1. First we evaluate $\vec{d} = \vec{b} \times \vec{c}$:

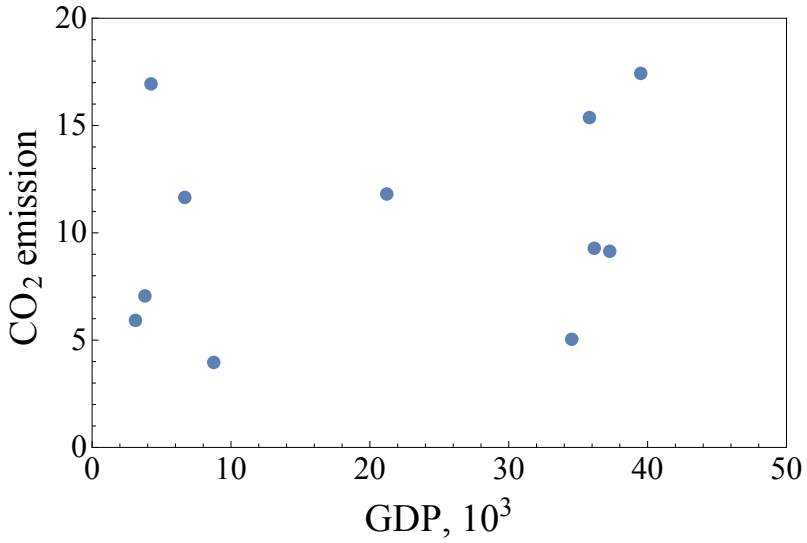
$$\vec{d} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & 1 & -1 \\ -1 & 1 & 1 \end{vmatrix} = 2\vec{i} + 2\vec{k}.$$

Then,

$$\vec{a} \cdot \vec{d} = 2 - 0 + 2 = 4,$$
$$\vec{a} \times \vec{d} = \begin{vmatrix} \vec{i} & \vec{j} & \vec{k} \\ 1 & -1 & 1 \\ 2 & 0 & 2 \end{vmatrix} = -2\vec{i} - 2\vec{k}.$$

2. True

3. I don't think a correlation exists (see pic).



4. The distance x between fringe maxima (or minima) is given by

$$x = \frac{\lambda D}{2d}.$$

Measurements of small fibres may be based on diffraction on a thin wire, for which $x \propto \lambda D/r$, where r is the radius of the wire. The coefficient of proportionality is of order 1 and can be found from geometry.

5. The energy of one photon is

$$E_0 = \frac{hc}{\lambda} = 2.07 \text{ eV},$$

so the work per electron is

$$W = E_0 - E_{\max} = 0.13 \text{ eV}.$$

6. The capacitor C_1 is charged to voltage $V_1 = 6$ V, so the charge on the top plate is $Q = C_1 V_1 = 18$ µC.

7. The cinema screen should reflect light in all directions as much equally as it can. The mirror only lets a person see a bright spot on the screen, without seeing all the picture.