Forces/Tension

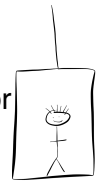
Name_____

A) **Straight Line Tension**

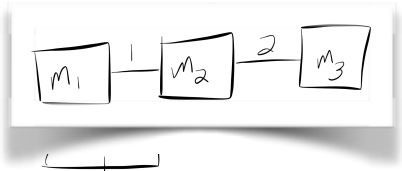
1) A 46 kg mass is hanging from a rope. The tension in the rope is:

2) An 8.72 m/s^2 acceleration (upward) is applied to the rope in #1. What tension is felt now?

3) A 72 kg man is in a 1250 kg elevator. (A) As the elevator accelerates upward at 22 m/s^2, what tension is in the cable? (B) When it is traveling upward at a constant speed, the tension is? The elevator stops. (C) The tension is? (D) As it descends, accelerating at 5 m/s^2, the cable has what tension? After descending at a constant speed for some time, it slows to a stop with a 18 m/s^2 braking force. (E) What tension is in the cable then?



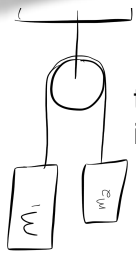
4) Three masses are connected as shown. M_1 is 8.3 kg, M_2 is 4.6 kg and M_3 is 7.9 kg. If they are accelerated to the left along a frictionless surface at 5.89 m/s^2, what is the tension in both ropes? What force is being exerted?



5) If there is a μ of .289 between the blocks and the table and it continues to accelerate at the 5.89 m/s^2 rate, what are the new tensions?

6) If the setup in #4 is now hung vertically, with m_1 on top, what tensions would be felt in the two ropes?

7) An 8 kg mass and a 6 kg mass are suspended as shown. (A) What is the tension in the string If you are holding m_2 so it can't yet move? (B) After being released, what tension is felt in the string?



B) **Angled Static Tension**

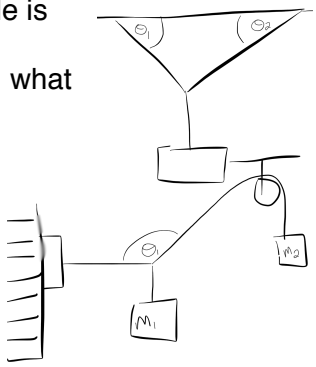
1) A 79 kg mass is suspended as shown. The angle on the left is 60^o and the right angle is 30^o. What is the tension in each cable?

2) If the tension in the left cable is 132 N, the left angle is 41^o and the right angle is 36^o, what is the mass?

3) A 29 kg mass is suspended as shown. The angle on the left is 51^o and the right angle is 33^o. What is the tension in each cable?

4) The angle in the diagram 2 is 120^o. m_1 is 27 kg. What is m_2? What is the tension in the horizontal cable?

5) If m_1 is 2.47 kg and makes a right angle with the horizontal cable, and m_2 is 4.28 kg, what angle is formed, and what tension is produced in the angled cable?



C) **Angled Dynamic Tension**

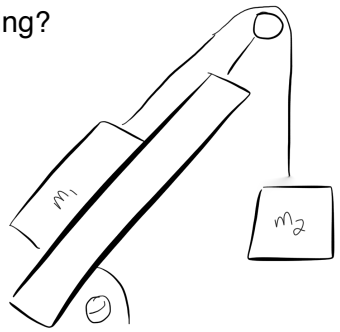
1) A 14.6 kg box sits on a ramp inclined to 42^o, (A) what force is pulling it down the ramp? (B) What would be it's acceleration? (C) If there is sliding friction of .369, what would the acceleration be now? (D) What static friction μ would be needed to keep the box from sliding at that angle?

2) What force is needed to accelerate a 2.96 kg box UP a 47^o ramp with a μ_k of .375 at 15.2 m/s^2?

3) m_1 and m_2 are both 9.27 kg. The angle of incline is 57^o. What tension is in the string? How quickly is the system accelerating?

4) If there is a μ_k of .289 between m_1 and the table, what is the tension now?

5) m_1 is 8.92 kg, and the μ_s is .397 between m_1 and the table. If the angle of incline is 57^o, what is the largest mass that would NOT get motion? If μ_k is .319 and you bump the table, what is the acceleration and tension in the system?



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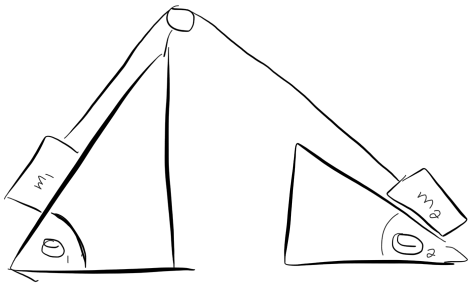
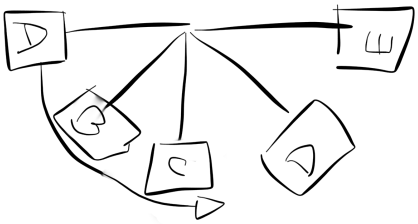
D) ***More* Angled Dynamic Tension**



1) In the setup to the right, m_1 is 14.5 kg, and m_2 is 8.92 kg. The left angle is 62° and the right angle is 47°. What would be the resulting tension in the string if friction did not exist?
2) If the μ_k is .239 in all surfaces, what tension should be present?
3) If, m_1 is 38.4 kg, and m_2 is 29.2 kg. The left angle is 60° and the right angle is 45°. What would be the resulting tension in the string if friction did not exist?
4) Draw a detailed free-body diagram labeling all forces acting if friction IS present.
5) What minimum static friction μ would prevent movement in the setup for #3?
6) A mass of 2.92 kg swings in pendulum-like motion as shown to the right. If the string is 1 m long and the mass is released at point A, how fast is the mass traveling at point C?
7) What is the tension of the string at point A?
8) What is the tension of the string at point C If the weight was released at point A?
9) If the angle between point C and D is 40°, What is the tension at D?



Pbs A
1) 450 N
2) 850 N
3) a) 42000 N
b) 13000 N
c) 13000 N
d) 6400 N
e) 37000 N
4) 1) 73.6 N
2) 46.5 N
Fa) 123 N
5) 1) 109 N
2) 68.9 N
Fa) 183 N
6) 1) 123 N
2) 77 N
7) a) 78 N
b) 67 N

Pbs B
1) 775 N down, 671 N left side, 388 N right side
2) 16.2 kg
3) 280 N down, 180 N right side, 240 N left side
4) 31.2 kg, 153 N
5) 145°, 42.0 N
Pbs C
3) 0.791 m/s², 83.6 N
4) 90.8 N
5) 9.41 Kg, 0.203 m/s², 90.4 N
1) 95.8 N, 6.56 m/s², 3.87 m/s², 0.900

Pbs D
1) 87 N
2) 90.2 N
3) 256 N
5) .316
6) 4.43 m/s
7) 0 N
8) 85.9 N
9) 65.8 N