Problem 5A

Work ANSWERS!!

Fill each blank below with the word or phrase that completes the statement.

1. The total work done on an object is the _**sum**_ of the work done by the individual forces.

2. Positive work is done when____**force is in direction of motion**____.

3. The work done by a force parallel to the displacement is determined by multiplying the _**amount**___ of the force by the__**displacement**_____ .

4. The difference between positive and negative work is __**pos work is in the direction of motion, negative work is opposite the direction of motion**_____ .

5. Positive and work both occur parallel to the __**displacement (motion)**_____.

6. No work is done when the _**force**_____ is perpendicular to the___**displacement (motion)**_____ .

7. What is the equation for determining the amount of work done on an object when the force is applied at an angle? __**Work = Force *cos (θ) *Dis or F*D*cos(θ)**_

**12. A wagon is pulled 45 m along a level road at constant velocity. Find the amount of work done on the wagon by a force of 85 N that is applied to the handle and that makes an angle of 20.0° with the horizontal.

Work = Force *cos (θ) *Dis
Work = 85 N* cos (20) * 45
= 79.87 N* 45 m = 3594 N m or 3594 Joules

13. A piano is lifted 3.0 m vertically. Determine the work done on the piano if its mass is 750 kg.

Work = F *D =Fg *D = mg h = 750 (9.8) (3) = 7350 N * 3 m= 22050 Joules

**14. Determine the work done on a sled that is pulled 20.0 m by a 105 N force applied at an angle of 50° to the horizontal.

Work = Force *cos (θ) *Dis
= 105 * cos (50) * 20 = 67.5 N* 20 m =1349.9 Joules

15. A 34.5 kg box with an initial velocity of 10.0 m/s slides to a stop along a level road. If the displacement of the box is 17.5 m, determine the force of friction on the box and the work done to stop it.

Work = Force * Dis = mA *Dist
We need A……
$$Vf^2 = Vi^2 + 2\,A\,D \qquad A = Vi^2/(2D) = 10(10)/(2*17.5) = 100/35 = -2.857 \ m/s^2 = A$$
Ff=mA= 34.5 kg (2.857 m/s^s) = - 98.57 N = Ff
Work = F*D= -98.57 N*17.5m= 1725 Joules

WORK
The largest palace in the world is the Imperial Palace in Beijing, China. The palace covers a rectangle 750 m long by 960 m wide. If you were to push a lawn mower around the perimeter of such an area, applying a constant horizontal force of 60.0 N,what amount of work would you do?

Perimeter is 750 +960+750+960= 3420 m
Work = F*D= 60*3420=205, 200 Joules

1. With an overall height of 195 m, Lake Point Tower in Chicago is the tallest apartment building in the United States (although not the tallest building in which there are apartments). Suppose you live on the top floor of the building and your mass is 60.0 kg. How much work is done on you by the force of gravity as you ride the elevator from the top floor to the ground floor?

Work=F*D = Fg*D= mg h = 60(9.8) * 195= 588 N * 195 m = - 114, 600 Joules=Work done by gravity

2. In 1985 in San Antonio, Texas, an entire hotel building was moved several

blocks on 36 dollies. The mass of the building was about
1.45 *10^6 kg. Suppose the amount of work done on the building was
100 Mega J and the resistive force that had to be overcome was just
2.00 percent of the building's weight. How far was the building moved?

*Mass = 1 450 000 kg, Weight =mg= 1 450 000 * 9.8 = 14 210 000 Newtons*
Resistive Force = 2% (Weight) = .02 (14 210 000) =284 200 Newtons
*Work = F * D= 100, 000, 000 Joules = 284 200 N* Dist*
Dist = Work/Force = 100 000 000 / 282 200 = 351.9 m

3. A hummingbird has a mass of about 1.7 g. If the hummingbird ascends
straight up with a net acceleration of 1.2 m/s^2, how much work
does it do over a distance of 8.0 m?
*Work = Fup * Dist*

Fnet = Fup – Weight,
Fup = Weight + Fnet = .0017*9.8 + .0017*1.2
Fnet = mA= .0017*1.2 =.00204 Newtons
Weight= mg = .0017*9.8 = .01666 Newtons
Fup = Weight + Fnet = .00104+.01666= .0187 Newtons
Work = Fup* Height= .0187 N * 8 m = .1496 Joules=Work