

AP Physics 1

Name: _____ Score: _____

1. A 2 kg mass is at $x = 0$ and a 6 kg mass at $x = 8$ m. Where is the centre of mass, in metres?

_____ m

2. What is the SI unit of force?

- ☐ joule
☐ watt
☐ newton
☐ pascal

3. You push a wall with a force of 50 N. With what force does the wall push back on you?

- ☐ 25 N
☐ 50 N
☐ 0 N – walls do not push
☐ 100 N

4. An object has zero net force acting on it. What must be true of its motion?

- ☐ It has constant velocity (possibly zero)
☐ It must be speeding up
☐ It must be at rest
☐ It must be turning

5. A net force of 12 N acts on a 3 kg trolley. What is its acceleration, in $\frac{\text{m}}{\text{s}^2}$?

_____ m/s^2

6. What is the weight of a 5 kg bag on Earth, where $g = 9.8 \frac{\text{N}}{\text{kg}}$? Answer in N.

_____ N

7. Which friction acts on an object that is being pushed but has **not** started to move?

- ☐ no friction at all
☐ both, equally
☐ static friction
☐ kinetic friction

8. A spring with $k = 200 \frac{\text{N}}{\text{m}}$ is stretched by 0.10 m. What is the spring force, in N?

9. A ball whirls on a string in a horizontal circle. The string suddenly snaps. Which way does the ball fly?
- ☐ it stops immediately
 - ☐ straight toward the centre
 - ☐ along the tangent, in a straight line
 - ☐ straight outward, away from the centre
10. The centre of mass must always lie inside the material of the object.
- ☐ True ☐ False

AP Physics 11. **6 m**

$$x_{\text{cm}} = \frac{2(0) + 6(8)}{2 + 6} = \frac{48}{8} = 6 \text{ m} - \text{closer to the heavier mass.}$$

2. **newton**

Force is measured in **newtons** (N). Joules measure energy, watts power, pascals pressure.

3. **50 N**

By the third law the reaction is equal in size: the wall pushes back with 50 N.

4. **It has constant velocity (possibly zero)**

Zero net force $\Rightarrow$ zero acceleration $\Rightarrow$ constant velocity. Rest is the special case where that velocity is zero.

5. **4 m/s²**

$$a = F_{\text{net}}/m = 12/3 = 4 \frac{\text{m}}{\text{s}^2}.$$

6. **49 N**

$$W = mg = 5 \times 9.8 = 49 \text{ N.}$$

7. **static friction**

Before sliding, **static** friction acts and grows to match the push, up to $\mu_s N$.

8. **20 N**

$$F = kx = 200 \times 0.10 = 20 \text{ N.}$$

9. **along the tangent, in a straight line**

With no inward force, inertia carries the ball in a straight line – along the **tangent** where the string broke.

10. **False**

A ring or boomerang has its centre of mass in empty space. Only symmetric solid bodies keep it inside.