LECTURE 4 REVIEW QUESTIONS

1) Unit conversion: Fill in the missing values of angular measure in the table below.

	Degrees	Radians	Revolutions
a)	90		
b)		1	
c)	180		
d)			1
e)		2.75π	

2) During the knee flexion phase of a squat exercise, the relative angle of the knees moves from 180° to 95°. If you perform 10 complete squats, what is the total angular distance (in degrees and radians) and the total angular displacement (in degrees and radians) undergone at the knee?

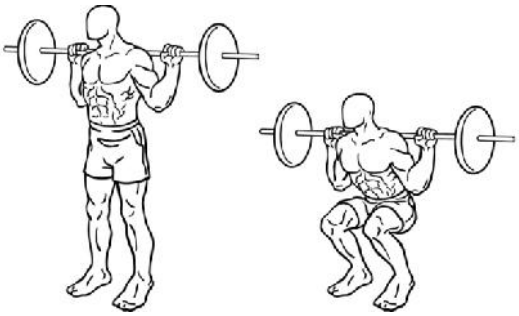
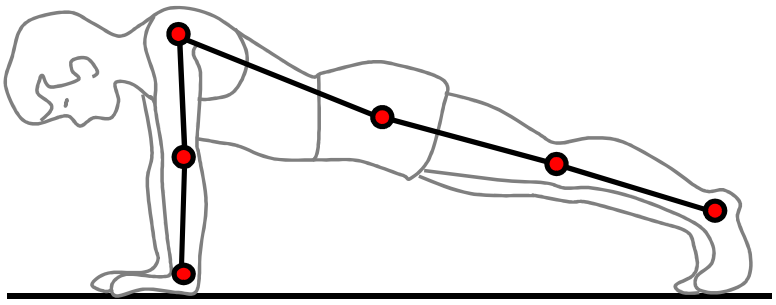


Image from: http://everkinetic.com/

3) Identify the following angles for the diagram below: a) the relative angle of the shoulder, b) the relative angle of the elbow, c) the absolute angle of the upper arm, d) the absolute angle of the thigh, e) the relative angle of the knee.



4) Describe a specific movement for which a relative but not an absolute angle is important to measure. Describe a specific movement for which an absolute but not a relative angle is important measure. Explain your answers.

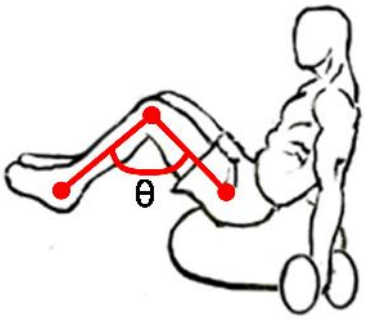
5) Based on the diagram and the table, calculate the absolute angle of the shank (lower leg), the absolute angle of the foot and the relative angle of the ankle.

Marker	Co-ordinates (x,y)
Toe	(6.9, 5.2)
Ankle	(6.6, 6.2)
Knee	(8.5, 8.3)

6) The absolute angle of the thigh has the following angular velocities during the support phase of walking. Calculate the angular acceleration at time 0.02 s in rad/s^2 and in deg/s^2.

Time (s)	Angular Velocity (rad/s)
0	1.033
0.02	1.511
0.04	1.882
0.06	2.190

7) You rotate your knee from an angle of 45° to 112° in 0.32 s at a constant angular velocity. (a) What is the angular velocity of the knee joint in °/s? (b) If the length of the shank segment (measured from the knee joint to the ankle joint) is 40 cm, what is the linear velocity, in m/s, at the ankle?



8) Using the concept of angular kinematics, explain why taller golfers may have an advantage over shorter golfers when trying to hit a golf ball with the greatest velocity. What might be a disadvantage of taller compared to shorter golfers?

Answers:
1) a) 0.5π rad, 0.25 rev; b) 57.3 °, 0.16 rev; c) π rad, 0.5 rev; d) 360 °, 2π rad; e) 495 °; 1.38 rev
2) angular distance = 1700 °, 29.67 rad; angular displacement = 0 °, 0 rad
5) shank angle = 47.9º above right horizontal; foot angle = 73.3º below right horizontal; ankle angle = 121.2º
6) 21.23 rad/s^2; 1216.1 deg/s^2
7) a) 209.4 °/s; b) 1.46 m/s