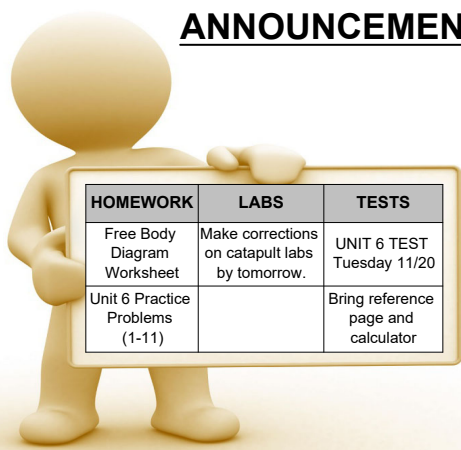


ANNOUNCEMENTS



6.4 Newton's Third Law

LEARNING TARGETS

6.3 I can define, explain, and apply Newton's third law to solve problems.



Newton's Laws of Motion

1. Newton's First Law of Motion

- Every object will continue in a **state of rest** or **with constant speed in a straight line** unless acted upon by an external force.

2. Newton's Second Law of Motion

- When a net force act on an object, the **object accelerates** in the direction of the net force. The acceleration is directly proportional to the net force and inversely proportional to the mass. Thus, $a \sim F/m$ or, $a \propto F/m$

3. Newton's Third Law of Motion

- Whenever one object exerts a force on a second object, the **second object exerts an equal and opposite force** on the first.

PHY115 - South College - Bozler

slide 2

Mass vs. Weight

Mass

- a measure of how much matter an object is made of
- does not change, regardless of where something or someone is



Mass = 59 kg
Weight = 579 N

Weight

- the force of gravity on an object
- equal to the mass of the body times the local acceleration of gravity



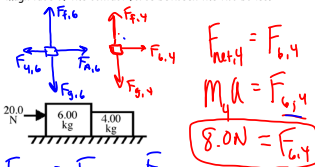
Mass = 59 kg
Weight = 96 N

Why do you think the person's weight is less on the moon?

<http://www.exploratorium.edu/rosh/weight/index.html>

Newton's 3rd Law Example

A 6.00-kg block is in contact with a 4.00-kg block on a horizontal frictionless surface as shown in the figure. The 6.00-kg block is being pushed by a horizontal 20.0-N force as shown. What is the magnitude of the contact force between the two boxes?



$$F_{net,6} = F_{A,6} - F_{g,6}$$

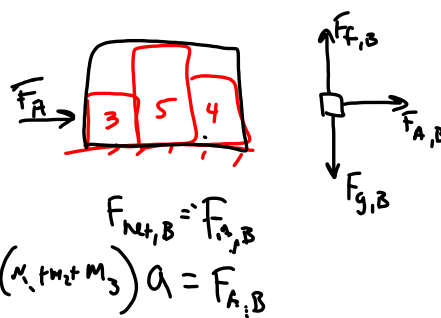
$$M_b a = 20N - m_b a$$

$$(6\text{ kg})a = 20N - (4\text{ kg})a$$

$$+4a \quad +4a$$

$$(10\text{ kg})a = 20N$$

$a = 2.0 \text{ m/s}^2$



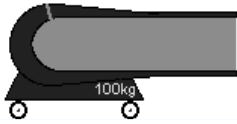
$$F_{net,B} = F_{A,B}$$

$$(M_1 + M_2 + M_3)a = F_{A,B}$$

Recoil



$$\Sigma p = 0$$

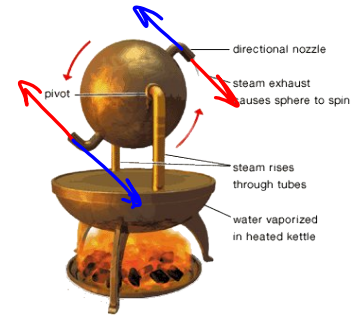


5kg

Applications of Newton's 3rd Law



Hero's Engine



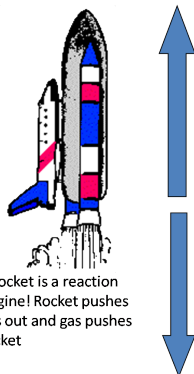
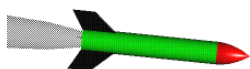
Applications of Newton's 3rd Law



Fly Board



Newton's 3rd Law



A rocket is a reaction engine! Rocket pushes gas out and gas pushes rocket