Force Problems III

Numbers 1 to 7 refer to the diagram below, which shows a hand holding up a 4 kg mass by a string.

Imagine you pull up on the mass with a force of 40 N. (We would call this force the tension in the string).
a. What is the weight of the mass?



- b. So what is the net force on the mass?
- c. So what is the acceleration of the mass?
- 2. If you pull up on the mass with a force of 60 N, what is the acceleration of the mass? (Find the net force first.)
- 3. If you pull up on the mass with a force of 30 N, what is the acceleration of the mass? (Find the net force first.)
- 4. If the mass is accelerating <u>up</u>, what has to be true about the tension in the string?
- 5. If the mass is accelerating <u>down</u>, what has to be true about the tension in the string?
- 6. If the mass has a constant speed, what has to be true about the tension in the string?
- 7. If the mass is accelerating up at 1.5 m/s^2 , what is the tension in the string?

Numbers 8 to 11 refer to the following diagram:

$$\begin{array}{c} \hline 2.5 \text{ kg} \\ \hline \end{array} \quad F_a = 10 \text{ N}$$

8. What is the force of friction if the acceleration of the block is 4 m/s^2 ?

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- 9. What is the force of friction if the acceleration of the block is 0 m/s^2 ?
- 10. What is the force of friction if the acceleration of the block is 3 m/s^2 ?
- 11. A 125 kg astronaut is at rest in outerspace. She then turns on the booster jets in her space suit and speeds up to 0.8 m/s in 2.5 seconds.
 - a. What was her acceleration?
 - b. What was the net force on her?
 - c. What was the force of the booster jets on her?
- 12. A 25 kg box initially at rest is pulled to the right with a constant force of 50 N. After 3 seconds, the box has traveled 7 meters.
 - a. What was the acceleration of the box?
 - b. What was the net force on the box?
 - c. Why is the net force less than the applied force of 50 N?
 - d. What is the force of friction on the box?

- 13. Starting from rest, a 35 kg child is pulled with a constant force of 55 N for 5 seconds. There is also a constant frictional force of 40 N.
 - a. What was the net force on the child?
 - b. What was the acceleration of the child?
 - c. What was the final speed of the child?

Answers: 1.a) 40 N b) 0 N c) 0 m/s² 2) 5 m/s² up 3) 2.5 m/s² down 4) Tension > weight 5) Tension < weight 6) Tension = weight 7) 46 N 8) 0 N 10) 2.5 N 11. a) 0.32 m/s² b) 40 N c) 40 N 9) 10 N 12. a) 1.56 m/s² b) 38.9 N c) there must be friction d) 11.1 N 13. a) 15 N b) 0.43 m/s² c) 2.14 m/s