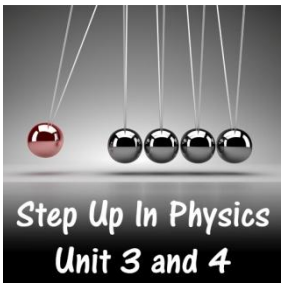
# Torque

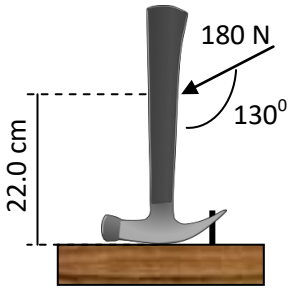
*Problems Worksheet*




1. A 28.0 cm long wrench is used to tighten a bolt. Calculate the torque applied to the wrench by the 345 N force shown in the diagram below.

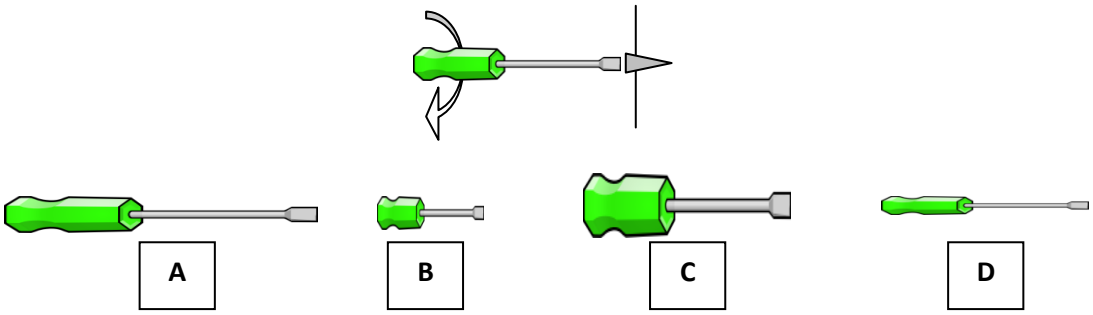

2. The two saucepans carrying water shown below are identical apart from having different length handles. A chef carries each saucepan filled with water across the kitchen by holding the very end of the handle. Explain which saucepan would be harder to keep horizontal to avoid spilling the water.

3. A claw hammer can be used to pull out unwanted nails from wood.
    a. Calculate how much torque is applied to the hammer shown below.



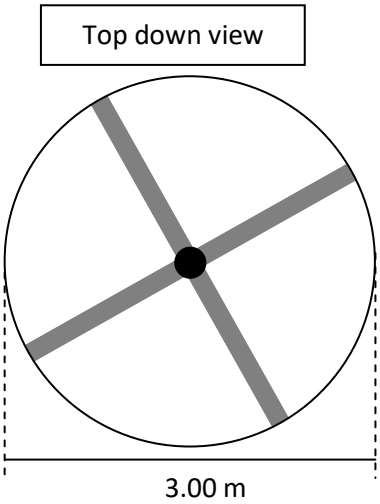

    b. List three changes that could be made to increase the amount of torque applied to the hammer.

4. Jason is using a screwdriver to remove a screw that is secured within a wall. Despite fitting really well inside the screw's divots, no matter how hard Jason tries, he can't get the screwdriver to start turning the screw.



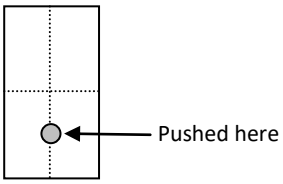

Which alternative screwdriver (A, B, C or D) should Jason attempt to use that is more likely to successfully turn the screw? Explain why this would be a more effective screwdriver.

5. A 2.10 m high revolving entrance to a shop is made of four glass panels attached to a central axle. The door is designed to start swinging when it feels a 8.00 Nm torque.



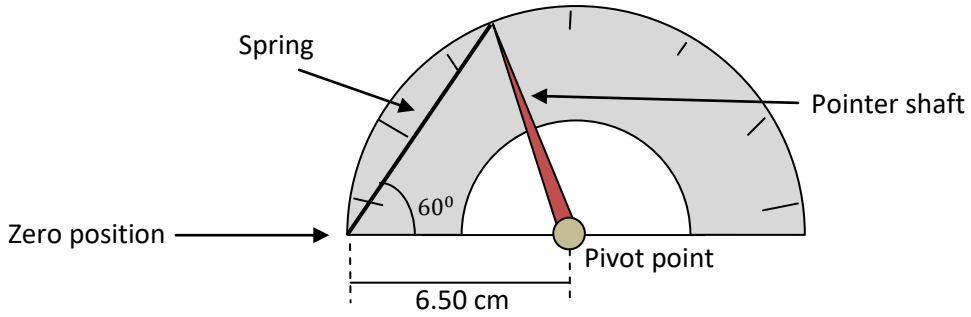

a. Calculate the force required to start the door swinging when one person pushes directly onto the middle of one of the four glass panels.

b. If a child pushes in the middle of the panel, but lower down, as shown in the diagram below, how would the force required to start the doors swinging be affected?




c. Is it possible to start the door swinging with a 4.00 N force? Justify your response.

6. The pointer shaft of a makeshift analogue dial is pulled back towards the zero position by a spring. The spring is attached from the zero position to the tip of the 6.50 cm pointer shaft. In the diagram below, the spring is angled at $60^0$ above the zero position (horizontally aligned with the pivot point) and has a tension of 1.10 N.




a. Calculate the torque applied to the pointer shaft by the spring.

b. Assuming that the tension in the spring remains constant, how does the torque change as the pointer shaft begins rotate, getting closer to the zero position? Justify your response.