

## The Law of Gravity

*The forces of nature are mathematical.*

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Gravity

## The Problem of the Moon

- ❖ Moving things usually stop.
- ❖ What keeps the planets going around the Sun?
- ❖ What keeps the Moon going around the Earth?

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Gravity

## Inertia

*the tendency of things to keep moving*

- ❖ Aristotle: moving things want to stop
- ❖ Galileo: they want to keep going
- ❖ Descartes: they want to keep going in straight lines

*René Descartes*

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Gravity

## The Law of Inertia

*Newton's 1<sup>st</sup> Law of Motion*



An object at rest stays at rest, and an object in motion stays in motion in a straight line at a constant speed unless a force acts on it.

The correct question: *What keeps the Moon from moving in a straight line at a constant speed?*

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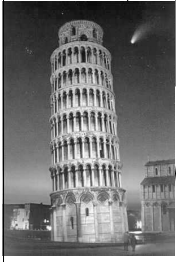
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Gravity

## The Pisa Principle



*Falling things fall at the same rate ...in the absence of air resistance.*



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Gravity

## Acceleration due to gravity

*little "g"*

Time (sec)	Speed (m/s)
1	10
2	20
3	30
4	40

- ♣ Falling objects *accelerate*
- ♣  $g$  = acceleration = speed change per sec
- ♣ Earth:  $g = 10 \text{ m/s/s}$
- ♣ Distance fallen in 1st sec: 5 m
- ♣ Horizontal projectiles accelerate at the same rate (regardless of horizontal speed)

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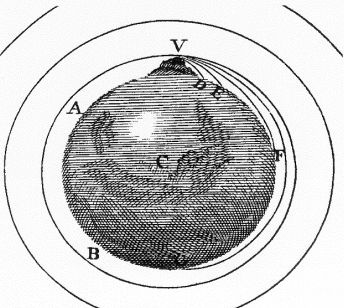
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Gravity

### Orbital Motion



Orbiting satellites are falling *around* the Earth

same speed regardless of mass

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Gravity

### The Moon is in orbit!



*One had to be a Newton to see that the Moon is falling, when everyone sees that it doesn't. - Paul Valery*

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