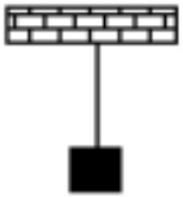
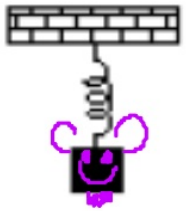
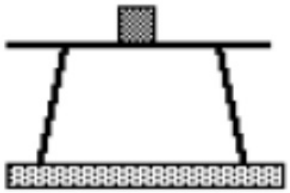
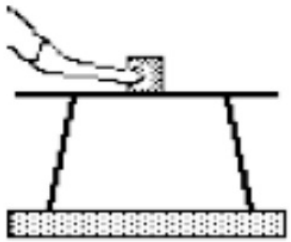
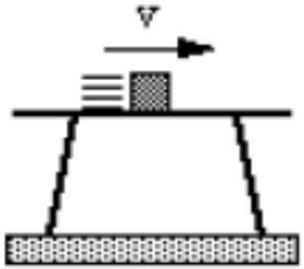
Description of Situation	Force Present (P) or Absent (A)?	Explanation
 1. A block hangs <u>at rest</u> from the ceiling by a piece of rope. Consider the forces acting on the block. AM	Gravity P or A? Spring: P or A? Tension P or A? Normal: P or A? Friction P or A? Air Res.: P or A?	has mass / on Earth rope
 AJ 2. A block hangs from the ceiling by a spring. Consider the forces acting on the block when it is at rest (at its equilibrium position).	Gravity P or A? Spring: P or A? Tension P or A? Normal: P or A? Friction P or A? Air Res.: P or A?	has mass / on Earth Spring present

Description of Situation	Force Present (P) or Absent (A)?	Explanation
 3. A ball is shot into the air with a spring-loaded cannon. Consider the forces acting on the ball while it is in the air. JJ	Gravity P or A? Spring: P or A? Tension P or A? Normal: P or A? Friction P or A? Air Res.: P or A?	mass / on Earth in air / moving
 4. A skydiver (who hasn't opened his parachute yet) falls at terminal velocity. Consider the forces acting on the skydiver.	Gravity P or A? Spring: P or A? Tension P or A? Normal: P or A? Friction P or A? Air Res.: P or A?	in air / moving

Description of Situation	Force Present (P) or Absent (A)?	Explanation
 5. A block rests on top of a table. Consider only the forces acting upon the block. KA	Gravity P or A? Spring: P or A? Tension P or A? Normal: P or A? Friction P or A? Air Res.: P or A?	mass / on Earth surface
 6. A block is being pushed across the top of a table. Consider only the forces acting upon the block. JS	Gravity P or A? Spring: P or A? Tension P or A? Normal: P or A? Friction P or A? Air Res.: P or A?	mass / on Earth surface on surface / moving moving

Description of Situation	Force Present (P) or Absent (A)?		Explanation
 7. A block slides across the top of a table. Consider only the forces acting upon the block. CB	Gravity	(P) or A?	mass / on Earth
	Spring:	P or (A)	
	Tension	P or (A)	
	Normal:	(P) or A?	surface
	Friction	(P) or A?	surface (opposes motion) moving
	Air Res.:	(P) or A?	moving
8. The driver of a car has her foot on the gas pedal. The wheels are turning as the car accelerates down the road. Consider only the forces acting upon the car. CS	Gravity	(P) or A?	mass / on Earth
	Spring:	P or (A)	
	Tension	P or (A)	
	Normal:	(P) or A?	surface
	Friction	(P) or A?	surface / moving (opposes motion)
	Air Res.:	(P) or A?	moving

Description of Situation	Force Present (P) or Absent (A)?	Explanation
 9. A person is sitting on a sled and gliding across loosely packed snow along a horizontal surface. Consider only the forces acting on the person. HS	Gravity P or A? Spring: P or A? Tension P or A? Normal: P or A? Friction P or A? Air Res.: P or A?	mass / on Earth surface (sled) between person and sled moving
 10. The wheels of a car are locked as it skids to a stop while moving across a level highway. Consider only the forces acting on the car. JM	Gravity P or A? Spring: P or A? Tension P or A? Normal: P or A? Friction P or A? Air Res.: P or A?	

Description of Situation	Force Present (P) or Absent (A)?	Explanation
11. A bucket of water, attached by a rope, is being pulled out of a well. Consider only the forces acting on the bucket.	Gravity P or A?	mass
	Spring: P or A?	
	Tension P or A?	rope
	Normal: P or A?	
	Friction P or A?	
	Air Res.: P or A?	moving

1. The standard metric unit for mass is kg and the standard metric unit for weight is N.

2. An object's mass refers to d and an object's weight refers to b. Fill in each blank.
   a. the amount of space it takes up
   b. the force of gravitational attraction to Earth
   c. how dense an object is
   d. the amount of stuff present in the object

3. Complete the following table showing the relationship between mass and weight.

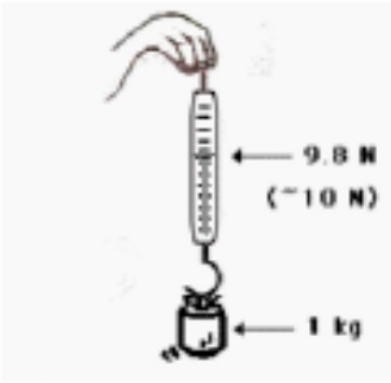
Object	Mass	Approx. Weight
Melon	1 kg	$W = mg = (1)(9.8) = 9.8 \approx 10$ N
Apple	$m = \frac{W}{g} = \frac{1.0}{9.8} = .102 \approx .10$ kg	~1.0 N
Pat Eatladee	25 kg	$W = mg = (25)(9.8) = 245 \approx 250$ N

4. Different masses are hung on a spring scale calibrated in Newtons.

The force exerted by gravity on 1 kg = ~10 N.

The force exerted by gravity on 5 kg = ~ 50 N.

The force exerted by gravity on 70 kg = ~ 700 N.



5. The value of g in the British system is 32 ft/sec^2. The unit of force is pounds. The unit of mass is the slug. Use your weight in pounds to calculate your mass in units of slugs. **PSYW**

$g = 32\ ft/s^2$ $\quad W = 150\ lb$ $\quad \frac{W}{g} = \frac{mg}{g}$

$m = \frac{W}{g} = \frac{(150\ lb)}{32\ ft/s^2} = 4.6875$

4.7 slugs

6. You might be wondering about your metric weight. Using conversion factors, convert your weight in pounds to units of N. (Use 1 N = 0.22 pounds) **PSYW**

$W = F_g = 150\ lb$ $\quad 150\ lb \left| \frac{1\ N}{.22\ lb} \right. = 681.81\ N$

680 N

7. What is the mass and weight of a 10-kg object on earth?

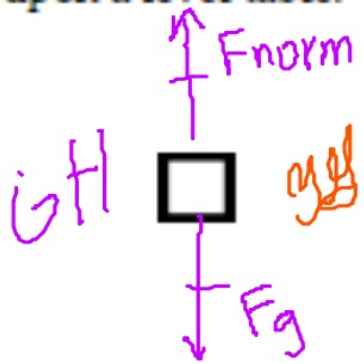
Mass = 10 kg Weight = ~100 N (98 N)

What is the mass and weight of a 10-kg object on the moon where the force of gravity is 1/6-th that of the Earth's?

Mass = 10 kg Weight = 16.6 ≈ 17 N

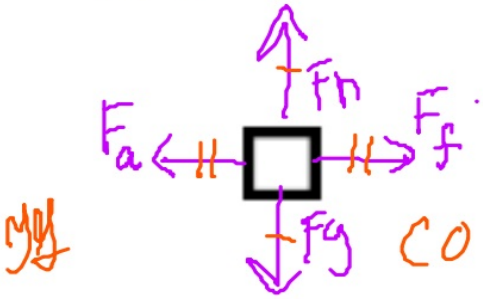
8. **Conclusion**: The mass of an object is independent of the object's location in space.

a. A physics book rests upon a level table.

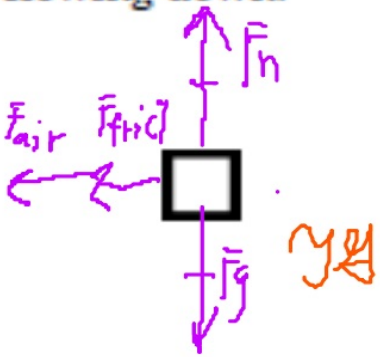


b. A skydiver is falling and has reached a terminal velocity.

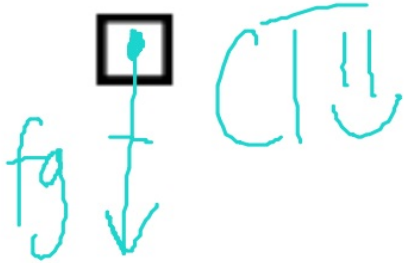
c. A large crate is being pushed leftward at a constant velocity.



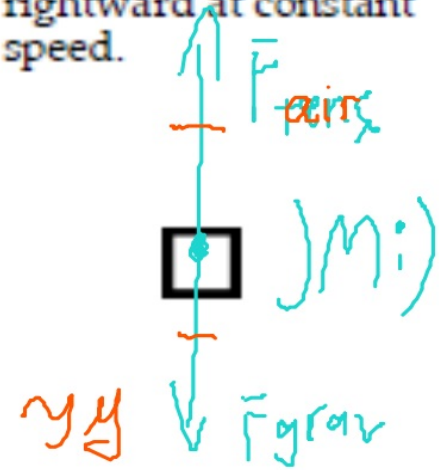
d. A sledder has reached the bottom of a hill and is coasting rightward while slowing down.



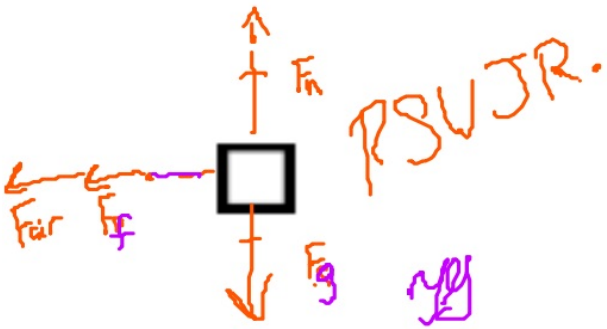
e. A ball is moving upwards towards its peak. Ignore air resistance.



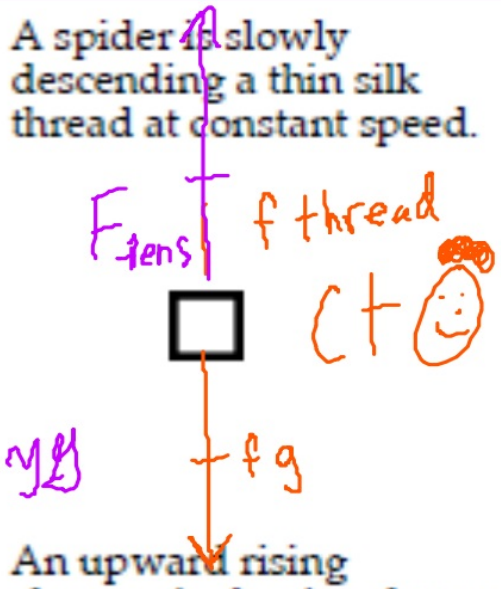
f. An air track glider moves rightward at constant speed.



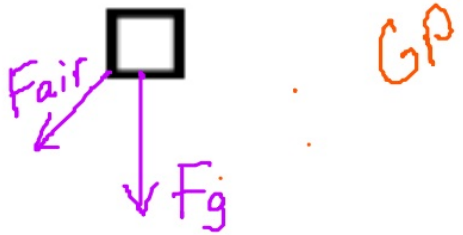
g. The brakes are applied to a rightward moving car and it skids to a stop.



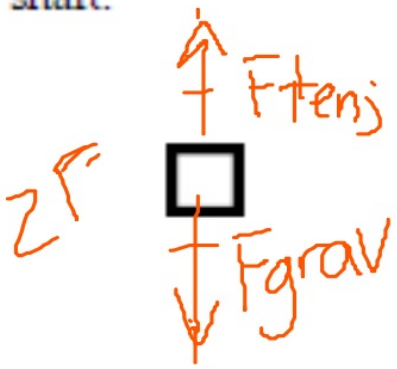
h. A spider is slowly descending a thin silk thread at constant speed.



i. A projectile is moving upwards and rightwards towards the peak of its trajectory.



j. An elevator is rising at a constant velocity; it is not touching the elevator shaft.



k. An upward rising elevator is slowing down; it is not touching the elevator shaft.

l. A force is applied to accelerate a crate across a rough horizontal surface.