

This is my own work _____ LAB TA _____ Time _____

Total Body Center of Mass

Define (<20 words)

Show 2 ways the position of the Center of Mass can be changed relative to the right foot

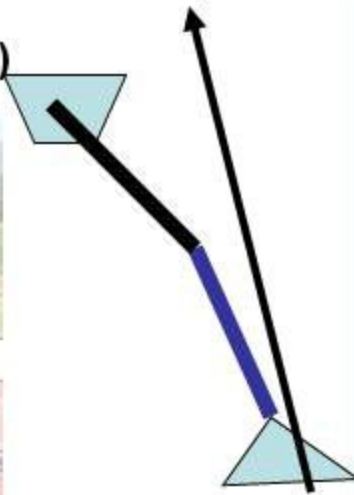
Knee Net Joint Moment (NJM)

Define (<20 words)

List 3 ways to decrease the magnitude of the NJM at the knee and draw 3 pictures showing how

Determine the Joint Kinetics (NJF, NJM) at knee

Net Joint Moment (NJM)
Net Joint Force (NJF)

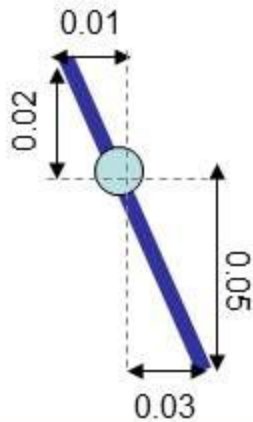


Report Final Answer by
DRAWING Reality Diagram of
Shank HERE

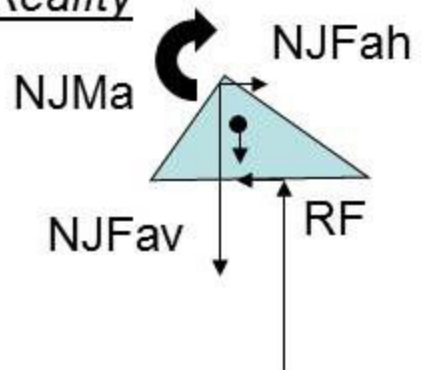


Must show all work to receive credit

Shank $W_{sh}=10N$



Reality



Magnitudes at ankle
 $NJF_{ah} = 3000\text{ N}$
 $NJF_{av} = 7000\text{ N}$
 $NJMa = 800\text{ Nm}$

Using these idealized reaction force-time curves during the last contact *estimate* CM vertical velocity and horizontal velocity at takeoff?

Area under RF_v-time curve is light
Area under RF_h-time curve is dark

Long Jump



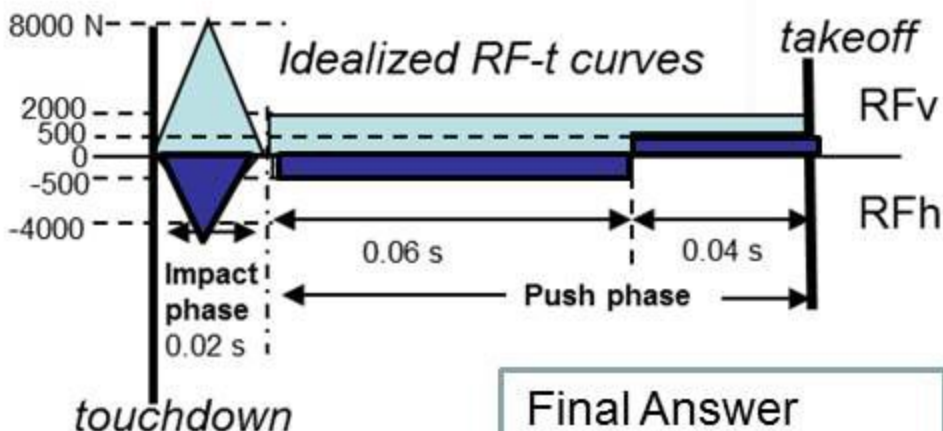
at touchdown

Total body mass = 70kg

$$CMV_v = 0 \text{ m/s}$$



$$CMV_h = 10 \text{ m/s}$$



Final Answer
at takeoff?

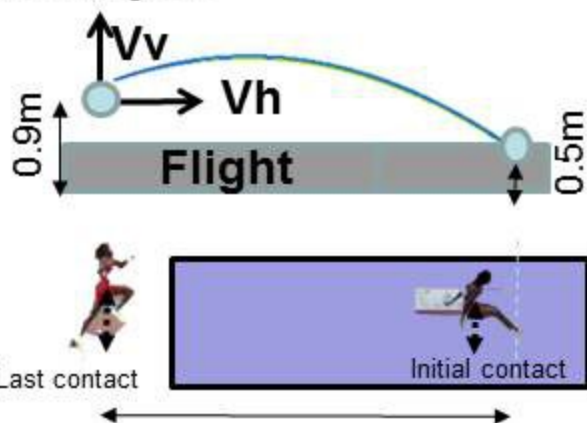
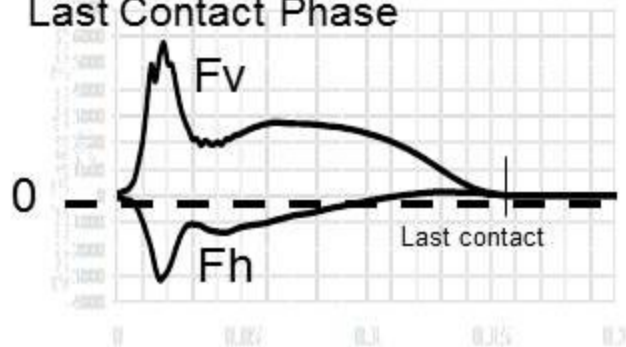
$$CMV_v = \underline{\quad} \text{ m/s}$$

$$CMV_h = \underline{\quad} \text{ m/s}$$

Must show all work to receive credit

Long Jump Analysis

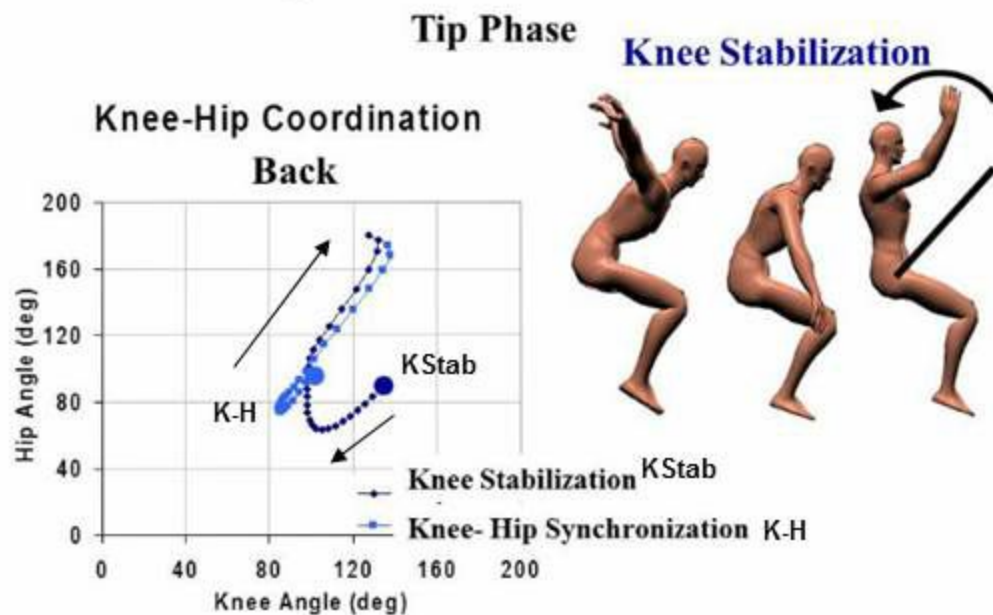
Reaction Forces during Last Contact Phase



Draw force-time curve graphs during last contact phase to show **how** the athlete could increase their horizontal CM displacement during the flight phase of the jump.

Draw Force-time curves here and < 20 words to explain.

Between Subject Differences in Joint Control



Circle correct answer (based on data plotted)

For both Joint Control Strategies

Rate of knee flexion during the squat is **>** **or** **<** than during extension

Range of hip motion is **>** **or** **<** than for knee

Circle TRUE OR FALSE

T F Knee stabilization control strategy maintains hip angle during joint extension

T F Individuals using both strategies initiate knee extension at the same angle

T F During joint extension, muscles crossing the anterior of the knee and hip shorten at the knee and lengthen at the hip

Draw FBD of the total body at each instant in time (in boxes) and draw the associated CM or Force – time curves

FBDs

Plots for Total Body CM

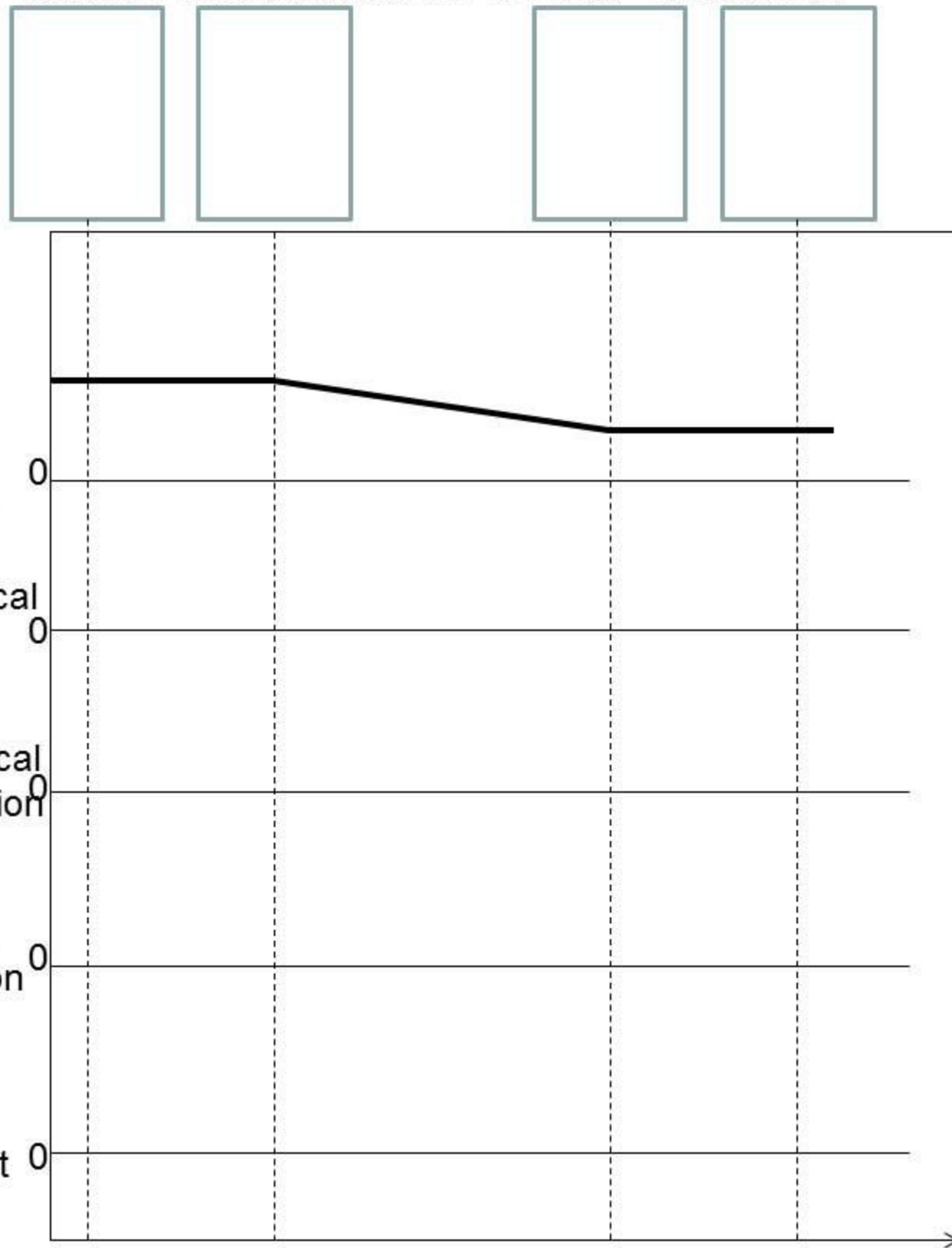
CM Vertical Position

CM Vertical Velocity

CM Vertical Acceleration

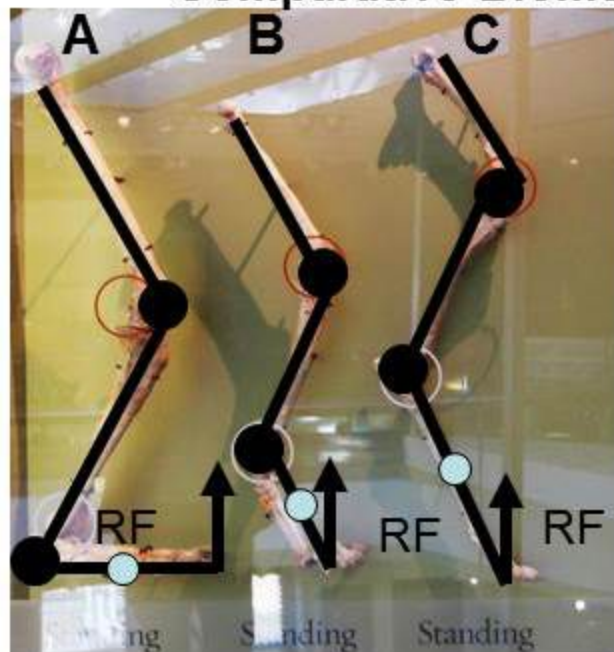
Vertical Reaction Force

Body Weight



Time (s)

Comparative Biomechanics: Different Legs of Animals



Using FBDs /Reality Diagrams
and < 20 words

Show WHY the NJM at the ankle
will be different for

Animal B vs Animal C

assume

- *RF are the same magnitude*
- *same foot segment angles*
- *same shank segment angles*

Show WHY the NJM at the ankle
will be different for

Animal A vs Animal C

assume

- *RF are the same magnitude*
- *same foot segment lengths*
- *same shank segment angles*