Dynamics Worksheet #1

1. A 5.5 kg block is initially at rest on a frictionless horizontal surface. It is pulled with a constant horizontal force of 3.8 N.
    (a) What is its acceleration?
    (b) How long must it be pulled before its speed is 5.2 m/s?

2. In a modified "tug-of-war" game, two people pull in opposite directions on a 25 kg sled on an icy road. If the participants exert forces of 90 N and 92 N, what is the acceleration of the sled?

3. An object is acted on by two forces F_1=3.7 N and F_2=4.3 N as shown.
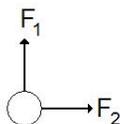
    Calculate the net force acting on the object.

4. A 40 kg girl and an 8.4 kg sled are on the surface of a frozen lake. By means of a rope the girl exerts a 5.2 N force on the sled, pulling it toward her. Assuming that no frictional forces exist
    (a) what is the acceleration of the sled?
    (b) what is the acceleration of the girl?

5. What strength of fishing line is needed to stop a 9.0 kg salmon swimming at 3.0 m/s in a distance of 0.2 m?

6. A 5.1 kg block is pulled along a frictionless floor with a force of 12 N by a rope attached at an angle of 25° with the horizontal. Calculate the acceleration of the block.

7. A worker drags a crate across a factory floor at a constant velocity by pulling on rope attached to the crate. The worker exerts a force of 480 N on the rope which is inclined at 38° with the horizontal. Calculate the frictional force between the crate and the floor.

8. A street lamp weighs 150 N. It is supported equally by two wires that form an angle of 120° with each other.
    (a) What is the force of tension in each of the wires?
    (b) If the angle between the wires is reduced to 90° what is the force of tension in the wires?

9. A 110 kg crate is pushed at constant speed up a frictionless 34° ramp with a force parallel to the ramp. Calculate the force pushing the crate.

10. You place a box of mass 20 kg on an incline plane that makes a 35° angle with the horizontal. Calculate the frictional force if
    (a) the box is stationary.
    (b) the box accelerates down the slope at a rate of 2.5 m/s^2.

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