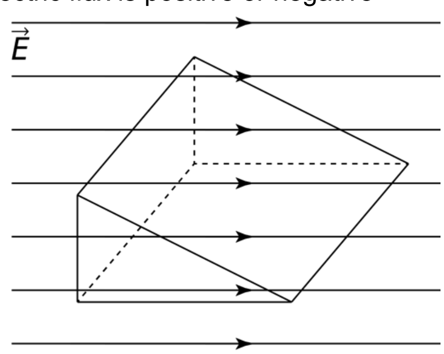
Flux is defined as any effect that appears to pass or travel through a surface or substance, however, realize that effect does not need to move. Hence, "appears to".

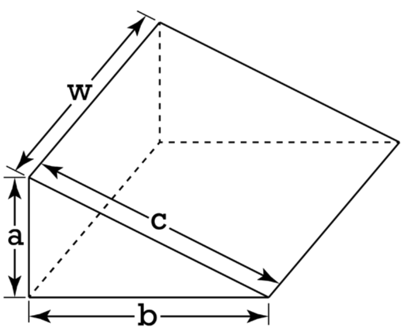
Electric flux is the measure of the amount of electric field which passes through a defined area. The equation for electric flux of a uniform electric field is:

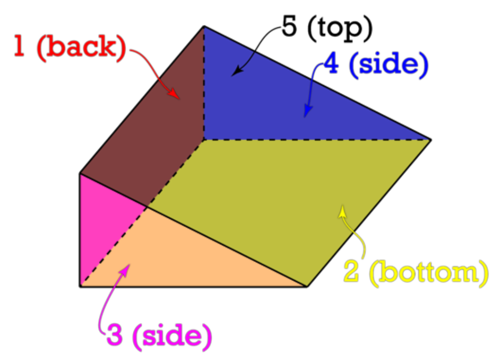
- $\Phi_E = \vec{E} \cdot \vec{A} = EAcos\theta$
- Φ is the uppercase, Greek letter phi
- E is the uniform electric field *(use magnitude)*
- A is the area of the surface through which the uniform electric field is passing *(use magnitude)*
- θ is the angle between the directions of E and A
    - Notice this is the same form as the equation for work. This means you use the magnitudes of E and A, and cosθ determines if the electric flux is positive or negative
    - $W = \vec{F} \cdot \Delta\vec{r} = F\Delta r \cos\theta$
- Electric flux is a scalar
- The units for electric flux are $\dfrac{N \cdot m^2}{C}$



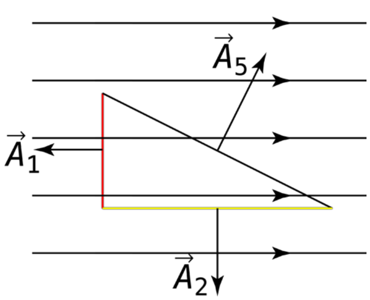
Usually, electric flux is through some sort of closed surface. So, let's do an example and determine the net electric flux of a uniform, horizontal electric field through a right triangular box.

Let's define and label the dimensions and sides of the triangular box as:





And now we can determine the electric flux through each side:



Electric flux for Area 1 (back): θ_1 is 180° because Area 1 is to the left or out of the rectangular box and the electric field is to the right.

$$\Phi_1 = EA_1cos\theta_1 = E(aw)\cos(180°) = -Eaw$$

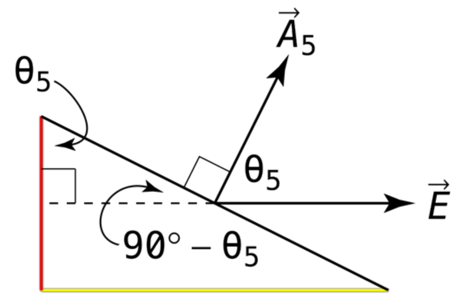
Electric flux for Area 2 (bottom): θ_2 is 90° because Area 2 is down or out of the rectangular box and the electric field is to the right.

$$\Phi_2 = EA_2cos\theta_2 = E(bw)\cos(90°) = 0$$

Electric flux for Areas 3 and 4 (sides): θ_3 and θ_4 are both 90° because Area 3 is out of the page and Area 4 is into the page (and the electric field is to the right).

$$\Phi_3 = EA_3 cos\theta_3 = E\left(\frac{1}{2}ba\right)\cos(90°) = 0 = \Phi_4$$

Electric flux for Area 5 (top): To understand why $\cos\theta_5 = a/c$, we need to draw another diagram.



$$\cos\theta_5 = \frac{A}{H} = \frac{a}{c}$$

$$\Phi_5 = EA_5 cos\theta_5 = E(cw)\left(\frac{a}{c}\right) = Eaw$$

And the total electric flux through the entire triangular box is:

$$\Phi_{\text{total}} = \Phi_1 + \Phi_2 + \Phi_3 + \Phi_4 + \Phi_5 = -Eaw + 0 + 0 + 0 + Eaw = 0$$

Notice that:

- When an electric field is going into a closed surface, the electric flux is negative.
- When an electric field is coming out of a closed surface, the electric flux is positive.