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Estimate the Sun's temperature without leaving the school

Worksheet: The inverse square law of light

Materials

- 5 W light bulb
- Smartphone
- Phyphox software
- Ruler

Procedure

Main questions: how does the distance to a star influence its apparent brightness? How would the Sun's light intensity change if the distance from the Earth to the Sun were increased by a factor of five?

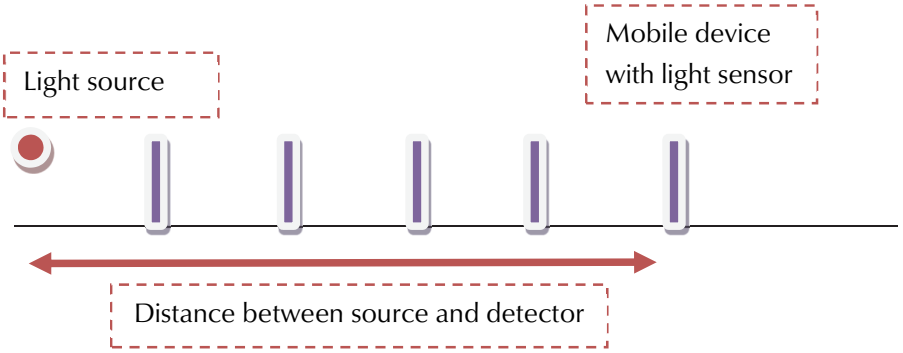


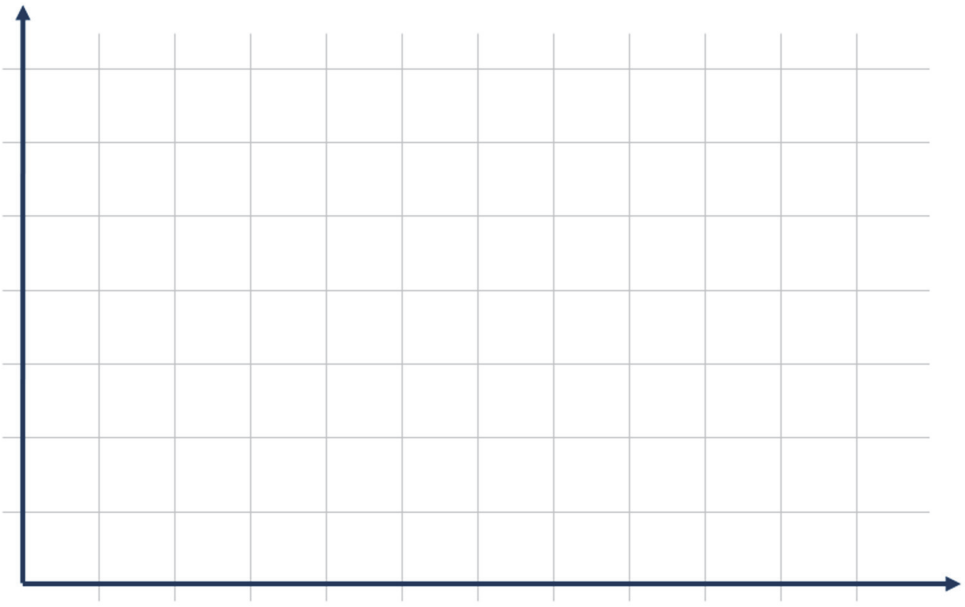
Image courtesy of the author

Turn on the light and place the smartphone at a distance of 20 cm. Then activate the phyphox software and choose the light sensor to record the measurement.

Place the smartphone at a distance of 40 cm, record the next measurement, and complete the table.

Distance, *D* (cm)	**Intensity of light (lux)**
20	
40	
60	
80	

Plot a graph of intensity of light versus distance. Don't forget to label the graph axes!



By analyzing the graph, determine the relationship between brightness and distance. Is it directly proportional, inversely proportional, or inversely proportional to the square of the distance?

It is noteworthy that astronomers employ the inverse square law of light to measure distances to stars and galaxies.

Upon completion of this activity, answer the following questions:

1. Express the unit of measurement for the magnitude of the intensity in terms of Joules, seconds, and metres.

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2. A light bulb has a power of 20 W. Calculate the intensity at a distance of 2 m from the bulb.

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