This can be a very important result that is useful in many (symmetric) situations. But, how do you “count” field lines? Remember that when we developed the idea of the electric field, with the balloon, we said that the strength of the electric field was proportional to the density of lines:

\[ E \propto \frac{\text{# of lines}}{\text{area on balloon}} \]

so:

\[ \text{# of lines} \propto E \cdot \text{area of balloon} \]

Or, if we believe that the # of lines \( \propto q_{enc} \) then in general,

\[ q_{enc} \propto E \cdot A \]

Now what is the \( \propto \) in \( E \cdot A \)?

\[ A_2 \gg A_1 \]

but \( q_{enc} \) is the same???

Let’s look at a situation where the electric field is constant:

\[ E = \frac{Q}{A} \]

\[ q_{enc} = E \cdot A \]

from above we have

\[ q_{enc} \propto E \cdot A \]