

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/second² m/s²

Force* newtons N

Weight newtons N

Mass kilograms kg

Time seconds s

Work joules J

Gravity** meters/second² 9.8 m/s²

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

*: *Gravity will always be 9.8 m/s²* 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 $\frac{1}{2}$ length × width

Area of a trapezoid $\frac{1}{2} (b^1 + b^2) \times \text{height}$

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 $\frac{1}{2}$ mass × velocity²

Potential energy mass × gravity × height

Centimeters to meters cm × 0.01

Kilometers to meters km × 1000

Acceleration $\sqrt{v^f - v^i} / T^f - T^i$

Kinematic Formulas

$\Delta x = \frac{v^f^2 - v^i^2}{2a}$ 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