# Physics 12: Torque and Static Equilibrium Worksheet, What a Treat!

1. Two forces are acting on a lever, both to the right of the pivot. If the sum of their two torques is zero, and neither force is parallel to the lever, what must be true? (more than one may apply)

 a. Both forces point in the same direction.

 b. The forces point in opposite directions.

 c. The components of the forces perpendicular to the lever are in opposite directions.

 d. The components of the forces perpendicular to the lever are in the same direction.

 e. The magnitudes of the perpendicular components must be equal.

 f. The magnitudes of the products of the forces and their respective distances from the pivots must be equal.

 g. The magnitudes of the products of the perpendicular components of the forces and their respective distances from the pivots must be equal.

 h. The magnitudes of the products of the parallel components of the forces and their respective distances from the pivots must be equal.

2. Two forces are acting perpendicularly to a lever. Force 1 acts a distance d1 from the pivot, Force 2 acts a distance d2=2d1 from the pivot. The torques from these two forces cancels. What is the ratio F2/F1?

 a. 2 b. ½ c. 1.5 d. 2F e. F/2

3. At what angle should a force be applied to a lever in order to provide maximum torque?

 a. 0o b. 45o c. 90o d. 180o

4. Find the centre of gravity for the object below. The connecting rod is rigid and massless.

 (Give answer relative to the left end of the object)

 2.0kg 1.5kg 3.2kg

 0.18m 0.42m 0.63m

5. The beam shown is non-uniform, 4.0m long, and has a cable attached two thirds of the way along its length. The tension in the cable is 4545N. The mass of the beam is 175kg.

 Cable

 225kg

 41o

 a. Locate the centre of mass for the beam

 b. Find the force acting at the base of the beam.

6. A block rests on a very strong inclined plane. The block is uniform and has a mass of 298 256 252kg. (It is very dense.) The dimensions of the block are 0.000 050m x 0.000 018m (It is very, very dense). What is the maximum angle of inclination, θ, before the block tips? Assume the block does not slide.

 θ

**LIKELY TEST QUESTION!**

7. A 1.20m tall dolly is used to move a stack of uniform boxes. What force must the mover apply to the handle to keep the dolly in rotational equilibrium, state the direction of force as either A or B?

 0.30m

 0.40m

 19kg 0.60m

 B

 **F** A 36kg

 0.50m

 53o

8. What is the net torque provided by these four forces on this object about the pivot shown?

 0.50m

 140N

 0.30m

 0.15m

 21o

 110N

 160N

9. A 1.2kg board of length 3.60m initially rests on two supports as shown.

  0.40m 2.2 m x

a) What maximum distance is from the right-hand support can a 2.20kg bird walk before the board begins to leave the left-hand support?

b) What force does the right-hand support exert on the board at that instant.