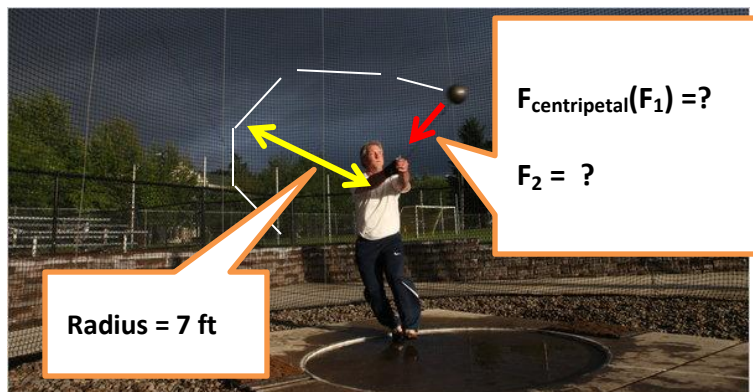


CENTRIPETAL FORCE & PROJECTILES

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Hammer Throw Becomes a Mystery



QUESTIONS: (a) Convert 60 mph to ft/s? (b) Convert 16 lb to slugs? (c) Find $F_{\text{centripetal}}(F_1)$ when spinning hammer at 60 mph (V_1)? (d) Find the distance (X_1) this hammer is thrown if thrown at 60 mph at a 45° angle? (e) Convert 86.74 meters into ft? (f) If the hammer went 86.74 m (X_2), find the velocity (V_2 in ft/s) it was thrown at when thrown at a 45° angle? (g) Find the centripetal force (F_2 in lb) exerted when the hammer is thrown at the higher velocity (V_2) in (f)? **HINT:** 60 mph = 88 ft/s, 3.281 ft/m
ANSWERS: (a) 88 ft/s, (b) 0.5 slugs, (c) ~553 lb, (d) ~244 ft., (e) ~284.58 ft., (f) ~95 ft/s, (g) ~645 lb

Lance Deal, 49, is the last American to win an Olympic medal in the hammer throw. And that was in 1996.

EUGENE, Ore. — Lance Deal, the last American to win an Olympic medal in the hammer throw, swept the hammer cage he built free of rain the other day at Hayward Field. Deal, who won silver in the 1996 Atlanta Games, had designed and welded the cage for symmetry and easy viewing. He bought the protective black nylon netting from a business in Bellingham, Wash. The smallest gauge net the company had made was for a Playboy centerfold, and the largest was for a fishing boat that could swallow two football fields of fish.

He had not thrown in months. And when he did — gracefully spinning four times and lancing the hammer three stories high and nearly a football field long — he yelped from the effort. Then he grew philosophical.

“The secret of the hammer,” he said mysteriously, “is the pendulum.” Rather than being bitter, American hammer throwers seem introspective. **They wax poetic about physics, rhythm and kamiwaza**

— the Japanese word for divine work or superhuman feat. There is another, contested explanation why the United States has not been able to close in on **the 86.74-meter world record**, set by a former Soviet thrower, Yuriy Sedykh, in 1986. It has to do with what hammer throwers call the system.

The system is the centrifugal force (actually centripetal force on 16 lb hammer) created when the thrower begins spinning, speeding up to 60 miles per hour while gripping a 4-foot wire (7 ft from center of body) attached to the 16-pound hammer.

