Rounding and Bounds

If $x = 10.28$ is correct to 2 dec places

then $10.275 \leq x < 10.285$

If $x = 3270$ to 3 s.f.

$3265 \leq x < 3275$

These are known as error intervals

Establish error intervals for the following

1) $a = 46.3$ to 1 d.p. $46.25 \leq a < 46.35$

2) $b = 87000$ to 2 s.f $86500 \leq b < 87500$

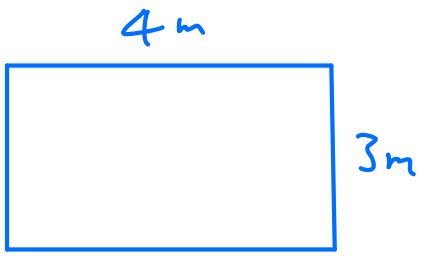
3) $c = 10.0$ to 1 d.p $9.95 \leq c < 10.05$

4) $d = 217$ to 3 s.f $216.5 \leq d < 217.5$

5) $e = 1,000,000$ to 1 s.f. $500,000 \leq e < 1,500,000$

Bounds - Upper and Lower

Ex1



Suppose a carpet measures 4m x 3m each measurement correct to 1 s.f.

Establish error bounds for the permeter and area of this carpet

Note the nominal values are

Perimeter = 4 + 3 + 4 + 3 = 14m

Area = 4 x 3 = 12 m^2

$3.5m \leq$ Length $< 4.5m$

$2.5m \leq$ Width $< 3.5m$

Smallest perimeter = 3.5 + 2.5 + 3.5 + 2.5 = 12m

Smallest area = 3.5 x 2.5 = 8.75 m^2

Largest perimeter = 4.5 + 3.5 + 4.5 + 3.5 = 16m

Largest area = 4.5 x 3.5 = 15.75 m^2

$12\text{m} \leq \text{Perimeter} < 16\text{m}$

$8.75\text{m}^2 \leq \text{Area} < 15.75\text{m}^2$

Speed, Time, Distance

$$\text{Average Speed} = \frac{\text{Dist}}{\text{Time}}$$

Suppose the school running track 100m lane is 100m correct to nearest metre

Suppose stop watch measures correct to nearest second.

John runs the 100m at sports day in 12 seconds. Find upper and lower bounds for his speed.

$$\text{Nominal speed} = \frac{100}{12} = 8.33 \text{ ms}^{-1}$$

$99.5\text{m} \leq \text{Distance} < 100.5\text{m}$

$11.5\text{s} \leq \text{Time} < 12.5\text{s}$

$$\text{Max Speed} = \frac{100.5}{11.5} = 8.74 \text{ ms}^{-1}$$

$$\text{Min Speed} = \frac{99.5}{12.5} = 7.96 \text{ ms}^{-1}$$

$7.96\,ms^{-1} \leq$ speed $< 8.74\,ms^{-1}$

Ex 3

I have a plank 6m long correct to nearest 10cm

I cut off a piece A 3.5m to nearest 5cm leaving piece B

Find bounds for the length of B

$$5.95m \leq \text{Plank} < 6.05m$$

$$3.475m \leq A < 3.525$$

$$B = P - A$$

$$\text{Max } B = 6.05 - 3.475 = 2.575m$$

$$\text{Min } B = 5.95 - 3.525 = 2.425m$$

$$2.425m \leq \text{Length of } B < 2.575m$$
