Illuminance
Video Notes

What is Illuminance?

Illuminance is the rate at which light energy lands upon a 1-m^2 surface some distance from the source.

It is useful to think of illuminance as a *Surface Thing*, since it is measured at the surface.

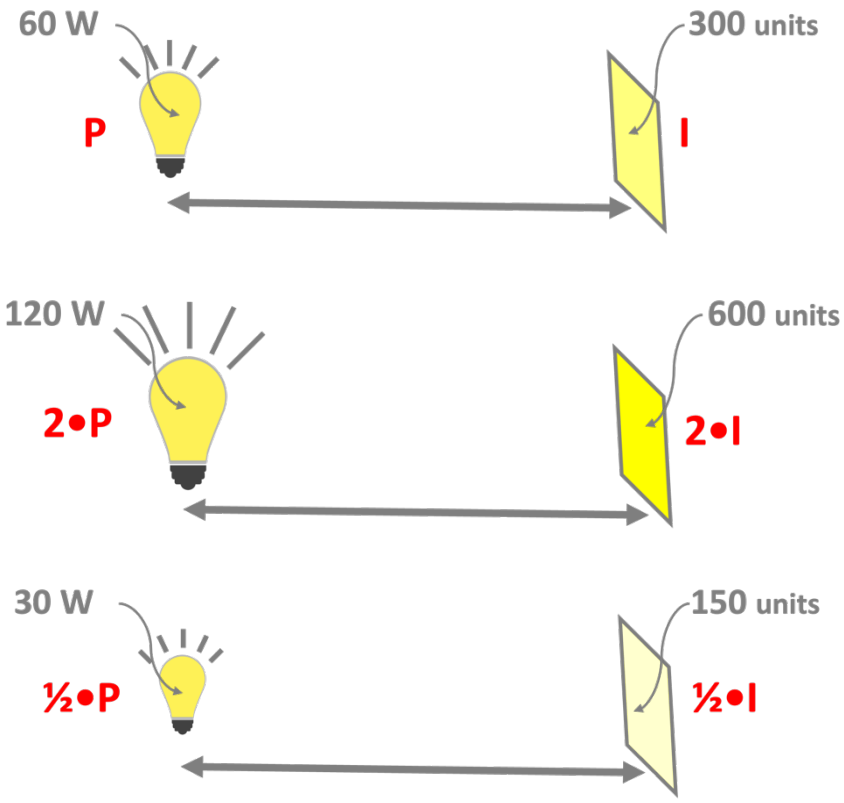
Illuminance depends upon …

- The rate at which light is emitted by the source (e.g., a lit bulb)
- The distance from the source to the surface

Illuminance and the *Source Thing*

Illuminance is **directly proportional** to the rate at which light energy is emitted (given off) by the source. This is technically referred to as the **luminous flux**.

- It is useful to think of this as a *Source Thing*, since it is related to the properties of the source of light.
- While not precisely accurate, it is useful to think of this as the bulb's power … and as being proportional to the bulb's electrical power in watts.
- A doubling of the *source thing* will result in twice the illuminance. A 120-Watt bulb will have twice the illuminance as a 60-Watt bulb.
- And a halving of the *source thing* will result in twice the illuminance. A 30-Watt bulb will have one-half the illuminance as a 60-Watt bulb.

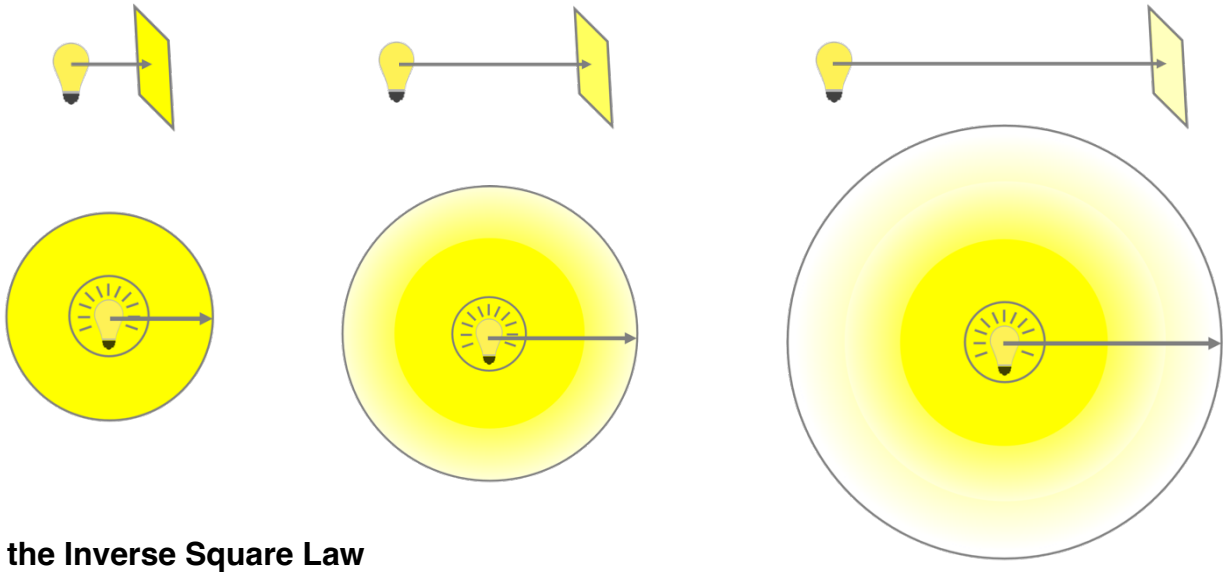


Illuminance and Distance

Illuminance is **inversely proportional** to the **square** of the distance between the source and the surface. This is known as an **inverse square relationship**.

As light energy from a source travels outward in all directions at the same speed, it spreads over a spherical surface that becomes larger and larger with distance from the source. The same light energy is landing on a larger surface as a smaller surface, yet it is

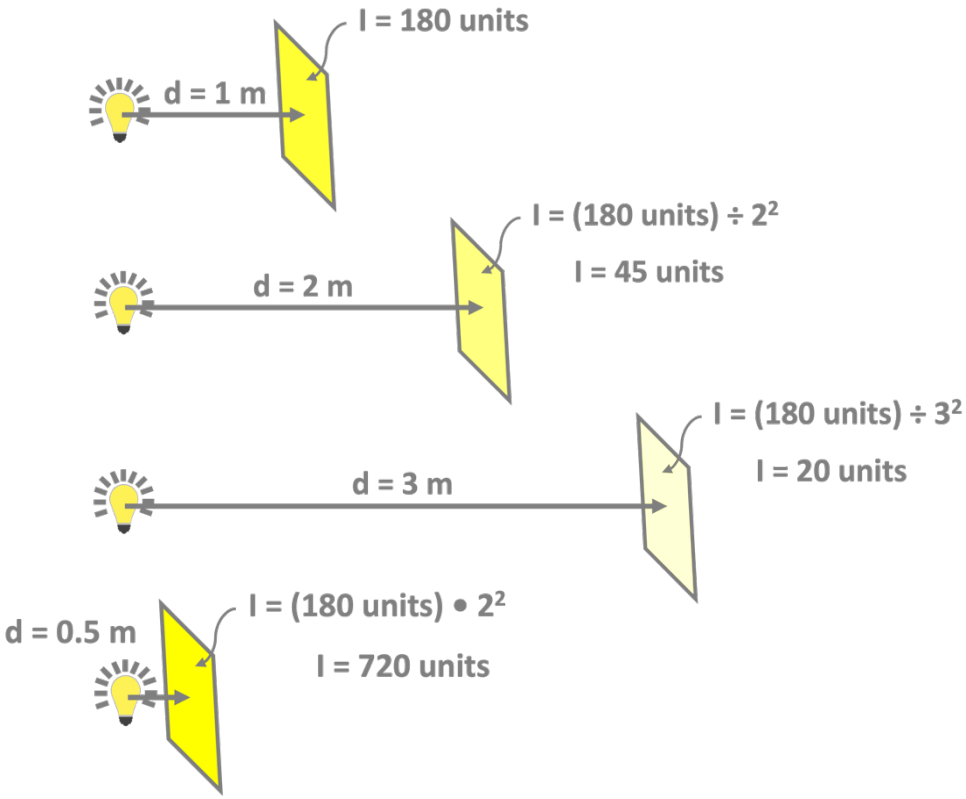
spread more thinly on the larger surface area and is *more concentrated* on the smaller surface areas. You can think of light energy as being **diluted by distance** from the source.



Using the Inverse Square Law

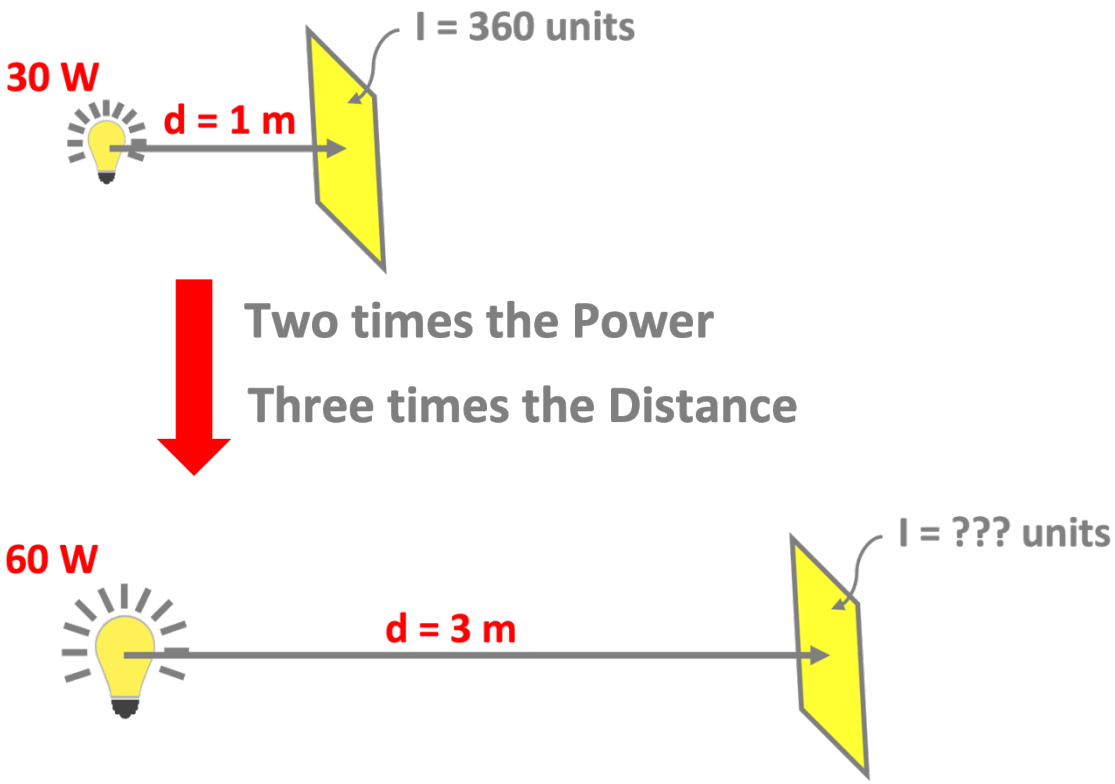
Illuminance is **inversely proportional** to the **square** of the distance between the source and surface.

- Doubling the distance causes the illuminance to be 1/4th as much.
- Tripling the distance causes the illuminance to be 1/9th as much.
- Quadrupling the distance causes the illuminance to be 1/16th as much.
- And finally, halving the distance causes the illuminance to be four times greater.



Putting it All Together

- Illuminance is directly proportional to the **power** of the light bulb.
- Illuminance is inversely proportional to the square of the **distance** to the surface.
- If both power and distance are changed, then the new illuminance value can be predicted by making two changes to the original illuminance value. Do the changes in two systematic steps.



$I_{new} = (360 \text{ units}) \bullet 2 \; / \; 3^2 = 80 \text{ units}$

Two times the Power

Three times the Distance

Dataway!!