What is Torque?

Worksheet

Torque is the turning effect of a force around a pivot: = Fdsin, where F is the applied force, d is the distance from the pivot, and is the angle between the force and the lever arm.

= F d @sin()

Questions

1. What is the formula for torque?

A) = F/d
B) = Fdsin
C) = ma
D) = Fd

2. At what angle between force and lever arm is torque maximum?

A) 0
B) 45
C) 90
D) 180

3. What is the SI unit of torque?

A) Joule (J)
B) Newton (N)
C) Newton-meter (Nm)
D) Watt (W)

4. A force applied exactly along the lever arm (= 0) produces

A) Maximum torque
B) Half the maximum torque
C) Zero torque
D) Negative torque

5. A wrench applies a 100 N force perpendicular to a 0.3 m bolt handle. Find the torque.

6. A 20 N force is applied to a door at 60 from the hinge line, 0.8 m from the hinge. Find the torque.

7. A 150 N force is applied parallel to a 0.5 m lever arm (= 0). Find the torque.

8. Define: What is torque?

9. Define: What is a lever arm?

10. Define: At what angle is torque maximum for a given force and distance?

Answer Key

1. B) = Fdsin - Torque is force times lever arm times the sine of the angle between them.
2. C) 90 - sin(90) = 1, giving the maximum torque for given F and d.
3. C) Newton-meter (Nm) - Torque = force distance, measured in newton-meters.
4. C) Zero torque - sin(0) = 0, so no rotational effect is produced.
5. = Fdsin = 90 so sin = 1 = 100 0.3 1 = 30 Nm
6. = Fdsin = 20 0.8 sin(60) = 16 0.866 13.86 Nm
7. = Fdsin = 0 so sin = 0 = 150 0.5 0 = 0 Nm
8. The rotational equivalent of force - it measures how effectively a force turns an object around a pivot: = Fdsin.
9. The perpendicular distance from the pivot point to the line of action of the force.
10. = 90 (force perpendicular to the lever arm), since sin(90) = 1.