Centripetal Acceleration

1. The largest salami in the world, made in Norway, was more than 20 m long. If a hungry mouse ran around the salami’s circumference with a tangential speed of 0.17 m/s, the centripetal acceleration of the mouse was 0.29 m/s². What was the radius of the salami?

2. An astronomer at the equator measures the Doppler shift of sunlight at sunset. From this, she calculates that Earth’s tangential velocity at the equator is 465 m/s. The centripetal acceleration at the equator is $3.41 \times 10^{-2}$ m/s². Use this data to calculate Earth’s radius.

3. An ostrich lays the largest bird egg. A typical diameter for an ostrich egg at its widest part is 12 cm. Suppose an egg of this size rolls down a slope so that the centripetal acceleration of the shell at its widest part is 0.28 m/s². What is the tangential speed of that part of the shell?

4. A waterwheel built in Hamah, Syria, has a radius of 20.0 m. If the tangential velocity at the wheel’s edge is 7.85 m/s, what is the centripetal acceleration of the wheel?

5. NASA uses large centrifuge to study the effects of large forces on astronauts prior to their going into space. A subject in the 20-G centrifuge, which has a radius of 8.9 m, can have a centripetal acceleration as large as 20.0g, where g equals 9.81 m/s². What is the tangential speed of the subject?

6. Susan runs around a circular track with a circumference of 400 m. If she experiences a centripetal acceleration of $2.79 \times 10^{-2}$ m/s², how long will it take to run one lap around the track? (Yes, you do have all the information you need.)

7. NASA wants to build a space station that simulates gravity so that the astronauts do not experience as much bone loss while they are in outer space. The space station is designed so that it has a radius of 75.3 m and it rotates counter clockwise. What is the astronaut’s tangential speed when the station is operating properly?