

2.1.1

Consider a mass m on a horizontal surface with friction coefficient μ .



1. **Force decomposition**
The force F is decomposed into horizontal and vertical components:
 $F_x = F \cos \alpha$
 $F_y = F \sin \alpha$

2. **Normal force**
The normal force N is the force exerted by the surface on the mass, perpendicular to the surface.
 $N = mg - F_y$

3. **Friction force**
The friction force f is the force exerted by the surface on the mass, parallel to the surface and opposite to the direction of motion.
 $f = \mu N$

4. **Net force**
The net force F_{net} is the sum of all forces acting on the mass.
 $F_{net} = F_x - f$

5. **Acceleration**
The acceleration a is the rate of change of velocity.
 $a = \frac{F_{net}}{m}$

6. **Velocity**
The velocity v is the rate of change of position.
 $v = at$

2.1.2

Consider a mass m on a horizontal surface with friction coefficient μ .

2.1.3



2.1.4

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7. **Position**
The position x is the distance from the origin.
 $x = \frac{1}{2}at^2$

8. **Time**
The time t is the duration of the motion.
 $t = \frac{v}{a}$

9. **Work**
The work W is the energy transferred to the mass.
 $W = F_{net}x$

10. **Power**
The power P is the rate of change of work.
 $P = \frac{W}{t}$