1. Dropped from rest through 1.80 m: landing speed (m/s, three decimals)?

   _____ m/s

2. The 2.5 kg till on a 25 degree ramp: normal force (N, two decimals)?

   _____ N

3. A 2.5 kg till falls 1.80 m onto a mount with $k = 4900$ N/m: maximum deflection (m, four decimals)?

   _____ m

4. A 2.5 kg till hits at 5.943 m/s with $e = 0.35$: size of the impulse (N · s, two decimals)?

   _____ N · s

5. A 0.310 m wheel rolling at 2.00 m/s: angular velocity (rad/s, three decimals)?

   _____ rad/s

6. A 5.0 kg disk has rolled 1.50 m and has 19.04 J in total. How is it split?

   ☐ 19.04 J moving along, none spinning

   ☐ 12.70 J moving along, 6.35 J spinning

   ☐ 6.35 J moving along, 12.70 J spinning

   ☐ 9.52 J each

7. The horizontal and vertical parts of the slide-off motion:

   ☐ each have their own time

   ☐ are equal in size at landing

   ☐ use the same time, set by the vertical fall

   ☐ swap energy with each other

8. On the 25 degree ramp, the normal force equals:

   ☐ mg sin 25°

   ☐ mu_k mg

   ☐ mg cos 25°

   ☐ mg

9. In $mg(h + x) = \frac{1}{2}kx^2$, why is the $+x$ there?

exercises.lol exercises.com.cn

   ☐ x is measured from the table

   ☐ energy is not kept in impacts

   ☐ gravity keeps doing work while the spring compresses

10. The coefficient of restitution is the ratio of:

    ☐ final energy to initial energy

    ☐ impulse to momentum

    ☐ separation speed to approach speed

    ☐ rebound height to drop height

1. **5.943 m/s**

   v = sqrt(2gh) = sqrt(2 × 9.81 × 1.80).

2. **22.23 N**

   N = mg cos 25°.

3. **0.1393 m**

   $mg(h+x) = \frac{1}{2}kx^2$: $2450x^2 = 24.525(1.80 + x)$, so $x = 0.1393$ m.

4. **20.06 N · s**

   $J = m(1+e)v = 2.5 \times 1.35 \times 5.943 = 20.06$ N · s.

5. **6.452 rad/s**

   $\omega = v/r = 2.00/0.310 = 6.452$ rad/s.

6. **12.70 J moving along, 6.35 J spinning**

   For a disk, two thirds is in moving along and one third in spinning.

7. **use the same time, set by the vertical fall**

   One t governs both directions, and the vertical fall sets it.

8. **mg cos 25°**

   There is no acceleration across the slope, so $N = mg\cos 25°$.

9. **gravity keeps doing work while the spring compresses**

   The weight falls the height h plus the whole compression x.

10. **separation speed to approach speed**

    It compares speeds at the contact, not energies or heights.

exercises.lol exercises.com.cn