

Generic Tasks: Slope

Ramp



To make sure that ramps can be used by wheelchairs, their slope must not be higher than 6% - this could be examined in a MCM task as well.

**Determine the slope of the ramp.
Give the result in percentage (degrees).**

Data to be measured:

Difference in height $\Delta y =$

Difference in length (horizontal) $\Delta x =$

Length of the ramp $\Delta l =$

Solution:

$$m = \frac{\Delta y}{\Delta x} \text{ or } m = \frac{\Delta y}{\sqrt{(\Delta l)^2 - (\Delta y)^2}}$$

For the degree of the slope:

$$\alpha = \tan^{-1}\left(\frac{\Delta y}{\Delta x}\right) \text{ or } \alpha = \sin^{-1}\left(\frac{\Delta y}{\Delta l}\right)$$

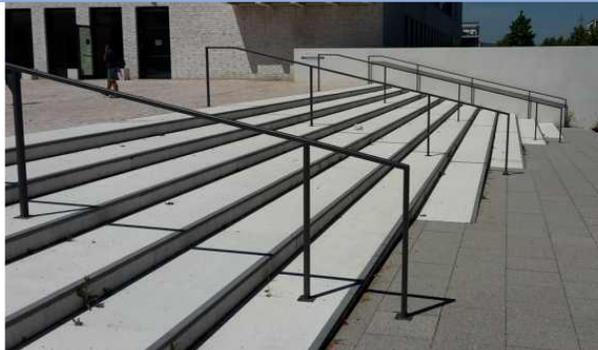
Possible hints:

- Use a gradient triangle.
- $m = \frac{\Delta y}{\Delta x}$: Difference in height divided by difference in length (horizontal)
- The result should be given in percentage. For example, $m=0,8$ equals 80 percent.

For results in degrees:

- Give the result in degrees, $\tan^{-1}(m) = \alpha$. Be sure, that your calculator mode is on DEG.

Handrail of stairs



At this handrail, it is not easy to measure the difference in height. A water level can help!



Such spiral staircases can often be found as escape route in public buildings.

Determine the slope of the handrail. Give the result in percentage (degrees).

Data to be measured:

Difference in height $\Delta y =$

Difference in length (horizontal) $\Delta x =$

Length of the ramp $\Delta l =$

Solution:

$$m = \frac{\Delta y}{\Delta x}$$

At the spiral staircase, one might only measure the length of the handrail.

$$m = \frac{\Delta y}{\sqrt{(\Delta l)^2 - (\Delta x)^2}}$$

For the degree of the slope:

$$\alpha = \tan^{-1} \left(\frac{\Delta y}{\Delta x} \right) \text{ or } \alpha = \sin^{-1} \left(\frac{\Delta y}{\Delta l} \right)$$

Possible hints:

- Use a gradient triangle.
- $m = \frac{\Delta y}{\Delta x}$: Difference in height divided by difference in length (horizontal)
- The result should be given in percentage. For example, $m=0,8$ equals 80 percent.

For results in degrees:

- Give the result in degrees, $\tan^{-1}(m) = \alpha$. Be sure, that your calculator mode is on DEG.