# M1.11 Identify uncertainties in measurements and use simple techniques to determine uncertainty when data are combined

### Quiz

1. A microscope graticule allows fine-scale measurements to be made under a microscope. If the graticule’s uncertainty is ± 0.5 µm, and a protozoan parasite *Trypanosoma* is measured as 50 µm, calculate the percentage error for this measurement.
2. Cell cultures of the bacteria *E. coli* can be measured by a spectrophotometer to give an accurate (to within 2%) reading of bacteria cm-3
A sample has been calculated as containing 3 \* 109 bacteria cm-3
Calculate the absolute uncertainty of this measurement.
3. A plant shoot is measured for growth over a 5-day time period. Every morning it was measured with a ruler an uncertainty of ±0.5 mm and the height recorded as show below. Calculate the difference in height between days 1 and 5 and state the percentage error in this measurement.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Day** | 1 | 2 | 3 | 4 | 5 |
| **Height (mm)** | 8 | 11 | 16 | 21 | 24 |

### Produced in collaboration with the University of East Anglia

**Document updates**

 v1.0 April 2017 Original version.

 v1.1 June 2019 Changed how the word accuracy and uncertainty were used in order to be in line with the ‘Language of measurement’