November 2004
Regulars

Two's company, three's a crowd: solution

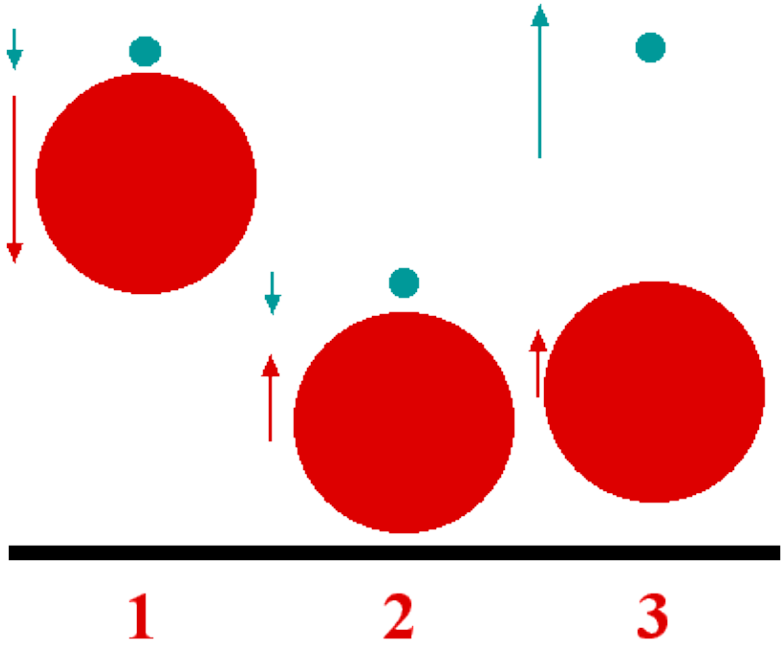
If we drop the ping−pong ball vertically from rest from a height H above the ground then it will hit the ground at a speed V given by $V^2 = 2gH$, where g is the acceleration due to gravity. If the bounce is perfectly elastic then it will rebound to a height H.

Now drop the ping−pong ball and the basket ball from the same height so they are initially almost touching, with the basket ball closer to the ground. Ignoring the slight separation between the two balls and their sizes and assuming the bounces are all perfectly elastic, the basket ball rebounds from the ground with speed V and hits the ping−pong ball when it is still falling at speed V.

So, relative to the basket ball, the ping−pong ball rebounds upwards at speed $2V$ after its velocity gets reversed by the collision. Since the basket ball is moving at speed V relative to the ground this means that the ping−pong ball is moving upwards at

$$2V + V = 3V$$

relative to the ground after the collision. Since the height reached is proportional to V^2 this means that it will rise $3^2 = 9$ times higher than in the absence of its collision with the basket ball. In practice the loss of energy incurred at the bounces will ensure that it rises a little less than this.



Don't try this indoors!

Back to Outer space: Is this a record?

Plus is part of the family of activities in the Millennium Mathematics Project, which also includes the NRICH and MOTIVATE sites.