Phys 131 2023

Lecture 6

Mon: HW by 5pm

Ex 42, 43, 45, 46, 49, 51, 52, 54

Tues: Warm Up 3 (D2L) Survey Q1,2

Free fall motion

An object is in free fall if it moves vertically only under the influence of Earth's gravity. Such objects clearly have non-zero acceleration. Experimental observations show:

1) the acceleration of the object is independent of its mass and its state of motion

2) the acceleration is constant (near Earth's surface) and

$$a = -g \qquad \text{where} \qquad g = 9.81 \text{ m/s}^2$$

g always positive

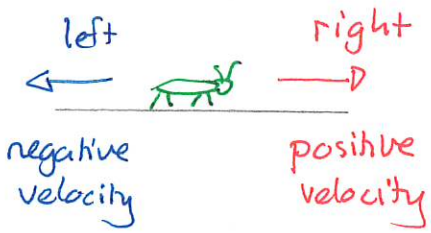
→ Quiz 1 90% } 95%

Quiz 2 50% - 80% } 70%

Motion in Two Dimensions

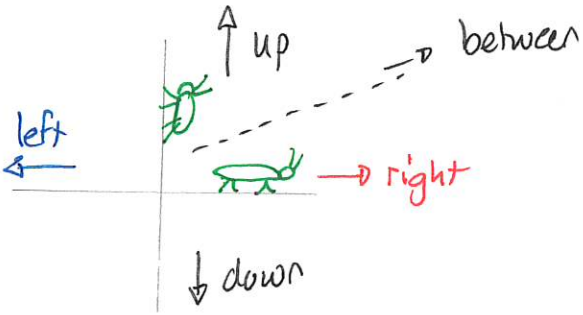
Many objects move in more than one dimension. This will require expanding the kinematical description of an object's motion. The key difference will be the multitude of possible directions.

One dimension



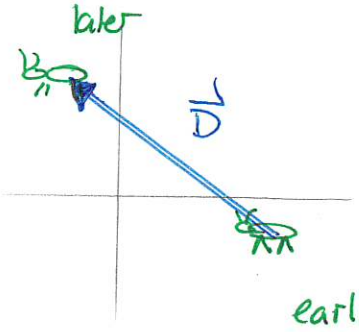
since there are only two distinct directions we can use positive or negative.

Two dimensions



There are infinitely many directions and positive vs negative are not sufficient to characterize them all.

We return to the idea of displacement. This can be generally be described by:



> A displacement vector describes a change in position and is one arrow with
>
> 1) tail at earlier position
> 2) head " later position

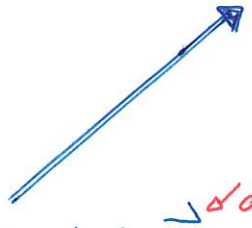
We will denote such displacement vectors as $\vec{D}$ and they contain two pieces of information.

1) magnitude
2) direction

$\vec{D}$ ← arrow means vector

D ← label to describe which vector

vector



symbol $\vec{D}$ ← arrow

* has size and direction

numerical description

1) magnitude of vector = size of vector

* for a displacement vector the magnitude is the length in meters
* magnitude is never negative

2) direction of vector = some description of which way it points
e.g. angle from x-axis
or compass points

We need to be able to convert these vectors into mathematical entities amenable to algebraic operations LINEAR ALGEBRA

First:

Two vectors $\vec{A}$ and $\vec{B}$ are equal ($\vec{A} = \vec{B}$) ⇔ $\vec{A}, \vec{B}$ have same magnitude AND $\vec{A}, \vec{B}$ have same direction

Quiz ~~3~~ 70% → 100% ≳ 90% - 95%