

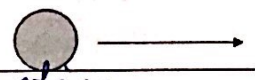
Unit 2: Dynamics Study Guide

Directions: Complete the following review questions to prepare for the test. Use your notes to help you.

Unit 2 Exam: Thursday,
November 14, 2019

Newton's 1st Law

- How are mass and inertia related?
- bigger mass, bigger inertia
- Which object has more inertia: tennis ball or bowling ball? Why? Explain.
- bowling ball because it has bigger mass
- According to Newton's 1st law of motion, if gravity and friction are not present, what should the object below theoretically keep doing? Why?
- will continue to move ~~in~~ the same direction at the same speed



Newton's 2nd Law

- What happens when there is an unbalanced net force upon an object?
- object will move/accelerate
- Explain how an object's mass affects the amount of force needed to get it to accelerate.
- bigger mass, more force to accelerate

For questions #6-8: Don't forget the **UNITS** and **SHOW YOUR WORK!**

$$F = m \cdot a$$

- A baseball accelerates at 83 m/s^2 . The mass is 0.5 kg . What was the force of the baseball bat?

$$F = ?$$

$$m = 0.5 \text{ kg}$$

$$a = 83 \text{ m/s}^2$$

$$F = (0.5)(83)$$

$$F = 41.5 \text{ N}$$

- A bicycle accelerates at 7 m/s^2 when the bicyclist applies a force of 16 N . How much does the bicycle and rider weigh? (Round your answer to the tenths - 1 decimal place).

$$F = 16 \text{ N}$$

$$m = ?$$

$$a = 7 \text{ m/s}^2$$

$$F = ma$$

$$16 = m(7)$$

$$\frac{16}{7} = \frac{7m}{7}$$

$$2.3 \text{ kg} = m$$

- Gravity impacts a sled weighing 1.32 kg sliding down a hill by 5 N . What is the acceleration of the sled? (Round your answer to the tenths - 1 decimal place).

$$F = 5 \text{ N}$$

$$m = 1.32 \text{ kg}$$

$$a = ?$$

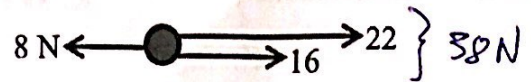
$$F = ma$$

$$\frac{5}{1.32} = \frac{1.32a}{1.32}$$

$$3.8 \text{ m/s}^2 = a$$

Free Body Diagrams & Net Force:

1) In the free body diagram to the right,



a) is the object going to accelerate? EXPLAIN your answer using evidence.

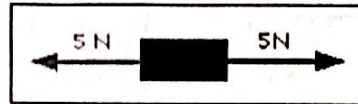
Yes, the object will accelerate because it is an unbalanced force.

b) What is the net force and direction?

$$30 - 0 = 30 \text{ N}$$

$$30 \text{ N} \rightarrow$$

2) In the free body diagram to the right,



a) is the object going to accelerate? EXPLAIN your answer using evidence.

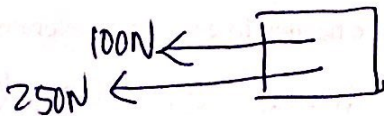
No, the object will not accelerate because it is a balanced force.

b) What is the net force and direction?

$$0 \text{ N}$$

3) Dennis and Gina are pushing on a box to the left of the room. Dennis pushes with 250 N of force and Gina pushes with 100 N of force.

a. DRAW a free body diagram showing the forces.



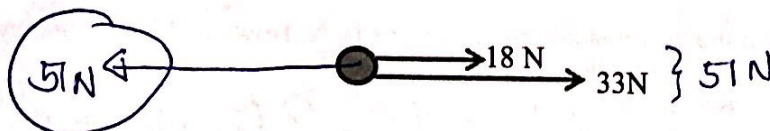
b. What is the net force if they both push in the same direction?

$$250 + 100 = 350 \text{ N left}$$

c. What is the net force if they push in opposite direction.

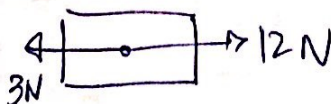
$$250 - 100 = 150 \text{ where } 250 \text{ is}$$

4) Draw and label the missing force needed to have the object below in equilibrium (equal forces).



$$\begin{array}{r} 18 \\ 33 \\ \hline 51 \text{ N} \end{array}$$

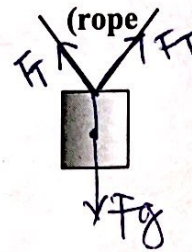
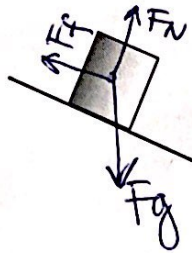
5) Draw a free body diagram and find the net force and direction: A car is moving east with a force of 12 N while friction pushes back on the car with a force of 3 N.



$$\begin{array}{r} 12 \\ - 3 \\ \hline 9 \text{ N} \rightarrow \end{array}$$

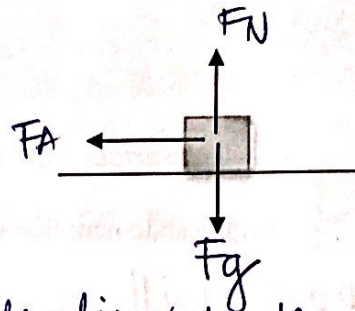
Types of Forces and Free Body Diagrams:

1) Draw and label all the forces acting on the objects below.



2) An ice cube is pushed across a *frictionless* counter.

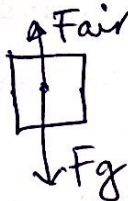
- What forces are present on the ice cube?
Label the diagram on the right.
- Is the ice cube accelerating? Justify your answer.



Yes ~~the~~ the ice cube is accelerating to the ~~right~~ left because an unbalanced force to the ~~right~~ left was applied on it.

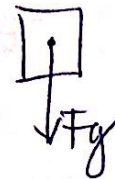
3) A leaf is falling from a tree. Consider air resistance.

- Draw a free body diagram on the right.
- Label each force vectors.



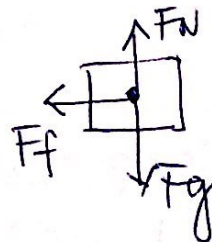
4) A ball is dropped from rest from the top of a building. (Neglect F_{air})

- Draw a free body diagram on the right.
- Label each force vectors.



5) A car is skidding to a stop while traveling to the right across a level roadway surface.

- Draw a free body diagram on the right.
- Label each force vectors.



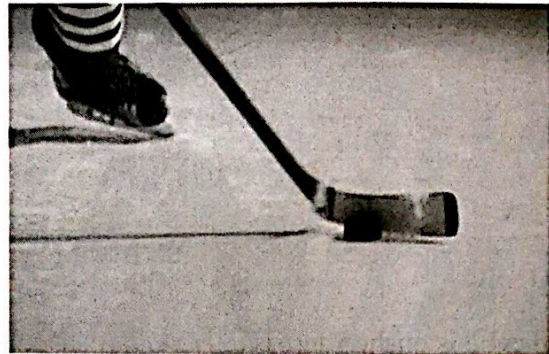
CLAIM – EVIDENCE – REASONING:

Study the scenario and the problem below. Write a CER to answer the problem.

Scenario 1: On Grass



Scenario 2: On Ice



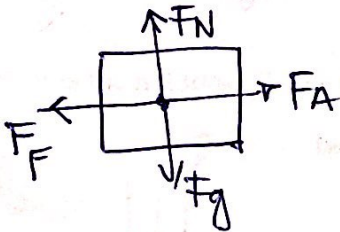
PROBLEM: In which surface would the ball accelerate less?

CLAIM: Write a statement that is relevant to the problem.

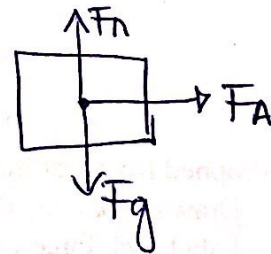
The ball will accelerate less on the grass surface.

EVIDENCE: Draw a Free Body Diagram to show acceleration of the ball in both surfaces.

On Grass:



On Ice:



REASONING: Explain why your claim and evidence support each other using the Laws of Motion. Use the words net force, force of friction, force of gravity, acceleration, etc.

On grass, friction makes it harder for the ball to accelerate. On ice, the absence of friction allows the ball to accelerate faster after the applied force is acted upon it.