Answer on Question #42110-Physics-Mechanics-Kinematics-Dynamics

A cannonball is shot toward a target on the ground a certain distance away. If it was shot at an angle θ_1 of 35º and hit the target, what other angle could the cannonball be shot from and still hit the target? (assume the cannonball is shot with the same velocity).

Solution

We can use projectile motion. The range of the projectile is

$$R = \frac{v_0^2 \sin 2\theta}{g},$$

where θ is the launch angle, g is an acceleration of gravity, v_0 is initial velocity of the projectile.

So

$$R_1 = R_2 \to \frac{v_0^2 \sin 2\theta_1}{g} = \frac{v_0^2 \sin 2\theta_2}{g} \to \sin 2\theta_1 = \sin 2\theta_2.$$

But $\sin 2\theta_1 = \sin(\pi - 2\theta_1)$, thus

$$2\theta_2 = \pi - 2\theta_1 \to \theta_2 = \frac{\pi}{2} - \theta_1 = 90 - 35 = 65°.$$

Answer: $65°$.

A snowflake is floating through the air with a constant velocity. The net force acting on it is **zero** and its acceleration is **zero**.

Two people are pushing a 35 kg box. One person pushes with a force F_1 of 45 North and the other person pushes with a force F_2 of 60 N South. What is the resulting force on the box?

Solution

The resulting force on the box is

$$F = F_2 - F_1 = 60 - 45 = 15\ N\ South.$$

Answer: 15 N South.

According to Newton's Law of Universal Gravitation, as the distance between two objects increases, the force between them **decreases**.

According to the impulse-momentum theorem, the more force there is applied to an object, **which has the greater rate of change of momentum.**