



Supertasks

[Handwritten notes on physics topics including wave interference, optics, and thermodynamics]

Wave Interference:
 $v = \lambda f$
 $\Delta x = \lambda \Delta n$
 $\Delta \phi = 2\pi \Delta n$
 Path difference $\Delta r = r_2 - r_1$
 Phase difference $\Delta \phi = k \Delta r$
 Maxima: $\Delta r = m\lambda$
 Minima: $\Delta r = (m + \frac{1}{2})\lambda$

Optics:
 Snell's Law: $n_1 \sin \theta_1 = n_2 \sin \theta_2$
 Critical angle: $\theta_c = \sin^{-1}(\frac{n_2}{n_1})$
 Lens formula: $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$
 Magnification: $M = \frac{v}{u}$

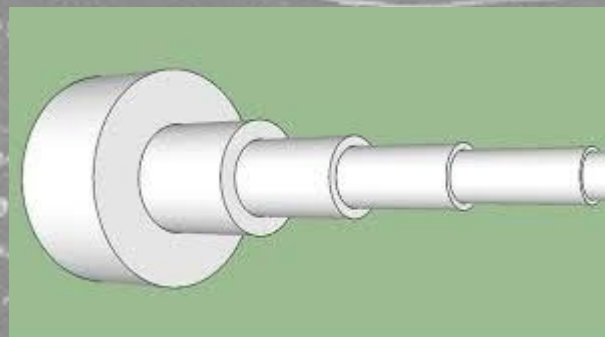
Thermodynamics:
 Heat: $Q = mc\Delta T$
 Work: $W = PdV$
 Efficiency: $\eta = \frac{W}{Q}$

Diagrams:



Voitsova Sophia
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Introdacion.

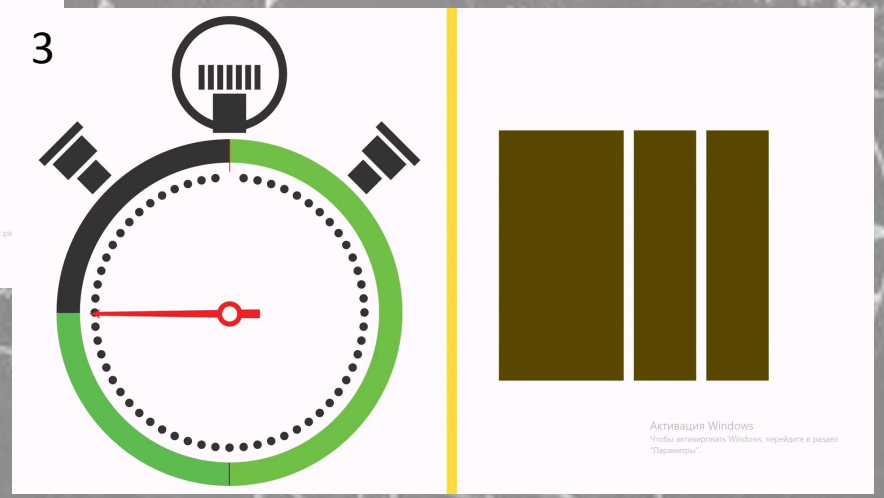
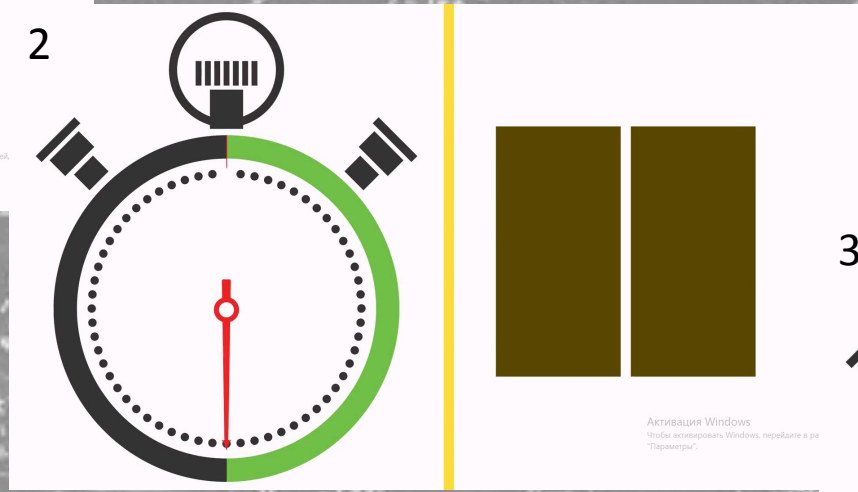
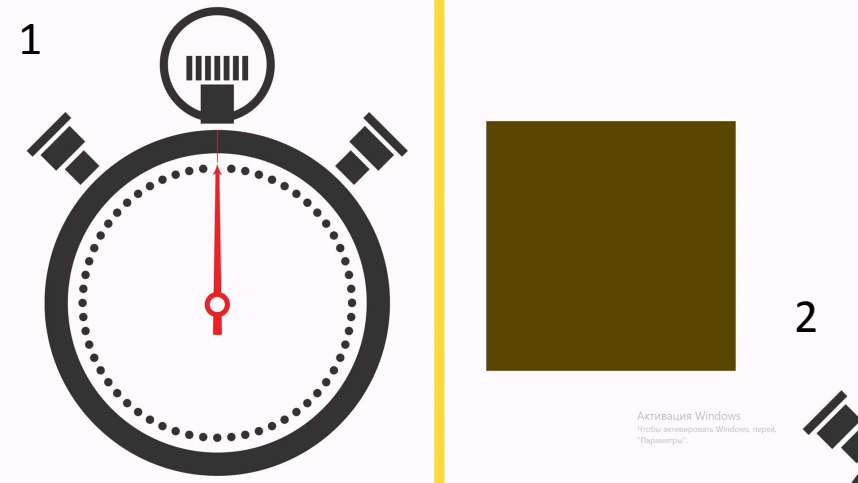
The Paradox of Gabriel's Horn.



What is a Gabriel's cake?

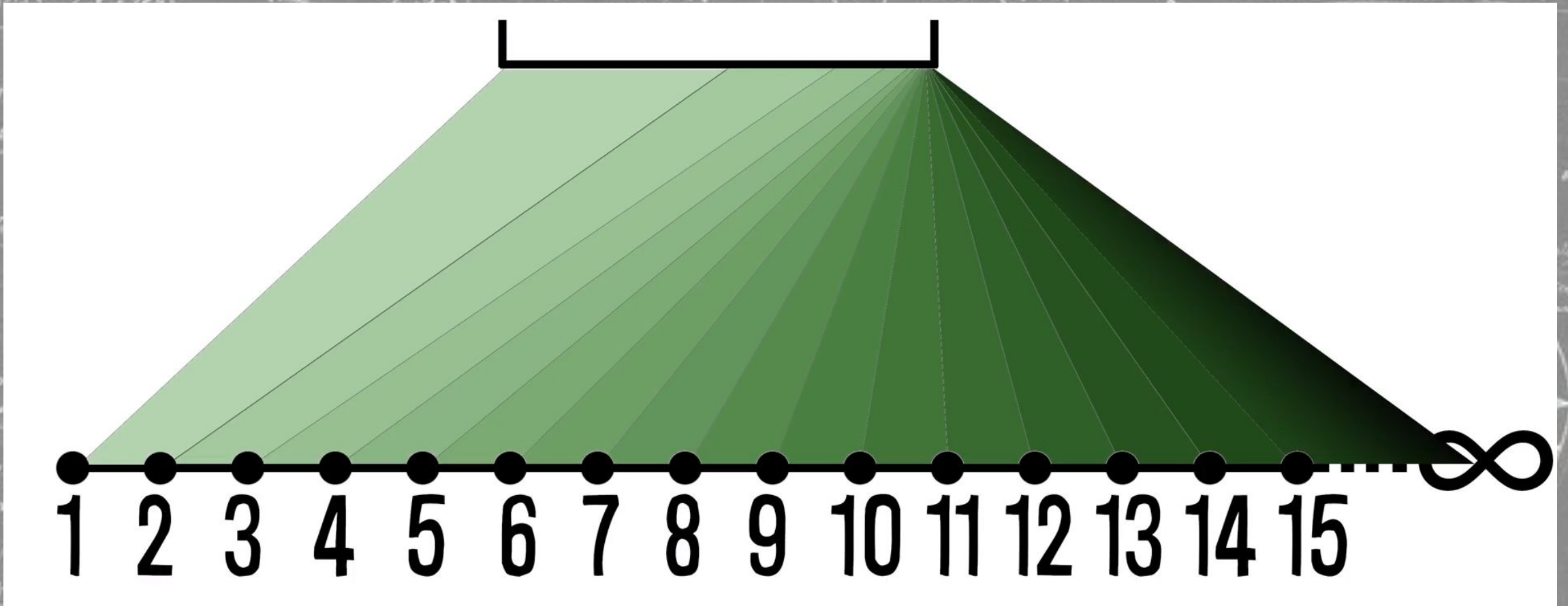


Gabriel's cake in two minutes



Supertask

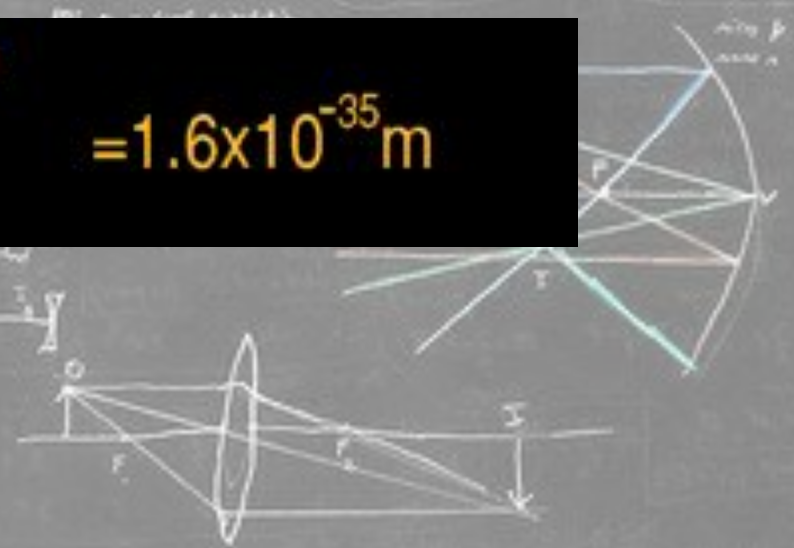
Infinitely actions in the limited period of time is a **SUPERTASK**.



Limitations of the real world

$$\text{Planck Time} = \sqrt{\frac{G\hbar}{c^5}} = 5.4 \times 10^{-44} \text{ s}$$

$$\text{Planck Length} = \sqrt{\frac{G\hbar}{c^3}} = 1.6 \times 10^{-35} \text{ m}$$



Conclusion

Logically an infinite number of individual actions can be carried out over a finite period of time. But only logically!

