Physics Review

1. Apply the work equation to determine the amount of work done by the applied force in each of the three situations described below. (from http://www.physicsclassroom.com/Class/energy/U5L1aa.cfm)
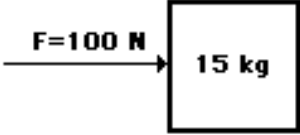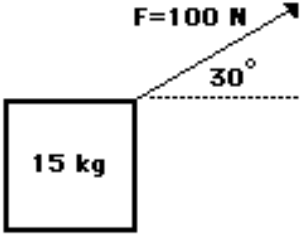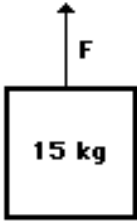
Diagram A	Diagram B	Diagram C
F=100 N → 15 kg	F=100 N 30° 15 kg	F ↑ 15 kg
A 100 N force is applied to move a 15 kg object a horizontal distance of 5 meters at constant speed.	A 100 N force is applied at an angle of 30° to the horizontal to move a 15 kg object at a constant speed for a horizontal distance of 5 m.	An upward force is applied to lift a 15 kg object to a height of 5 meters at constant speed.

Diagram A Answer:

W = (100 N) * (5 m)* cos(0 degrees) = **500 J (1 SF)**
The force and the displacement are given in the problem statement. It is said (or shown or implied) that the force and the displacement are both rightward. Since F and d are in the same direction,the angle is 0 degrees.
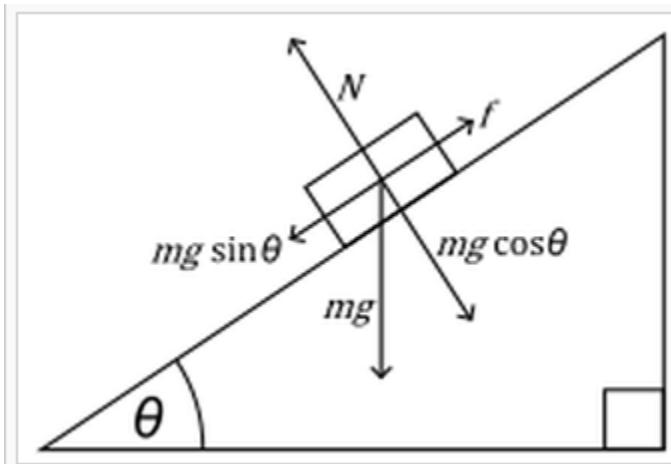
Diagram B Answer:

W = (100 N) * (5 m) * cos(30 degrees) = **433 J = 400 J (1 SF)**
The force and the displacement are given in the problem statement. It is said that the displacement is rightward. It is shown that the force is 30 degrees above the horizontal. Thus, the angle between F and d is 30 degrees.

Diagram C Answer:

W = mgh = (15*9.8 N) * (5 m) = **735 J = 7 X 10² J (1 SF)**

2. On a frictionless ramp show that the acceleration, a, of an object sliding down the ramp is equal to gsinθ.

mgcosθ will be used next year to figure out friction's effects.

Effective force = mgsinθ = ma.
m cancels:
gsinθ = a.

3. a) Why does the mass of an object not change from one planet to the other?

If the number of atoms in an object stays the same its mass won't change.

b) Yet, why does the weight vary?

Differences in density, radius and mass of a planet will affect g (that's why g varies a bit on earth too) . Weight = mg, so the weight will vary.
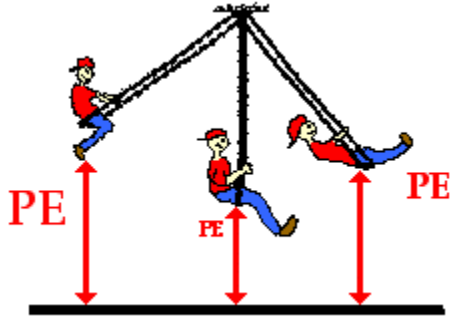
4.

Diagram from: http://www.physicsclassroom.com/class/energy/u5l1b.cfm

    a) If the boy is not moving when he is 2.0 m above the ground, how fast will he be moving at the instant that he is 1.0 m above the ground? Ignore air friction.

    b) Is the loss in potential energy equal to the gain of kinetic energy?

    a) Total energy at height of 2.0 m= total energy at height of 1.0 m

    P.E. + K.E at height of 2.0 m = P.E. + K.E at height of 1.0 m

    $mgh_1 + 0$ (not moving) $= mgh_2 + 0.5\ mv^2$.

    Cancel m:

    $gh_1 = gh_2 + 0.5\ v^2$.

    $9.8(2.0) = 9.8(1.0) + 0.5\ v^2$.

    V = 4.4 m/s

    b) yes