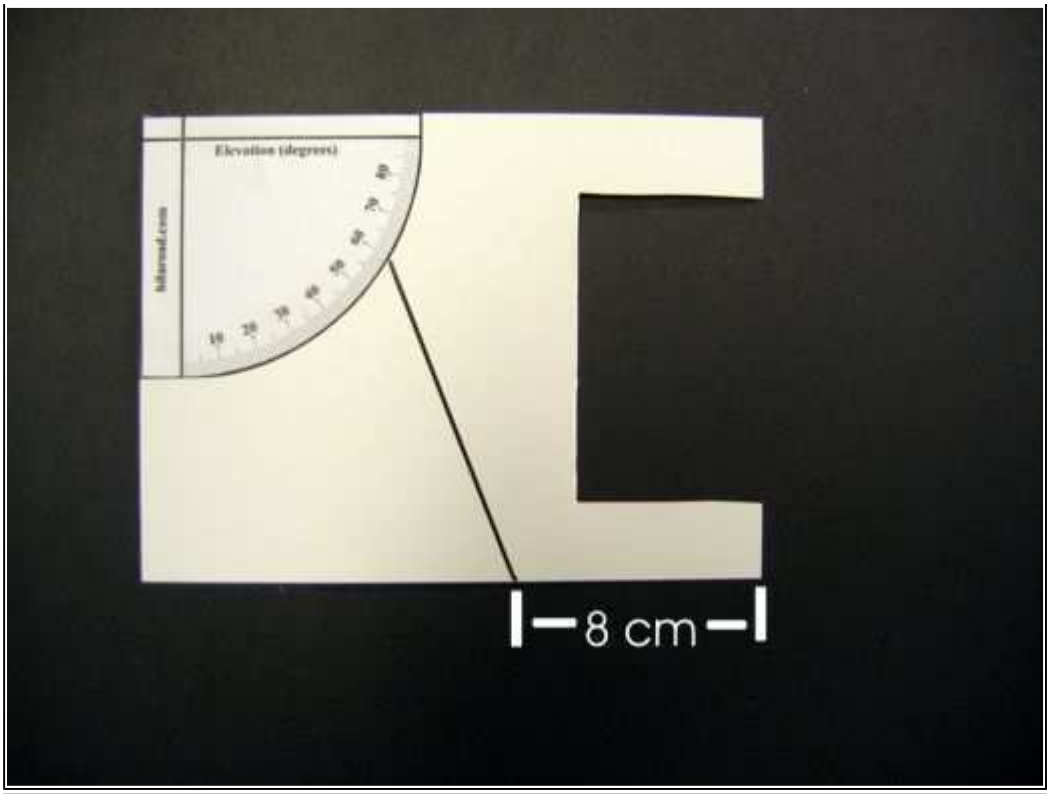
Cut the angle template.

Open and print this page:

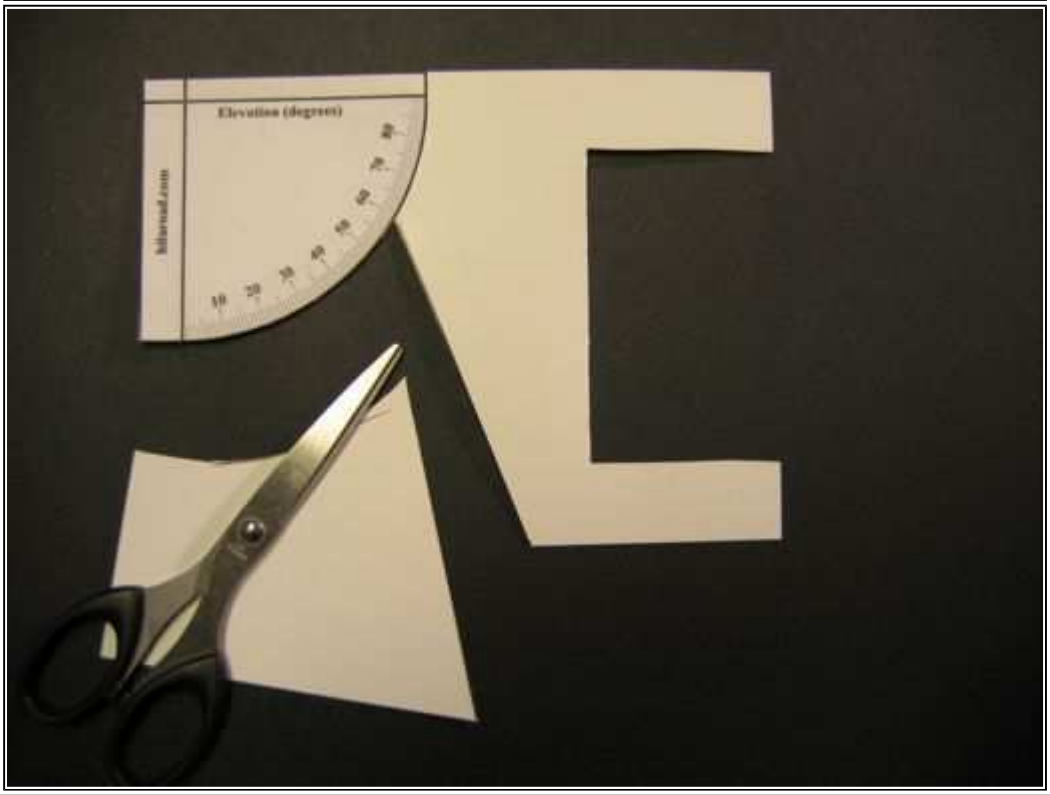
Adobe Acrobat: PDF file for angle template.



Glue the angle template to the card base.
It is important that the angle template is aligned accurately with the edges of the card.



Draw a line from the 60 degree mark to 8 cm from end of card.



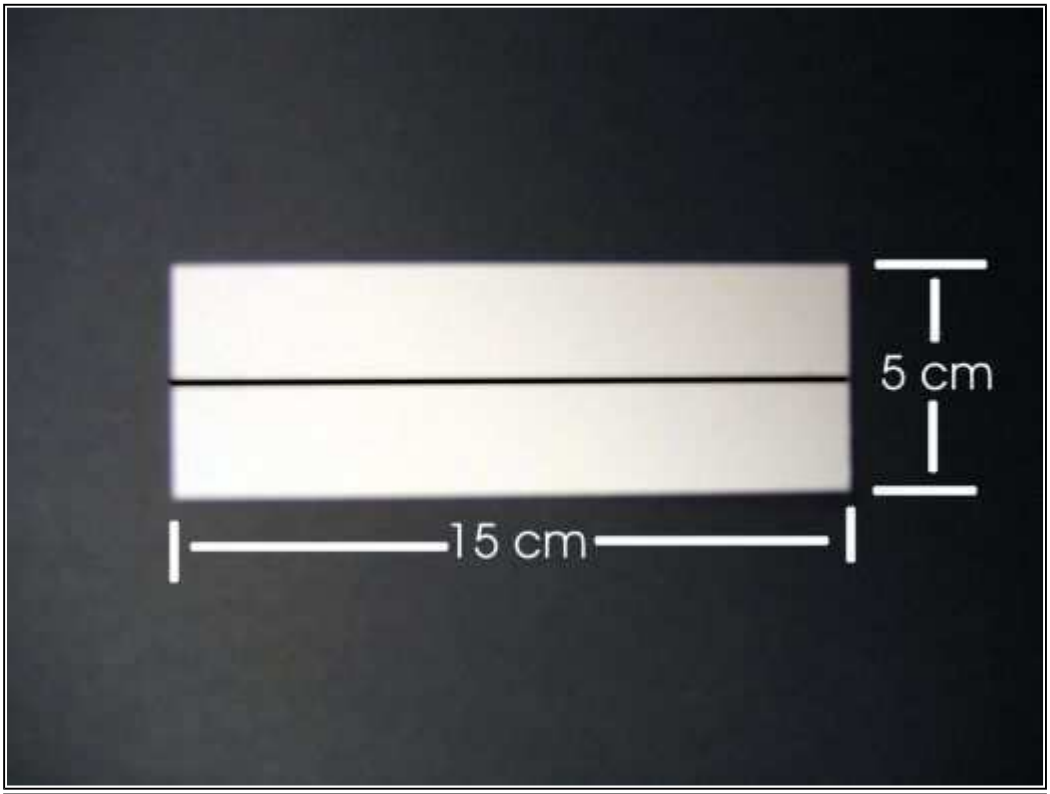
Cut as shown.

[Link to Next Construction Steps:]

[Return to Hila Projects Index]

Inclinometer

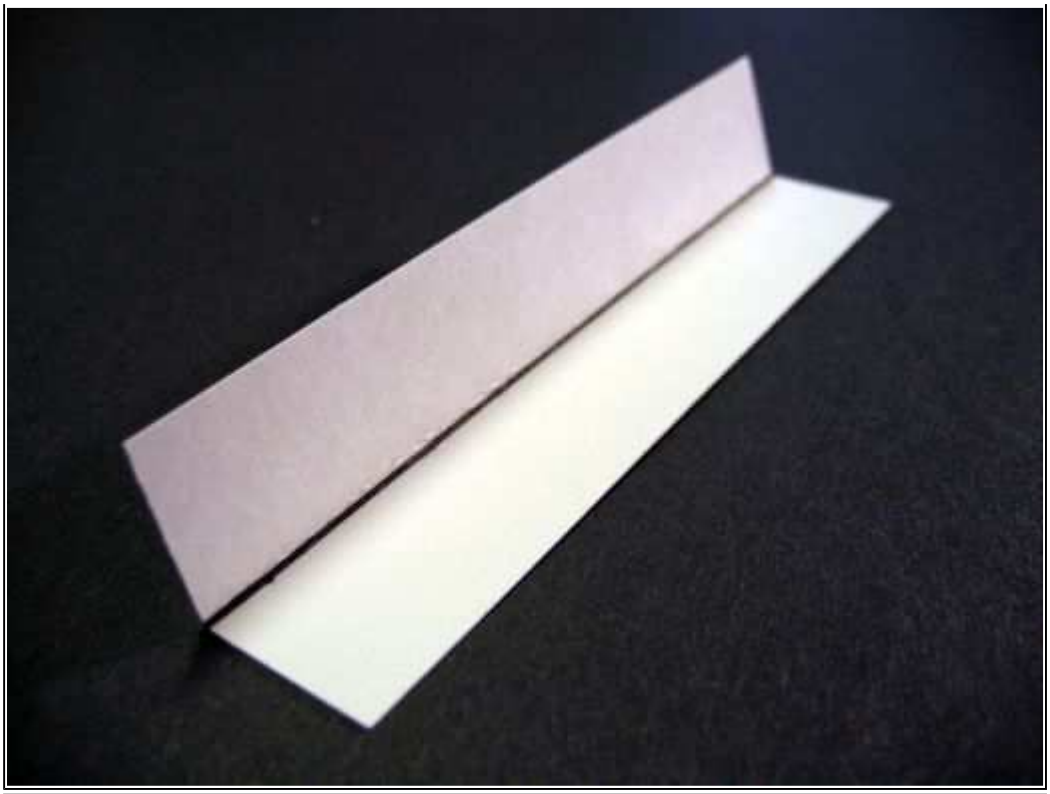
Construction Continued:

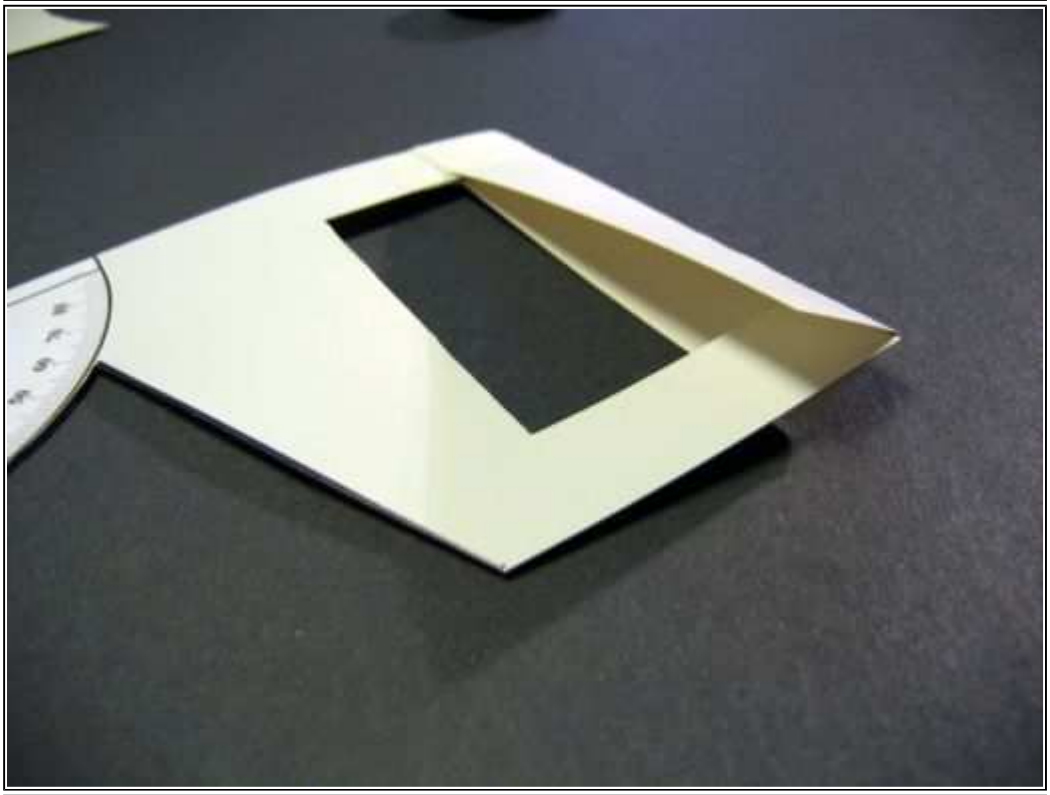


Cut a 5 cm X 15 cm card.

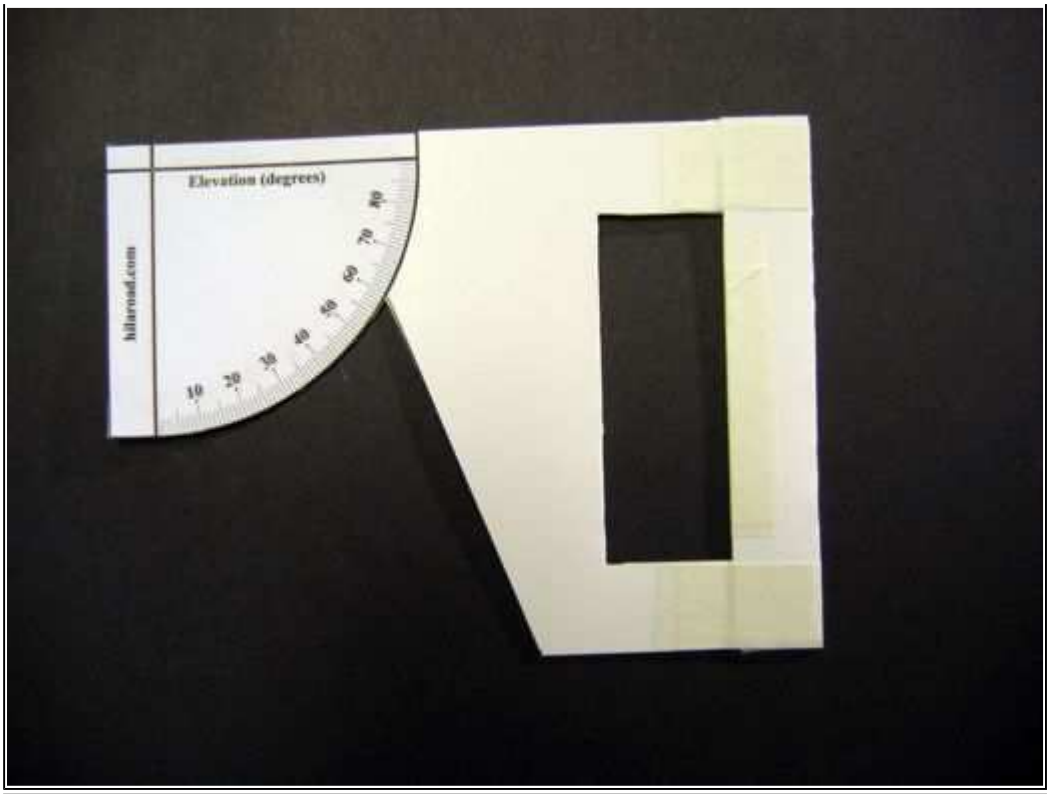
Draw a line down the center.

Fold card on line.

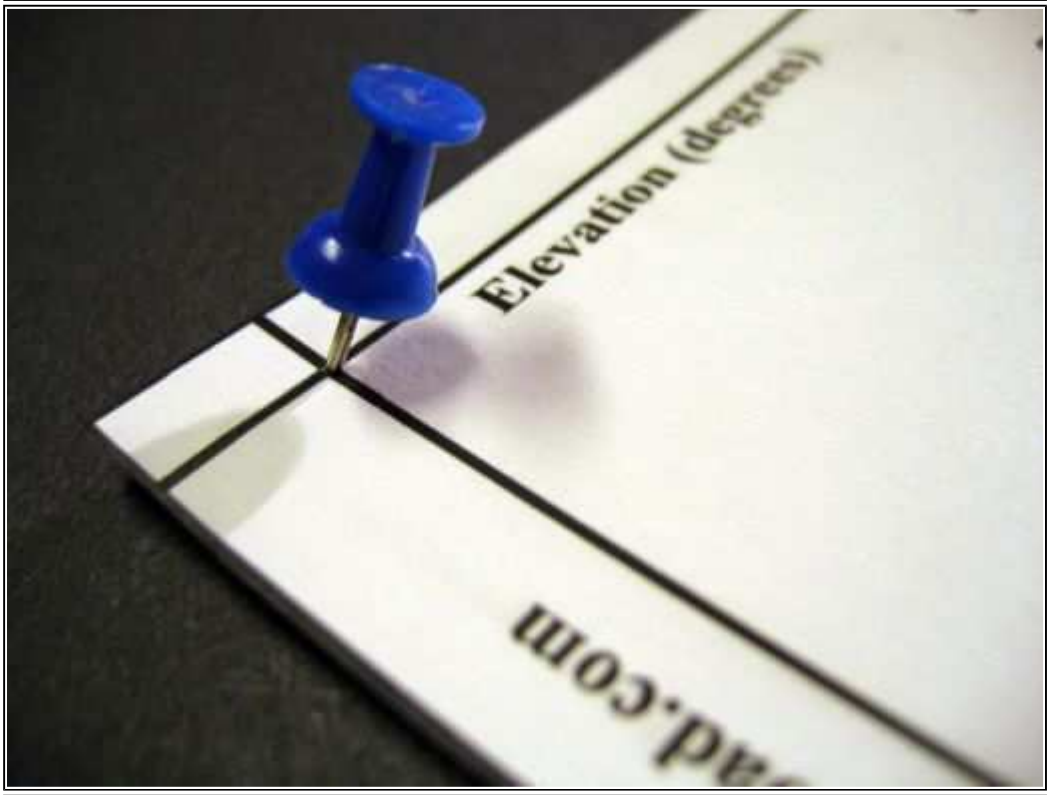




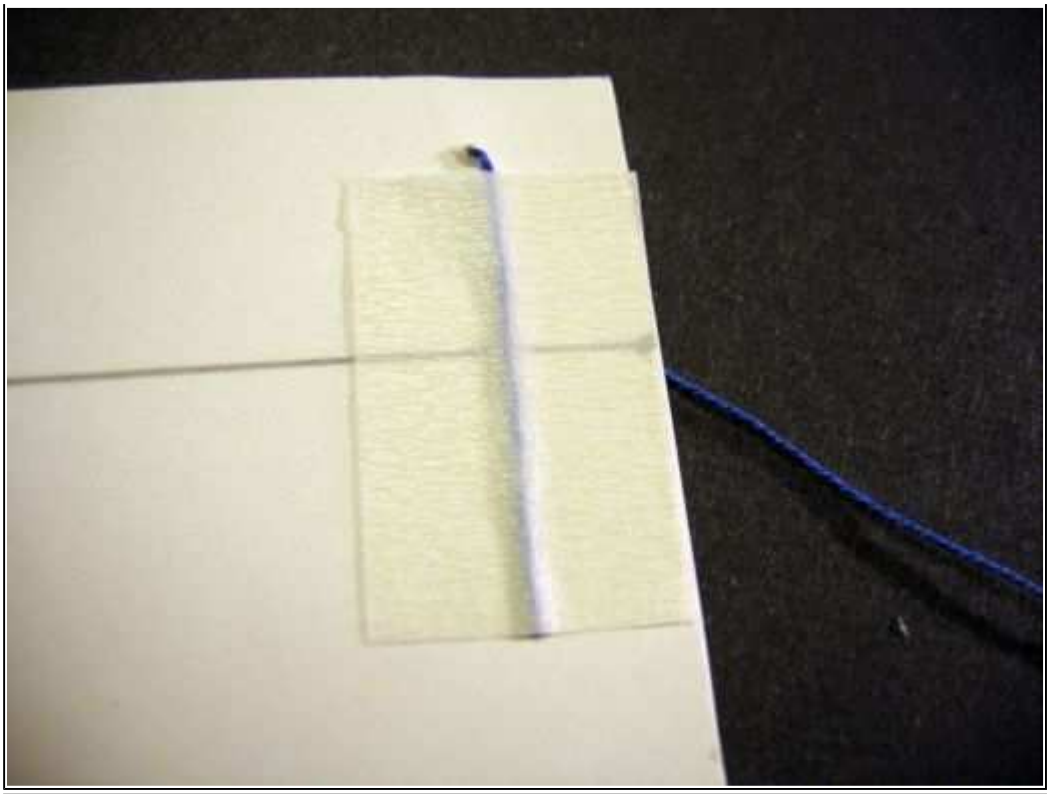
Tape and glue the handle to the main inclinometer card.



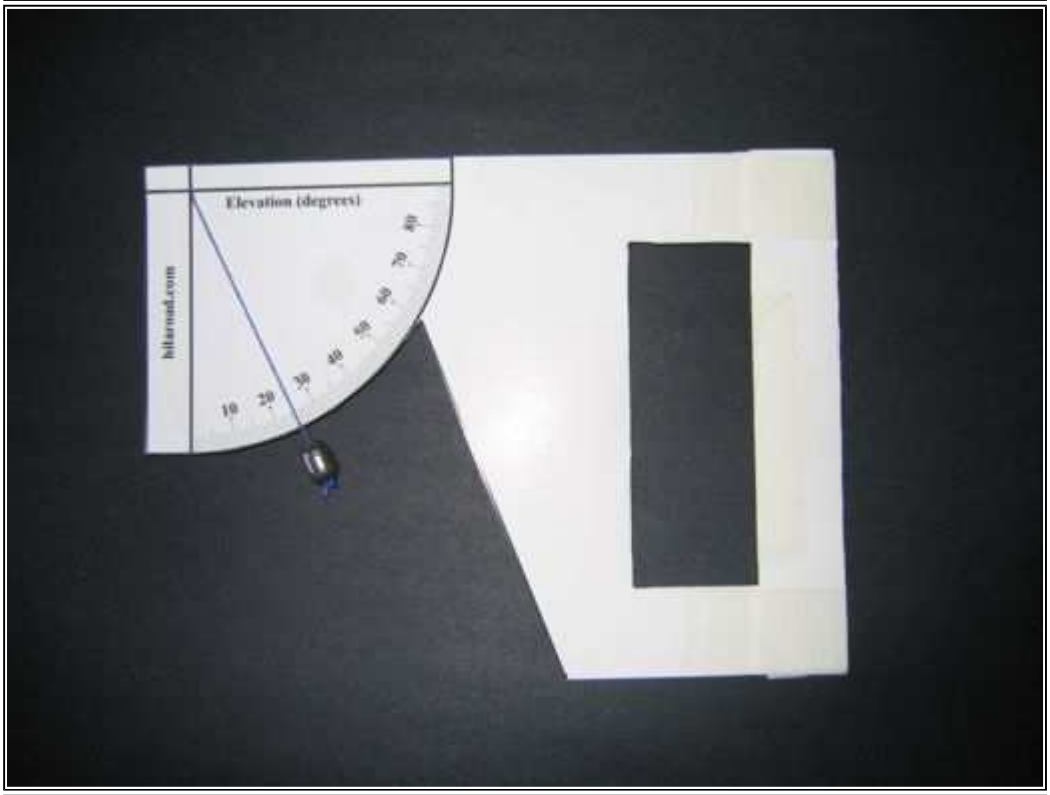
Secure the handle with tape.



Using a pin, push a hole through the upper left corner.



Push a string through the hole. Tape end of string to back of card.

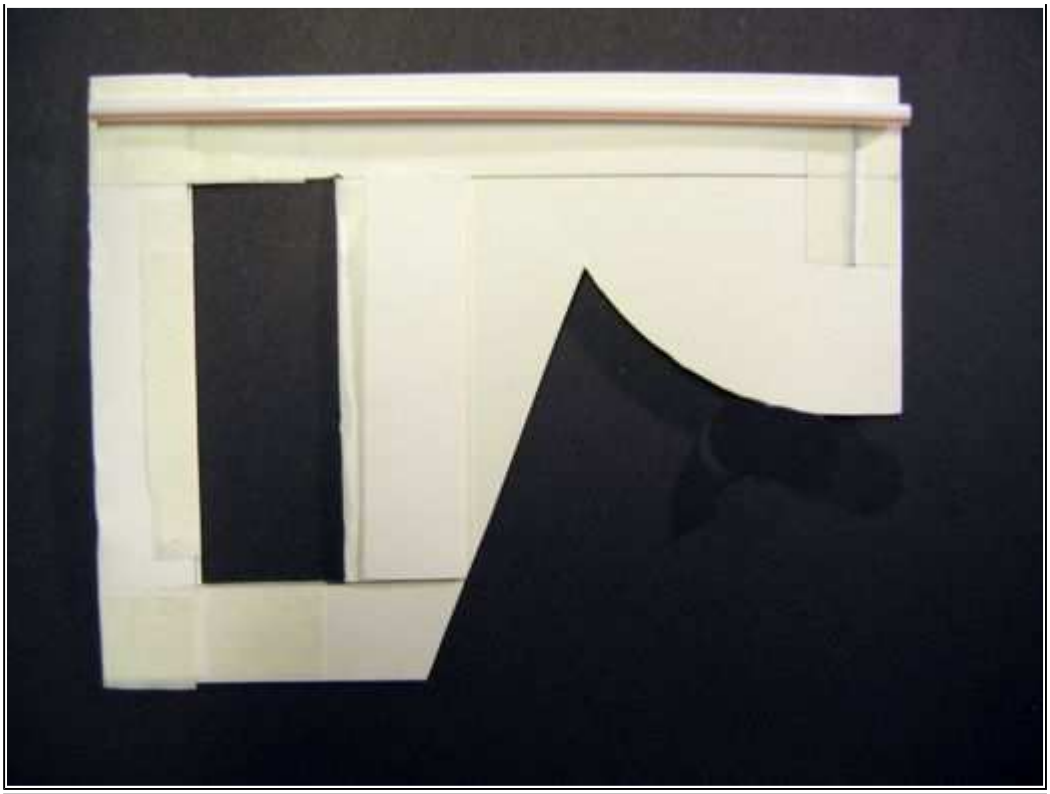


Attach a weight to the end of the string.

Make sure it swings freely below the angle marks.

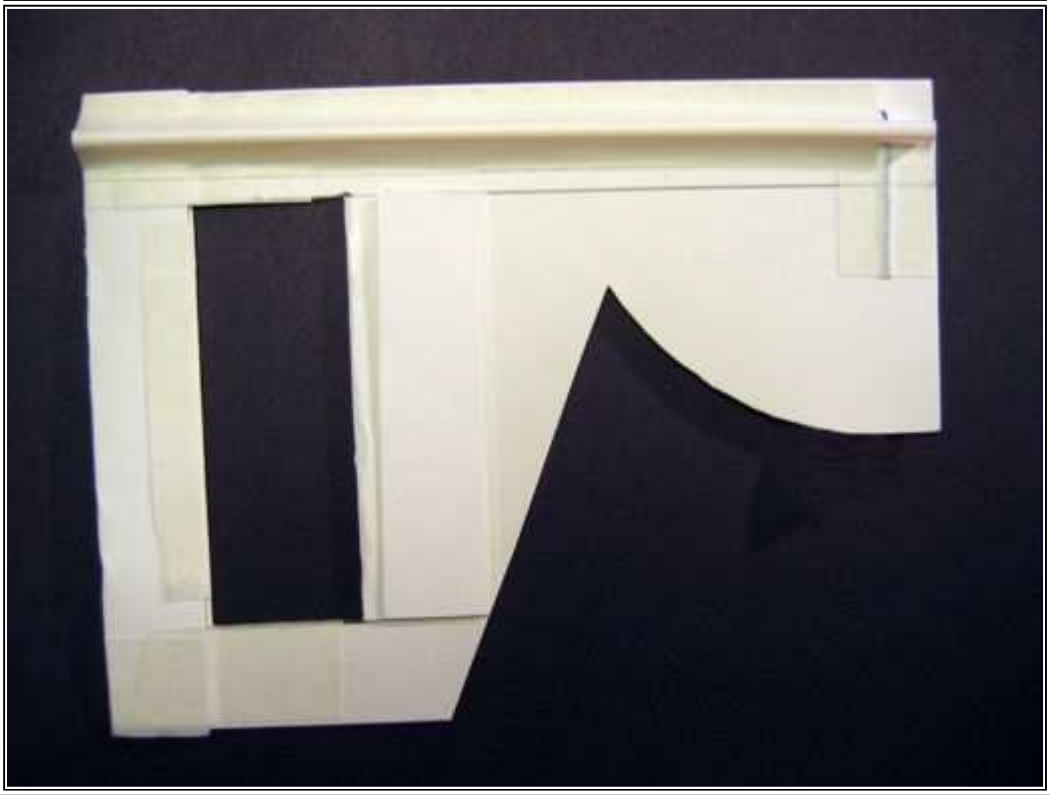
A fishing weight works well.

A penny, taped to the string, can also be used.



Lay a straw along the structure as indicated.

The straw stiffens the inclinometer.

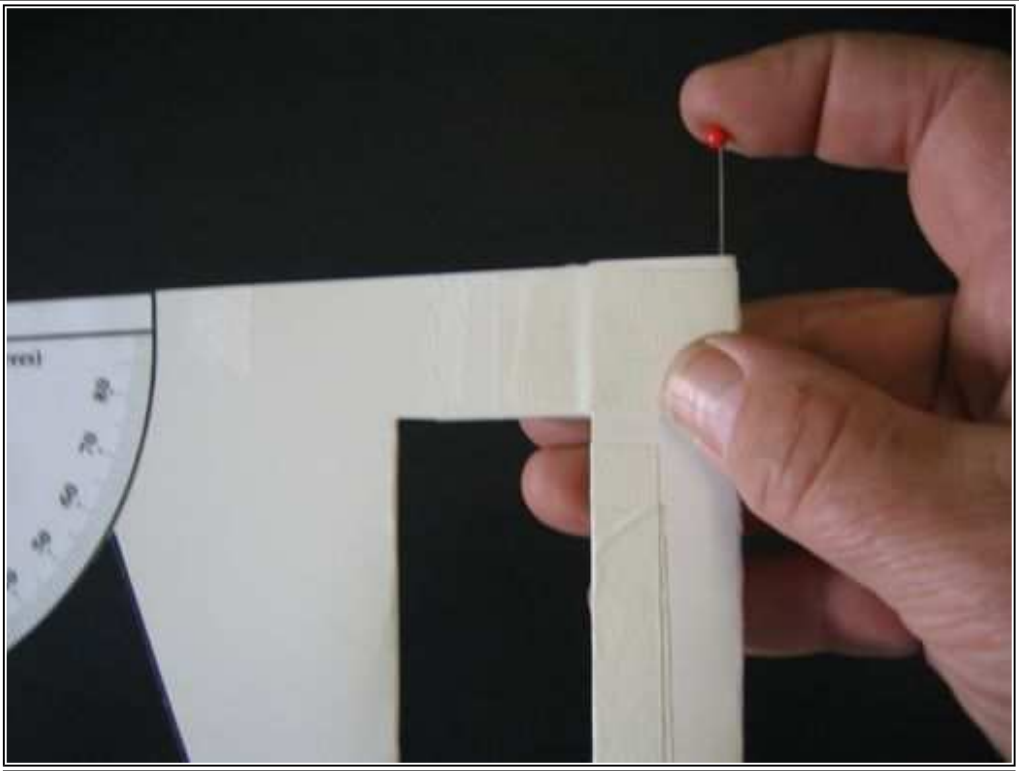
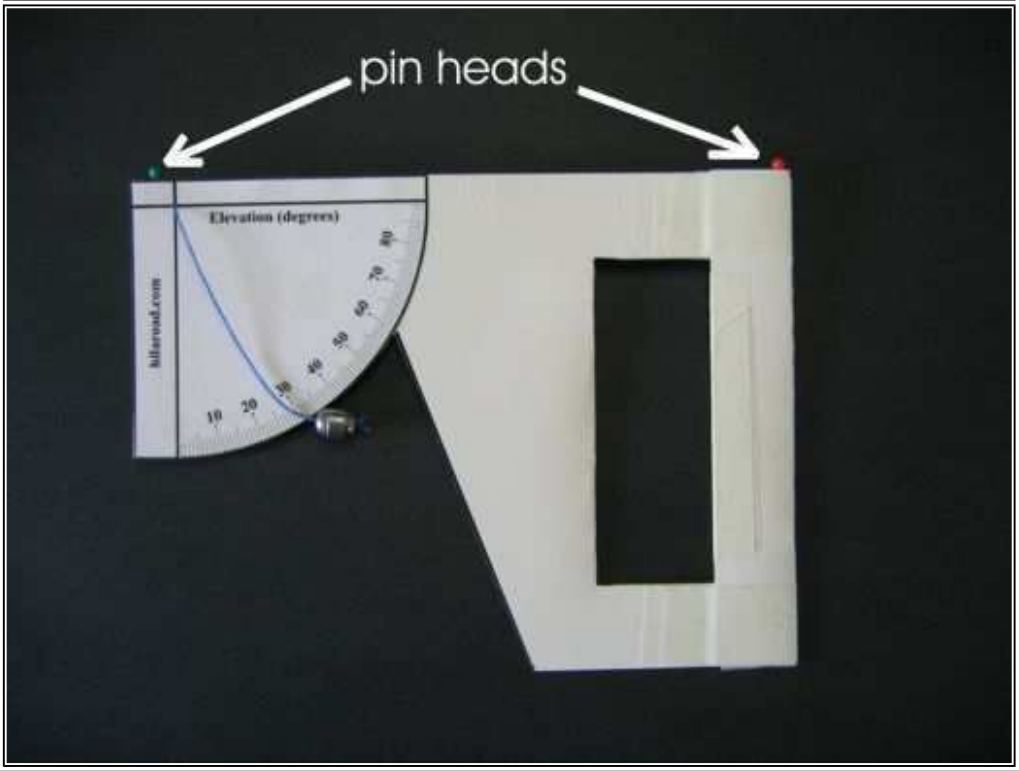


Tape the straw securely to the back of the inclinometer.

[Final Assembly]

Inclinometer

Construction Continued:

	Use large headed pins as sights. Use two different colours. Press one into each end on top of the inclinometer. Press one into the folded card of the handle. Press another in behind the straw and tape at front.
	The two pinheads serve as sights. They are aligned with the observed object.

[Using the Inclinometer]

Using the Inclinometer

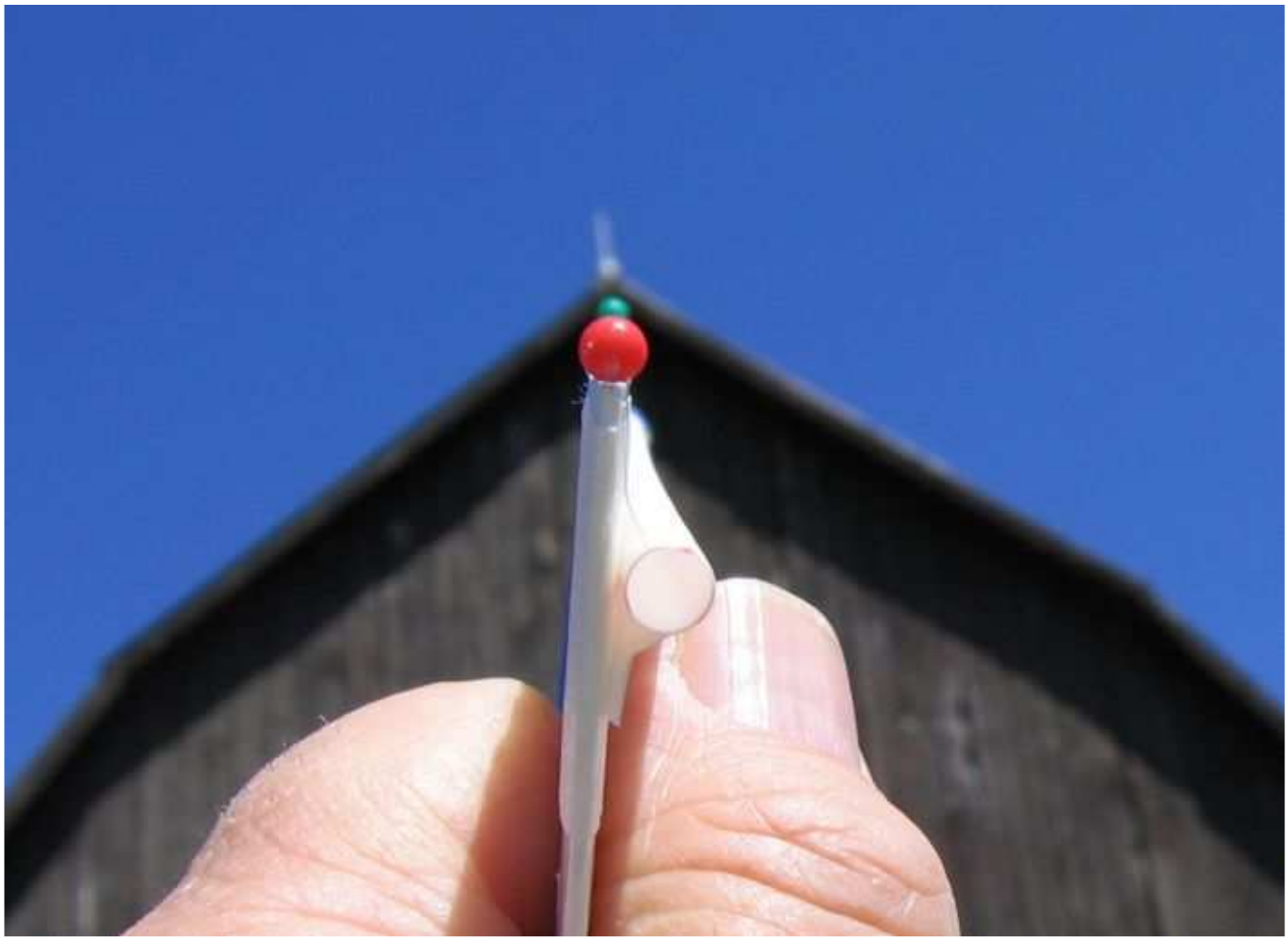
To determine the height of our barn I moved back 10 meters from the end of the barn.

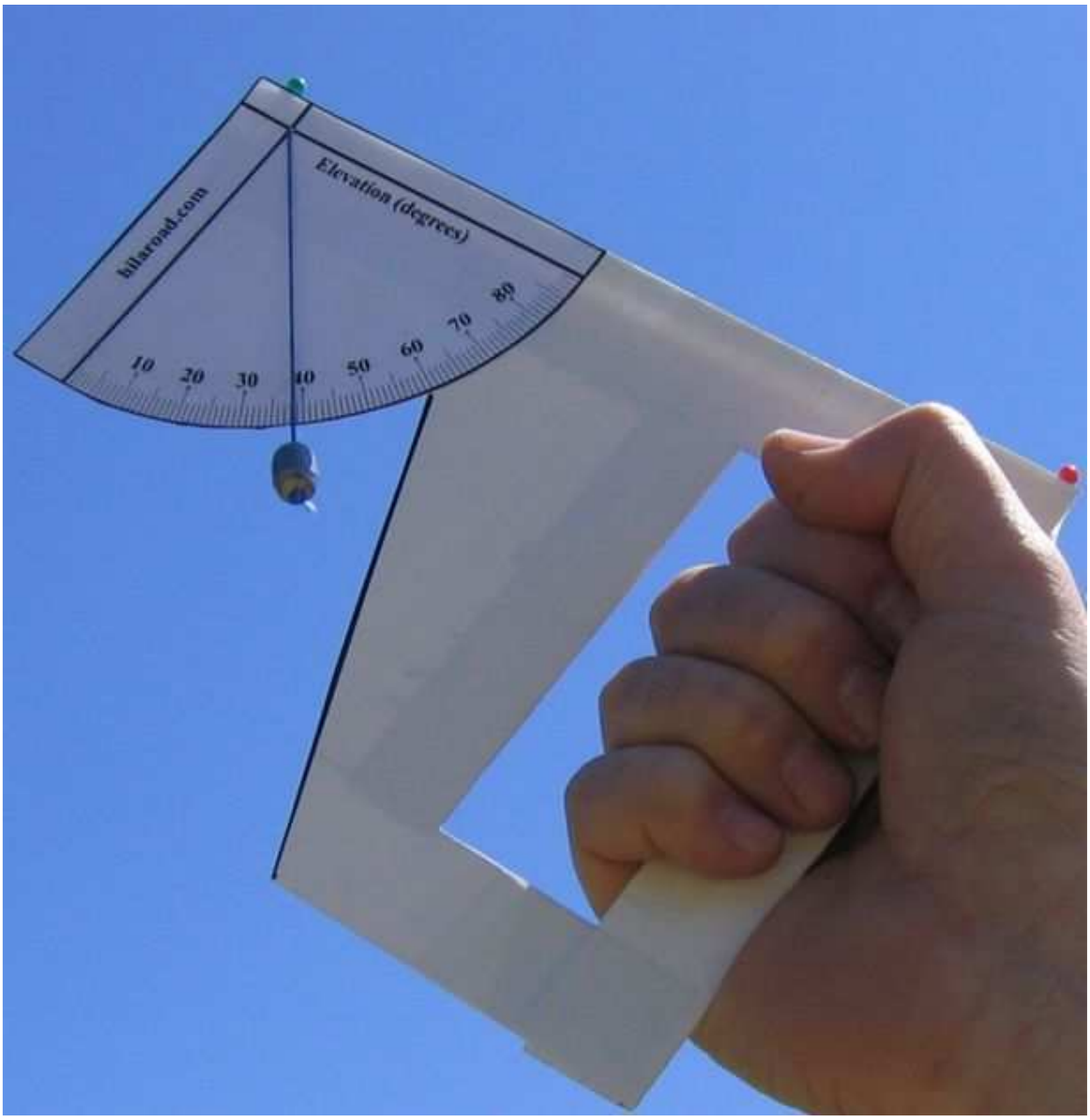
10 meters represents the **baseline** for this measurement.

Use a measuring tape to accurately measure the baseline and record the number in your notes.

I have aligned the sights of the inclinometer on the peak of the barn roof.

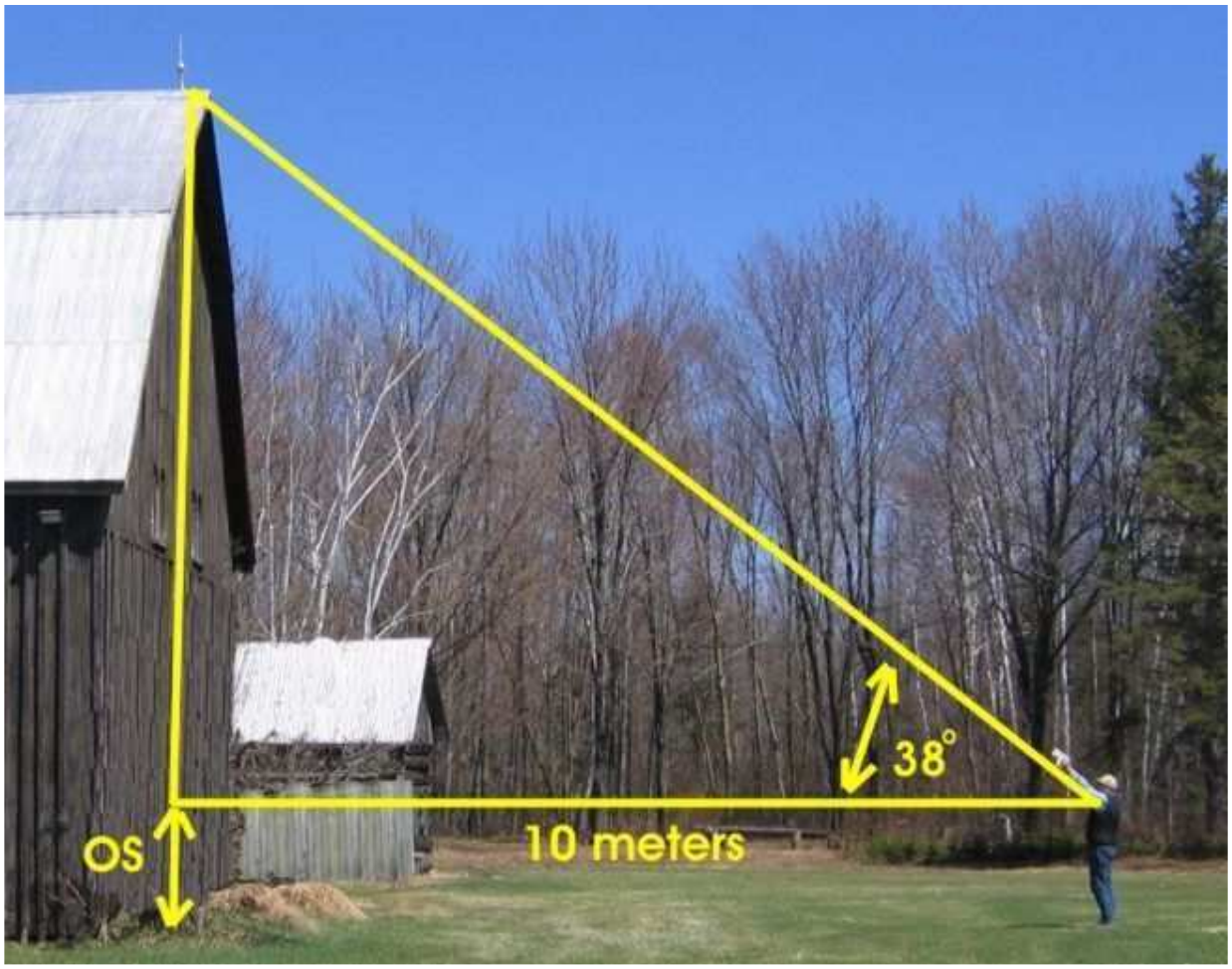
The image below shows the alignment of the sights.





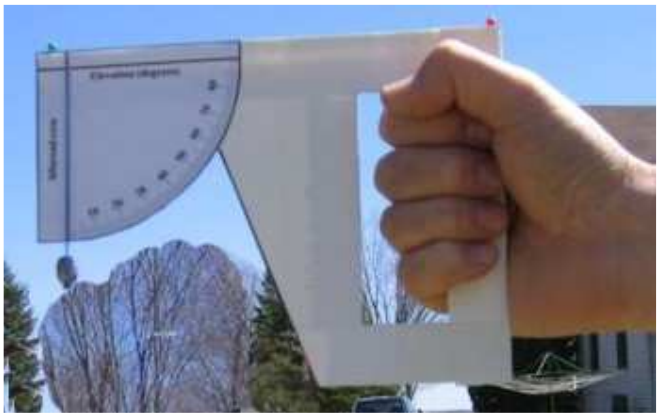
The angle indicated by the inclinometer is 38 degrees.

Record this angle.



In the above image "OS" represents the offset.

This distance is not included in our triangle and we must determine it.



Determine the offset by setting the inclinometer to "0" degrees.

Note where the sites point to on the object, in this case on the barn

The yellow dot indicates the spot that the sights aligned with.

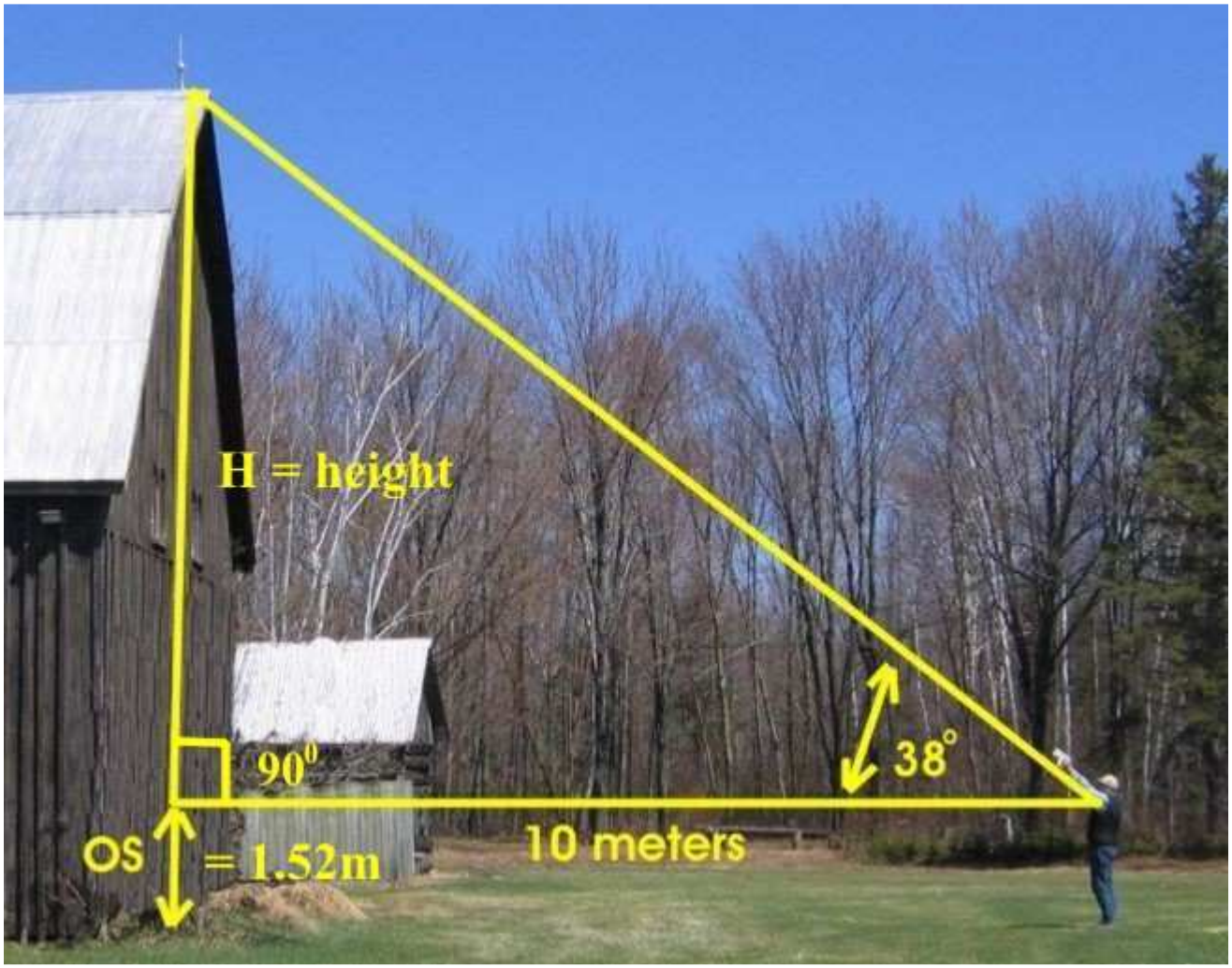
The offset "OS" in the above image, is the distance from the ground to the sight spot.

Measure the distance from the ground to the offset spot.

For this barn the offset is 1.52 meters.

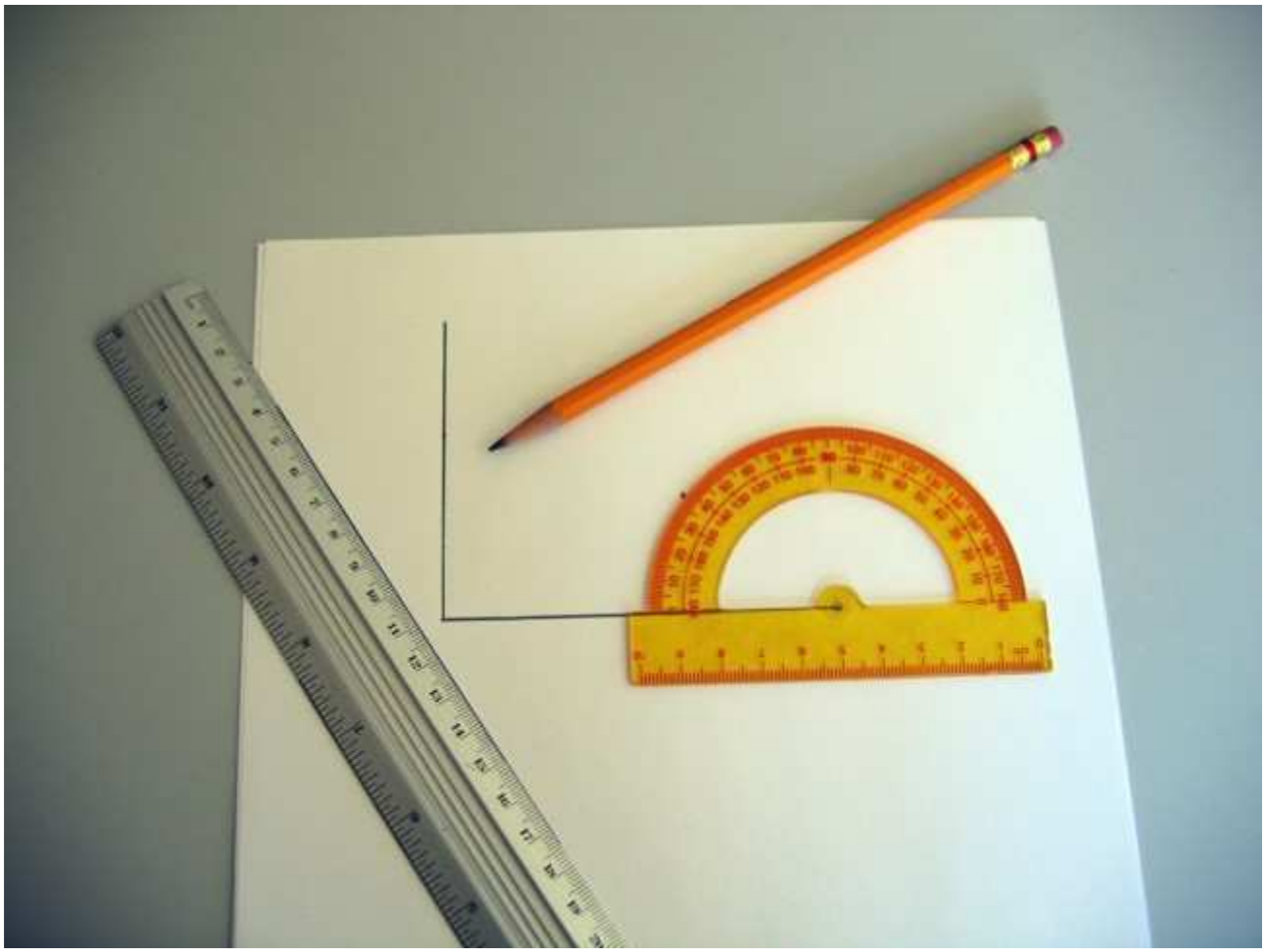
The Final Calculation

Calculating the height of the barn.



We can now calculate "H" by creating a scale drawing.

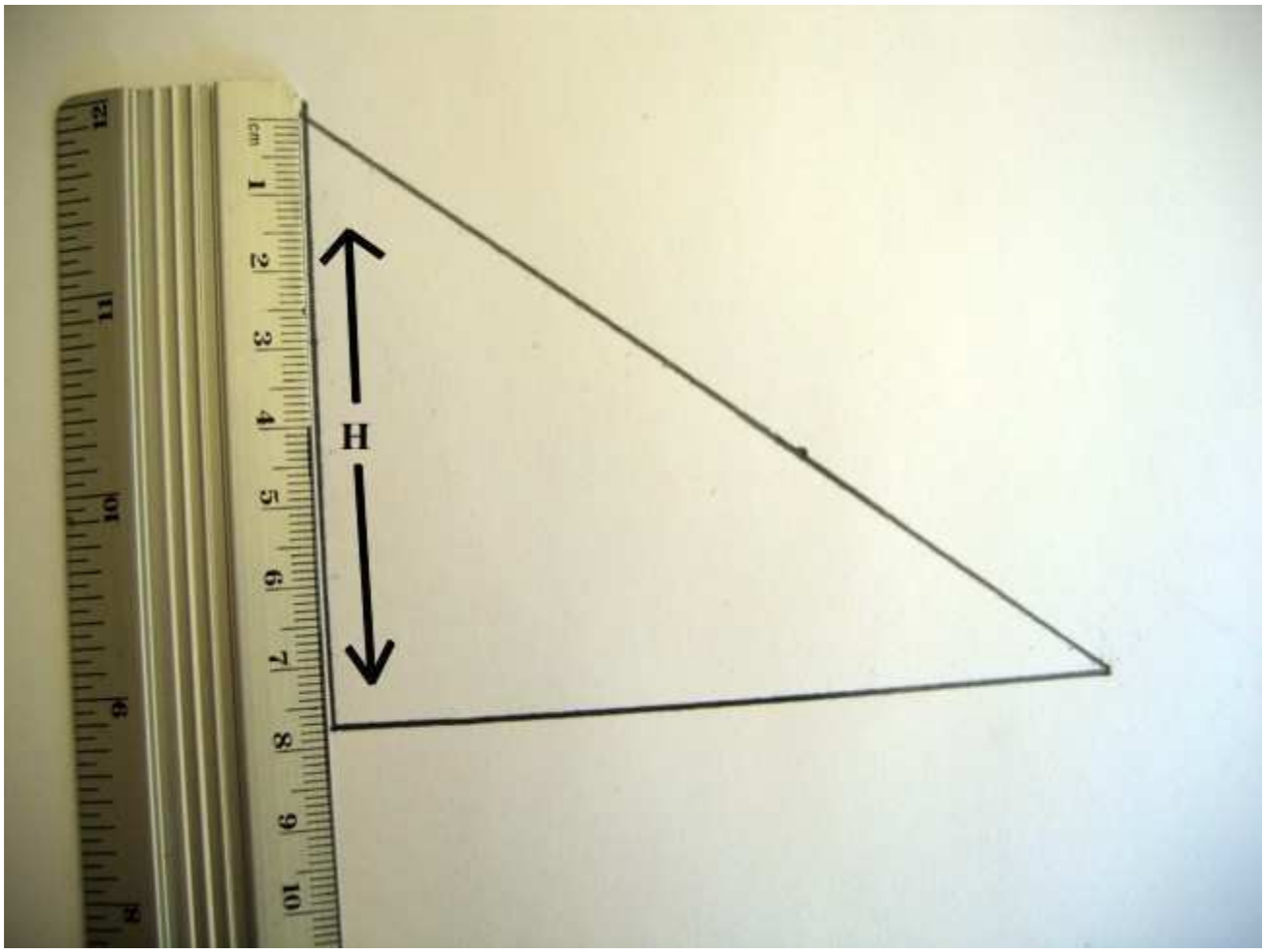
In our scale drawing 1 cm will represent 1 meter.



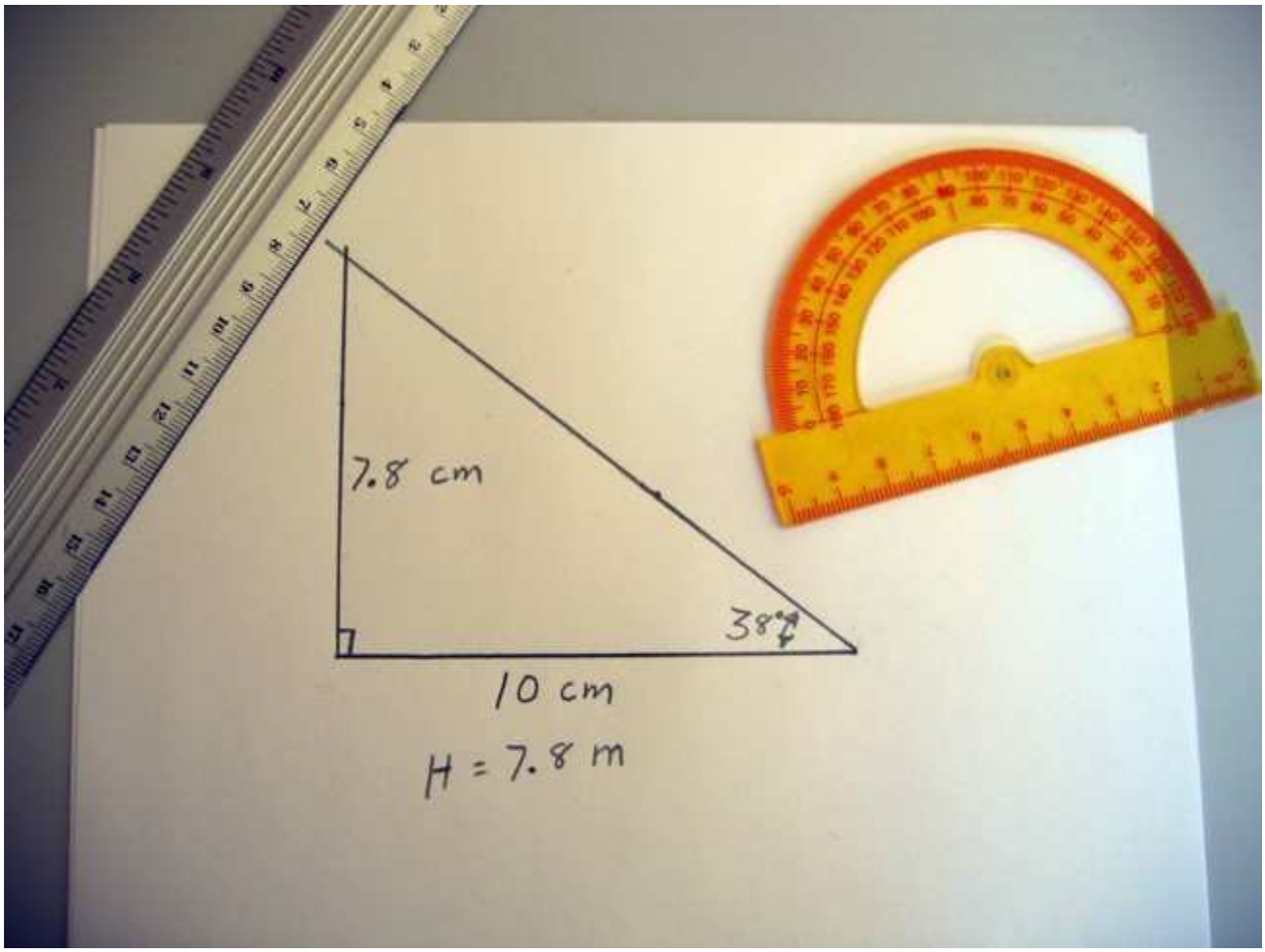
With a ruler draw a 10 cm baseline.

Draw a line at 90 degrees at one end and 38 degrees at the other.

These lines intersect at the peak of the barn.



Measure "H" in cm, this number represents "H" in meters.



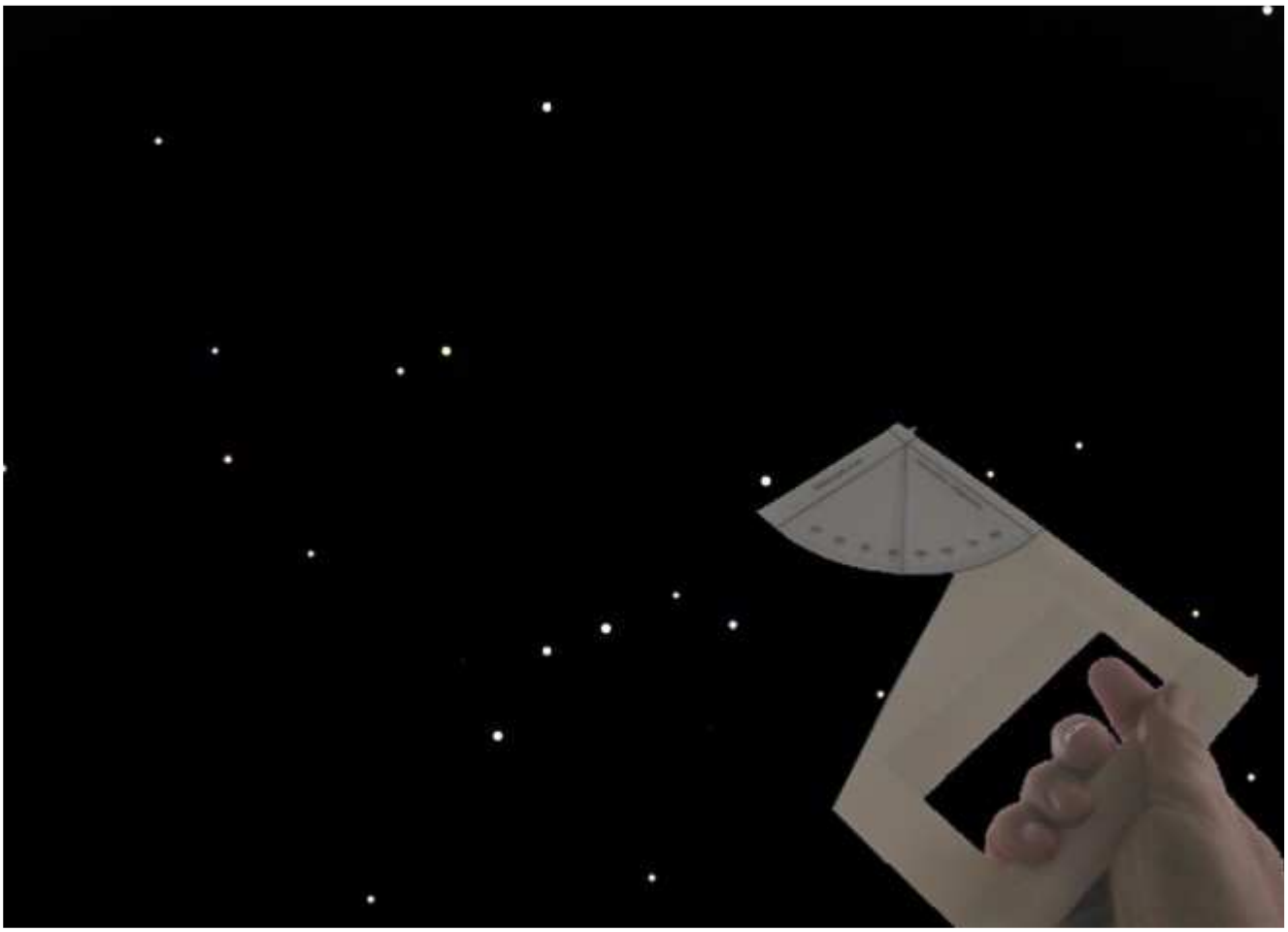
We have calculated that H=7.8 meters, OS the offset was 1.52 meters.

Adding 7.80m + 1.52m, we get the height of the barn, 9.32 meters.

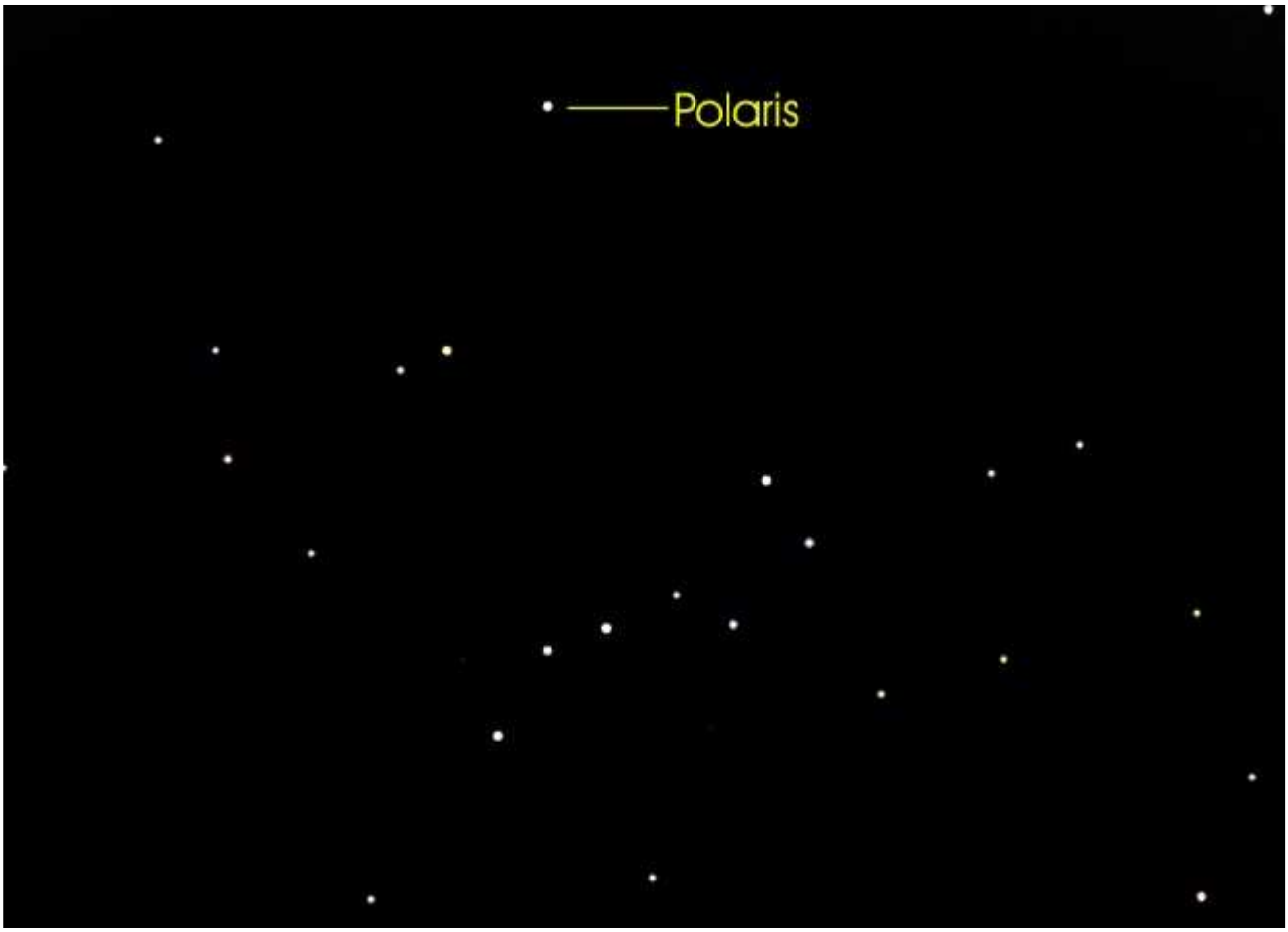
Determine your latitude.

Return

Using the inclinometer to determine your latitude.

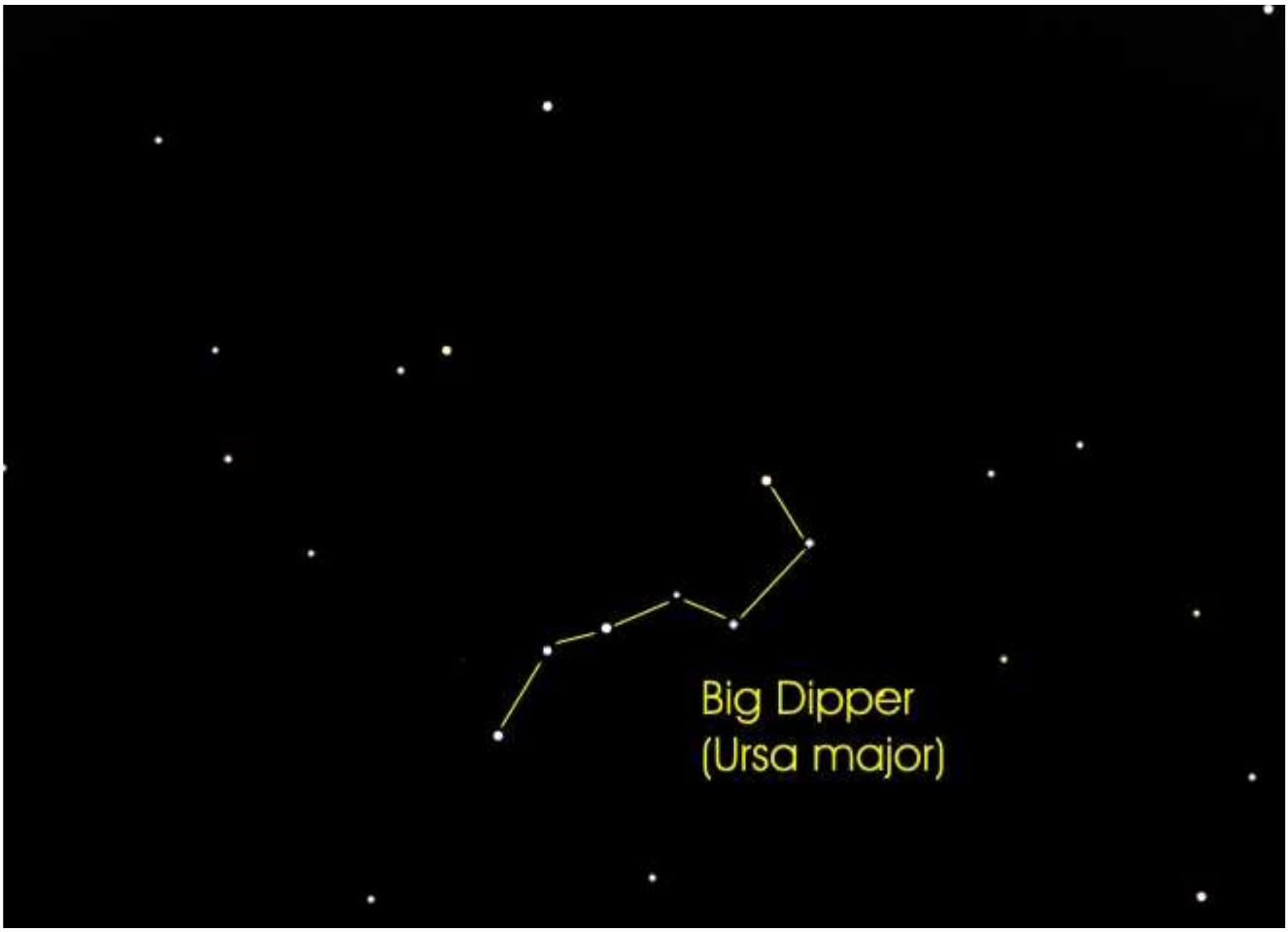


Latitude in the northern hemisphere (above the equator) is the angle from the horizon to Polaris, the North Star.

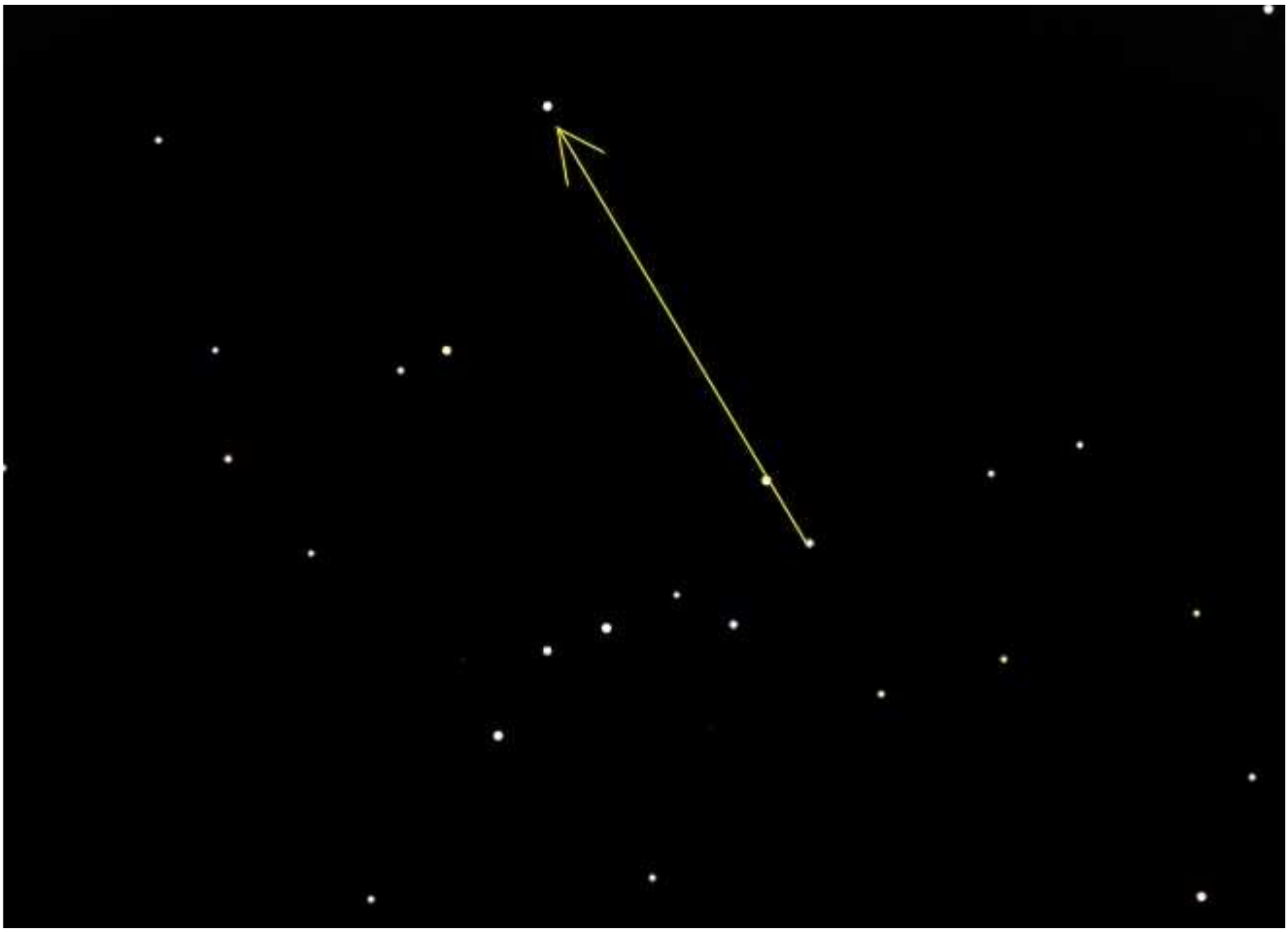


Polaris, the North Star, is important because it is aligned with Earth's axis of rotation, as a result it doesn't "move".

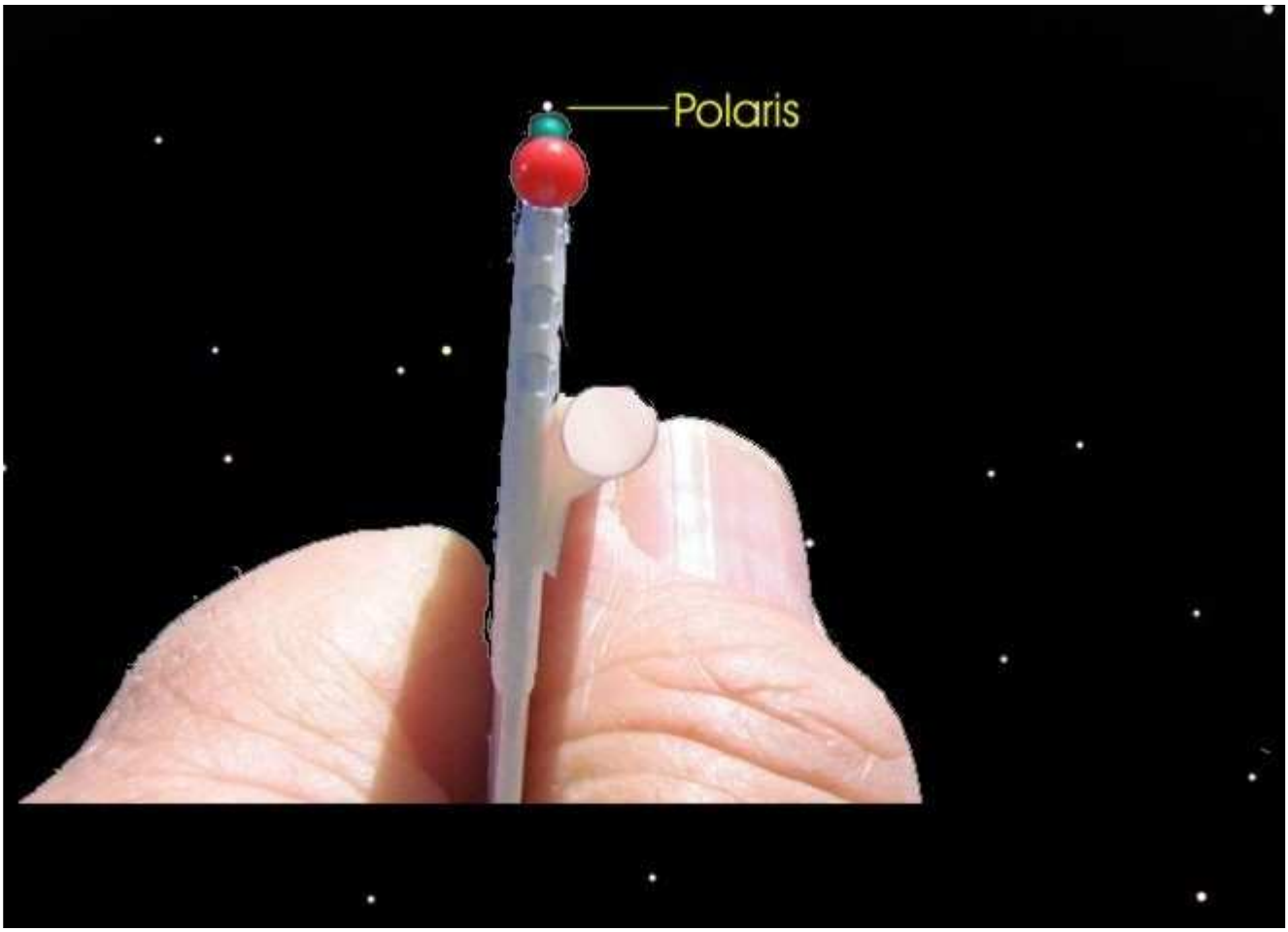
When viewing Polaris you are facing true North.



To find Polaris, locate the constellation Ursa major (Big Dipper).

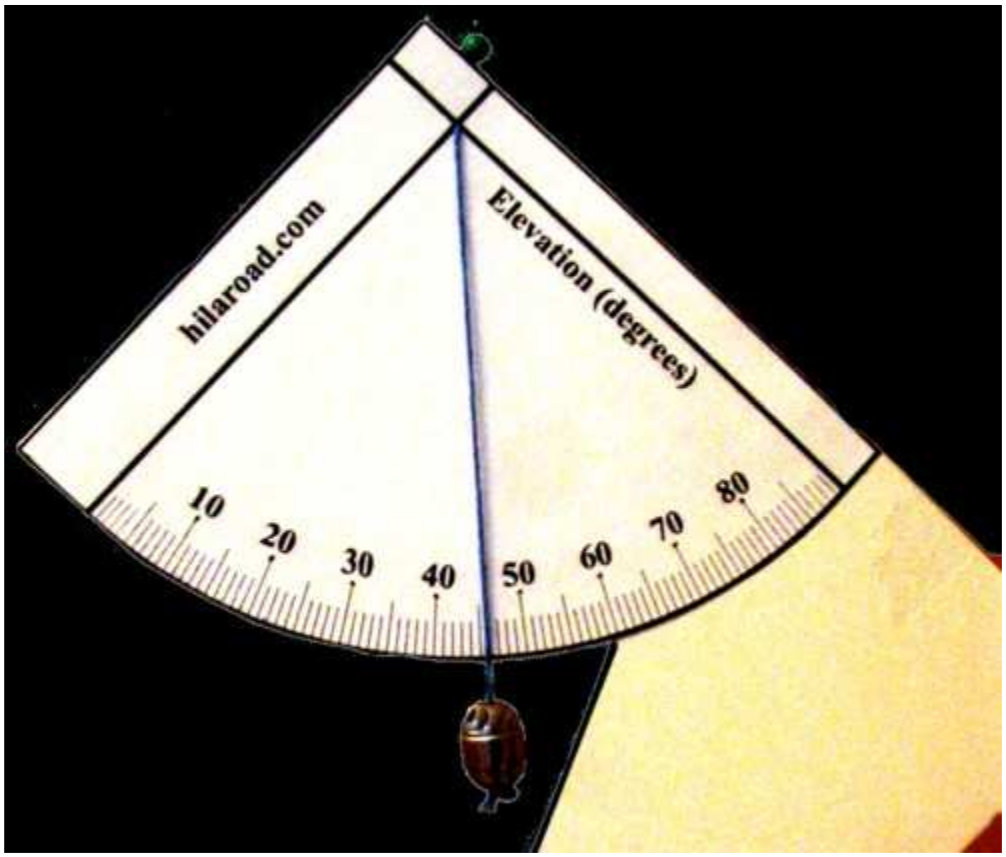


The last two stars in the "pot" part of the Dipper point at Polaris.



Align the "sights" (two pin heads) with the star Polaris.

The angle shown on your inclinometer is your latitude.



My home is located at latitude 46 degrees as indicated above.

Return to Inclinometer Construction