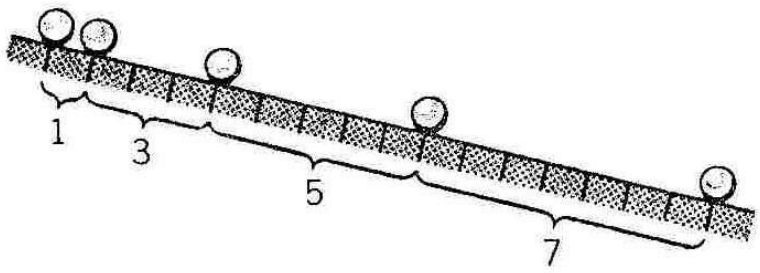
Galileo's Law of Uniform Acceleration of Falling Bodies

- By concentrating on measuring actual distances and time, Galileo discovered a simple relationship that accounted for bodies "falling" toward the Earth by rolling down a plane.
- Since the relationship did not change as the plane got steeper, Galileo reasoned that it held for bodies in free fall.

Galileo's Law of Uniform Acceleration of Falling Bodies, 2

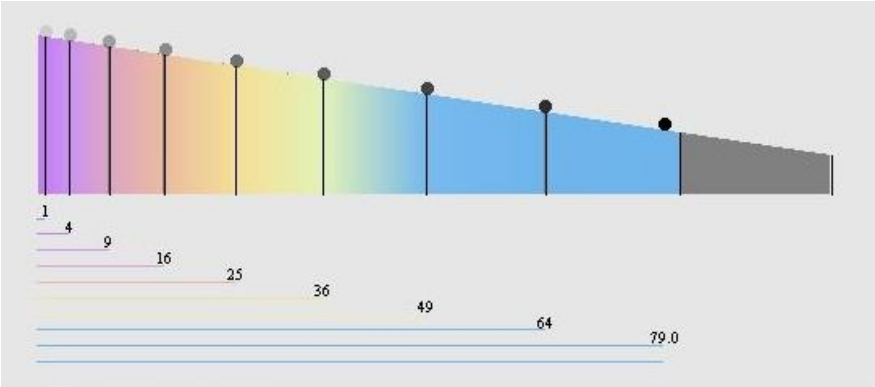
- The law states that falling bodies gain speed at a constant rate, and provides a formula for calculating distance fallen over time once the starting conditions are known.
- Nowhere does the law attempt to explain why a heavy body falls down.
- The law specifies *how* a body falls, not *why.*

The Law of Odd Numbers



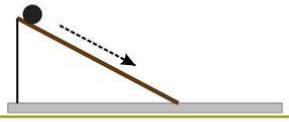
From his observations and analysis of motion using inclined planes, Galileo discovered a pattern of how objects move under the influence of a constant force (in this case gravity) that produces uniform acceleration. He found that any object under the conditions of uniform acceleration would travel distances that would increase by factors according to the odd integers in relation to successive time intervals.

The Law of Squares



From his observations and analysis of motion using inclined planes, Galileo discovered a pattern of how objects move under the influence of a constant force (in this case gravity) that produces uniform acceleration. He found that any object under the conditions of uniform acceleration would increase their total displacements from a starting position according to factors of the square integers of time.

The amazing results



- What astounded Galileo was that he found a simple numerical relationship between the distance the ball rolled down the plane and the time elapsed.

Time interval	Distance rolled in interval n	Total Distance
1st	1d	1d
2nd	3d	4d
3rd	5d	9d
4th	7d	16d
5th	9d	25d
n	(n^{th} odd number) x d	n^2 x d

The amazing results

- No matter how steep or not the inclined plane was set and no matter whether the ball rolled was heavy or light, large or small, it gained speed at the same uniform rate.
- Also the total distance travelled was always equal to the distance travelled in the first time interval times the square of the number of time intervals.

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