CENTRIPETAL FORCE

Unit 14 Dr. John P. Cise , Professor of Physics,
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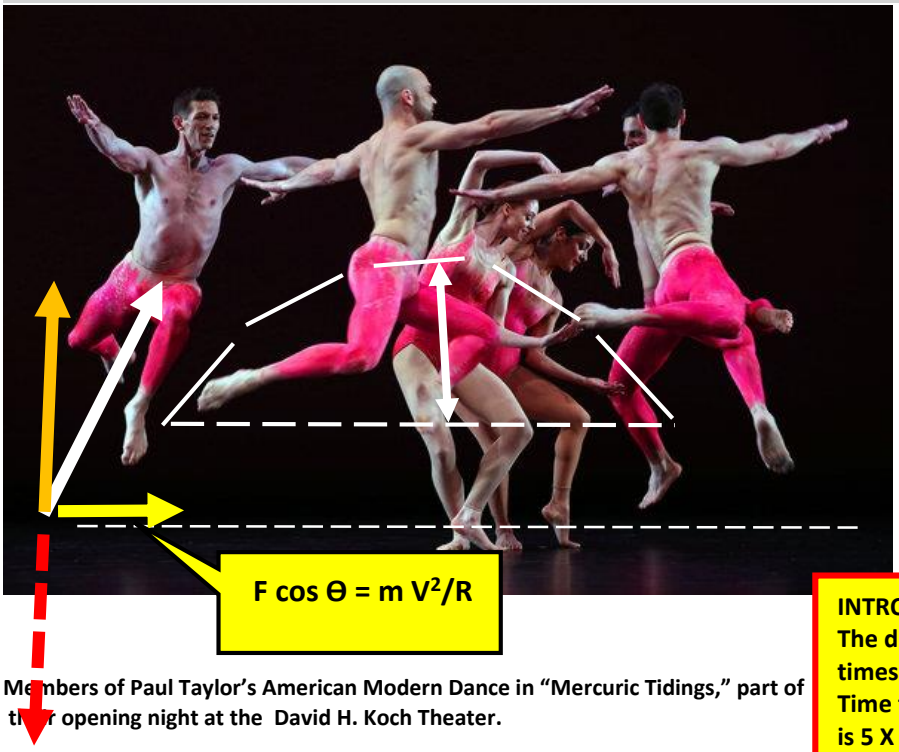
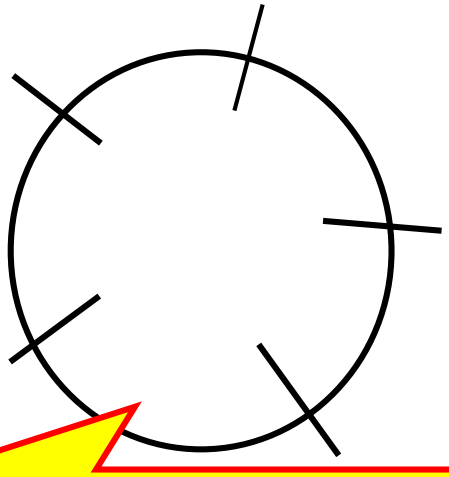
By Alastair Macaulay. Dedicated to my wife Gertrudes C Cabacungan , RN

Paul Taylor Jump-Starts His Season with a Frisky Burl Ives



Members of Paul Taylor's American Modern Dance in "Mercuric Tidings," part of their opening night at the David H. Koch Theater.



INTRODUCTION 1:
The dancers are leaping up and down (2 ft.) five times as they dance around a 5 ft. radius circle. Time to go up and down five times (see questions) is 5 X (0.707) =3.53 s

"Mercuric Tidings" begins and ends with a tight, multilayered tableau. How much that contains! When the dancing starts, that nucleus begins to peel open, row upon row. Soon the stage seems full, and yet we can see the central seedpod has not finished spilling its contents. Energetically formal like its Schubert music, "Mercuric" is an inscrutable ceremony whose simultaneous geometries pass as satisfyingly and inexplicably as those of constellations in the sky. In an amazing slow movement, a series of three male-female duets are each counterbalanced by one officiating lone woman and a corps of three; the spacing keeps changing, and the sense of harmonic tension never loses its fascination.

INTRODUCTION 2: **The function of this application is to verify the approximate angle of tilt (see white arrow above) of dancers as they dance around the 5 ft. radius circle. The Vertical component (shown in orange) of white vector force F (floor back on dancers) is F sin. Θ. Down dashed red force on dancer is dancers weight m g. These two vertical forces are equal to each other: $F \sin \Theta = m g$ eq.1 Horizontally since the dancers are going in a circle (at constant speed V) a centripetal force is supplied by horizontal component of F (white) shown in yellow is force F cos. Θ, Thus horizontally: $F \cos \Theta = m V^2/R$ eq.2 dividing eq.1 by eq.2 yields:**

$$\tan \Theta = R g / V^2 \qquad \text{eq. 3}$$

QUESTIONS: **(a) Find time to drop 2 ft.? (b) Find time to do up and down (see graphic above)? This is the same time to move horizontally in one of the five segments of the circle above. (c) Find total time to go around the 5 ft. radius circle above? (d) Find circumference of this circle? (e) Find speed V ? (f) Using eq.3 from centripetal force concepts above, find angle of tilt Θ? (g) Is Θ reasonable?**

HINTS: $Y = V_0 t + \frac{1}{2} a t^2$, $X = V_{AVE} t$, $C = 2 \pi R$

ANSWERS: **(a) 0.3535 s. (b) 0.707 s. (c) 3.53 s. (d) C = 31.41 ft. (e) V = 8.9 ft./s. (f)~ 63.7° (g) Very plausible!**