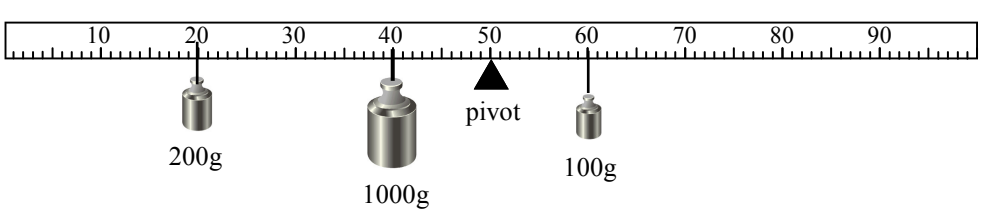
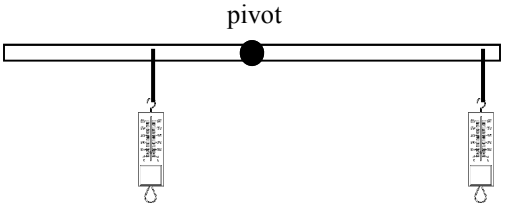
PreAP Forces 9

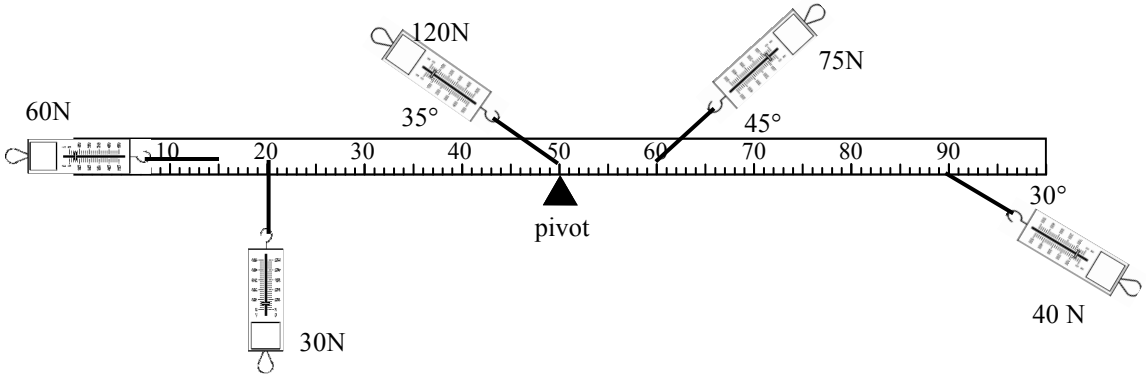


1. Where would you put the 500g mass to balance the lever?

2. Two forces are being applied to the lever at the left. The lever is not moving when both forces are applied.

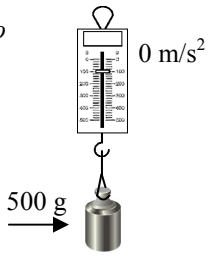


   A. Which spring scale gives positive torque?
   B. Which spring scale gives more torque?
   C. Which spring scale shows more force?
   D. If the left scale is turned so that its angle is no longer 90º but the force remains constant, what would happen to the lever?



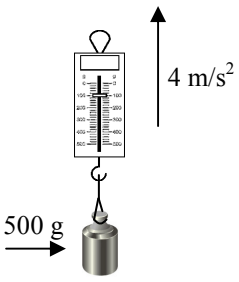
3. A. * Does the 30 N force provide a positive or negative torque?
   B. * On the diagram, calculate the individual torques on the lever above.
   B. * Calculate the net torque on the lever above.

A 500 g object is attached to a spring scale by a string. The mass is given three different accelerations. The diagram is not right for the tension. Use g = 10 m/s^2 Big Hint: 1000g = 1 kg (work in kilograms)



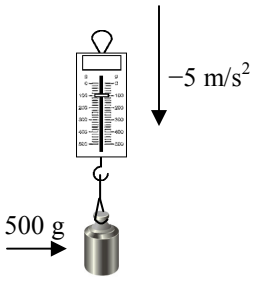
4. A. * <u>Calculate</u> the tension in the string when a = 0 m/s^2. (*Do your dot and diagram for the mass only*.)

   B. Does the scale read more, less, or the same as the weight of the object?



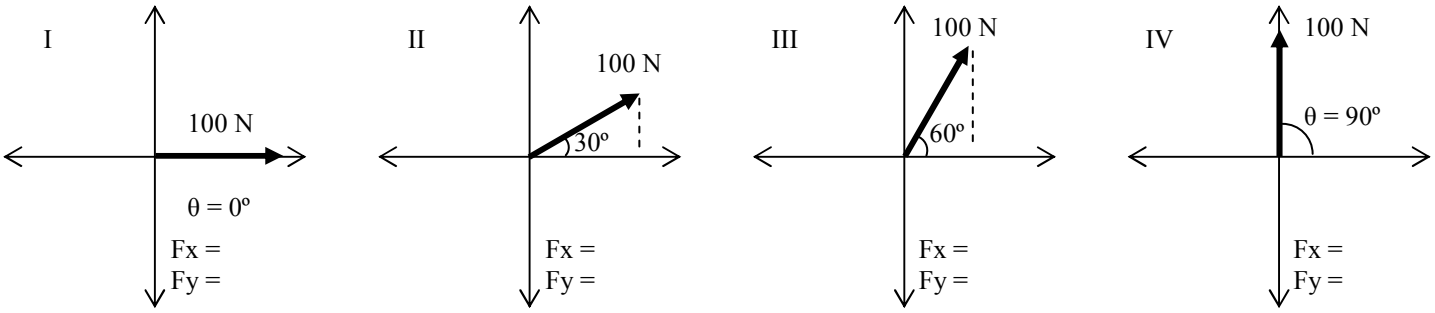
5. A. Calculate the tension in the string if the a = 4 m/s^2.

   B. Does the scale read more, less, or the same as the weight of the object?



6. A. Calculate the tension in the string if the a = −5 m/s^2.

   B. Does the scale read more, less, or the same as the weight of the object?

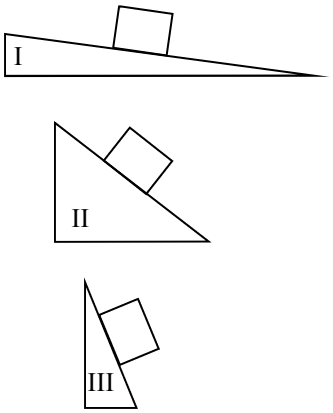


7. A 100 N force vector is rotated so that its angle changes from 0º to 90º.

   A. Calculate the x and y components for each situation above.
   B. Since the angle is measured from the x-axis, is the x-component sin or cos?
   C. As the angle increases, which component increases: x or y?
   D. So, as the angle increases, which function increases: sin or cos?

So, if some increases with the angle, use sin. Let's see how that makes our life easier.

8. Three equal masses are placed on different incline planes (ramps). The coefficients of friction are equal on each ramp.



   A. As the angle of the ramp increases the portion of the force of gravity pulling down the ramp increases or decreases?

      Gravity always pulls straight down and part of down is down the ramp (if the ramp is tilted, of course).

   B. As the angle increases, does the frictional force increase or decrease?
   C. Since $F_f = \mu F_N$ (friction depends on normal force), as the angle increases does the normal force increase or decrease?
   D. So, now using what you learned from Q7 above, is the component of gravity down the ramp sin or cos?
   E. Is the normal force sin or cos?

3A) The 30 N force causes CCW rotation which give + torque.
3B) The 60 N force gives no torque; The 40 N force give −8Nm of torque ($\tau = -40(.4)\sin 30°$) Figure out the others.
3C) 6.3 Nm total

4A) mg = 5 N (500g = 0.5 kg) T = 5 N, which is the same as the weight: T − mg = m(0)