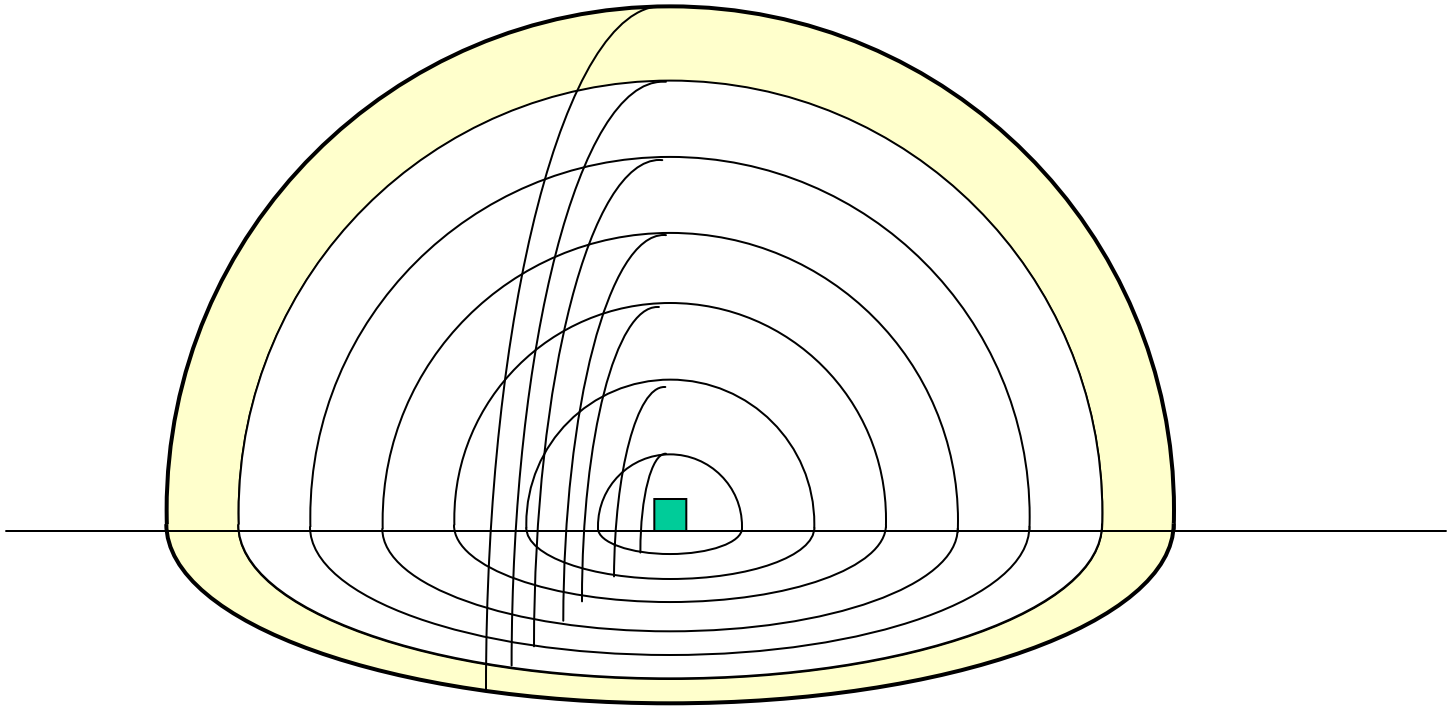
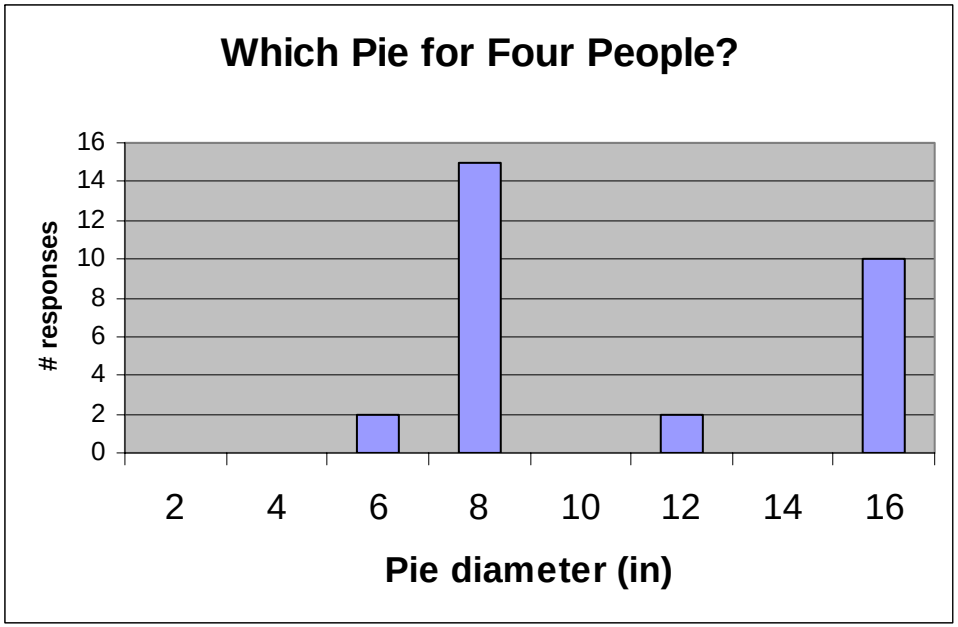


Pans for baking pies come in different sizes, identified by their diameters. A pastry shop specializes in making pies of any desired size, right down to a single-serving 4-inch tart. You are hosting a dinner with four people (yourself and three others). What size pie should you order from this shop (that is, what diameter)?

Responses from last year.



You have made a 1:1000 scale model of a battleship, and while painting it found that you had to cover 110cm^2. What area of paint is required for the real thing? [Express in m^2.]

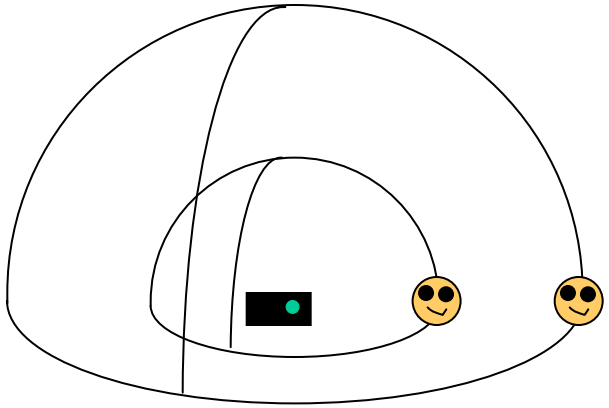
$$A \propto d^2$$

$$\frac{A_{\text{real}}}{A_{\text{model}}} = \frac{d_{\text{real}}^2}{d_{\text{model}}^2} = \left(\frac{d_{\text{real}}}{d_{\text{model}}} \right)^2 = 1000^2$$

$$A_{\text{real}} = 1000^2 A_{\text{model}} = 10^6 \left(110\,\text{cm}^2 \right)$$

$$A_{\text{real}} = 10^6 \left(110\,\text{cm}^2 \right) \left(\frac{1\text{m}}{100\,\text{cm}} \right)^2 = 11000\,\text{m}^2$$

Outside Dr. McLean's office, construction workers are blaring a radio so that from a distance of 25m the sound intensity is $8\times10^{-4}\text{W/m}^2$. When he approaches to a distance of 10m (to ask them to turn it down) what is the intensity?



$$I \propto \frac{1}{r^2}$$

$$\frac{I_n}{I_f} = \frac{\cancel{1}/\cancel{r_n^2}}{\cancel{1}/\cancel{r_f^2}} = \frac{r_f^2}{r_n^2}$$

Note how subscripts look upside down!

$$I_n = I_f \frac{r_f^2}{r_n^2} = \left(8\times10^{-4}\,\text{W/m}^2\right)\left(\frac{25\text{m}}{10\text{m}}\right)^2 = 5\times10^{-3}\,\text{W/m}^2$$