1 | Dot product:

- Name: dot product
- Result: Scalar
- Interpretation (what it measures): parallelity
  - the more parallel the larger the dot product
- Magnitude (with sign): $|\vec{a}||\vec{b}|cos(\theta)$
- Geometric magnitude: $|\vec{a}||\vec{b}_{\|\vec{a}}|$
- Direction: no direction
- Algebraic form: $a_x b_x + a_y b_y + a_z b_z$
- Algebraic properties:
  - commutative
  - associative
  - distributive across addition

2 | Cross product:

- Name: Cross product
- Result: Vector
- Interpretation (what it measures): Orthgonality
  - the more orthogonal the longer the cross product
- Magnitude (with sign): $|\vec{a}||\vec{b}|\sin(\theta)$
- Geometric Magnitude: $|\vec{a}||\vec{b}_{\perp\vec{a}}|$
- Direction: perpendicular to the two vectors
  - by the right hand rule by rotating the first vector into the second vector

3 | Application of cross product:

- In physics there is something called torque, notated τ
  - Torqe is the net force of things that rotate, so:
    - $F_{net} = ma$
    - $\tau_{net} = I\omega$
- Somethings to note about τ:
  - It increases with a longer lever
  - It increases with a greater force

        - that is perpendicular to the lever

- Given these requirements we can make a formula:
    - $|\tau| = |\vec{r}||\vec{F}_{\perp\vec{r}}|$, where $\vec{F}$ is the force applied to the door, and $\vec{r}$ is the radius of the lever.
    - this, the right side of the equation, can be described using the dot product: $|\tau| = \vec{r} \times \vec{F}$