Sample Exam Questions: Chapter Five

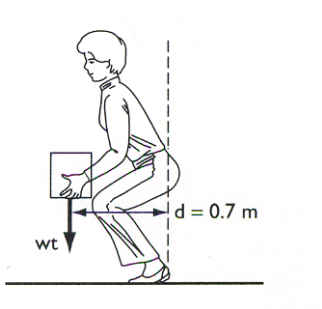
1. A 23-kg boy sits 1.5-m axis from the axis of rotation of a seesaw. At what distance from the axis of rotation must a 21-kg boy be positioned on the other side of the axis to balance the seesaw?
    a. 1.6 m
    b. 2.6 m
    c. 3.6 m
    d. 4.6 m

2. How much force must be produced by the biceps brachii at a perpendicular distance of 3 cm from the axis of rotation at the elbow to support a weight of 200 N at a perpendicular distance of 25 cm from the elbow?
    a. 1667 N
    b. 1777 N
    c. 1877 N
    d. 1977 N

3. Two people push on opposite sides of a swinging door. If the first exerts a force of 40 N at a perpendicular distance of 20 cm from the hinge, and the second exerts of force of -30 N at a perpendicular distance of 25 cm from the hinge. What is the net torque acting on the door
    a. 0.5 Nm
    b. 1.5 Nm
    c. 2.5 Nm
    d. 3.5 Nm

4. Which direction will the aforementioned door swing?
    a. Towards the first person
    b. Towards the second person
    c. The door will not move
    d. There is not enough information to determine the direction of motion

5. A worker holds a 90-N box at a distance of 0.7 m from the axis of rotation in her spine. Neglecting the effect of body weight, how much force must the lower back muscles exert, if the average moment arm (r) is 6 cm, to hold the box?
    a. 1050 N
    b. 1050 Nm
    c. More than 1050 N
    d. More than 1050 Nm



6. What is not a mechanical factor in determining the stability of a person?
    a. The height of the whole-body center of mass
    b. The weight of the person
    c. The nature of the base of support
    d. The fiber type of the lower extremity musculature

7. The center of mass and center of gravity for an individual can be used interchangeably only if:
    a. The individual is moving exceptionally fast
    b. The individual is exhibiting a large degree of trunk flexion
    c. The individual is very large
    d. The center of mass and center of gravity are synonymous

8. A weightlifter has mistakenly placed a 20-kg plate on one end of the bar and a 15-kg plate on the other end of the bar. The bar is 2.2 m long and has a mass of 20 kg, without the plates. The 20-kg plate is located 40 cm from the right end of the bar and the 15-kg plate is located 40 cm from the left end of the bar. Where is the center of mass of the bar, in relation to the right end of the bar, with the plates on it?
    a. 1.04 m
    b. 1.24 m
    c. 1.34 m
    d. 1.44 m

9. The shoulder joint of a tennis player is located at the coordinates <1,1.6> and the elbow joint is located at the coordinates <1.28, 1.77>. If the center of mass for the upper arm is estimated to be 43.6% of the distance from the shoulder joint to the elbow joint, where is the center of mass for the upper arm of this athlete?
    a. <1.18, 1.60>
    b. <1.12, 1.67>
    c. <1.10, 1.67>
    d. <1.00, 1.77>