Guide to: Bounds

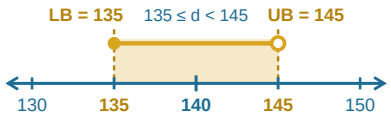
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Explanation:

When a measurement is rounded to a given unit, the Lower Bound (LB) is half a unit below the rounded value and the Upper Bound (UB) is half a unit above, giving the error interval **LB ≤ x < UB**. If a value is truncated rather than rounded, the LB is the stated value itself and the UB is one full unit above.

In calculations, choose the bounds of each variable carefully: UB(A + B) = UB(A) + UB(B), UB(A × B) = UB(A) × UB(B), UB(A − B) = UB(A) − LB(B), and **UB(A ÷ B) = UB(A) ÷ LB(B)**. To justify a final answer to a suitable degree of accuracy, round both UB and LB until they agree.

Example 1: d = 140 m (2 s.f.) and t = 8.4 s (1 d.p.). Find the upper bound of speed s = $\frac{d}{t}$ (2 d.p.).



Solution:

d (nearest 10 m): LB = 135, **UB = 145**
t (nearest 0.1 s): **LB = 8.35**, UB = 8.45
UB(s) = $\frac{\text{UB(d)}}{\text{LB(t)}} = \frac{145}{8.35}$ = 17.3652...
Answer: 17.37 m/s (2 d.p.)

Example 2: Using Example 1, find s to a suitable degree of accuracy and give a reason.

Solution:

LB(s) = $\frac{\text{LB(d)}}{\text{UB(t)}} = \frac{135}{8.45}$ = 15.9763...
UB(s) = 17.3652... and LB(s) = 15.9763...
To 1 s.f., both UB and LB round to **20 m/s**
(To 2 s.f., UB = 17 and LB = 16, which differ)
Answer: 20 m/s (both bounds round to 20 to 1 s.f.)

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