

Throwing a basketball

Aim: To show how impulse changes the movement of a thrown basketball.

Subjects: 1K10 (Dynamic Torque)
1K20 (Friction)
1N10 (Impulse and Thrust)

Diagram:



Equipment: • Basketball.

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Presentation: The lines on the basketball make it easy to see if the ball rotates yes or no. Throw the basketball and observe that before hitting the ground it does not rotate, but that after rebound it rotates (see Figure 1A). Also can be observed that after rebound the ball moves steeper than when it was in the throw (again: see Figure 1A).

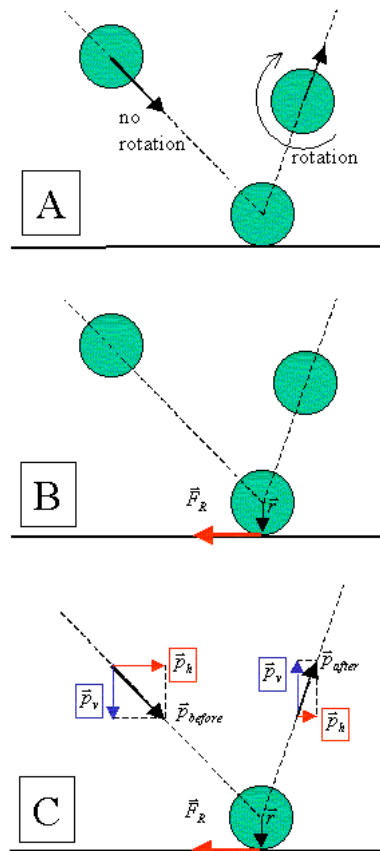


Figure 1

Explanation: The ball has an impulse p , which can be looked at as consisting of a vertical component p_v and a horizontal component p_h . When the ball hits the ground, p_v is reversed (supposing complete elasticity). But p_h changes because the friction force F_R , that acts during a short time (Δt), reduces the horizontal impulse by an amount of

$$\Delta \vec{p}_h = \int_0^{\Delta t} \vec{F}_R dt .$$

The combination of unchanged p_v and changed p_h makes that the ball mounts steeper (Figure 1C).

That it rotates as well is due to the torque during contact with the ground, changing

$$\text{its angular momentum by an amount of: } \Delta \vec{L} = \int_0^{\Delta t} \vec{r} \times \vec{F} dt .$$

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- Sources:
- [American Journal of Physics](#), 72-7(2004), pag. 875-883
 - [Nederlands Tijdschrift voor Natuurkunde](#), 70-10(2004), pag. 347
 - [Walker, J., Roundabout, the Physics of Rotation in the Everyday World](#), pag. 8-12