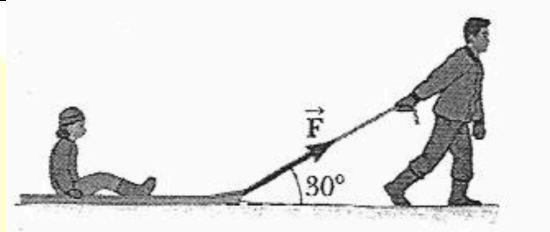


Part 1 (9 marks): Indicate the answer choice that best completes the statement or answers the question

Q1: Consider an object moving to the right at a constant velocity. Which of the following statements is true?

- A There is only one force applied to the object directed to the right
- B The net force on the object is directed to the right
- c The net force on the object must be zero
- d There must be no forces at all applied to the object

Q2: A sled on frictionless ice is pulled by applying a force of $F = 130 \text{ N}$ directed 30° above the horizontal, as shown. The mass of the sled and its occupant is 60 kg . What is the acceleration of the sled?



- A 1.88 m/s^2
- B 1.08 m/s^2
- c 2.07 m/s^2
- d 1.25 m/s^2

Q3: You pull a cart across a horizontal surface by applying a constant horizontal force of 100 N . The force of friction between the cart and the surface is 20 N . The cart moves with an acceleration of 2 m/s^2 . What is the mass of the cart

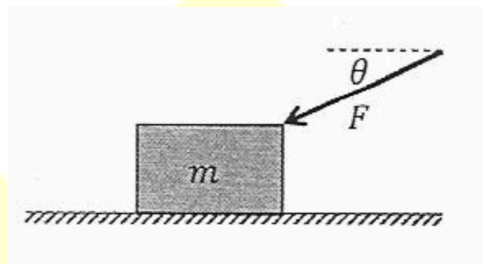
- A 10 Kg
- B 40 kg
- c 50 kg
- d 80 Kg

Q4: A rocket is launched from rest accelerating straight upwards. The apparent weight (normal force) of a 57 kg astronaut in the rocket during takeoff is 3000 N . What is the acceleration of the rocket?

- A 42.8 m/s^2
- B 62.4 m/s^2
- c 62.4 m/s^2
- d 55.7 m/s^2

- Q5: A ball is attached to a spring having a force constant $k = 32 \text{ Nm}$. When the ball is hanging from the spring and it is in equilibrium the spring extends by 5 cm. What is the mass of the ball?
- A 63 g B 640 g c 32 g d 163 g

- Q6: In the figure, a block of mass $m = 3 \text{ kg}$ is resting on a horizontal rough surface. The block is pushed with the force $F = 10 \text{ N}$ directed at $\theta = 30^\circ$ below the horizontal, as shown. What is the magnitude of the normal force acting on the block?



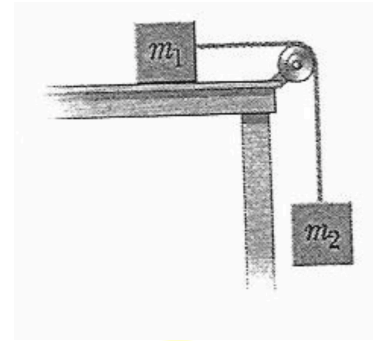
- A 29.4 N B 39.4 N c 24.4 N d 34.4 N

- Q7: A bucket of mass 4.5 kg is pulled using a rope. It accelerates upwards at 1.2 m/s^2 . What is the tension in the rope?



- A 44.1 N B 49.5 N c 38.7 N d 5.4 N

Q8: In the figure, a block of mass $m_1 = 7.5\text{ kg}$ on a horizontal surface is attached by a rope over a pulley to another block of mass m_2 . The system remains motionless if the hanging mass m_2 is not larger than 5.2 kg . What is the coefficient of static friction between the horizontal surface and the mass m_1 ?



A 1.44 B 2.30 c 0.69 d 0.77

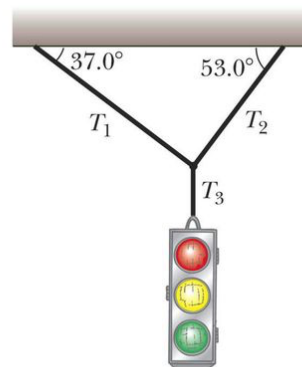
Q9: An 80-kg pilot at an air show performs a vertical loop with his plane and moves in a circular path of radius 58 m. At the bottom of the loop the plane is moving at 45 m/s. Determine the normal force acting upon the pilot.

A 2793.1 N B 2009.1 N c 3577.1 N d 1453.1 N

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Part 2 (6 marks): Solve the following TWO problems in the provided space and show your work in detail.

Q1. (3 marks) Consider a traffic light hanging on two cables fixed on a horizontal plan as in the figure below. The first cable makes an angle $\theta_1 = 37^\circ$ and the second cable makes an angle $\theta_2 = 53^\circ$ with the horizontal. If the traffic light is in equilibrium, and the tension in the second cable $T_2 = 102.2 \text{ N}$, find the tensions T_1 , T_3 , and determine the weight of the traffic light.



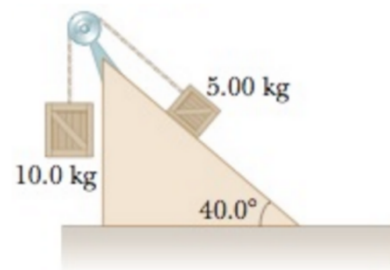
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Q2. (3 marks) Two blocks are connected by a string over a pulley, as shown in the figure. The smooth inclined surface makes an angle of 40° with the horizontal, and the block on the incline has a mass of $m_1 = 5 \text{ kg}$. The mass of the hanging block is $m_2 = 10 \text{ kg}$.

- Draw a free-body diagram for each block. Marks
- Determine the acceleration of the system
- Determine the tension in the string.



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