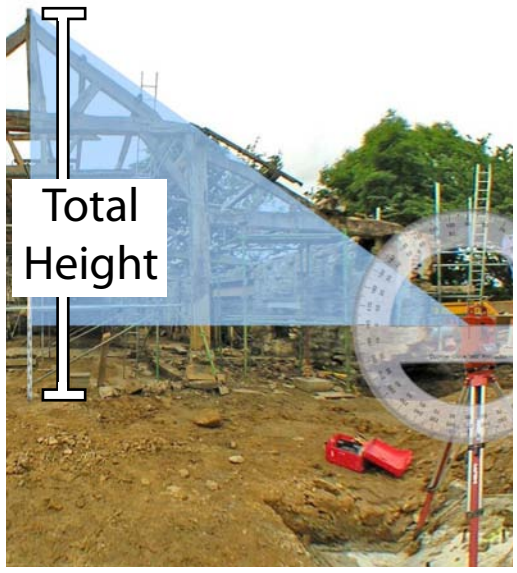
Theodolite survey

Virtual*maths*

www.virtualmaths.org

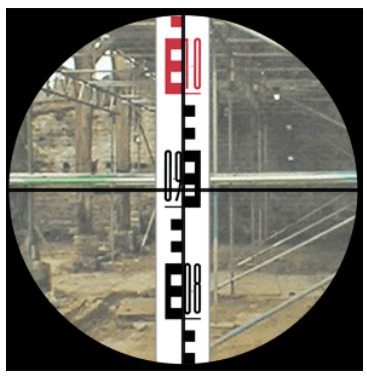


We will use a theodolite to calculate the total height of a building.

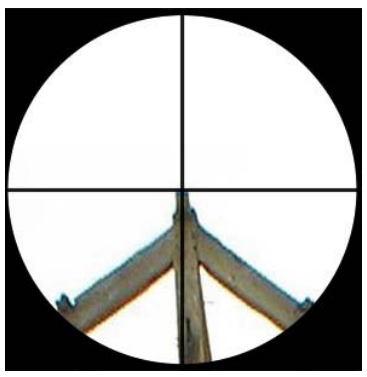
We also use a levelling staff. It is placed vertically, directly under the tallest point of the building.

The distance between each large number on the staff represents 100 millimetres or 0.1 metre

Each block represents 10 millimetres

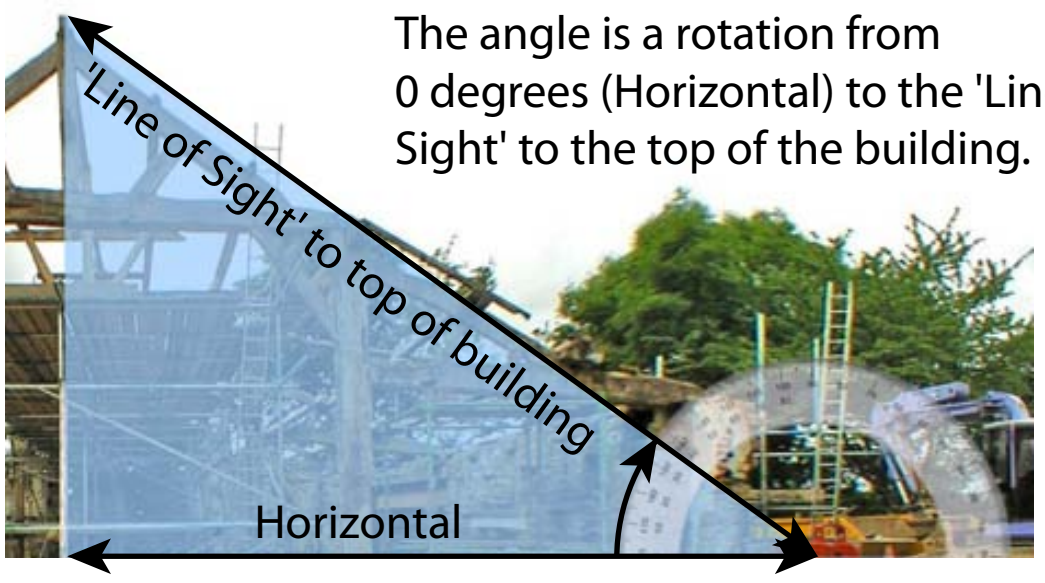


We align the theodolite view to horizontal, then focus onto the staff. The reading is the distance from the ground to the bottom of the blue triangle.

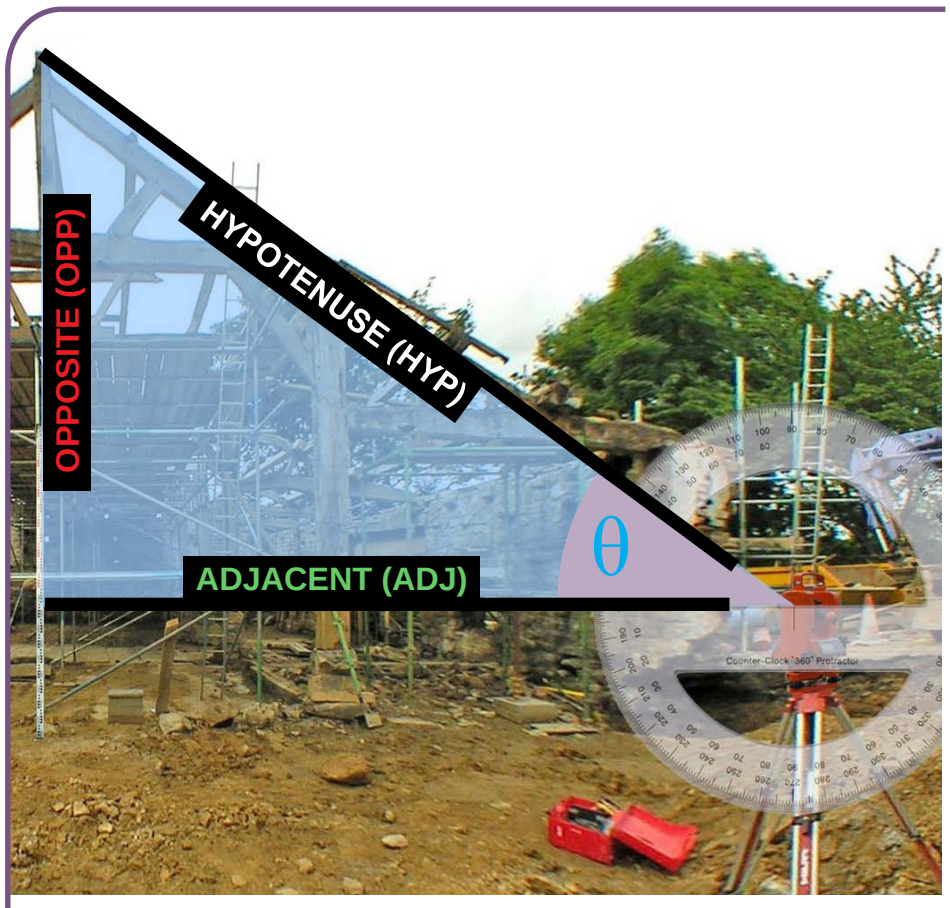


We then point the theodolite viewer at the top of the building and align the crosshairs to it.

The theodolite display gives a digital readout of the angle between horizontal and the top of the building.



The angle is a rotation from 0 degrees (Horizontal) to the 'Line of Sight' to the top of the building.



We also measure the distance from the theodolite to the staff, which gives us the **adjacent** length of the triangle.

θ (theta) is the mathematical symbol used to represent the angle between the **hypotenuse** and **adjacent** lengths of a triangle.

Because we have measured the **adjacent** length and **theta** angle, we can work out the length **opposite** the angle by rearranging this formula:

$$\tan\theta = \frac{opp}{adj}$$

We know the value of θ and **adj** but we don't know the value of **opp** so we rearrange the formula as:

$$opp = adj \times \tan\theta$$

We then add **opp** to the staff reading, which gives us the total height.

leeds metropolitan university

West Yorkshire Lifelong Learning Network