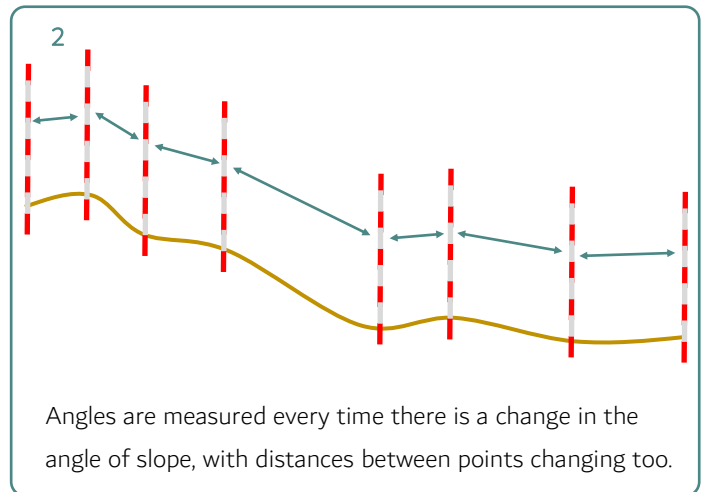
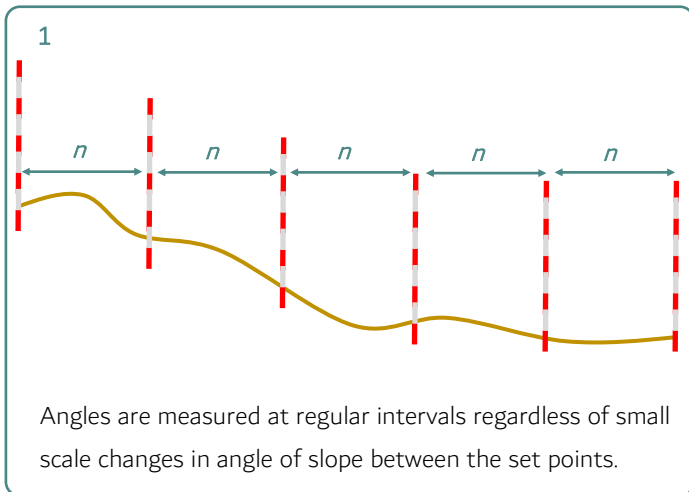


Determining the angle of a slope, or its gradient can help one to draw and map out the morphology of different areas (such as a beach environment), or make links between the gradient and other factors such as the rate of infiltration or overland flow.

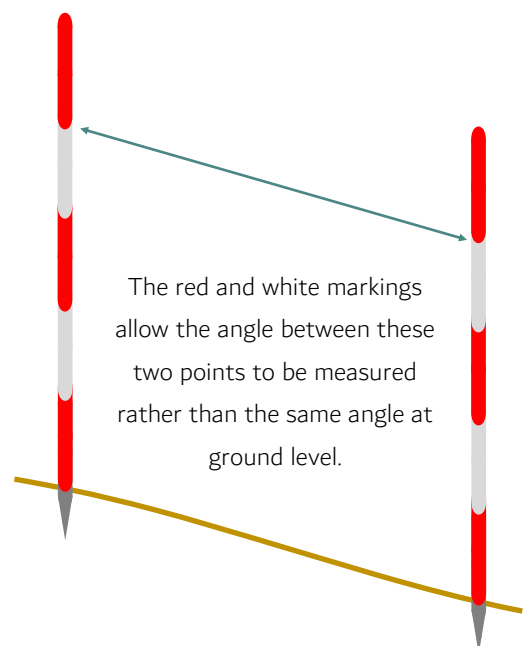
The angle of a slope is likely to be measured in sequence along a transect rather than just be a single measurement in one place. Therefore, in the design of the transect, one must establish at what points one would take a gradient measurement. There are two schools of thought in this regard:

1. Measure the gradient at regular intervals along the transect, for example over every five metre section of the transect. While this provides a degree of consistency and means that students do not have to think about where exactly each measurement should take place, it does mean that it is possible that changes in the angle of the slope in between these set points, which are significant in the overall morphology of the area, will not be measured and the whole shape of the transect will be 'smoothed' artificially.
2. Measure the gradient of a section of the transect that represent a change in the angle of slope, regardless of the distance this covers. Though this will give a more accurate picture of the shape of the transect, it relies on students being very precise in their ability to read the landscape and identify the points at which the angle of slope changes.



Regardless of how the transect is sectioned out, the method of measuring the angle of slope between each point is the same. One requires two ranging poles and a gun clinometer as well as a tape measure. The tape measure is laid out such that it stretches from one end of the transect to the other.

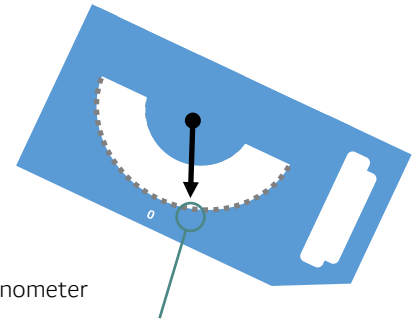
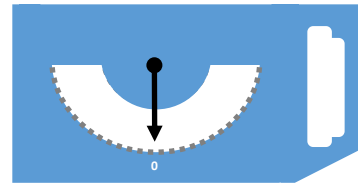
A ranging pole is simple a marker stick, usually made from metal, that is coloured in red and white alternate bands. They have a spike at one end to allow them to be dug into the ground. Starting at one end of the transect, a ranging pole is pushed into the ground such that all of the red and white sections are visible. A second ranging pole is placed in the ground at the further extent of the section to be measured. The red and white marking on the pole are extremely useful and not just to make the poles stand out. Without a ranging pole, the user would have to lie flat on their stomach and measure the angle of slope literally along the ground. The ranging pole allow users to measure the angle from a standing position as they can measure the angle between the point that separates the red and white section on one pole with that exact same point on the corresponding pole.



A gun clinometer is a hand held piece of field equipment that measures the angle at which it is tilted. It comprises of a plastic housing on which is attached a free swinging marker arrow. As the clinometer is tilted, the free swinging arrow is weighted such that it will always point directly down. A gradient scale is printed on the clinometer housing so that as the arrow swings into position, it gives a measurement of the angle at which the clinometer is held.

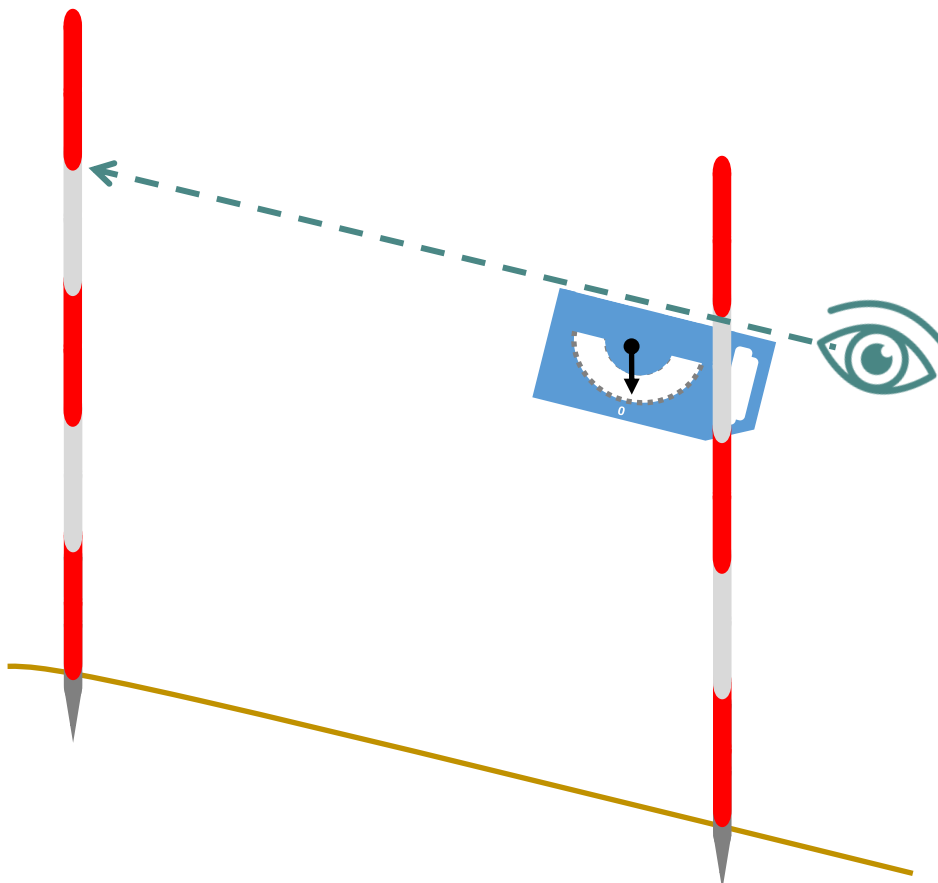
A gun clinometer also has a trigger. Engaging the trigger frees the arrow and releasing the trigger will then hold the arrow in that position. This means that the measurement can be taken and the clinometer moved so that the user can read off the angle before returning to the measuring position.

Other types of clinometer do exist, though all work on the same principle.



Tilting the clinometer swings the arrow marker such that it now points at the gradient on a scale marked on the housing.

The user then places the top of the clinometer at the separation point between the red and white markings on the first ranging pole. It should be angled such that the clinometer is pointing directly at the same point on the opposing ranging pole and users should look directly along the top of the clinometer to ensure this is the case.



The gradient for that section of the ground, between the two ranging poles can then be read off the clinometer, and the process repeated along the entire length of the transect. Gradients that are going up-slope are recorded as positive integers, while gradients going down-slope are recorded as negatives. Where students are measuring every change in the angle of slope (example number 2 above), they should also measure the distance between each ranging pole and record this alongside the gradient.