Newton's Laws Equations Worksheet

Level: GCSE / AP Physics 1 / IB SL | Difficulty: Intermediate | Topic: Mechanics

Master Newton's three laws of motion with 10 problems covering net force, weight, friction, and tension. Each problem includes a full worked solution.

Equations you will need

F = ma	Newton's 2nd law: net force = mass x acceleration
W = mg	Weight: mass x gravitational field strength
f = muN	Friction: coefficient x normal force
SumF = 0	Newton's 1st law (equilibrium)
F_1_2 = -F_2_1	Newton's 3rd law (equal and opposite)

Symbol key

Symbol	Quantity	Unit
F	force	N (newtons)
m	mass	kg
a	acceleration	m/s^2
W	weight	N
g	gravitational field strength	9.8 m/s^2 (Earth)
mu	coefficient of friction	dimensionless
N	normal force	N

Practice problems

1. A 5 kg box is pushed with a horizontal force of 20 N on a frictionless surface. Find the acceleration.

2. Find the weight of a 70 kg person on Earth. (g = 9.8 m/s^2)

3. A 2 kg object accelerates at 3 m/s^2 across a rough surface. The applied force is 10 N. Find the friction force.

4. A 10 kg block sits on a surface with mu = 0.3. Find the friction force needed to start moving it. (g = 9.8 m/s^2)

5. Two forces act on a 4 kg object: 12 N right and 8 N left. Find the acceleration.

6. A car of mass 1200 kg decelerates from 20 m/s to rest in 5 s. Find the braking force.

7. A 3 kg mass hangs from a rope. Find the tension when it is stationary. (g = 9.8 m/s^2)

8. Same 3 kg mass now accelerates upward at 2 m/s^2. Find the new tension.

9. A 50 kg sled is pulled by a 200 N force on ice (mu = 0.1). Find acceleration. (g = 9.8 m/s^2)

10. An 80 kg astronaut pushes off a 200 kg satellite with a force of 100 N for 0.5 s. Find each one's acceleration.