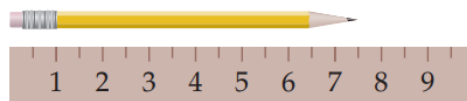


## Exercise 1.9

(a) What is the length of the pencil in the following figure if the ruler reads in centimeters? How many significant figures are there in this measurement? (b) An automobile speedometer with circular scales reading both miles per hour and kilometers per hour is shown. What speed is indicated, in both units? How many significant figures are in the measurements? [Section 1.6]




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### Solution

#### Part (a)

The ticks are spaced apart every 0.5 cm, so the uncertainty lies in the tenths place. (If the ticks were spaced apart every 0.1 cm, the uncertainty would lie in the hundredths place.)

$$7.5 \text{ cm}$$

This measurement has two significant figures.

#### Part (b)

In the kilometers per hour speedometer the ticks are spaced apart every 2 km/h, so the uncertainty lies in the ones place. (If the ticks were spaced apart every 1 km/h, the uncertainty would lie in the tenths place.) The needle is between the ticks representing 114 and 116.

$$115 \frac{\text{km}}{\text{h}}$$

This measurement has three significant figures. In the miles per hour speedometer the ticks are spaced apart every 10 mi/h, so the uncertainty lies in the ones place. The needle is a little bit past the 70 mi/h mark.

$$72 \frac{\text{mi}}{\text{h}}$$

This measurement has two significant figures.