Physics 112

Friday, November 27/15

http://mvhs-sherrard.weebly.com/

Textbook - ISBN

1. Unit 3 - Work and Energy
2. Section 1 - Work
2. Work
3. Textbook - Page 221, PP #1-3 - Completed in Class
4. Three Cases - No Work is Done - To Be Continued

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5. Textbook - Page 225, PP #4-10
6. Positive and Negative Work
7. Section 2 - Types of Energy and Work-Energy Theorems
8. Types of Energy - Overview
9. Mechanical Energy
10. Kinetic Energy
11. Textbook - Page 238, PP #19-21

Unit 3 - Work and Energy

Section 1

Work

Chapter 6 - Work, Power and Energy

(Page 216)

Work

energy
work

Work is:
-> always done on an object by an individual force
-> results in a change in the object

J -> joule

$J = Nm = \frac{kg\,m}{s^2} \cdot m = \frac{kg\,m^2}{s^2}$

$$W = F_{\parallel} \Delta d$$

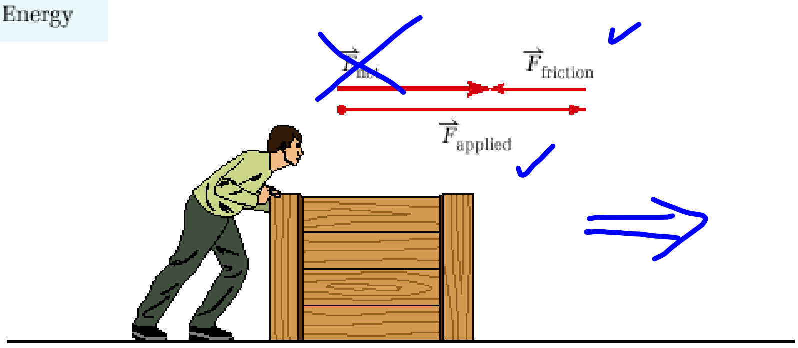
W -> work (Nm = J)

$F_{\parallel}$ -> magnitude of individual force (N)

Δd -> magnitude of displacement (m)

220 MHR • Unit 3 Momentum and Energy

Figure 6.3 When you were determining the motion of objects in Chapter 4, you used the net force acting on the object. The net force is really the vector sum of all of the forces acting on the object. When calculating work, you determine the work done by one specific force, not the net force.



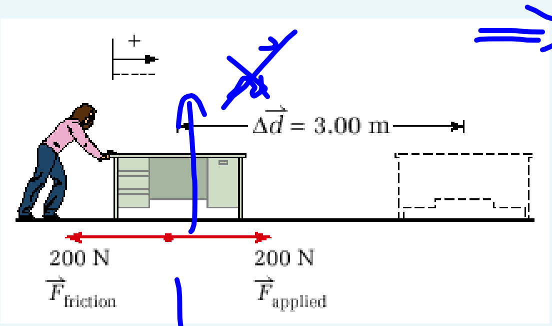
$$W = Fd$$

NOTE: Force and displacement are vectors. Work is a scalar.

MODEL PROBLEM

Determining the Amount of Work Done

A physics student is rearranging her room. She decides to move her desk across the room, a total distance of 3.00 m. She moves the desk at a constant velocity by exerting a horizontal force of 2.00×10^2 N. Calculate the amount of work the student did on the desk in moving it across the room.



c4

200 N

$d = 3.00$ m

$F = 2.00 \times 10^2$ N

$W = ?$

$W = Fd$

$W = 2.00 \times 10^2 \times 3.00$

$W = 600$ J

Page 221, PP #1-3

Three Cases
When No Work is Done
(Page 222)

Case 1: Applying a Force That Does Not Cause Motion

W = Fd
0J = ✓ 0m

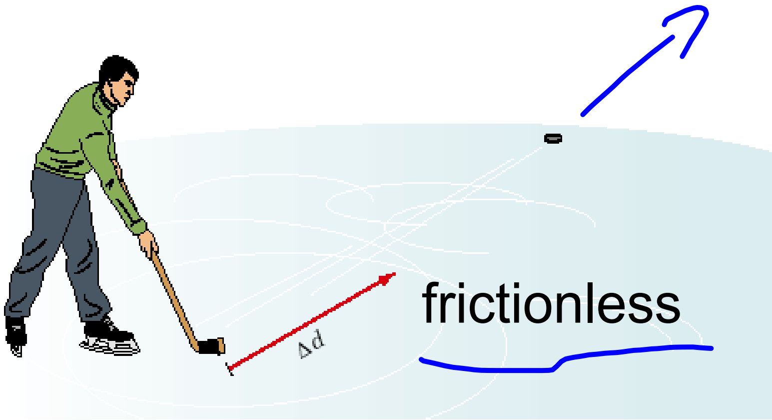
Consider the energy that you could expend trying to move a house. Although you are pushing on the house with a great deal of force, it does not move. Therefore, the work done on the house, according to the equation for work, is zero (see Figure 6.4). In this case, your muscles feel as though they did work; however, they did no work on the house. The work equation describes work done by a force that moves the object on which the force is applied. Recall that work is a transfer of energy to an object. In this example, the *condition* of the house has not changed; therefore, no work could have been done on the house.

Case 2: Uniform Motion in the Absence of a Force

Recall from Chapter 5 that Newton's first law of motion predicts that an object in motion will continue in motion unless acted on by an *external* force. A hockey puck sliding on a frictionless surface at constant speed is moving and yet the work done is still zero (see Figure 6.5). Work was done to start the puck moving, but because the surface is frictionless, a force is not required to keep it moving; therefore, no work is done on the puck to keep it moving.

$W = F d$

$0 J = 0$ ✓



Physics 122

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Friday, November 27/15

1. Experiment 7.2 - Range of a Projectile - Due - Monday, Nov. 30

2. Projectiles Fired at an Angle - To Be Continued

3. Text: Page 549, PP #13
   Page 570, Prob. #17, 19, 20 (omit graph)

Science 10

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Friday, November 27/15

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1. Assignment - Distance vs Time Graphs - To Be Marked
   - 5 Days Late
2. Assignment - Calculating Average Speed - To Be Marked
   - 2 Days Late
3. Calculating Velocity - Continue
4. Representing Vector Quantities
5. Resultant Displacement
6. Average Velocity
7. Video - Physics Meets Biology - Car Crashes

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8. Exercise - Position vs Time Graph
9. Sample Problems - Average Velocity
10. Velocity-Time Graphs

Chapter 11: Displacement and Velocity

(Page 340)

Physical Quantities

Scalar Quantities	Vector Quantities
size/magnitude (with units)	size/magnitude (with units) and direction

http://safeshare.tv/w/FKmoBgWxTy

time	t	12 s
distance	d	25 km
speed	v	10 m/s

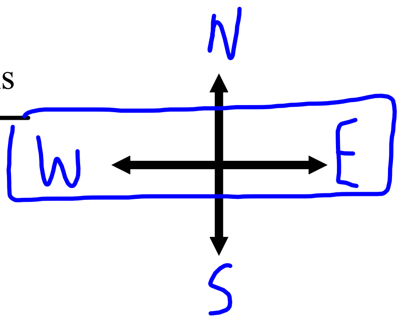
?

Direction

Direction is generally stated relative to a reference point (starting point).

By convention (traditionally):

Positive Directions	Negative Directions
right	left
up	down
north	south
east	west



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Position and Displacement

position - separation and direction from a reference point

symbol: $\vec{d}$ or **d**
unit: m, cm, km

$\Delta \vec{d}$

displacement - change in position
- the straight-line distance from some initial position in a given direction

symbol: $\Delta\vec{d}$ or Δ**d**
unit: m, cm, km

delta "change in"

$$\Delta\vec{d} = \vec{d}_f - \vec{d}_i$$

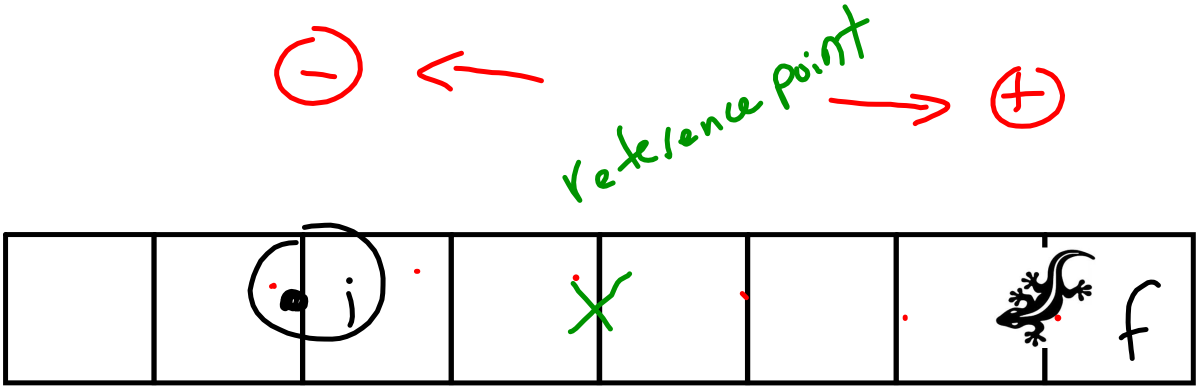
$\Delta\vec{d}$ -> displacement

$\vec{d}_i$ -> initial position

$\vec{d}_f$ -> final position

same units

Gecko Demo



$\vec{d}_i = -2$ tiles

$\vec{d}_f = +3$ tiles

$\Delta\vec{d} = \vec{d}_f - \vec{d}_i$

$\Delta\vec{d} = (+3) - (-2)$

$\Delta\vec{d} = +5$

100 Acre Wood

http://safeshare.tv/w/xvwcNRNnhE

http://safeshare.tv/w/saVawvCbtW

Reference A

$\vec{d}_i = L = +11\ b$

$\vec{d}_f = J = +17\ b$

$\Delta\vec{d} = \vec{d}_f - \vec{d}_i$

$\Delta\vec{d} = +17 - (+11) = +6\ b$

1. +6 b
2. -7 b
3. +9 b
4. +3 b
5. -9 b
6. 18 b
7. -9 b
8. -13 b.

* blocks.

Velocity

(Page 432)

Velocity is a vector quantity. 2 m/s N

↑ speed

velocity

↙ ↘

size/magnitude — direction

speed

v

symbol: $\vec{v}$ or **v**

unit: m/s, km/h

An object with constant speed and direction has constant velocity. This type of motion is called uniform motion.

Calculating Velocity

$$\vec{v} = \frac{\Delta\vec{d}}{t}$$

$\vec{v}$ → velocity ($\frac{m}{s}$, $\frac{km}{h}$)

$\Delta\vec{d}$ → displacement (m, km)

t → time (s, h)

Use this formula if the velocity of an object is constant.

The velocity of the train is 88 km/h [E].

Sample Problem 1

A train travels at a constant speed through the countryside and has a displacement 150 km [E] in a time of 1.7 h. What is the velocity of the train?

$\vec{v}$ - ?

$\Delta\vec{d} = +150 km$

$t = 1.7 h$

$\vec{v} = \frac{\Delta\vec{d}}{t}$

$\vec{v} = \frac{+150 km}{1.7 h}$

$\vec{v} = +88 \frac{km}{h}$

The velocity was 88 $\frac{km}{h}$ [E]

E

east