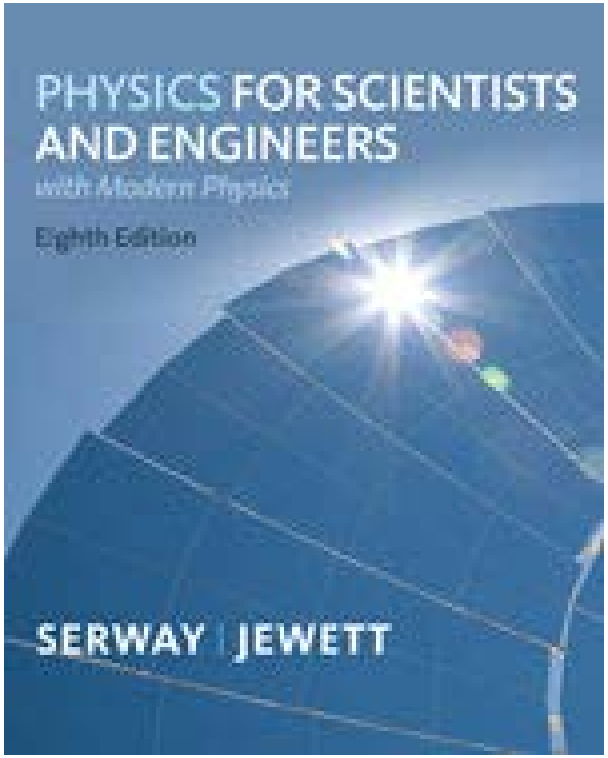
PHY 113 A General Physics I
9-9:50 AM MWF Olin 101

Plan for Lecture 1:

1. Welcome & overview
2. Class structure & announcements
3. Chapter 1 – measurement & units

PHY 113 A General Physics I
9-9:50 AM MWF Olin 101

Instructor: Natalie Holzwarth (Olin 300)
Course Webpage: http://www.wfu.edu/~natalie/f12phy113



Webpage for Webassign system:
http://www.webassign.net/

You will also need an
i-clicker device for each class

A scientific calculator will be needed
for homework and exams

Where to find information about the course on the web:

PHY 113 General Physics I -- Section A

MWF 9 AM-9:50 PM	**OPL 101**	**http://www.wfu.edu/~natalie/f12phy113/**

Instructor: Natalie Holzwarth	**Phone:**758-5510	**Office:**300 OPL	**e-mail:**natalie@wfu.edu

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- General information
- Syllabus and homework assignments
- Lecture Notes

Fall 2012 Schedule
for N. A. W. Holzwarth

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00-9:00	Lecture Preparation/ Office Hours	Lecture Preparation/ Office Hours	Lecture Preparation/ Office Hours	Lecture Preparation/ Office Hours	Lecture Preparation/ Office Hours
9:00-10:00	General Physics I PHY113		General Physics I PHY113		General Physics I PHY113
10:00-11:00	Classical Mech PHY711		Classical Mech PHY711		Classical Mech PHY711
11:00-12:30	Office Hours	Physics Research	Office Hours	Physics Research	Office Hours
12:30-2:00	Condensed Matter Theory Journal Club		Physics Research		Physics Research
2:00-3:30	Physics Research				
3:30-5:00			Physics Colloquium		CEES -- Renewable Energy Research

Travel dates:

- **Oct. 17, 2012 Duquesne University**

Comment about Physics Colloquia

WAKE FOREST UNIVERSITY

Department of Physics

- Home
- Undergraduate
- Graduate
- People
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- Facilities
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- News & Events
- Resources

Wake Forest Physics... Nationally recognized for teaching excellence; internationally respected for research advances; a focused emphasis on interdisciplinary study and close student-faculty collaboration.

News

Prof. Thonhauser receives NSF CAREER award

Carroll Group's Power Felt Featured on CNN International

Prof. Cho Organizes the Wake@Hanes Computational Thinking Workshop for Middle School Teachers

Congratulations to Wanyi Nie, Recent Ph.D. Recipient

Events

Tues Aug 28, 2012
Department Open House
1:00 PM to 3:00 PM in Olin Lobby
All Students Interested in Physics are Welcome!

Wed Aug 29, 2012
Welcoming Tea and Summer Research Presentations
3:45 PM in Olin 101
Refreshments at 3:15 in Lobby

Wed Sep 5, 2012
Physics Research Opportunities I
4:00 PM in Olin 101
Refreshments at 3:30 in Lobby

Wed Sep 12, 2012
Physics Research Opportunities II
4:00 PM in Olin 101
Refreshments at 3:30 in Lobby

FOREST UNIVERSITY

Department of Physics

WFU Physics Colloquium

TITLE: "Welcome to the WFU Physics Department"

TIME: Wednesday Aug. 29, 2012 at 3:45 PM*

PLACE: George P. Williams, Jr. Lecture Hall, (Olin 101)

* Note: early starting time.

Refreshments will be served at 3:15 PM in the lounge. All interested persons are cordially invited to attend.

PROGRAM

The purpose of this first seminar is to help new, returning, and prospective students (including both undergraduate and graduate students), faculty, and staff to become acquainted with each other and with the Physics Department. After refreshments in the lounge in the lobby of Olin Physical Laboratory (starting at 3:15), we will meet in the George P. Williams, Jr. Lecture Hall (Olin 101) at 3:45 PM for some announcements followed by presentations by some undergraduate students, highlighting their summer research experiences.

Course organization:

Grading:

It is likely that your grade for the course will be determined by the following factors:

2-4 exams*	45%
Final exam	25%
Problems sets**	15%
Laboratory work***	10%
Quiz****	5%

* In order to relieve exam stress, the lowest exam score will be weighted less then the other(s).

**Homework sets are processed through Webassign. In general there will one homework set for each lecture. Note that in many cases, there may be extra webassign problems available for practice. These will not count in your grade but may provide additional help with learning the material. Discussion of homework problems among classmates is allowed and encouraged, but all work submitted for grading should represent the student's *own best efforts*. Students are encouraged to keep a notebook or section of a notebook for the algebraic and graphical work associated with each assignment. This notebook will be especially helpful during tutorial sessions, consultations with your instructor, and preparing for exams. The numerical work for your homework must be submitted through WebAssign. After each assignment's "due" time has passed, the correct answers will be available through your Webassign account.

***It is the policy of the Physics Department that satisfactory completion of laboratory work is necessary for earning credit for the course. Laboratories begin meeting on Monday, September 3, 2012. Laboratory manuals may be purchased at the Book Store. The Lab scheduling is coordinated by Eric Chapman (Olin 110, email contact).

**** Reading assignments for each lecture should be completed before the class meeting. In place of a quiz, within 1 hour before each class, each student should email the instructor one or more thoughtful questions on the course topic. These questions, various iclicker exercises, and other in class quizes will comprise this component of your grade.

Schedule and assignments

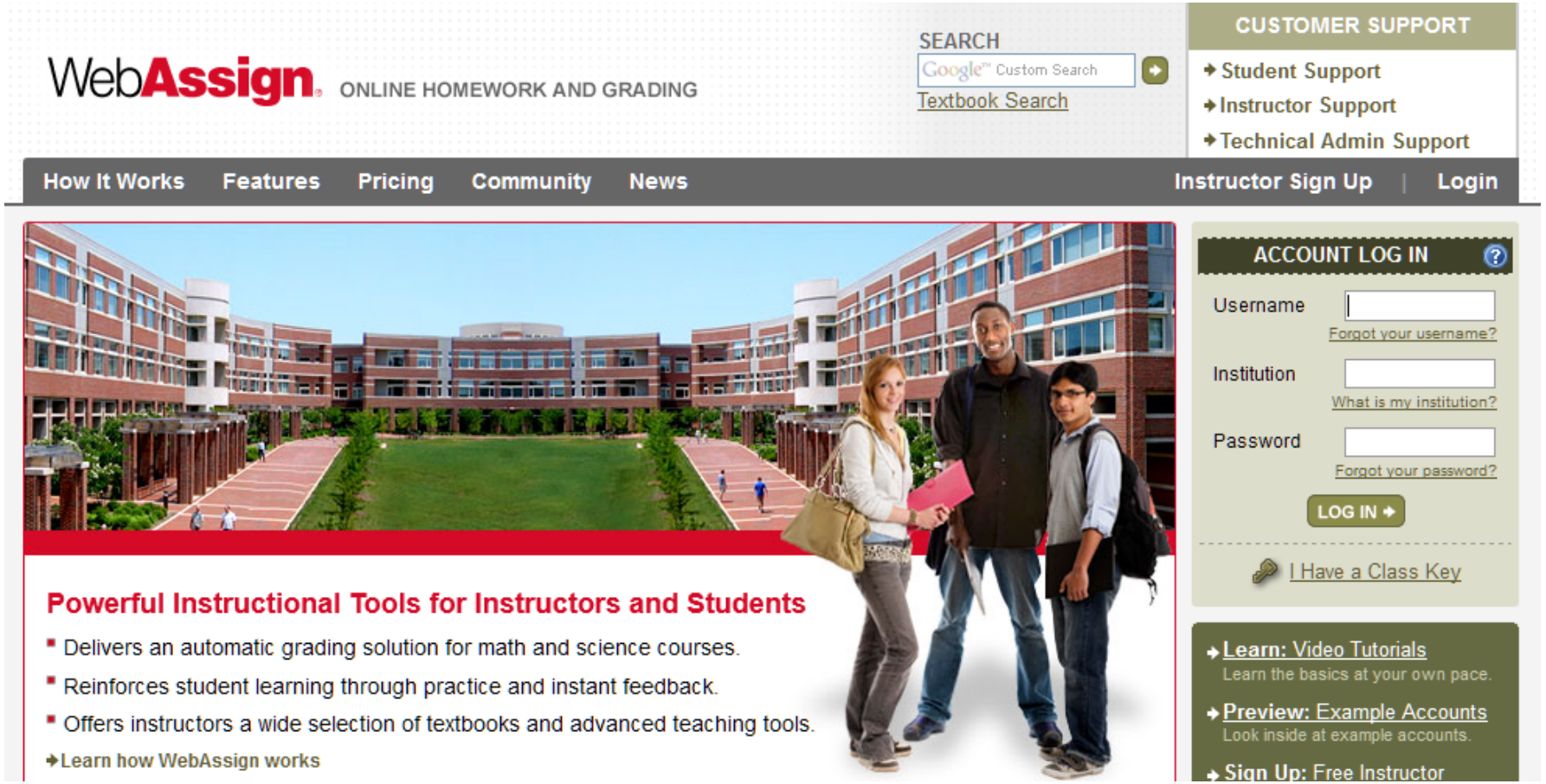
Note: This schedule will be modified; please check for changes and additions frequently.

Starting with reading assignment **2**, you are requested to email at least one topical question to your instructor within one hour of the start of class. [If your browser is correctly set up, this is most easily done using the links given in "Text Sections" in the schedule below.] If possible, your question will be addressed during the class lecture. In any case, your mailed question will be recorded for part of your "quiz" grade in the course.

Note that in many of the Webassign problem sets there are some zero point "extra practice" problems set in the assignment for your consideration.

No.	Lecture Date	Topic	Text Sections	Problem Assignments	Assignment Due Date
1	08/29/2012	Units & measurement	1.1-1.6	1.2,1.6,1.13,1.20	
2	08/31/2012	Motion in 1d -- constant velocity	2.1-2.3	2.1,2.8	09/07/2012
3	09/03/2012	Motion in 1d -- constant acceleration	2.4-2.8	2.13,2.16	09/07/2012
4	09/05/2012	Vectors	3.1-3.4		09/07/2012
5	09/07/2012	Motion in 2d	4.1-4.3		09/10/2012
6	09/10/2012	Circular motion	4.4-4.6		09/12/2012

www.webassign.net



Home

Natalie Holzwarth
PHY113, section A, Fall 2012
Instructor: Natalie Holzwarth
Wake Forest University

WebAssign Notices

Note: The following message is shown to your students. As WebAssign faculty you are not required to enter an access code. You have until Wednesday, September 12, 2012 at 12:00 AM EDT to enter an access code or purchase access online. Get access now.

My Assignments

Current Assignments (3)

Name	Due
Assignment 1	Sep 5 2012 11:50 PM EDT
Assignment 2	Sep 7 2012 11:14 AM EDT
Assignment 3	Sep 7 2012 11:25 AM EDT

Communication

No current forums

Announcements

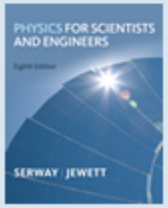
No Current Announcements

My Calendar

Jump to...

About this Class

General Physics I



Physics for Scientists and Engineers - 8e
Serway and Jewett

WebAssign

Monday, August 27 2012 03:29 PM EDT

Logged in as natalie@wfu

Log out

Home | My Assignments | Grades | Communication | Calendar | My eBooks | Notifications | Help | My Options

PHY113, section A, Fall 2012 » My Assignments

Natalie Holzwarth
PHY113, section A, Fall 2012
Instructor: Natalie Holzwarth

Assignment 1 (Homework)

Current Score : – / 0 **Due :** Wednesday, September 5 2012 11:50 PM EDT

Print Assignment

Question	1	2	3	4	Total
Points	–/0	–/0	–/0	–/0	–/0 (0.0%)

Description

This assignment consists of practice problems from Chapter 1 -- "Physics and Measurement", reviewing simple calculations of physical quantities and unit conversions.

Instructions

These problems are for practice and will not count toward your grade.

Assignment Submission

For this assignment, you submit answers by question parts. The number of submissions remaining for each question part only changes if you submit or change the answer.

Assignment Scoring

Your last submission is used for your score.

3. –/0 points My Notes | SerPSE8 1.P.013.

A rectangular building lot has a width of 63.0 ft and a length of 111 ft. Determine the area of this lot in square meters.

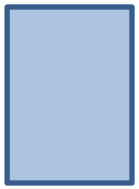
m^2

Need Help? Read It Chat About It

Problem solving steps

1. Visualize problem – labeling variables
2. Determine which basic physical principle(s) apply
3. Write down the appropriate equations using the variables defined in step 1.
4. Check whether you have the correct amount of information to solve the problem (same number of knowns and unknowns).
5. Solve the equations.
6. Check whether your answer makes sense (units, order of magnitude, etc.).

W=63 ft



L=111 ft

area = width * length

A = W * L

OK

$$A = 63\,\text{ft} \times 111\,\text{ft} \times \left(\frac{1\,\text{m}}{3.282\,\text{ft}}\right)^2$$

$$= 649.2\,\text{m}^2$$

4. –/0 points | My Notes | SerPSE8 1.P.020.WI.

Assume it takes 5.00 min to fill a 10.0-gal gasoline tank. (1 U.S. gal = 231 $in.^3$)

(a) Calculate the rate at which the tank is filled in gallons per second.

gal/s

(b) Calculate the rate at which the tank is filled in cubic meters per second.

m^3/s

(c) Determine the time interval, in hours, required to fill a 1.00-m^3 volume at the same rate. (1 U.S. gal = 231 $in.^3$)

h

Need Help? Read It | Watch It | Chat About It

$$a) \quad R = \frac{\Delta V}{\Delta t} = \frac{10\ \text{gal}}{5\ \text{min} \times 60\ s/\text{min}} = 0.033\ \text{gal}/s$$

i-clicker exercises:

Which of the following options do you prefer for the number of exams in the course?

A. 4 exams
B. 3 exams
C. 2 exams

Which of the following options do you prefer for the exam times?

A. Exams within class time (50 minutes)
B. Exams offered outside of class time

Preferences for tutorial:

A. Prefer tutorials for our section only
B. Prefer general tutorials for all sections
C. Other

Preferences for tutorial times: (Sunday – Thursday)

A. 5-7 PM
B. 6-8 PM
C. 7-9 PM
D. 8-10 PM
E. Other

➔ PHY 113 Labs will start Monday Sept. 3rd and run through the week of Nov. 29th. There will be no labs during Thanksgiving week.

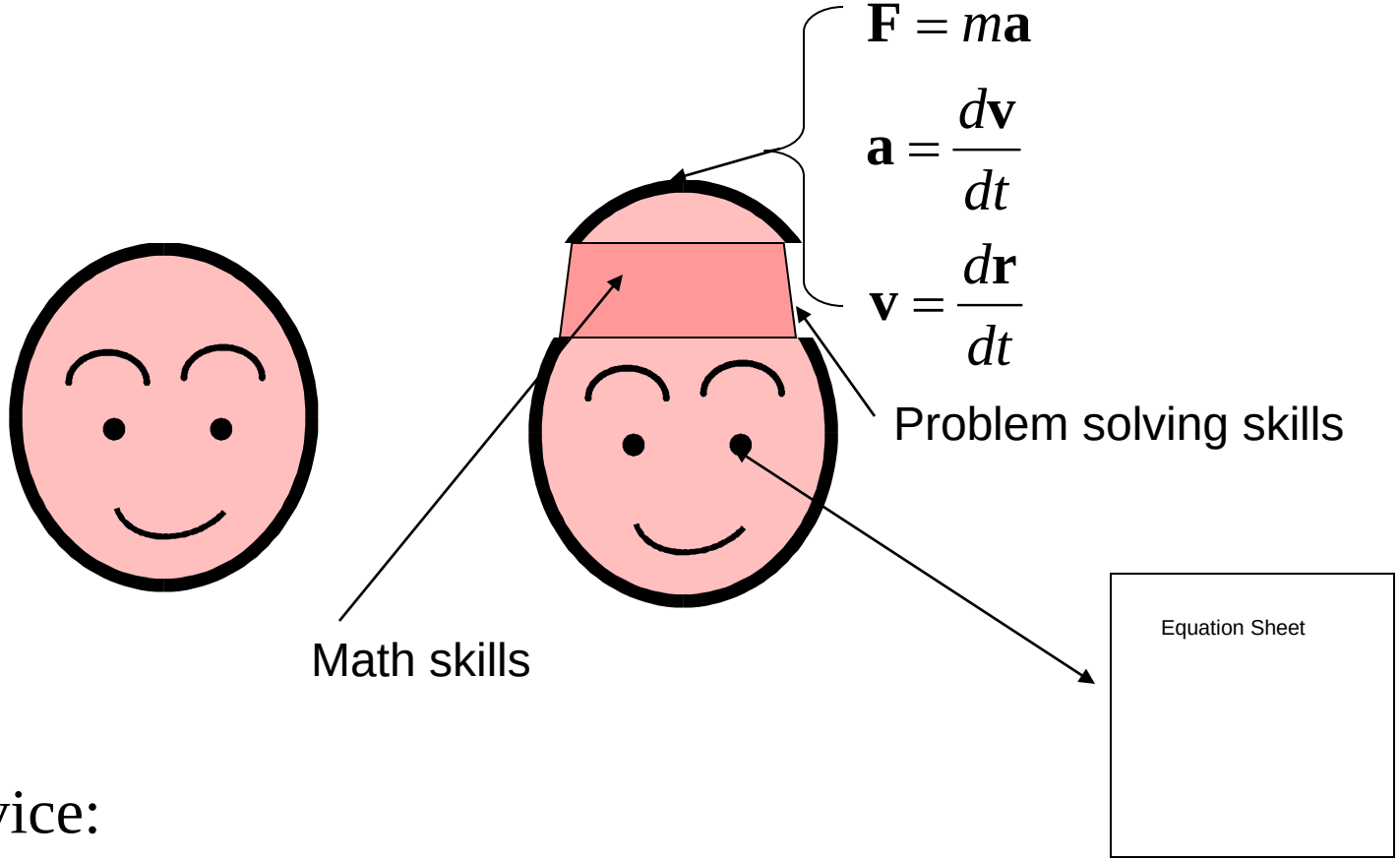
➔ PHY 113 Tutorial sessions will also start next week.

General advice on how to learn physics:

- Physics is built on basic principles ("laws") from which all results can be derived (deduced)
- Focus your attention on **understanding** the basic principles
- Practice **using** these basic principles to solve problems
- Memorization is of little use in the study and practice of physics

Note: In general, the best way to learn physics is to **practice problem solving**. One benefit of learning physics is the development of general problem solving skills. Note that memorization of the text and lecture material is rarely useful.

As you are working problems, you may wish to construct a sheet of paper containing the basic equations you use. This basic equation sheet (8.5 in x 11 in) can be used during exams.



Advice:

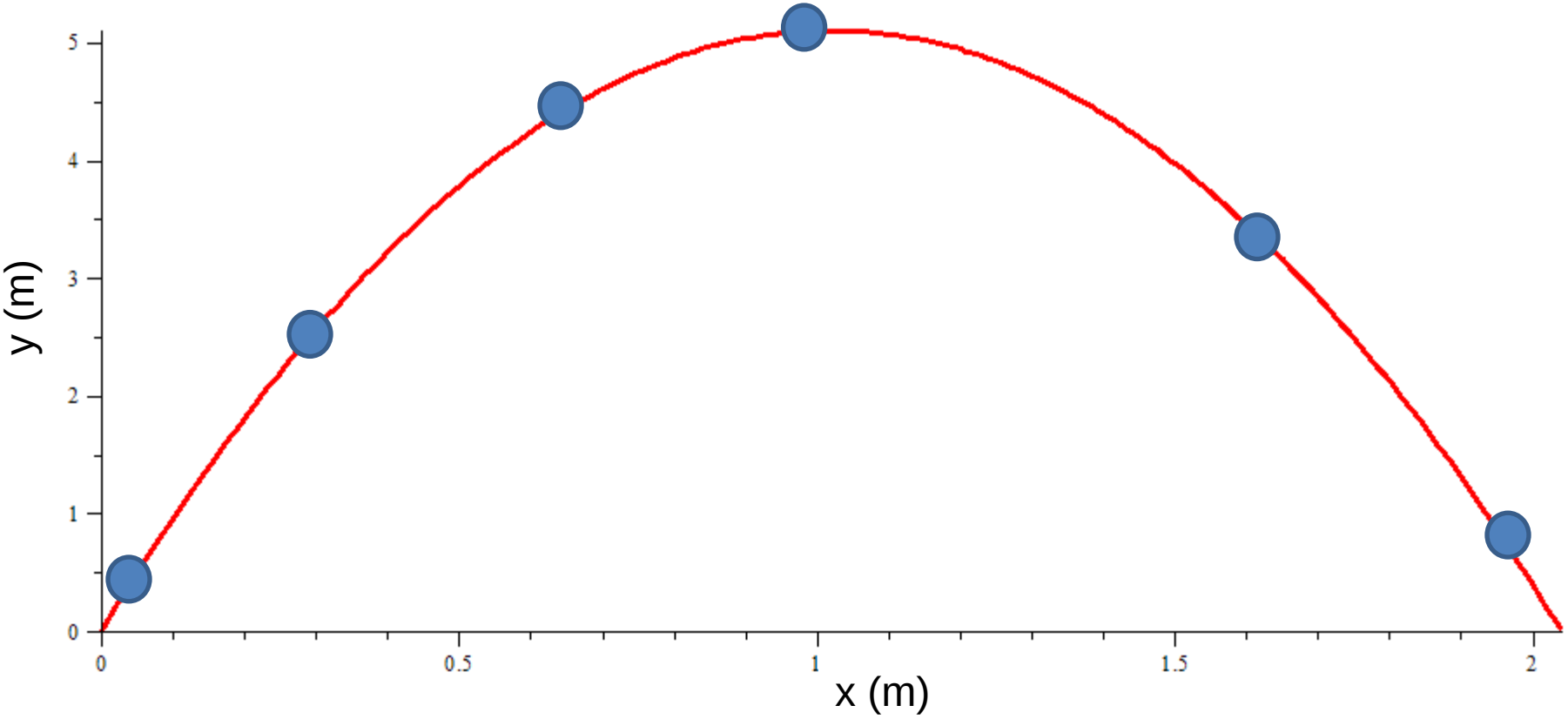
1. Keep basic concepts and equations at the top of your head.
2. Practice problem solving and math skills
3. Develop an equation sheet that you can consult.

Problem solving steps

1. Visualize problem – labeling variables
2. Determine which basic physical principle(s) apply
3. Write down the appropriate equations using the variables defined in step 1.
4. Check whether you have the correct amount of information to solve the problem (same number of knowns and unknowns).
5. Solve the equations.
6. Check whether your answer makes sense (units, order of magnitude, etc.).

The Zeroth Law of Physics

All physical phenomena can be analyzed using fundamental "laws" which are stated in terms of basic concepts and represented in terms of mathematical expressions and equations.



Why would a physicist (or anyone else) want to know that the ball follows a parabolic trajectory?

A. Because it tests the basic principles of physics.
B. Because it can help a golfer get a hole in one.
C. Because it shows that gravity is affecting the motion of the ball.
D. Because it shows a contrast with straight line motion.
E. Because it makes you look smart.

Measurement units

Standard units “SI” (by international agreement in 1960)

- length – meter
- mass -- kilogram
- time -- second

http://www.nist.gov/pml/wmd/metric/length.cfm

Physical Measurement Laboratory

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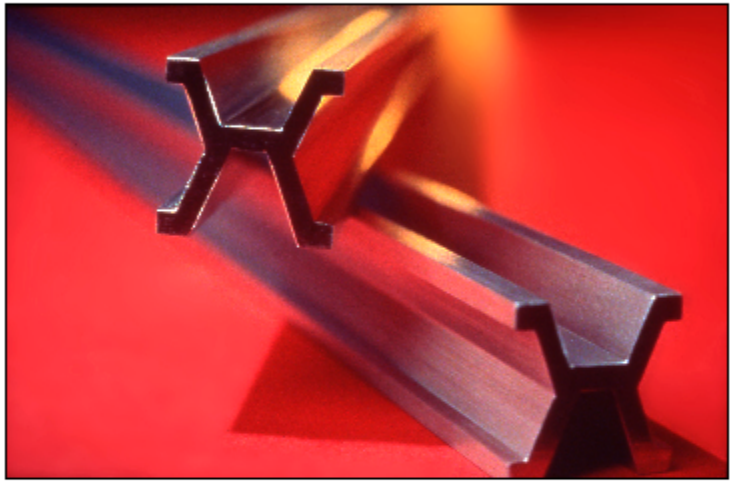
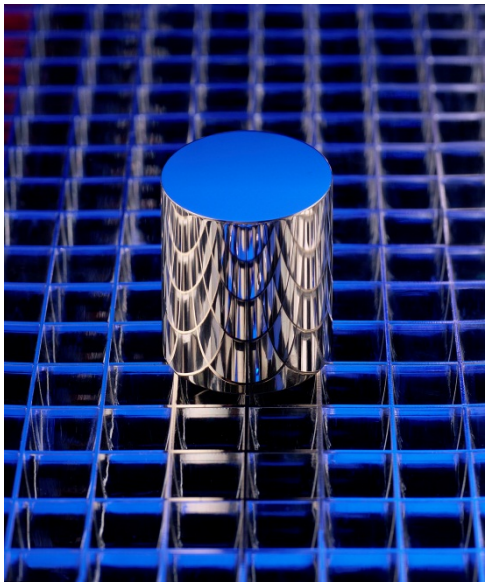
NIST Home > PML > Weights and Measures > Laws and Metric Program > SI Units - Length



SI Units: Length

The definition of the meter (m), which is the international unit of length, was once defined by a physical artifact - two marks inscribes on a bar of platinum-iridium. Today, the meter (m) is defined in terms of constant of nature: the length of the path traveled by the light in vacuum during a time interval of 1/299, 792, 458 of a second. The Length - Evolution from Measurement Standard to a Fundamental Constant explains the evolution of the definition of the meter. Follow these changes over time in the NIST Length Timeline.

http://www.nist.gov/pml/wmd/metric/mass.cfm



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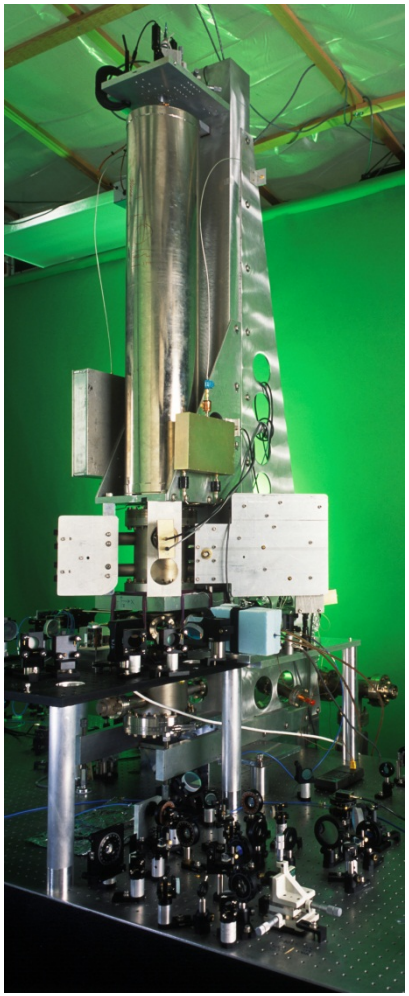
SI Units: Mass

The kilogram is the SI base unit of mass and is equal to the mass of the international prototype of the kilogram, a platinum-iridium standard that is kept at the International Bureau of Weights and Measures (BIPM). The primary standard of mass for this country is United States Prototype Kilogram 20, which is a platinum-iridium cylinder kept at NIST.

The kilogram, originally defined as the mass of one cubic decimeter of water at the temperature of maximum density, was known as the Kilogram of the Archives. It was replaced after the International Metric Convention in 1875 by the International Prototype Kilogram which became the unit of mass without reference to the mass of a cubic decimeter of water or to the Kilogram of the Archives. Each country that subscribed to the International Metric Convention was assigned one or more copies of the international standards; these are known as National Prototype Meters and Kilograms. Learn more about the history and current definition of the kilogram.

Among the SI base units, the kilogram (kg) is the only one whose name and symbol, for historical reasons, include a prefix. "Kilo" the SI prefix for 1000 or 10^3. Names and symbols for decimal multiples and submultiples of the unit of mass are formed by attaching prefix names to the unit name "gram," and prefix symbols to the unit symbol "g." Learn more about this historical quirk.

http://www.nist.gov/pml/wmd/metric/time.cfm



SI Units: Time

The second is the duration of 9 192 631 770 cycles of the radiation associated with a specific transition of the cesium 133 atom. The second is realized by turning an oscillator to the resonance frequency associate with the above definition. Just before entering a microwave cavity, cesium atoms are forced into the right atomic state by a laser beam. A detector registers a signal only when the oscillator delivers just the right frequency to the microwave cavity causing transitions and changing the state of the atoms. This change in state is sensed at the detector.

The number of periods or cycles per second is called frequency. The SI unit for frequency is the hertz (Hz). One hertz is the same as one cycle per second. Standard frequencies and the correct time are broadcast by radio stations WWV and WWVB in Colorado, and WWVH in Hawaii. NIST delivers digital timing signals by telephone and through the internet.

Official U.S. Government time is provided by NIST and USNO. NIST also offers an Internet Time Service (ITS) and an Automated Computer Time Service (ACTS) that allow setting of computer and other clocks through the Internet or over standard commercial telephone lines. Free software for using these services on several types of popular computers can be downloaded there. Information about these services can be found on the Time and Frequency Division Web site.

TABLE 1.1 *Approximate Values of Some Measured Lengths*

	Length (m)
Distance from the Earth to the most remote known quasar	1.4×10^{26}
Distance from the Earth to the most remote normal galaxies	9×10^{25}
Distance from the Earth to the nearest large galaxy (Andromeda)	2×10^{22}
Distance from the Sun to the nearest star (Proxima Centauri)	4×10^{16}
One light-year	9.46×10^{15}
Mean orbit radius of the Earth about the Sun	1.50×10^{11}
Mean distance from the Earth to the Moon	3.84×10^{8}
Distance from the equator to the North Pole	1.00×10^{7}
Mean radius of the Earth	6.37×10^{6}
Typical altitude (above the surface) of a satellite orbiting the Earth	2×10^{5}
Length of a football field	9.1×10^{1}
Length of a housefly	5×10^{-3}
Size of smallest dust particles	$\sim 10^{-4}$
Size of cells of most living organisms	$\sim 10^{-5}$
Diameter of a hydrogen atom	$\sim 10^{-10}$
Diameter of an atomic nucleus	$\sim 10^{-14}$
Diameter of a proton	$\sim 10^{-15}$

TABLE 1.3

Approximate Values of Some Time Intervals

	Time Interval (s)
Age of the Universe	4×10^{17}
Age of the Earth	1.3×10^{17}
Average age of a college student	6.3×10^{8}
One year	3.2×10^{7}
One day	8.6×10^{4}
One class period	3.0×10^{3}
Time interval between normal heartbeats	8×10^{-1}
Period of audible sound waves	$\sim 10^{-3}$
Period of typical radio waves	$\sim 10^{-6}$
Period of vibration of an atom in a solid	$\sim 10^{-13}$
Period of visible light waves	$\sim 10^{-15}$
Duration of a nuclear collision	$\sim 10^{-22}$
Time interval for light to cross a proton	$\sim 10^{-24}$

TABLE 1.4 *Prefixes for Powers of Ten*

Power	Prefix	Abbreviation	Power	Prefix	Abbreviation
10^{-24}	yocto	y	10^{3}	kilo	k
10^{-21}	zepto	z	10^{6}	mega	M
10^{-18}	atto	a	10^{9}	giga	G
10^{-15}	femto	f	10^{12}	tera	T
10^{-12}	pico	p	10^{15}	peta	P
10^{-9}	nano	n	10^{18}	exa	E
10^{-6}	micro	μ	10^{21}	zetta	Z
10^{-3}	milli	m	10^{24}	yotta	Y
10^{-2}	centi	c			
10^{-1}	deci	d			

Terrible example: 10^{12} bull

Comments about “error analysis”

Here are some notes about error analysis. This will be discussed also in your laboratory work. Some helpful comments follow:

Some degree of error is associated with any measurement. For example, Suppose your ruler has centimeter and millimeter markings. If you measured one side of your text you could say that its length is $l_1 \pm \delta l_1$ (for example 22.2 ± 0.2 cm). Suppose the second length is measured as $l_2 \pm \delta l_2$ (for example 26.2 ± 0.2 cm), while the thickness is $t \pm \delta t$ (for example 6.3 ± 0.2 cm). If you now wanted to compute the expected volume of your text, that would be

$$V = l_1 \cdot l_2 \cdot t. \tag{1}$$

To get an idea of the error in your calculation you need to think about the error in each length measurement. Symbollically you can write this as the difference between the possible values and the expected value given in Eq. 1,

$$\delta V \equiv (l_1 \pm \delta l_1) \cdot (l_2 \pm \delta l_2) \cdot (t \pm \delta t) - l_1 \cdot l_2 \cdot t. \tag{2}$$

Expanding this, we find

$$\delta V \approx \pm \delta l_1 \cdot l_2 \cdot t \pm l_1 \cdot \delta l_2 \cdot t \pm l_1 \cdot l_2 \cdot \delta t \pm \ldots, \tag{3}$$

$$\delta V \equiv (l_1 \pm \delta l_1) \cdot (l_2 \pm \delta l_2) \cdot (t \pm \delta t) - l_1 \cdot l_2 \cdot t. \tag{2}$$

Expanding this, we find

$$\delta V \approx \pm \delta l_1 \cdot l_2 \cdot t \pm l_1 \cdot \delta l_2 \cdot t \pm l_1 \cdot l_2 \cdot \delta t \pm \ldots, \tag{3}$$

where the terms we have omitted, such as $\delta l_1 \cdot \delta l_2 \cdot t$ are expected to be much smaller than the terms we kept. If we want an estimate of the maximum possible error, then we can we should replace $\pm$ with $+$ and it is convenient to divide the estimate of the error in V by the the estimated value of V so that the expression becomes the very compact result:

$$\frac{\delta V}{V} = \frac{\delta l_1}{l_1} + \frac{\delta l_2}{l_2} + \frac{\delta t}{t}. \tag{4}$$

For the particular numbers quoted above, the fractional error is

$$\frac{\delta V}{V} = \frac{0.2}{22.2} + \frac{0.2}{26.2} + \frac{0.2}{6.3} = 0.048 \equiv \%4.8, \tag{5}$$

or $V = 3664 \pm 177$ cm^3.

In this case, the fractional error is equal to the sum of the fractional errors in each of the length measurements. This is not a general result, but frequently the error analysis simplifies to a compact result when expressed in terms of the fractional error of each measurement.