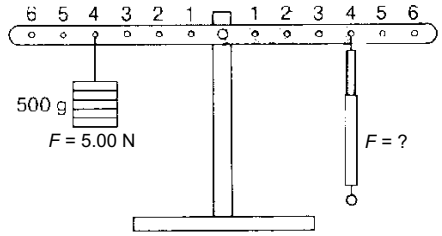
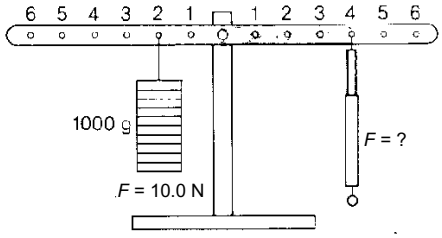
Lever and moment of force (torque) A20

1. Determine the force *F* required for the lever to be at equilibrium. The distance between two of the holes is always 10.0 cm.

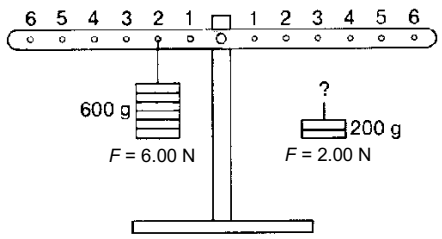
a)



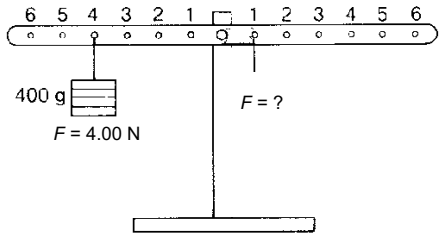
b)



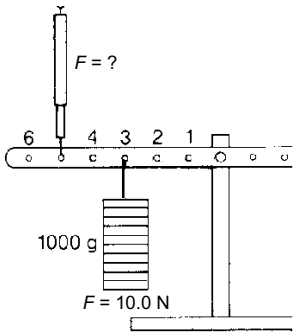
c)



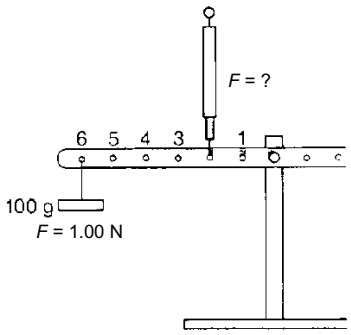
d)



e)

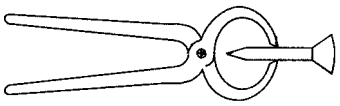


f)

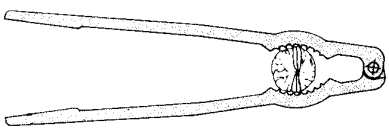


2. Draw the axis of rotation (pivot), the points where the forces are applied, and the lever arms. Remark: The tools a) and b) contain two levers each.

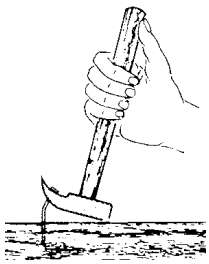
a)



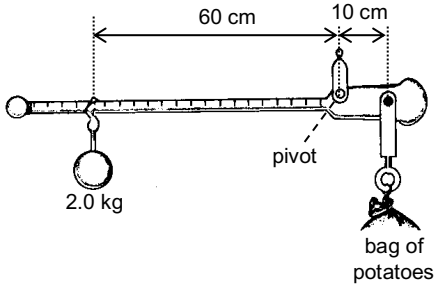
b)



c)

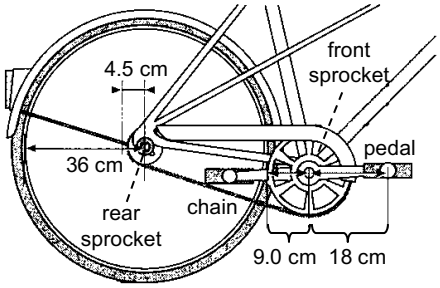


3. This scale uses only one piece of mass.
a) Explain how the scale works.
b) What is the mass of the bag of potatoes?

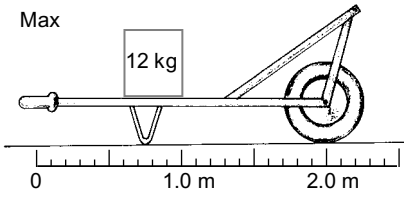


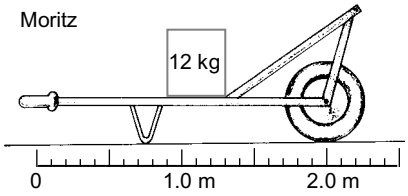
4. Here's an example of how forces are transmitted in a bicycle. The chains transfers force from the cog wheel (chain sprocket) at the front to the one at the rear.

a) What is the moment of force (torque) acting on the front sprocket (cog wheel), if someone applies a force of 500.0 N on the pedal?
b) What is the force acting on the chain?
c) Determine the force acting on the rear sprocket (cog wheel).
d) What is the moment of force (torque) acting on the rear sprocket (cog wheel)?
e) Calculate the force applied to the ground by the rear wheel.

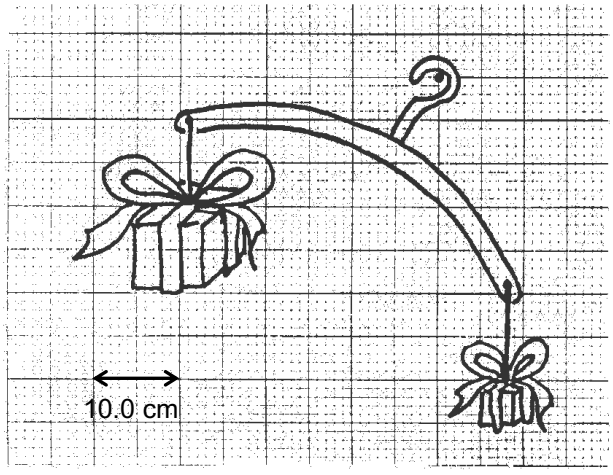


5. Max and Moritz have each placed a load on their wheel barrows (see picture).
a) Who needs to apply less force when he lifts the wheel barrow at the handle?
b) Draw in each picture the pivot (rotational axis), the direction of the forces and the lever arms.
c) What is the moment of force (torque) exerted by the weight of the box in each case?
d) Determine the amount of force required by Max and Moritz respectively if they lift their wheel barrows at the handle.





6. Two birthday presents are hanging from a clothes hanger. The weight of the smaller present is 7.25 N.



a) Draw the components of the lever arms perpendicular to the line of action of the forces exerted by the weights of the two presents. What is their length?
b) Calculate the weight of the larger present.

solutions

1. a) 5.00 N b) 5.00 N c) hole 6 d) 16.0 N e) 6.00 N f) 3.00 N
3. b) 12 kg
4. a) 90 Nm b) 1'000 N c) 1'000 N d) 45 Nm e) 125 N
5. c) Max: 141 Nm; Moritz: 106 Nm d) Max: 71 N; Moritz: 53 N
6. a) $r_{\perp(\text{right})}$ = 8.00 cm, $r_{\perp(\text{left})}$ = 29.0 cm b) 2.00 N