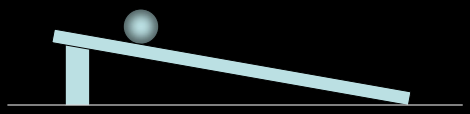
Questions of the Day

ZTF – Zero Total Force Model

Newton's 1st and 3rd Laws

Question of the Day



- A ball is released at the top of a ramp.
- Why does the ball do what the ball does?
- *Answer: The ball is interacting with other objects via forces.*

Question of the Day

- Why is "atom" a misnomer (a false name)?
- *Answer: Because "atom" means undividable, and an atom can be divided, or split, into more fundamental parts.*

Question of the Day

- What are protons and neutrons made of?
- *Answer: Quarks, which are a fundamental particle.*

Question of the Day

- What are electrons made of?
- *Answer: Electrons are made of… electrons. An electron is a fundamental particle, it's not made of anything smaller.*

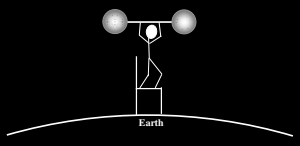
Question of the Day

- A police car gives a large truck a push. How does the push of the car on the truck compare to the push of the truck on the car…
  - while speeding up?
  - while moving at a constant speed?
- *Answer: The two objects are engaged in one contact interaction, so each object experiences same force, Newton's 3rd Law, $F_{car\text{-}truck} = -F_{truck\text{-}car}$*

Question of the Day

- Which of the following best describes the forces present as you throw a ball?
  - Force of hand on ball > Force of ball on hand
  - Force of hand on ball < Force of ball on hand
  - Force of hand on ball = Force of ball on hand
  - Not enough information is provided
- *Answer:* $F_{hand\text{-}ball} = -F_{ball\text{-}hand}$

Question of the Day



- How many forces are acting upon the person? What are they?
- *Answer: Three forces,* $F_{g\text{-}Earth,\ person}$, $F_{p\text{-}barbell,\ person}$, $F_{N\text{-}chair,\ person}$

Question of the Day

- Your friend is jumping up and forward off the end of a dock. How many forces are acting on your friend? What are they? Are they balanced?
- *Answer: Three forces,* $F_{N\text{-}dock,\ person}$, $F_{g\text{-}Earth,\ person}$, $F_{f\text{-}dock,\ person}$*; not balanced in order to provide acceleration up and forward.*

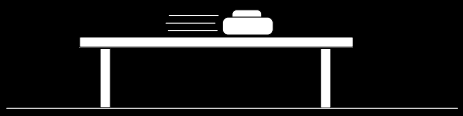
Question of the Day

- How many forces are acting on the donkey? …on the person? What are they?
- *Answer: four forces on each,* F_g, F_N, F_T, F_f

Question of the Day

- The donkey has a mass of 160 kg and the person has a mass of 80 kg. What is the gravitational force on each?
- *Answer:* $F_{g\text{-}Earth,\ donkey} = 1{,}568$ *N,* $F_{g\text{-}Earth,\ person} = 784$ *N*

Question of the Day

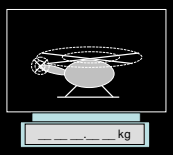


- Draw a force diagram for the hover-puck as it coasts along the surface of the table. Label the force vectors with proper notation.
- *Answer:* $F_{g\text{-}Earth,\ puck}$ *down,* $F_{p\text{-}air,\ puck}$ *up*

Question of the Day

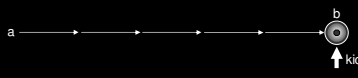
- Draw a force diagram for the hover-puck after it has left the table. Label the force vectors with proper notation.
- *Answer: $F_{g\text{-}Earth,\ puck}$ down*

Question of the Day

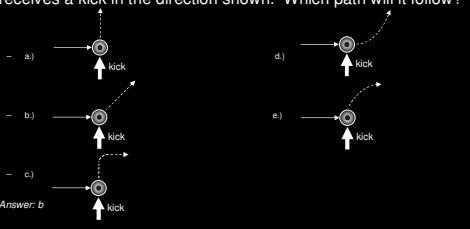


- A toy helicopter hovers inside a sealed box. The box is on a scale. Did the reading on the scale change when the helicopter lifted off the ground?
- *Answer: No, reading remains constant. Instead of helicopter pushing down on box, helicopter now pushes down on air, which pushes down on box.*

Question of the Day

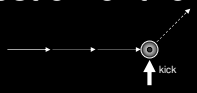


- A hover-puck moves at constant speed from "a" to "b". At "b" it receives a kick in the direction shown. Which path will it follow?



- *Answer: b*

Question of the Day



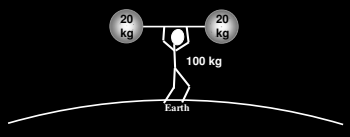
- As the frictionless hover-puck is traveling in its new direction…
  - Describe its speed.
  - Which of the following describes the forces upon it?
    - a.) downward force of gravity
    - b.) downward force of gravity, horizontal force in direction of motion
    - c.) downward force of gravity, upward force from air, horizontal force in direction of motion
    - d.) downward force of gravity, upward force from air
    - e.) none (no forces act on the puck)
- *Answer: speed will be constant; $F_{g\text{-}E,\ puck}$, $F_{p\text{-}air,\ puck}$*

Question of the Day

http://www.hq.nasa.gov/alsj/a15/a15v.1672206.mov

- Which will hit the ground first- hammer or feather?
- While the astronauts were on the moon, how did they keep from falling off?
  - Heavy boots? -- Ropes? -- Suction Cups?
  - "Gravity Boots"? -- Spikes on Boots?
- *Answer: Hit sat same time; Same reason we don't fall off Earth, gravity pulls you toward the surface.*

Question of the Day



- Determine the value of $F_{N\text{-}Earth,\ person}$.
- *Answer: F_N = (140 kg)(9.8 N/kg)=1372 N*

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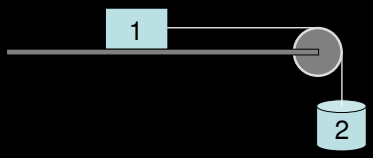

- Block 1 has a mass of 300 g and block 2 has a mass of 150 g. The pulley is frictionless. If block 1 is sliding at a constant velocity, then what must be the coefficient of friction between block 1 and the surface?
- *Answer: $\mu = F_f/F_N = 1.47\ N / 2.94\ N = 0.5$*

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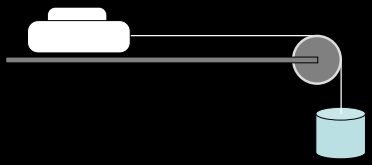
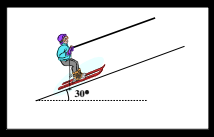


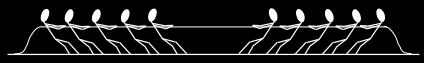
- Draw a force diagram for the frictionless hover-puck. Describe the hover-puck's motion.
- *Answer: hover-puck will have a constant acceleration to the right*

Question of the Day



- The skier is keeping from sliding down the hill by holding onto the rope.
  - Draw a force diagram for the skier.
  - Include vertical and horizontal reference lines
  - Label any angles
- *Answer: F_g, F_N, and F_T, the $\Sigma F=0$ since $\Delta v=0$*

Question of the Day



- In a tug of war, which team exerts a greater force on the other team, the winning team or the losing team?
- *Answer: The force of winning team on losing team is equal, but opposite, to the force of losing team on winning team. The force each team exerts against ground (and ground against them) is what determines who wins/loses.*