Part C2 Problems

1. A person whose weight is 900 N is standing on a "bathroom scale in an elevator accelerating downward. (a) What would have to be the elevator's acceleration in order that the scale read only 100 N? (b) What would have to be the acceleration in order that the person be "weightless"?

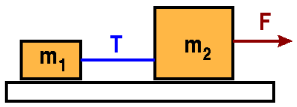
2. Two blocks are in contact on a tabletop, sliding together to the right. The one on the left has a mass of 3 kg, and the one on the right has a mass of 6 kg. A person is pushing to the right on the left block with a force of 36 N. What is the contact force between the two blocks?

3. A 50-N weight is hanging at the end of a string. A person pulling upward on the other end of the string causes the weight to accelerate upward at a rate of 1.33 m/s^2. (a) What is the tension in the string? (b) What force does the person exert?

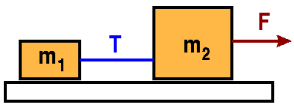
4. A 60-kg block at the end of a rope is being lowered to the ground. The rope's tension is 420 N. What is the block's acceleration (in m/s^2)?

5. A falling 3.0-kg object is connected to a string that passes over a pulley and connects to a 4.0 kg block sliding across a tabletop toward the pulley. (a) What is the acceleration of each of the objects? (b) What is the tension in the string?

6. The block on the left in the figure below has a mass of 2 kg. A force F = 60 N causes the acceleration of the pair to be 3 m/s^2, resulting in a tension in the connecting string of 6 N. What is the mass of the larger object?



7. The two blocks on a frictionless tabletop in the figure below are connected by a string, and the pair of blocks is pulled to the right by a force, F. The mass of the smaller block is 6 kg, and the mass of the larger block is 24 kg. What value of F (in newtons) would cause the tension in the string to be 54 N?



Solutions

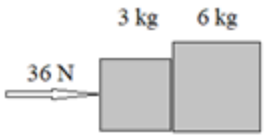
1.

m = 900/9.8
= 91.84 kg

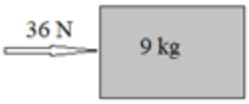
(a) -900 + 100 = 91.84 a
a = -8.71 m/s^2

(b) -900 - 0 = 91.84 a
a = -9.8 m/s^2

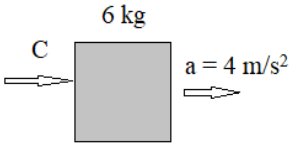
2.



same as:

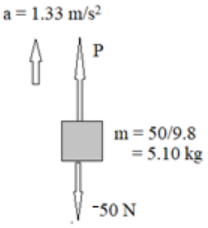


F = ma
36 = 9a
a = 4 m/s^2



F = ma
C = 6(4)
= 24 N

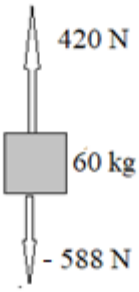
3.



P - 50 = 5.10 (1.33)
P = 56.78 N

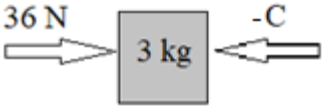
Person pulls upward with a force of 56.78 N. Tension is 56.78 N.

4.



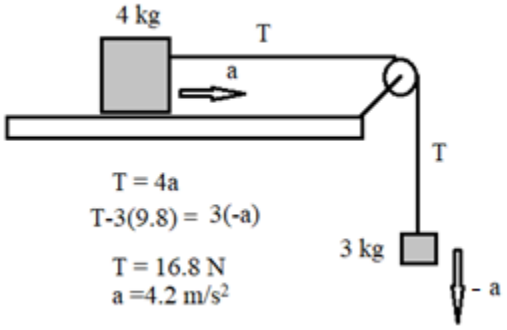
420-588 = 60a
a = -2.80 m/s^2

Problem 2: Other Way:



a = 4 m/s^2

36-C = 3(4)
C = 24 N

5. The acceleration of the 4-kg block is positive, a, while the falling block's magntitude of acceleration is the same, but negative.  	**6.** Isolate the 2-kg object: $6 = 2a$ $a = 3\ m/s^2$. Now apply Newtons' 2nd Law to the pair: $60 = (2 + m_2)\ 3$ $m_2 = 18$ kg
	7. Newton's 2nd Law applied to the 6-kg block: $54 = 6\ a$ $a = 9\ m/s^2$ Now apply F = ma to the 30-kg pair: $F = (6 + 24)(9)$ $= 270$ N