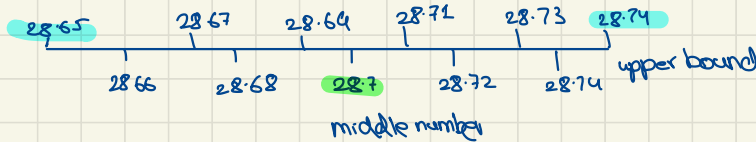# Upper and Lower Bounds

One tenth = $\frac{1}{10}$ = 0.1

One hundredth = $\frac{1}{100}$ = 0.01

1.d.p

① Length of 28.7m nearest to the tenth of ameter

Lower bound

| 28.65 | 28.67 | 28.69 | 28.71 | 28.73 | 28.74 |

28.66   28.68   28.7   28.72   28.74   upper bound

middle number

28.7   U.B $\xrightarrow{+}$ 28.75

$\frac{0.1}{2}$ = 0.05

L.B $\xrightarrow{-}$ 28.65

$28.65 \leqslant L \leqslant 28.75$

③ Population of a town is 352 000 correct to the nearest thousand.

$352\ 000 + 500 = 352\ 500$

352 000 $\frac{1000}{2}$ = 500

$352\ 000 - 500 = 351500$

$351\ 500 \leqslant n \leqslant 352500$

④ Speed 75 km/h correct to the nearest integer

75 —— 0·5+ → 75·5 km/h (u·b)
   $\frac{1}{2}$ = 0·5
   —— 0·5- → 74·5 km/h (l·b)

⑤ 324 km correct to the nearest km

324 —— → 324·5 km
   $\frac{1}{2}$ = 0·5
   —— → 323·5 km

⑥ 260 g correct to the nearest 10 grams

260 —— +→ 265 g (u·b)
   $\frac{10}{2}$ = 5
   —— -→ 255 g (l·b)

Complex examples

eg 1)
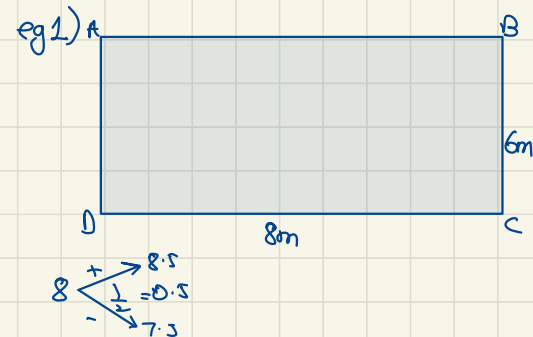
The length & width of the rectangle ABCD are correct to the nearest metre

Find (i) upper bound (ii) lower bound.

(a) length
  (i) 8·5 m (ii) 7·5 m

(b) width
  (i) 6·5 m (ii) 5·5 m

8 —— +→ 8·5
   $\frac{1}{2}$ = 0·5
   —— -→ 7·5

(c) Perimeter

(i) $2(L*b) \rightarrow 2(u\cdot b + u\cdot b)$
     $= 2(8.5 + 6.5)$
     $= 2(15)$
     $= \boxed{30cm}$

(ii) $2(L\cdot b + L\cdot b)$
      $= 2(7.5 + 5.5)$
      $= \boxed{26m}$

(d) Area

(i) $u\cdot b \times u\cdot b$
     8.5×6.5
     $\boxed{55.25m^2}$

(ii) $L\cdot b \times L\cdot b$
      7.5×5.5
      $\boxed{41.25m^2}$

②
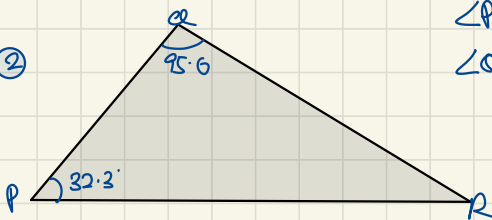
$\angle P = 32.3°$ correct to the nearest tenth of a degree
$\angle Q = 95.6°$ correct to the nearest tenth of a degree

Find (i) U.B   (ii) L.B of $\angle R$

increase value so decrease

(i) $\uparrow\angle R = 180 - (\downarrow P + \downarrow Q)$
    $= 180 - (L\cdot B - L\cdot B)$
    $= 180 - (32.25° + 95.55)$
    $\boxed{\angle R = 52.2°}$

$\angle P = 32.3 \xrightarrow[-0.05]{+0.05} \begin{array}{l} 32.35 \ (u\cdot b) \\ 32.25 \ (L\cdot b) \end{array}$

$\angle Q = 95.6 \xrightarrow[0.05]{} \begin{array}{l} 95.65 \ (u\cdot b) \\ 95.35 \ (L\cdot b) \end{array}$

(ii) $\angle R = 180 - (\angle P + \angle Q)$
     $\angle R = 180 - (UB + U\cdot B)$
     $\angle R = 180 - (32.35 + 95.65)$
     $\boxed{\angle R = 52°}$