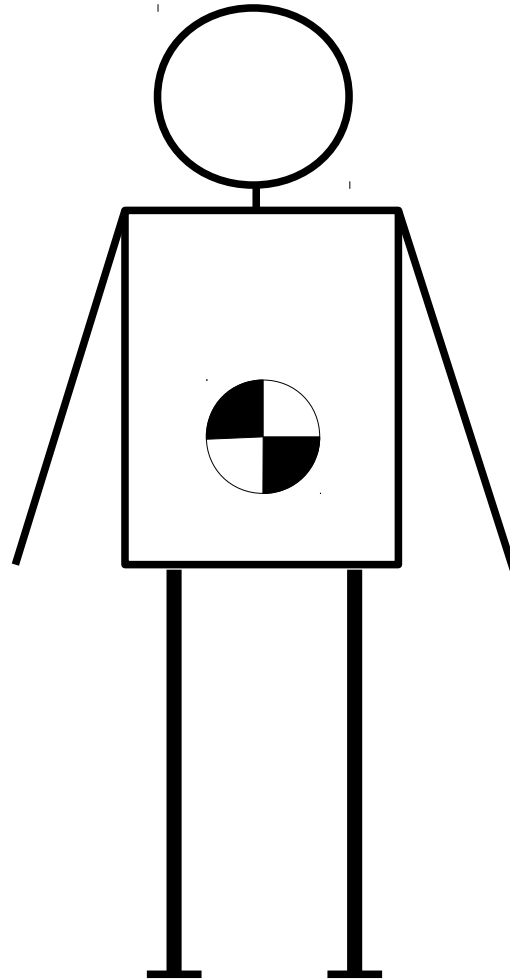
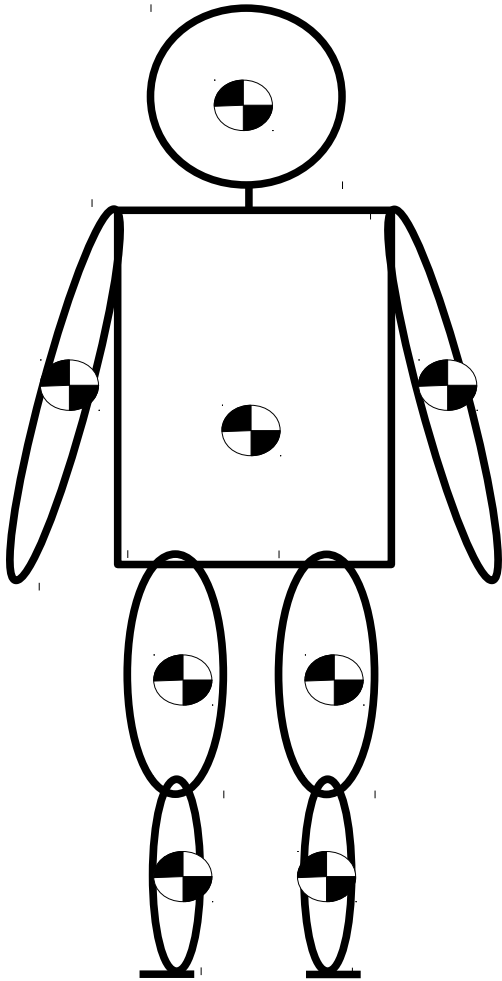


# Center of Mass (CoM)

The point at which all the body's mass seems to be concentrated\*



\*Kreighbaum and Barthels, 1996



Where are the segments?

What are the segments' properties?

# Length of segments

60 ANTHROPOMETRY

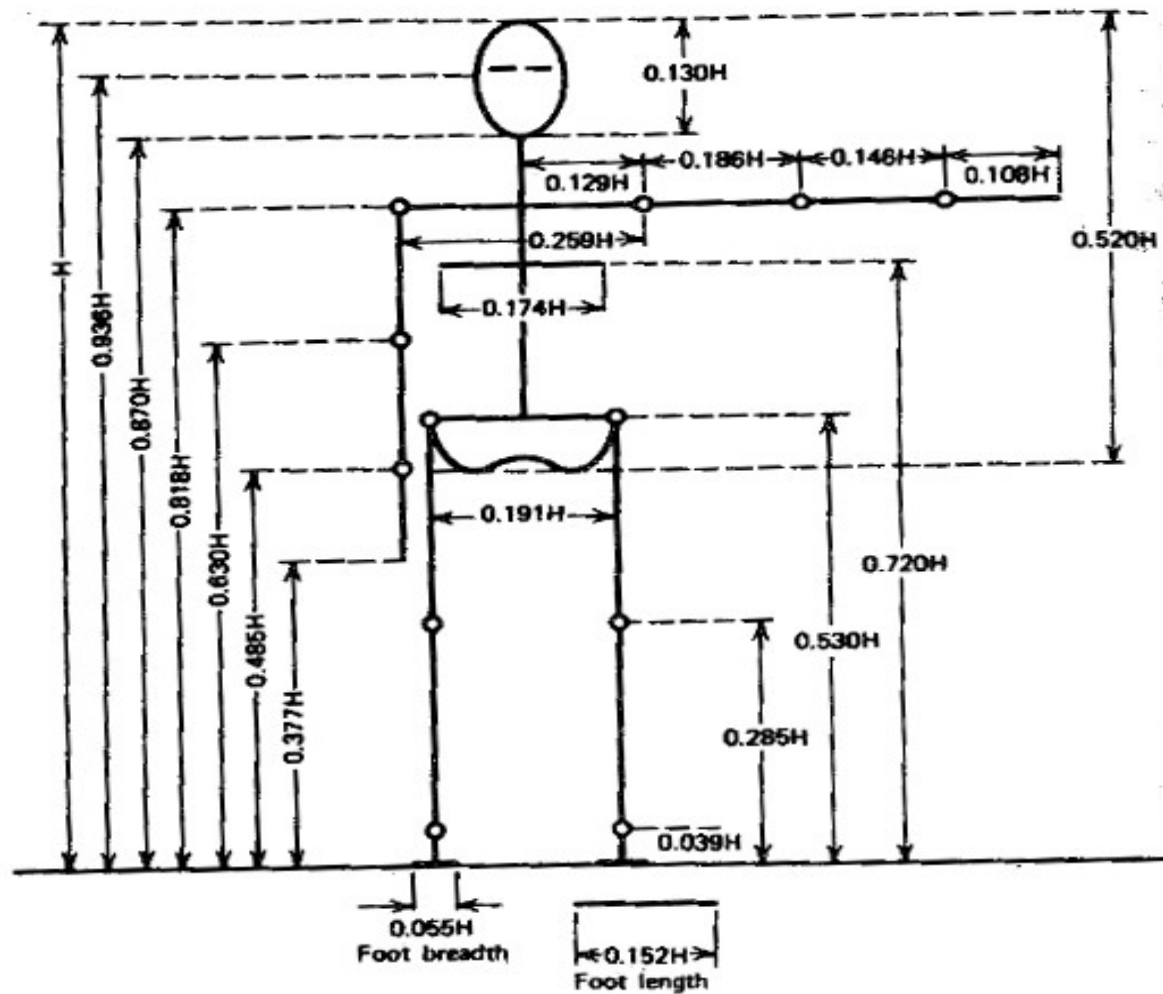


Figure 3.1 Body segment lengths expressed as a fraction of body height  $H$ .

If a subject is 1.70m tall,  
how long is his total leg?

Example:

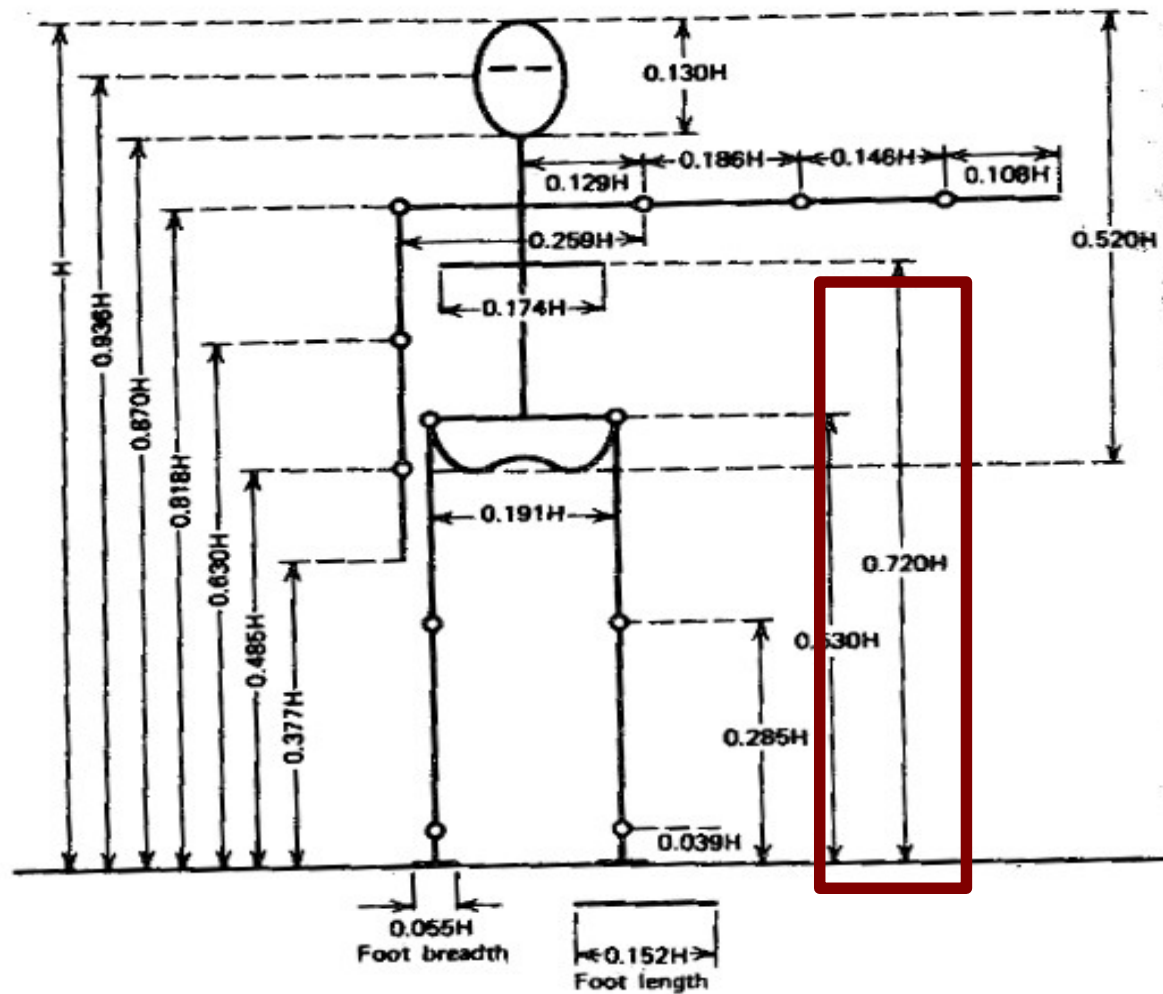


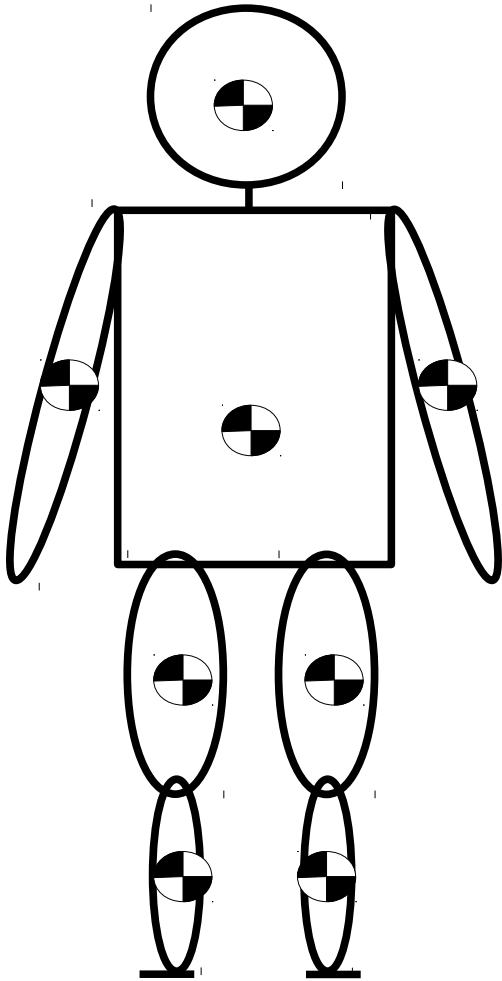
Figure 3.1 Body segment lengths expressed as a fraction of body height  $H$ .

Subject height: 1.70m

Length of total leg =  $0.530 \times 1.70\text{m}$

Length of total leg = 0.901m

What would be a more accurate way to determine segment length?



# Mass of segments

**TABLE 3.1 Anthropometric Data**

Segment	Definition	Segment Weight/ Total Body Weight	Center of Mass/ Segment Length		Radius of Gyration/ Segment Length		
			Proximal	Distal	C of G	Proximal	Distal
Hand	Wrist axis/knuckle II middle finger	0.006 M	0.506	0.494 P	0.297	0.587	0.577 M
Forearm	Elbow axis/ulnar styloid	0.016 M	0.430	0.570 P	0.303	0.526	0.647 M
Upper arm	Glenohumeral axis/elbow axis	0.028 M	0.436	0.564 P	0.322	0.542	0.645 M
Forearm and hand	Elbow axis/ulnar styloid	0.022 M	0.682	0.318 P	0.468	0.827	0.565 P
Total arm	Glenohumeral joint/ulnar styloid	0.050 M	0.530	0.470 P	0.368	0.645	0.596 P
Foot	Lateral malleolus/head metatarsal II	0.0145 M	0.50	0.50 P	0.475	0.690	0.690 P
Leg	Femoral condyles/medial malleolus	0.0465 M	0.433	0.567 P	0.302	0.528	0.643 M
Thigh	Greater trochanter/femoral condyles	0.100 M	0.433	0.567 P	0.323	0.540	0.653 M
Foot and leg	Femoral condyles/medial malleolus	0.061 M	0.606	0.394 P	0.416	0.735	0.572 P
Total leg	Greater trochanter/medial malleolus	0.161 M	0.447	0.553 P	0.326	0.560	0.650 P

If a subject's mass is 75kg,  
how much does his total leg weight?

Example:

**TABLE 3.1 Anthropometric Data**

Segment	Definition	Segment Weight/ Total Body Weight	Center of Mass/ Segment Length		Radius of Gyration/ Segment Length		
			Proximal	Distal	C of G	Proximal	Distal
Hand	Wrist axis/knuckle II middle finger	0.006 M	0.506	0.494 P	0.297	0.587	0.577 M
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Total leg	Greater trochanter/medial malleolus	0.161 M	0.447	0.553 P	0.326	0.560	0.650 P

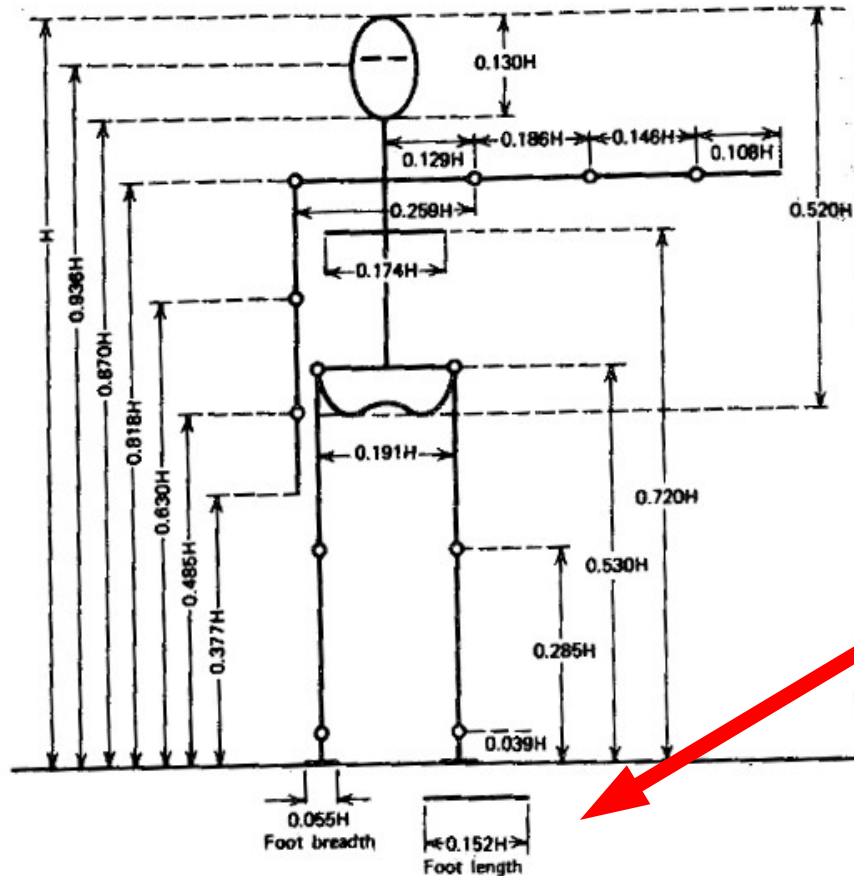
Subject total body mass: 75kg

Mass of total leg =  $0.161 \times 75\text{kg}$

Mass of total leg = 12.08 kg

How were these values determined?

# Numbers you need for Homework 2



Foot length:  $0.152 * H$

Figure 3.1 Body segment lengths expressed as a fraction of body height  $H$ .

## Numbers you need for Homework 2

Mass of Thigh:  $0.100 \cdot m$

Mass of Head:  $0.081 \cdot m$