

NEXT-TIME QUESTION

Figures 1 and 2 show the paths followed by 2 golf balls, A and B.

In each figure, does Ball A spend *more*, *the same*, or *less* time in the air than Ball B?

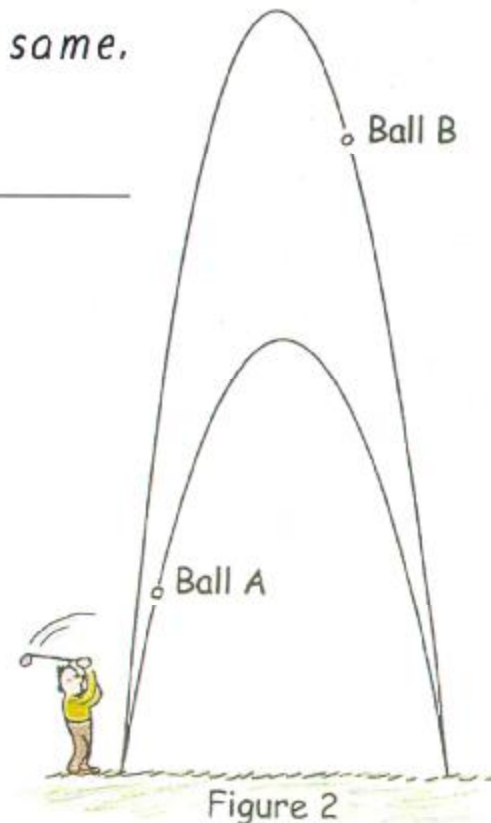
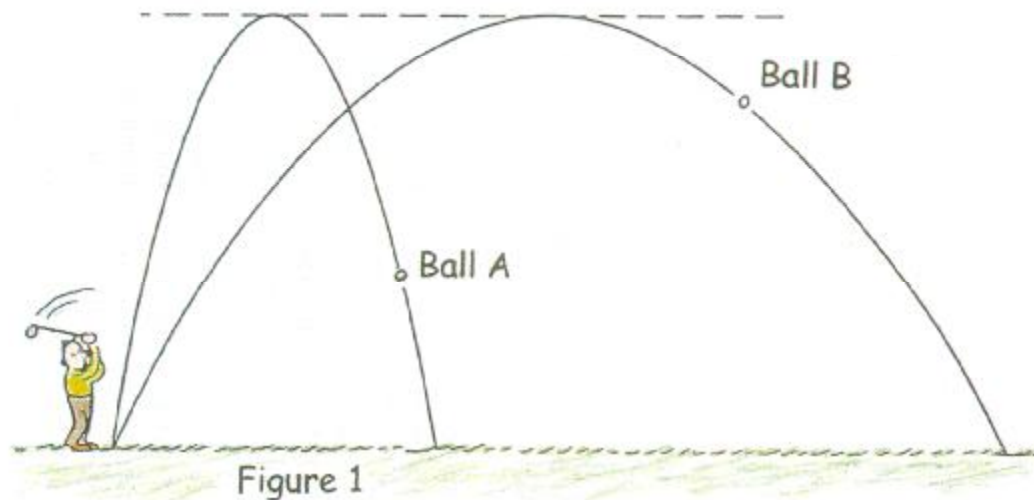
Figure 1: _____

Figure 2: _____

In each figure, does Ball A have a *greater*, *the same*, or *smaller* launch speed than Ball B?

Figure 1: _____

Figure 2: _____



thank to Andrew Stephanou

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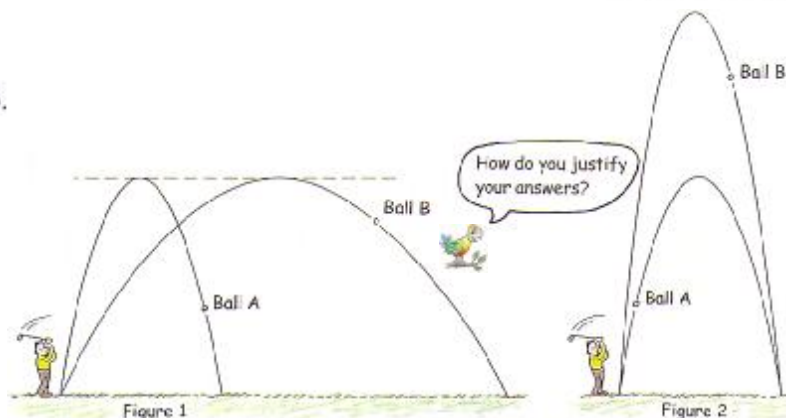
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Figure 1: _____ Figure 2: _____



Answers:

In Figure 1 Ball A is in the air for the same time as Ball B. In Figure 2 Ball A is in the air for less time. Launching speed of Ball A is smaller in both figures. The time of flight in all cases depends only on the vertical component of the initial velocity. In Figure 1 we see *equal maximum heights* of the balls, so the time of flight is the same for both. Since Ball A has a shorter range, the horizontal component of its initial velocity must be less than that of Ball B. So Ball A has a smaller launching speed.



That's right: $V = \sqrt{v_x^2 + v_y^2}$

In Figure 2 we see that both balls have the *same range*. We know that 45° gives maximum range for a given speed. Equivalently, 45° is the angle required for the smallest launch speed to achieve a given range. The closer the launch angle is to 45° , the closer the launch speed is to this smallest speed. The launching angles of both balls is appreciably greater than 45° . But notice that Ball A's launch angle is closer to 45° than Ball B's. So Ball A has the smaller launch speed of the two. Since it doesn't go as high, it also spends less time in the air.



The same maximum height implies the same vertical component of initial velocity, but the same range does not imply the same horizontal component.

Hewitt
Drewitt!