

PHYS 1441 – Section 002

Lecture #9

Monday, Mar. 2, 2009

Dr. Jaehoon Yu

- Weight and Apparent Weight
- Exam Solutions
- Application of Newton's Laws
 - Motion without friction
- Forces of Friction
 - Motion with friction

Today's homework is homework #5, due 9pm, Tuesday, Mar. 10!!



Announcements

- Term exam results
 - Class average: 46.6/106
 - Equivalent to 44/100
 - Top score: 86/106
- Evaluation criteria
 - Homework: 25%
 - Exams
 - Midterm and Final Comprehensive Exams (3/11 and 5/11): 19% each
 - One better of the two term Exams: 12%
 - Lab score: 15%
 - Pop-quizzes: 10%
 - Extra credits: 10% of the total
- Changes of Exam Dates
 - Mid-term exam scheduled on Mar. 11 now moved to Wed. Mar. 25
 - Second non-comprehensive exam scheduled on Apr. 13 now moved to Wed. Apr. 22
 - Final comprehensive exam stays on the same date, May 11

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Gravitational Force and Weight

Gravitational Force, F_g

*The attractive force exerted
on an object by the Earth*

$$\vec{F}_G = m\vec{a} = m\vec{g}$$

Weight of an object with mass M is

$$W = |\vec{F}_G| = M|\vec{g}| = Mg$$

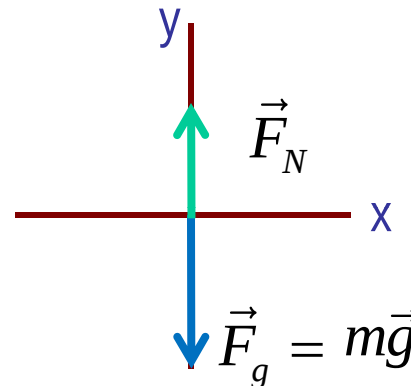
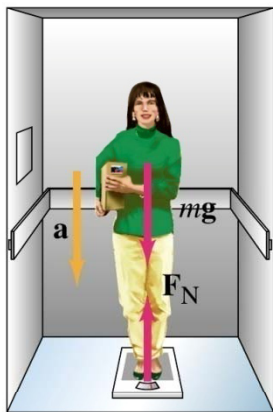
Since weight depends on the magnitude of gravitational acceleration, g , it varies depending on geographical location.

By measuring the forces one can determine masses. This is why you can measure mass using the spring scale.



Ex. 4 – 8 Apparent Weight

A 65kg woman descends in an elevator that briefly accelerates at $0.20g$ downward when leaving a floor. She stands on a scale that reads in kg. (a) During this acceleration, what is her weight and what does the scale read? (b) What does the scale read when the elevator descends at a constant speed of 2.0m/s ?



What is the force that measures the weight?
What is the direction of the net force?

$\vec{F}_N$

$-y$

$$\sum \vec{F} = \vec{F}_N - \vec{F}_g = m\vec{a} \quad \text{Newton's 2nd law}$$

x-comp. of net force

$$\sum F_x = 0$$

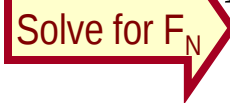
y-comp. of net force

$$\sum F_y = F_N - F_g = -ma$$

(a) $a = -0.20g$

$$F_N - F_g = -ma$$

$$= -m(0.2g)$$



$$F_N = mg - m(0.2g) = m(0.8g)$$

$$= 65 \cdot 0.8 \cdot 9.8 = 510\text{N}$$

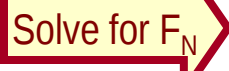
Reading

$$m' = 0.8m$$

$$= 52\text{kg}$$

(b) $a = 0.0g$

$$F_N - F_g = -ma = -m(0) = 0$$



$$F_N = mg - m(0) = mg$$

$$= 65 \cdot 9.8 = 640\text{N}$$

Reading

$$m' = m = 65\text{kg}$$

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What happens if the elevator is going up?