Lanchester model if you know about differential equations …

In a tank battle, one army has x tanks and the other army has y tanks. We are going to assume that the rate at which one army's tanks are destroyed is proportional to the number of tanks in the opposing army.

So:

$$\frac{dx}{dt}=-k_1 y \quad \text{and} \quad \frac{dy}{dt}=-k_2 x$$

Let's also assume that each army is equally good at aiming so that:

$$k_1=k_2$$

Dividing these equations gives:

$$\frac{dy}{dx}=\frac{x}{y}$$

So $\int y\,dy \int x\,dx$ So $\frac{1}{2}y^2=\frac{1}{2}x^2+c$ So $y^2=x^2+2c$

So as the battle proceeds y^2-x^2 will remain constant.

Example

At the start of the battle:

$x=24$ and $y=25$

Throughout the battle:

$y^2-x^2=49$

At the end of the battle:

$x=0$ and $y=7$

The strength of a tank army is not proportional to the number of tanks but to the square of the number of tanks. This means weird stuff can happen.

Example

I start with 30 tanks and you start with 42 tanks. In one big battle with all the tanks, I am going to lose. But what if I could arrange some small skirmishes.

If 5 of my tanks engage with 3 of your tanks, then at the end of this skirmish, I'll have 4 tanks and you will have no tanks. If I keep doing this, then I'll soon have more tanks than you!