

Imagine the Universe Website (Goddard Space Flight Centre)

Example to help understand the inverse squared law:

Inverse Squared Law Quiz - Model Answers (U.S. Units)

1. A light bulb looks dimmer the further away it is because? Answer: The same number of photons are spread over a larger area

Explanation:

Sphere in 3D Light Bulb
Area of a sphere = $4\pi r^2$
So intensity of light decreases as $\frac{1}{r^2}$ with distance r

2. Walking into your basement one night you notice you see only 10 ft with your trusty 50 Watt flashlight. How strong must your flashlight be to see the full 20 ft of your basement? Answer 200 W
Explanation:

The inverse square law means that if r doubles, intensity decreases by $\frac{1}{4}$. So the torch must be 4 times more powerful to reach twice as far.

3. While waiting for your bus you measure the intensity of its headlights as 10 lumen. After 10s you measure 20 lumen. What can you say about the motion of the bus in that 10s?
Answer The bus moved less than half the distance to you in 10s

Explanation:

The inverse square law means that if distance doubles, intensity decreases by $\frac{1}{4}$. As intensity has only halved, distance cannot have doubled.