Introduction to Physics

There are 3 ways to read in physics: reading to **know**, reading to **discover**, and reading to **understand**.

Key Words

Often we are given information from the wording of the problem that is not directly stated. For example, if a problem tells us that an object *started from rest*, we know that the initial velocity is zero, even though the problem didn't say anything about velocity.

If a problem says...	It is really telling us about...
Beginning	Starting/Initial Velocity
From ... to ...	Starting at ... and stopping at ...
From rest	Initial velocity (V^I)
Reaches	Final (velocity, sometimes)
Freely falling	Gravity

Scalar vs. Vector

A *scalar* is a quantity that has a magnitude only. A *vector* is a quantity with a magnitude and a direction.

Scalar	Vector
8 years old	10 kilometers east
14 days	12 miles west
3 meters	2 inches south
8 apples	5 yards north

Conversion Tables

1 kilometer	1000 meters
1 centimeter	0.01 meter
1 gram	0.001 kilogram

Standard Units in Physics

There are specific units that you must use when solving physics problems. If your final answer uses units other than these, it will be marked *wrong*.

Measurement	Unit	Abbr.
Distance	meters	m
Displacement	meters	m
Velocity	meters/second	m/s
Acceleration	meters/second^2	m/s^2
Force*	newtons	N
Weight	newtons	N
Mass	kilograms	kg
Time	seconds	s
Work	joules	J
Gravity**	meters/second^2	9.8 m/s^2

*: see force box below for everything measured in newtons.

**: Gravity will always be 9.8 m/s^2* unless a problem specifically mentions a zero-gravity environment (rare but possible).

Types of Force

There are several types of forces that are all measured in newtons. It is important to remember that every force is equal to **mass times acceleration**, but certain forces have easier ways of measuring them.

F^G	Force of gravity	Mass × gravity
F^D	Driving force	$F^G \sin \theta$
F^F	Force of friction	$\mu \times F^N$
F^N	Normal force	$F^G \cos \theta$

The website I made this cheat sheet on doesn't have a subscript option (the little letters used for things like initial velocity) so I put it in superscript instead. However, you will see it in subscript on the test, so be aware.

Formula List

Every formula you'll need for the class should be here!

Area of a rectangle	length × width
Area of a triangle	½ length × width
Area of a trapezoid	½ ($b^1 + b^2$) × height
Distance	speed × time
Speed	distance / time
Weight (F^G)	mass × gravity
Force (general)	mass × acceleration
F^D	$F^G \times \sin \theta$
F^N	$F^G \times \cos \theta$
F^F	$\mu \times F^N$
Work	Force × displacement
Kinetic energy	½ mass × velocity^2
Potential energy	mass × gravity × height
Centimeters to meters	cm × 0.01
Kilometers to meters	km × 1000
Acceleration	$V^F - V^I / T^F - T^I$

Kinematic Formulas

$\Delta x = V^{F2} - V^{I2} / 2a$	No t
$V^F = V^I + at$	No Δx
$\Delta x = V^I t + \frac{1}{2}at^2$	No V^F
$\Delta x = (V^F + V^I / 2) \times t$	No a

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