Evidence Problems

In orbital astronomy

1. **Determining distances of celestial objects from the Earth (and from the Sun) in a common unit.**

2. **Distinguishing merely apparent motions and changes of motions from real ones.**

In mechanics of local motion

1. **Making precise measurements of elapsed time was difficult because the characteristic times of phenomena of motion that could be controlled were short**

2. **While mean speeds may be measurable, via distance and time measurements, there was no obvious way of measuring speeds that vary with time**

3. **Theoretical claims that were being set forth usually concerned motions under idealized circumstances like the absence of air resistance – ideals that could not be realized in experimental practice**

Fundamental Result

Prop. 2. **If a moveable descends from rest in uniformly accelerated motion, the spaces run through in any times whatever are to each other as the duplicate ratio of their times; that is, are as the squares of those times.**

Corol. 1. **From this it is manifest that if there are any number of equal times taken successively from the instant or beginning of motion [during each of which a certain space is run through], … then these spaces will be to one another as are the odd numbers from unity, that is, as 1, 3, 5, 7, ….**

Corol. 2. **It is deduced, second, that if at the beginning of motion there are taken any two spaces whatever, run through in any [two] times, the times will be to one another as either of these spaces is to the mean proportional space between the two given spaces.**

i.e. $elapsed\ time_1 : elapsed\ time_2 :: space_1 : \sqrt{(space_1 \cdot space_2)} = \sqrt{space_1} : \sqrt{space_2}$