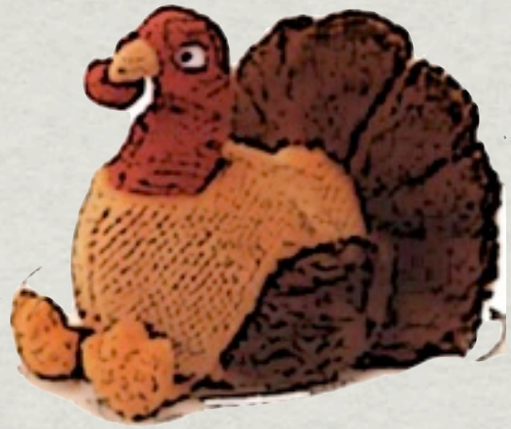
Centripetal Force

Mr Gobbles



Centripetal Force

$$F_c = \frac{mv^2}{r}$$

- Centripetal Force (N)
- Mass (kg)
- Velocity (m/s)
- Radius (m)

PROJECT

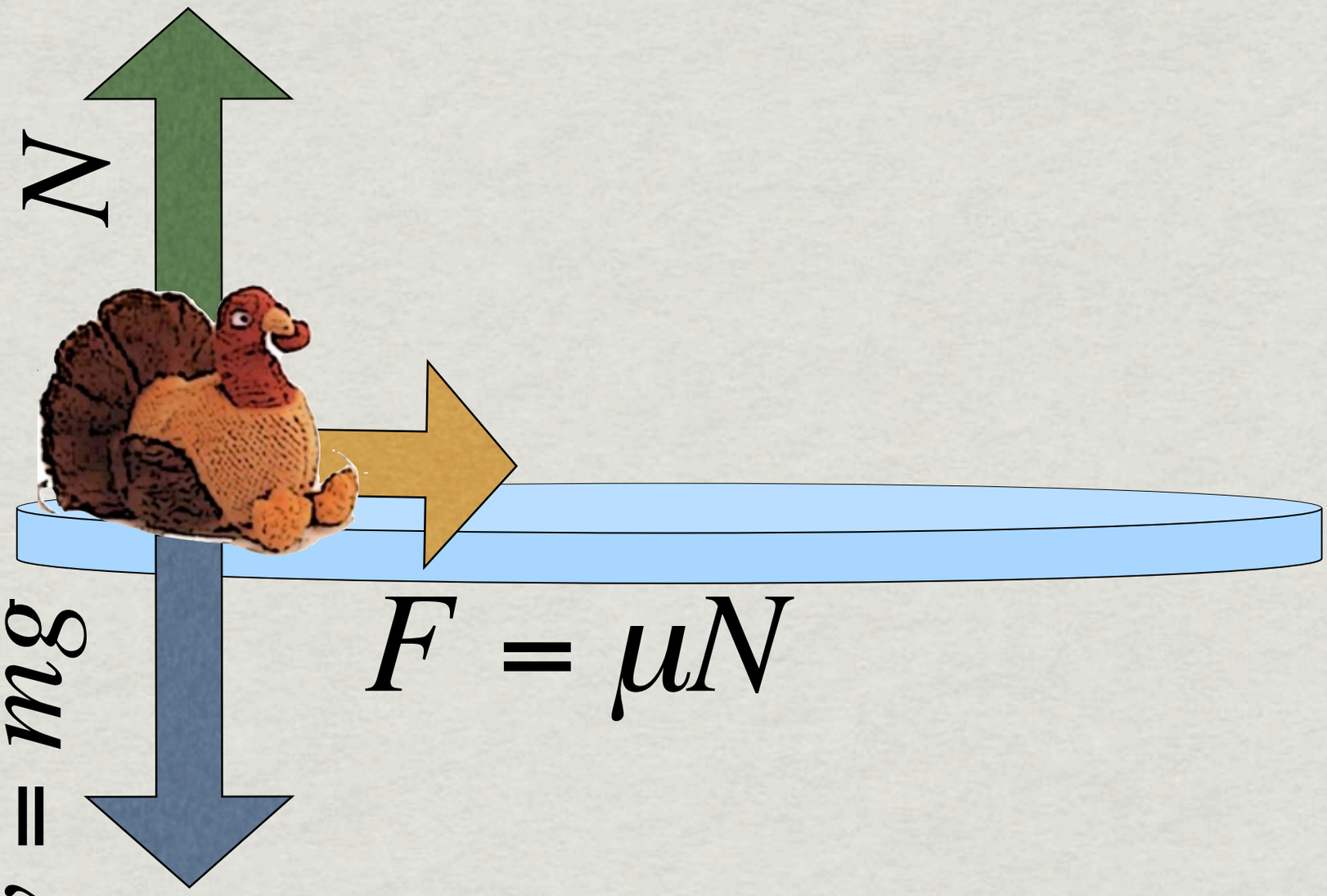
MERRY-GO-ROUND

CAROUSELS HAVE HORSES!

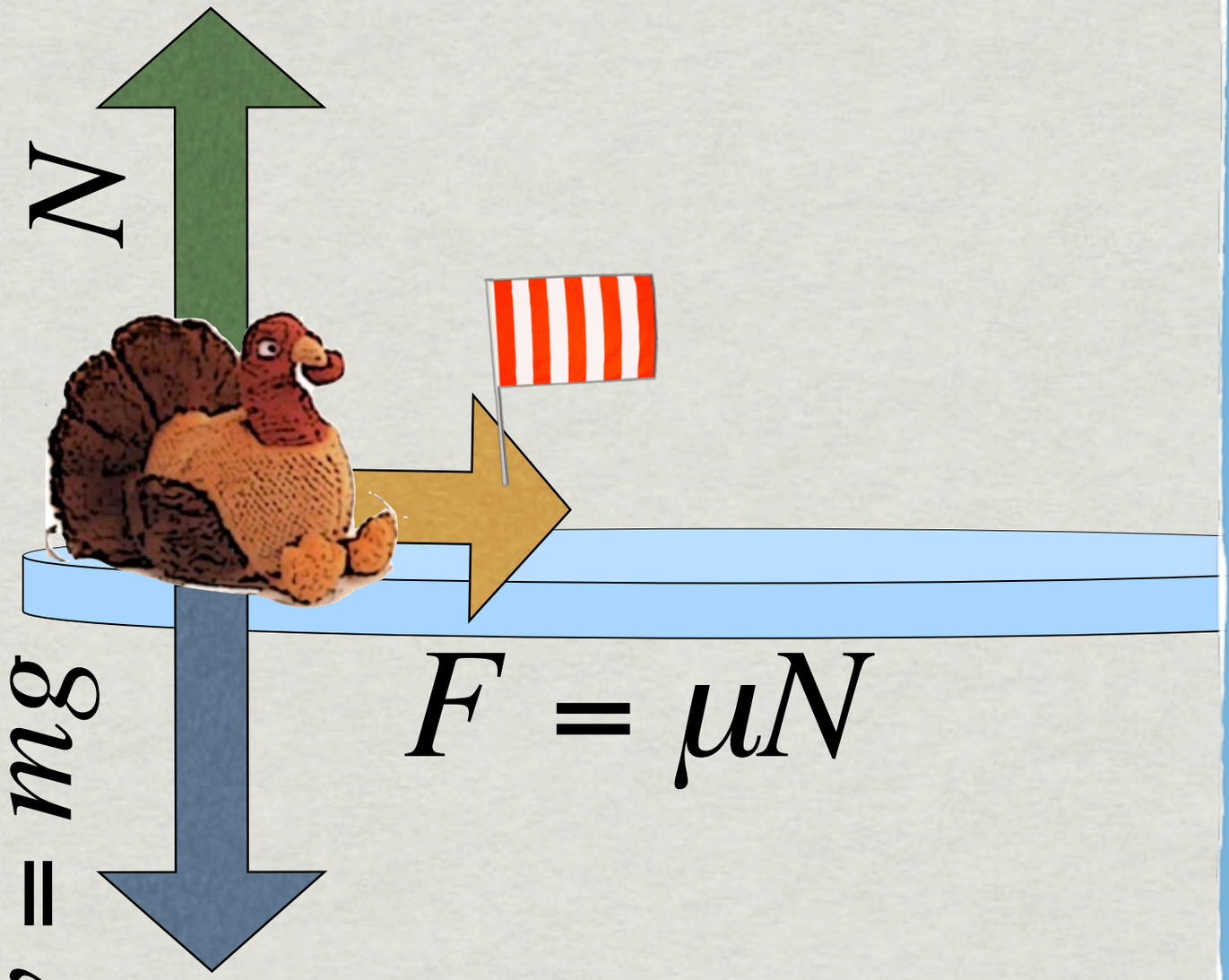
DATE **5/26/2010**

CLIENT **WHS**

Forces on the Turkey



Forces on the Turkey



$$\frac{mv^2}{r} = \mu N$$

$$\frac{mv^2}{r} = \mu mg$$

$$\frac{v^2}{rg} = \mu$$

PROJECT

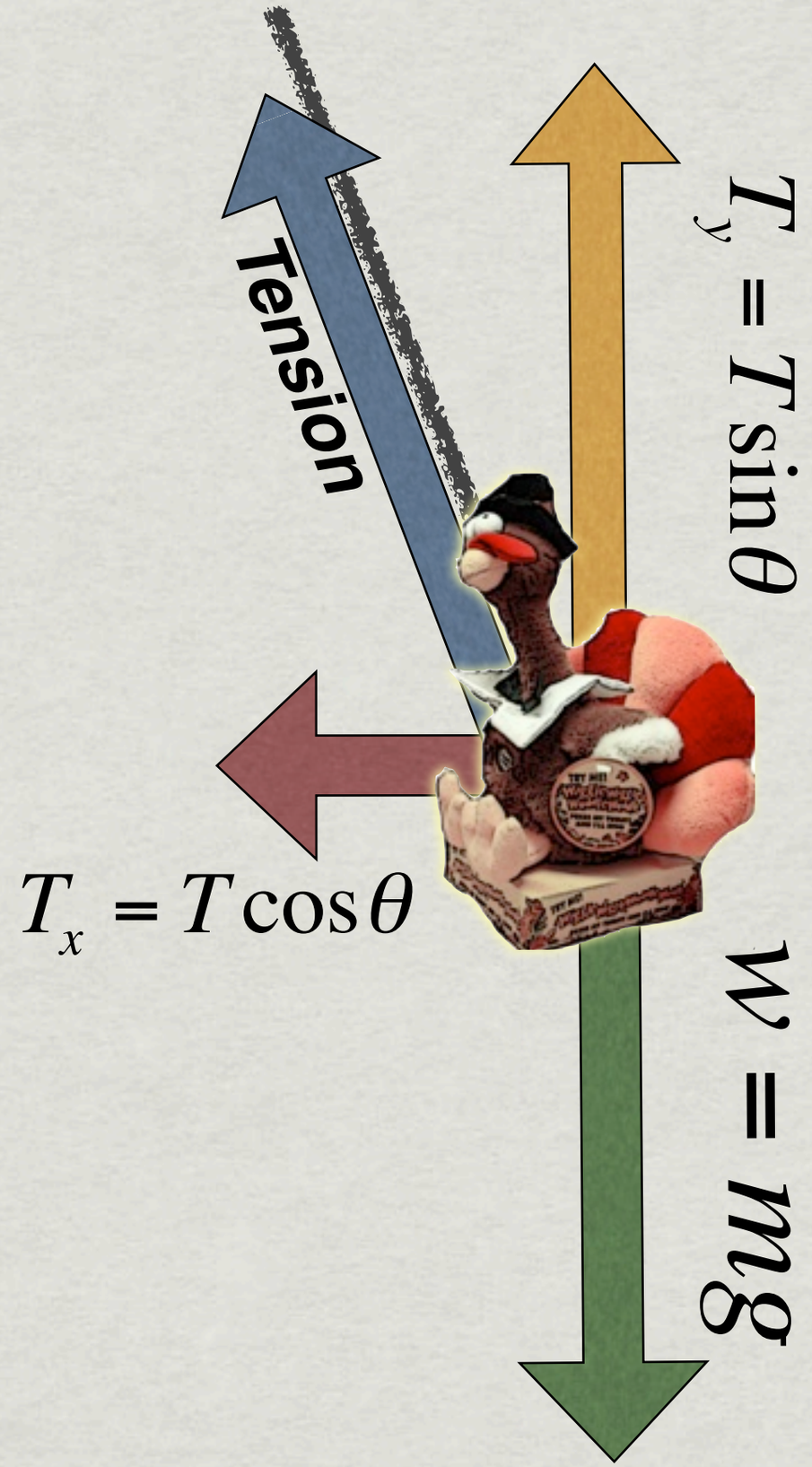
BIG SWING

WHAT KEEPS YOU FROM FALLING?

DATE 5/26/2010

CLIENT WHS

At an Angle

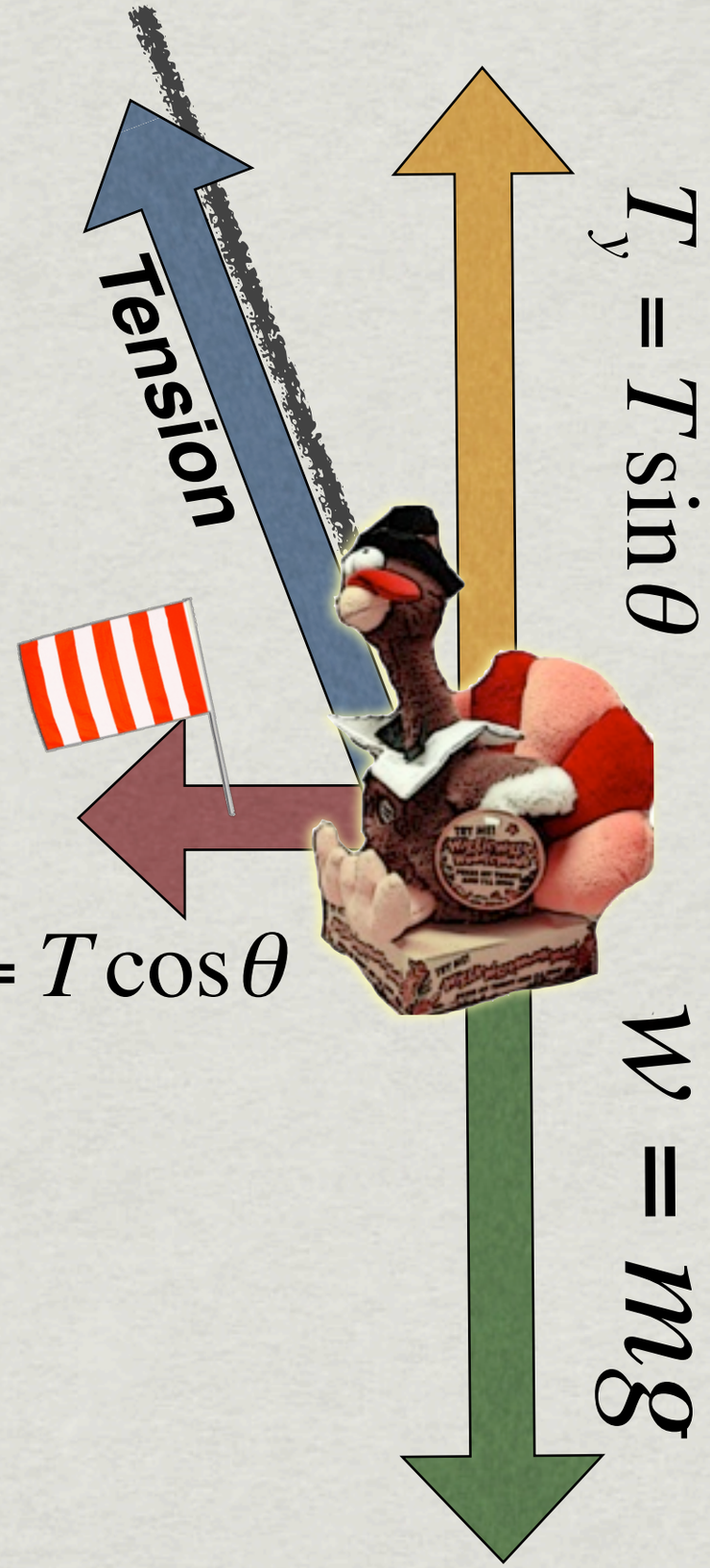


At an Angle

$$mg = T\sin\theta$$

$$\frac{mv^2}{r} = T\cos\theta$$

$$\frac{rg}{v^2} = \tan\theta$$



PROJECT

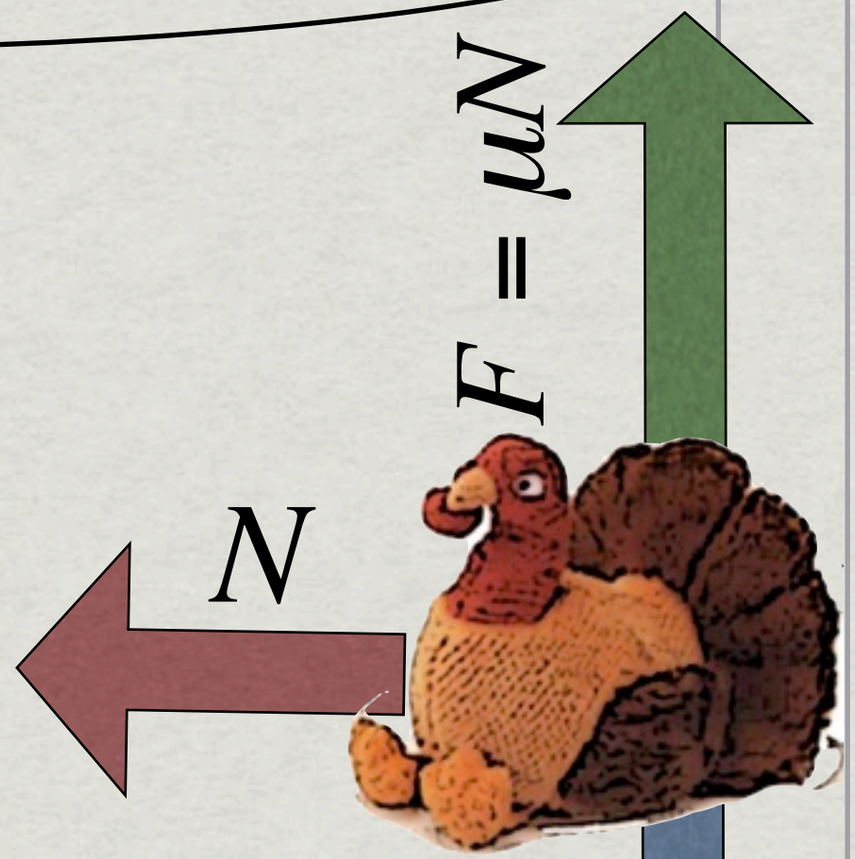
THE ROTOR

WHAT KEEPS YOU FROM FALLING?

DATE 5/26/2010

CLIENT WHS

The Rotor

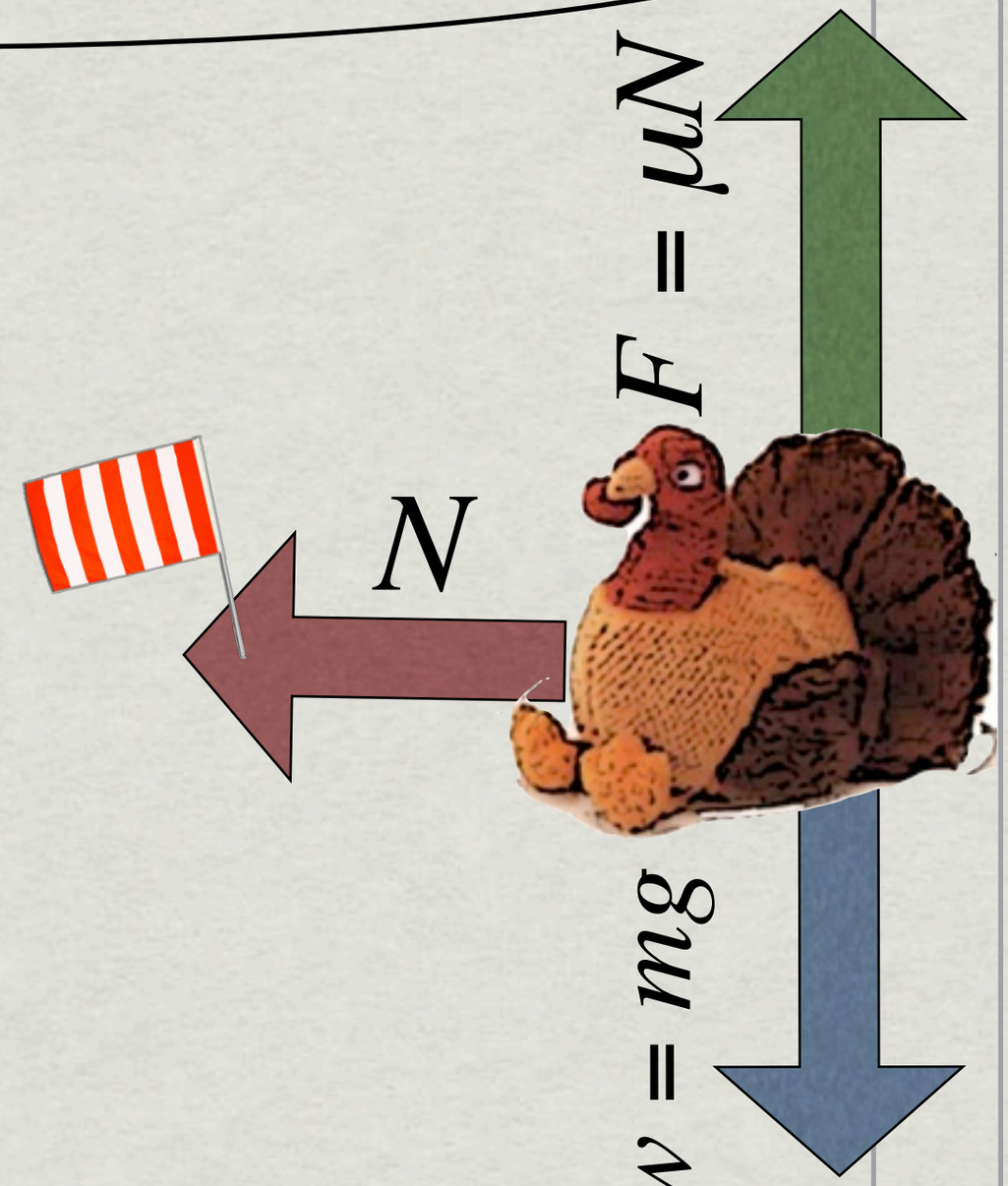


The Rotor

$$\frac{mv^2}{r} = N \qquad mg = \mu N$$

$$mg = \mu \frac{mv^2}{r}$$

$$\mu = \frac{rg}{v^2}$$



PROJECT

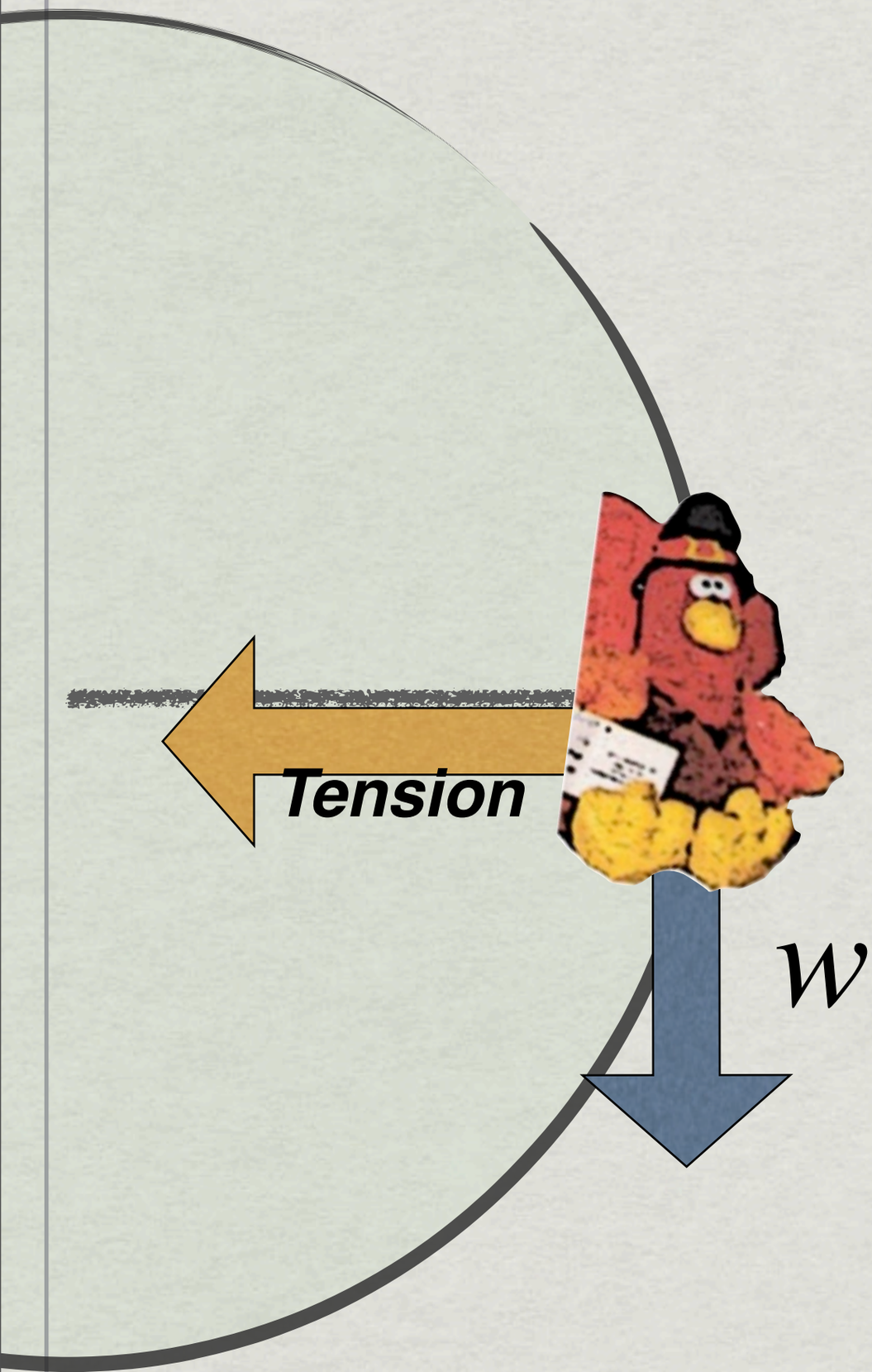
LOOPS

WHAT KEEPS YOU FROM FALLING?

DATE 5/26/2010

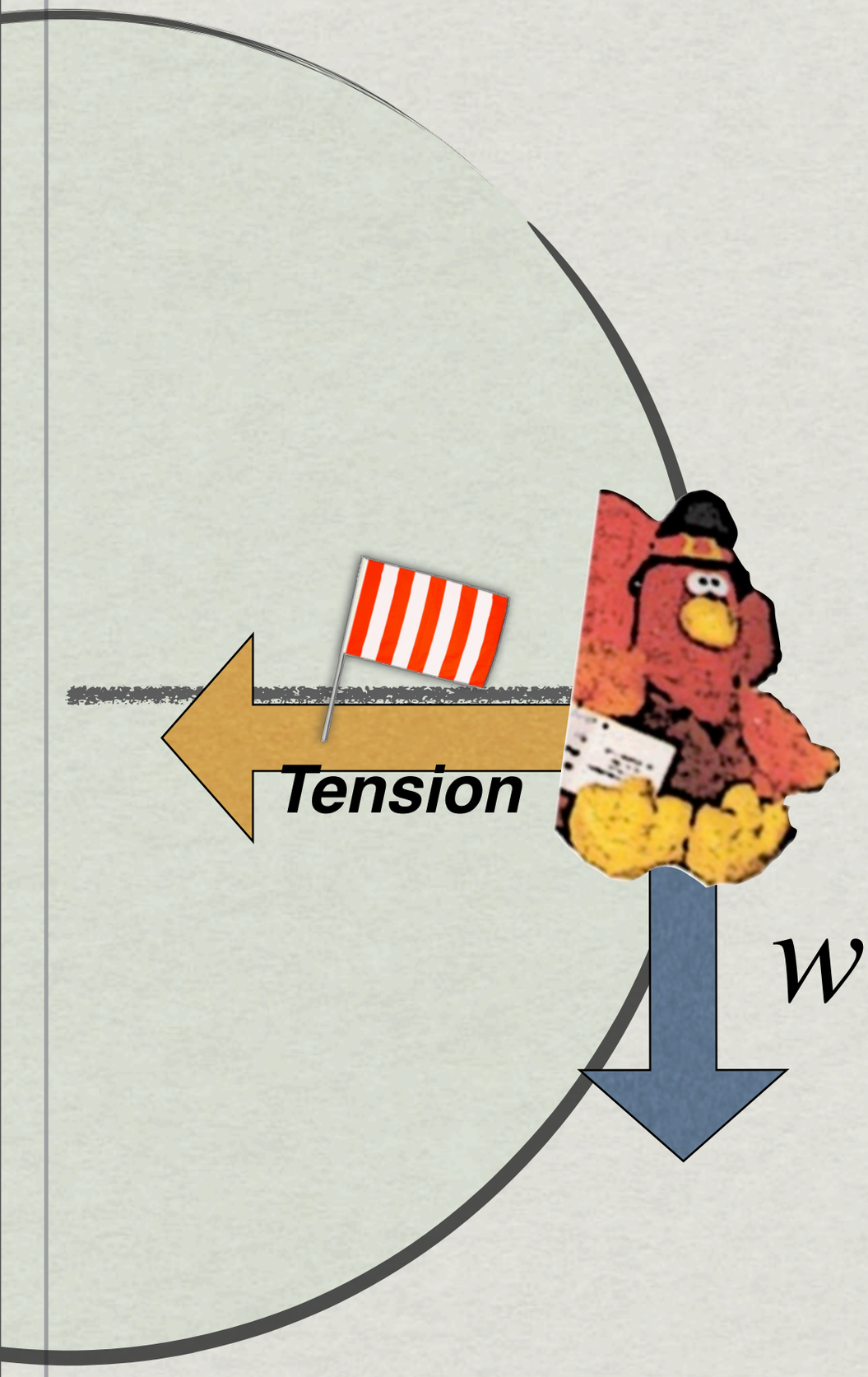
CLIENT WHS

Vertical Circles -Side



$$w = mg$$

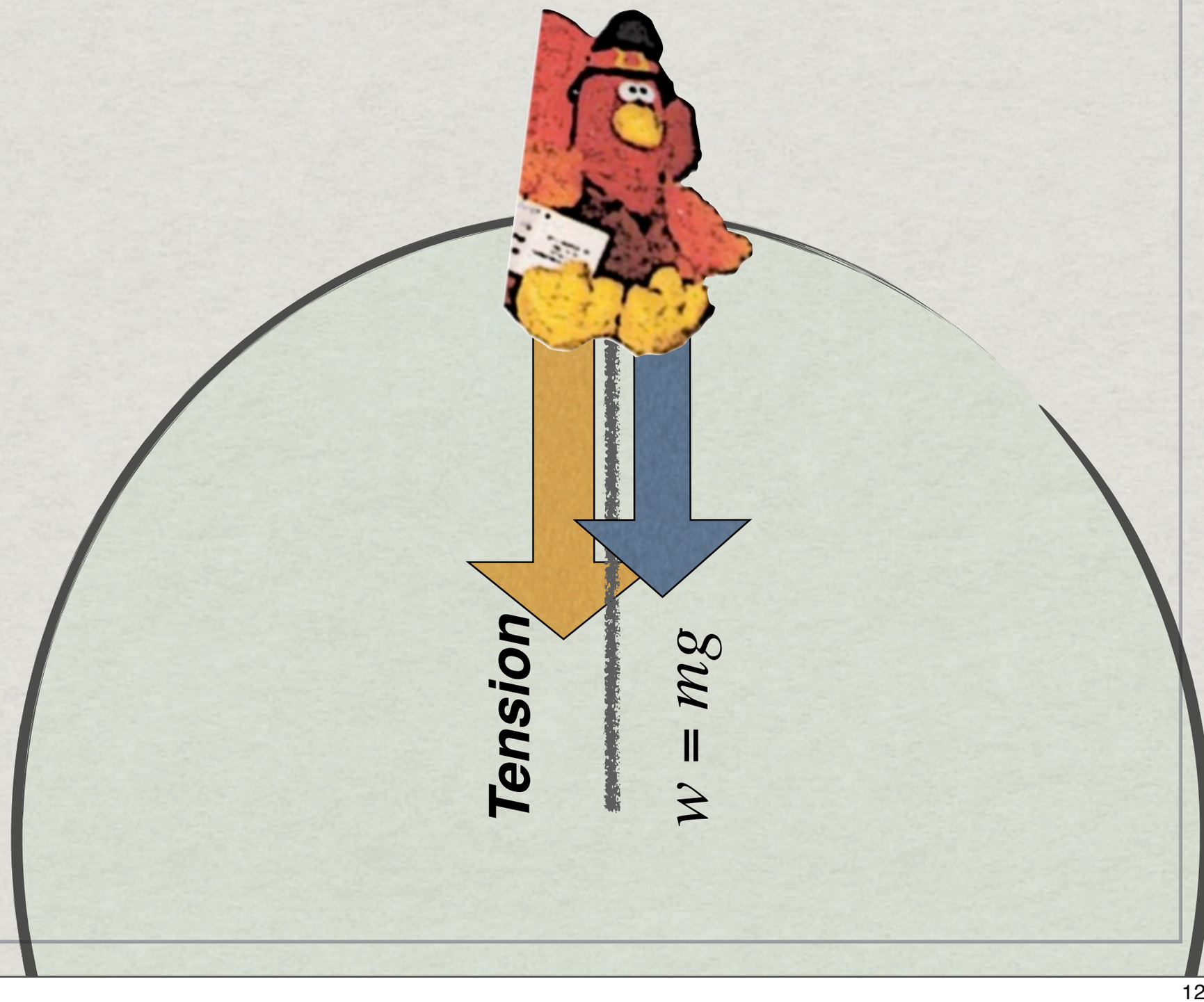
Vertical Circles -Side



$$\frac{mv^2}{r} = T$$

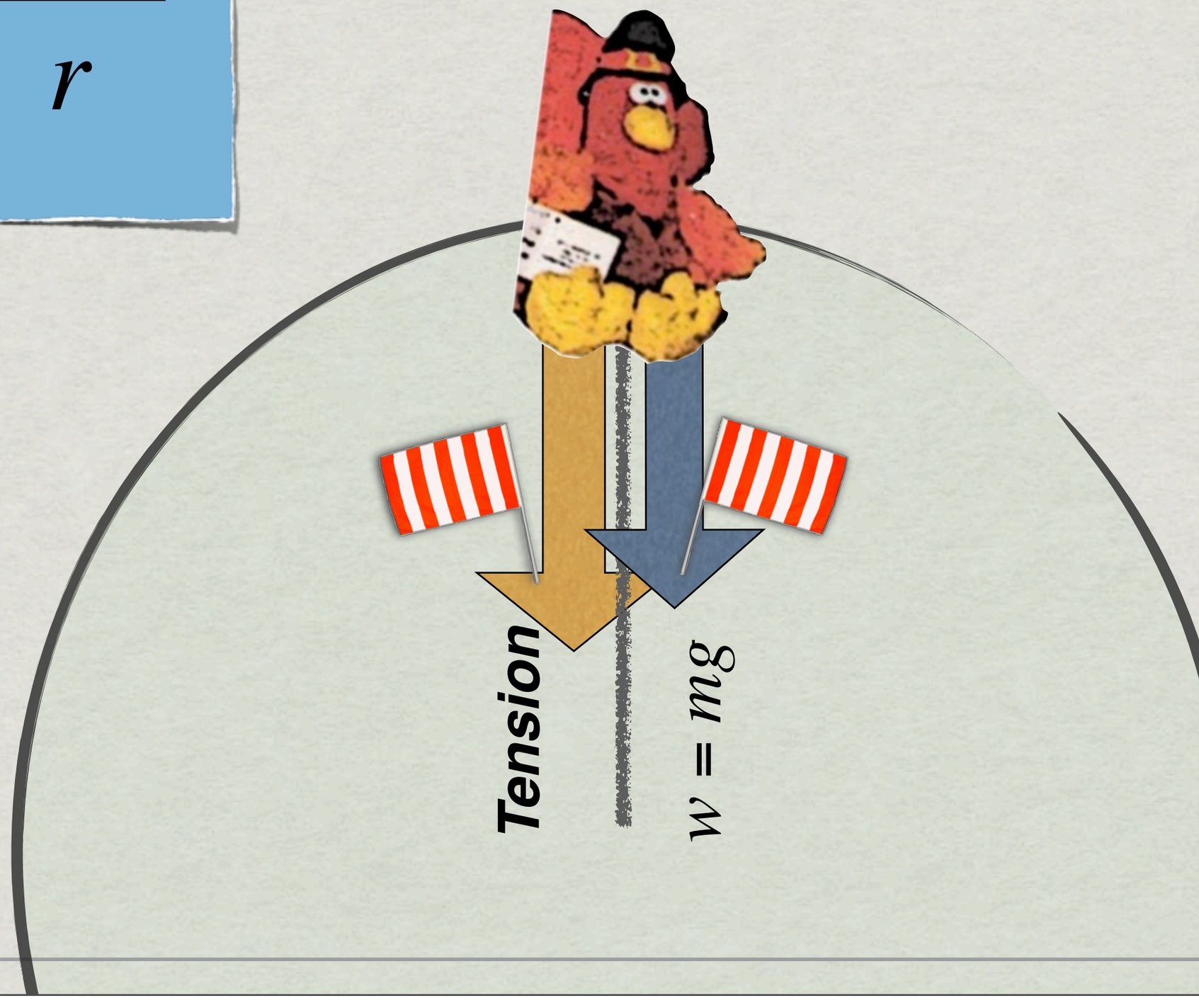
$$w = mg$$

Vertical Circles -Top

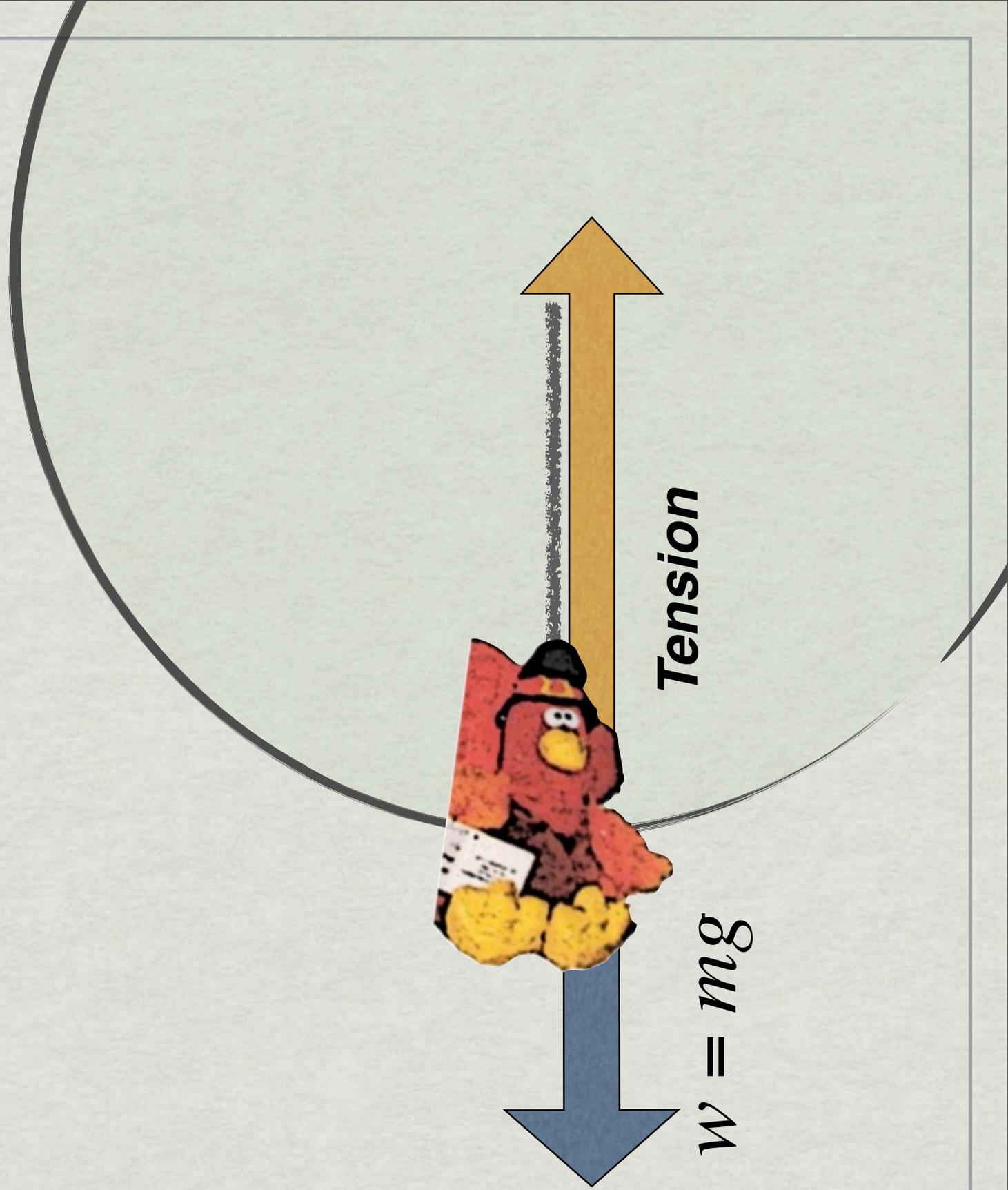


Vertical Circles -Top

$$T + w = \frac{mv^2}{r}$$

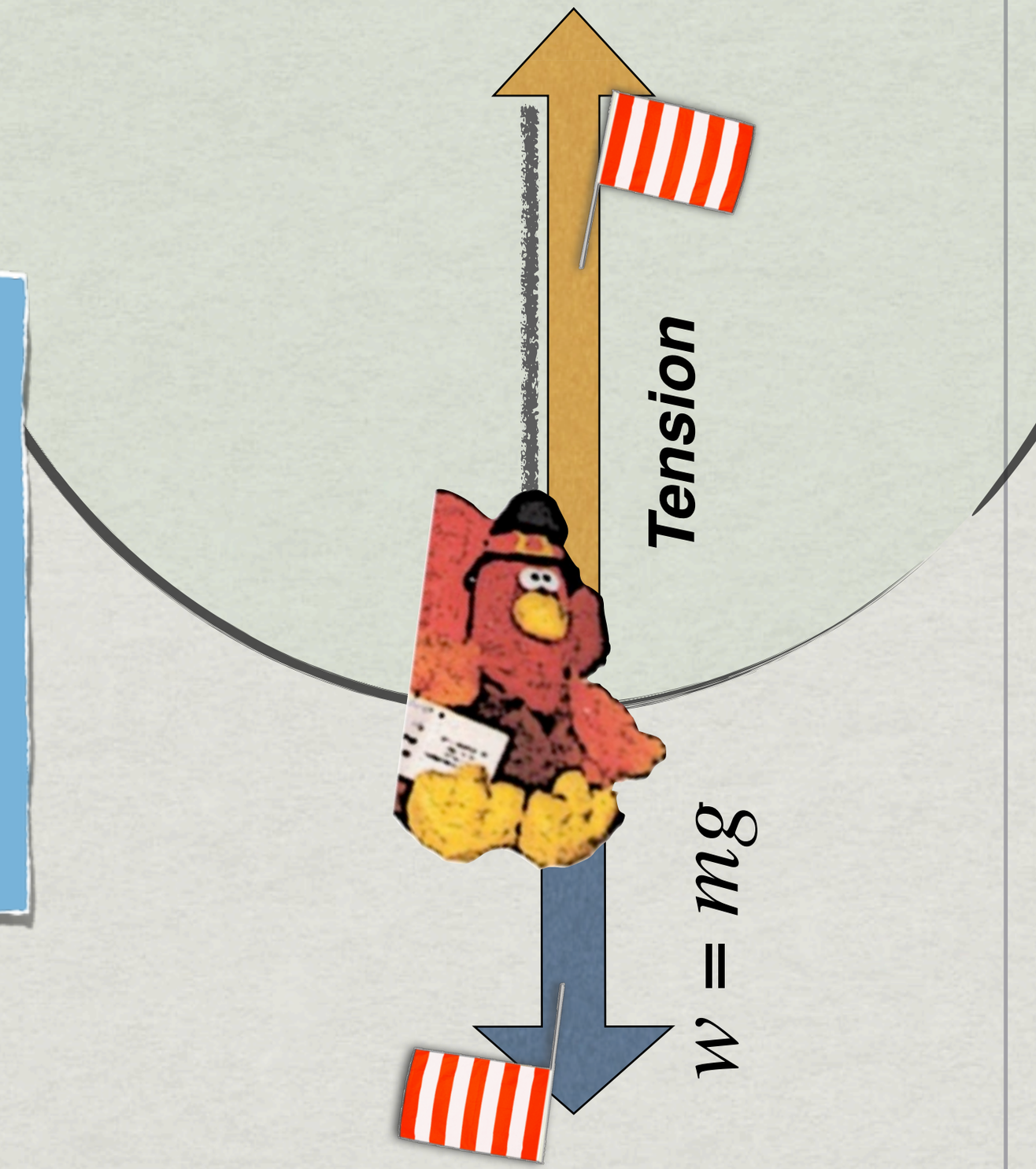


Vertical Circles
-Bottom

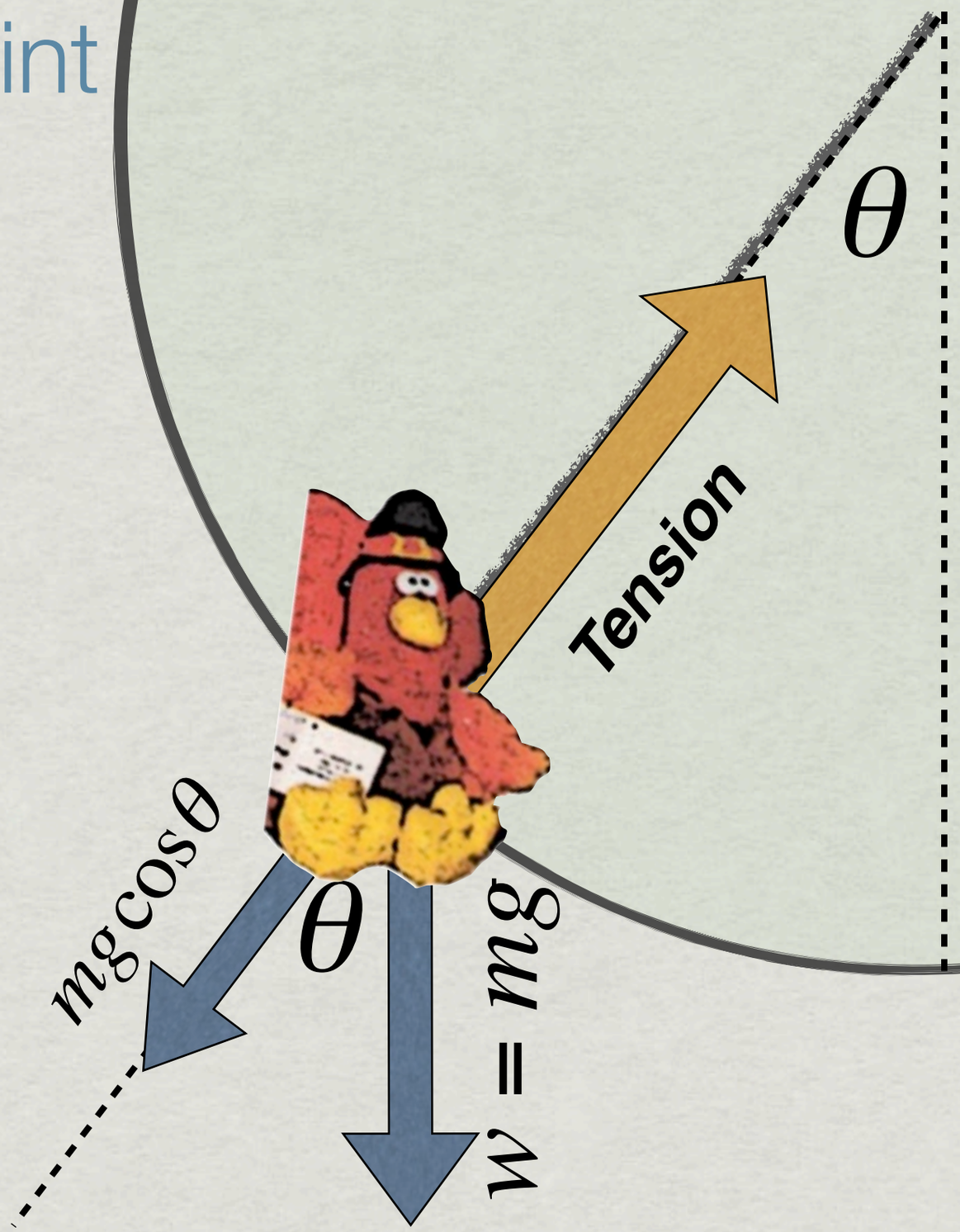


Vertical Circles
-Bottom

$$T - w = \frac{mv^2}{r}$$

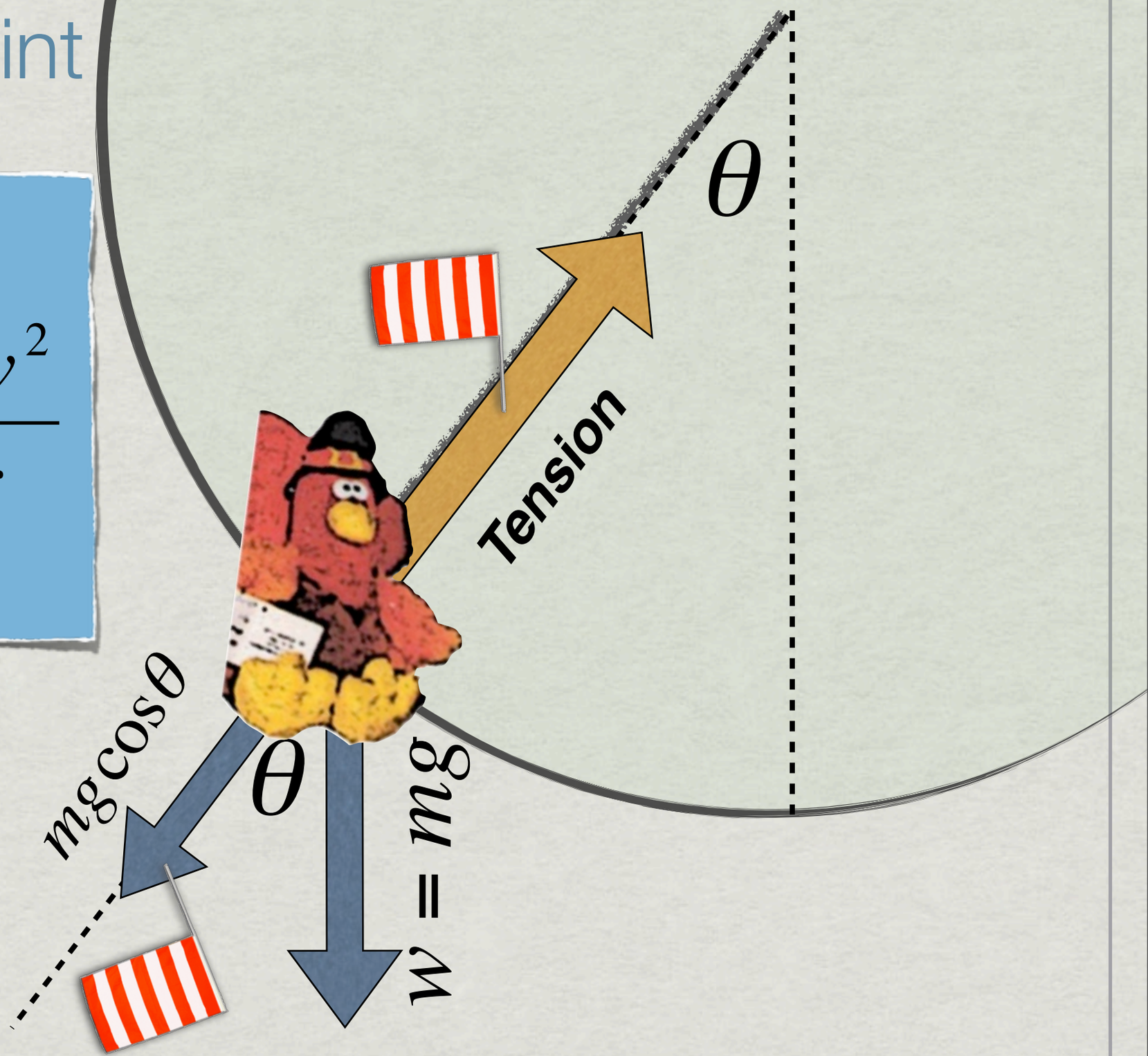


Vertical Circles
Honors- Any point



Vertical Circles
Honors- Any point

$$T - mg\cos\theta = \frac{mv^2}{r}$$



PROJECT

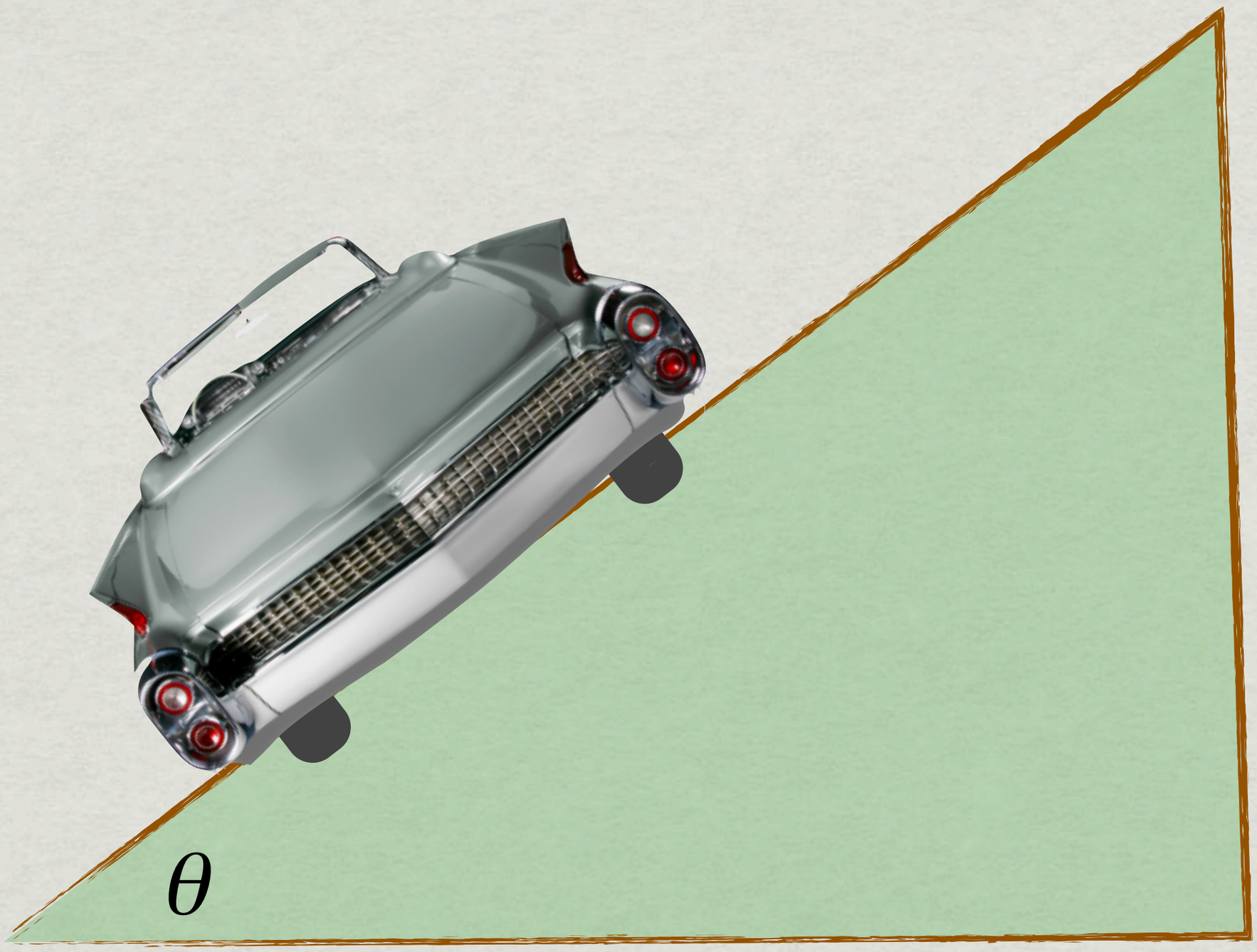
BANKED TURNS

A NORMAL THING TO DO

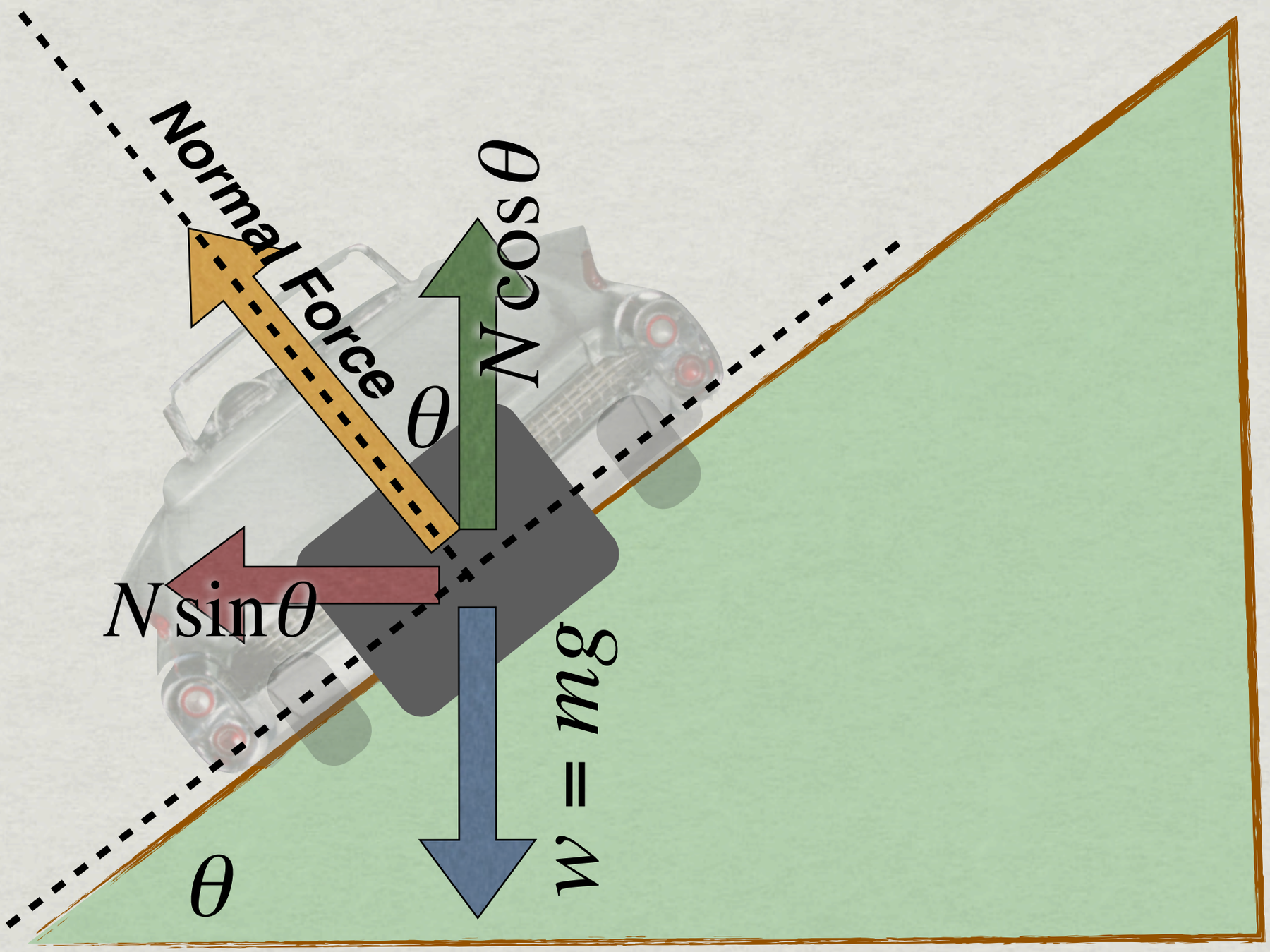
DATE 5/26/2010

CLIENT WHS

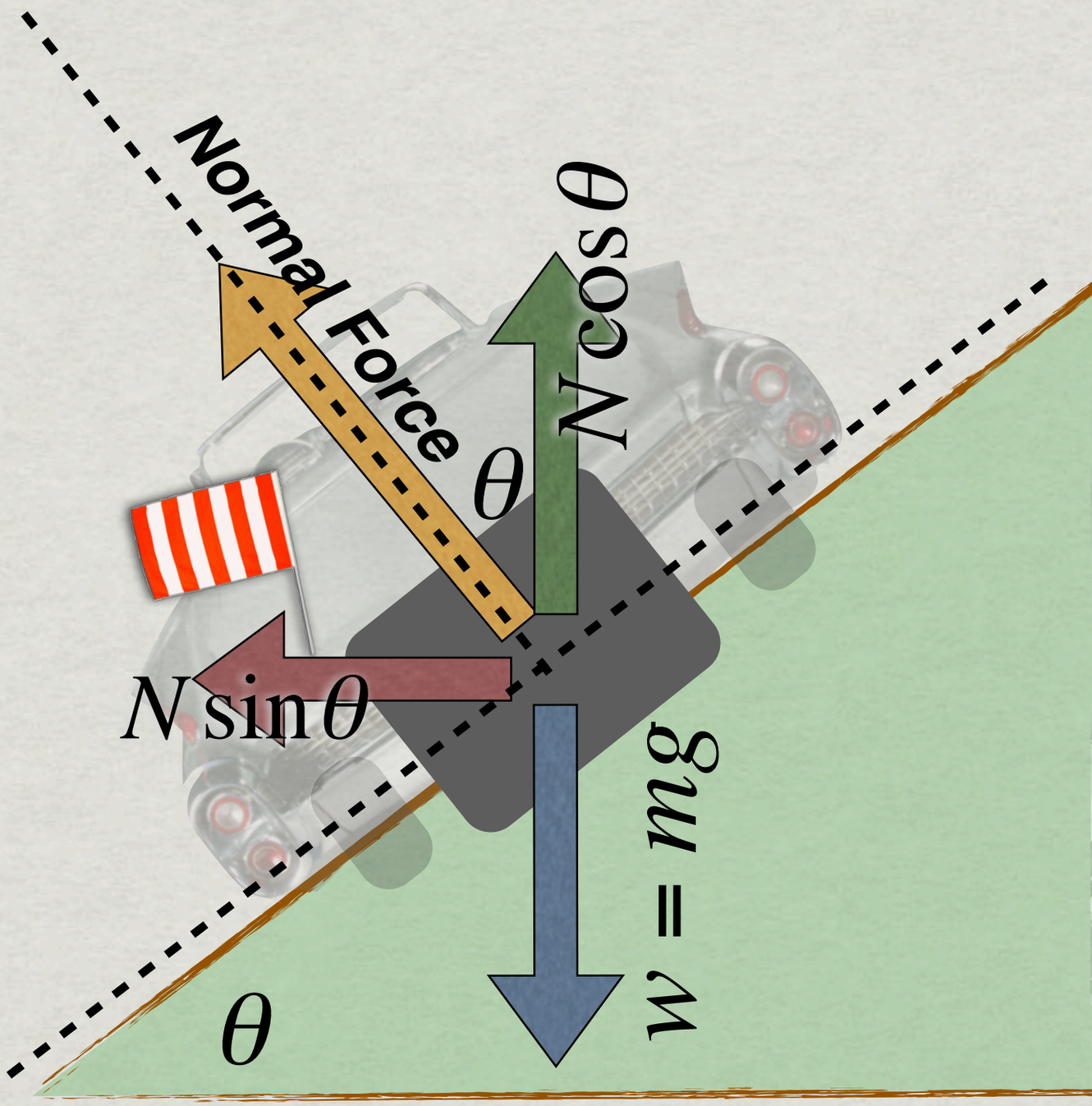
Honors -
On a banked turn



Honors -
On a banked turn



Honors -
On a banked turn



$$N\sin\theta = \frac{mv^2}{r}$$

$$N\cos\theta = mg$$

$$tan\theta = \frac{v^2}{rg}$$

Universal Gravitation

Newton's Law of Universal Gravitation

- F Force of Gravity
- M First Mass (kg)
- m second mass (kg)
- r distance (m)

$$F_g = \frac{GMm}{r^2}$$

$$G = 6.67 x 10^{-11} \, Nm^2 / kg^2$$

Between Students

$$F_g = \frac{GMm}{r^2}$$

- What is the force of attraction between the 50kg boy and the 40kg girl that is 1.5m in front of him?
- 5.93×10^{-8} N
- What forces are strong enough to hold him back?

Between Planets

$$F_g = \frac{GMm}{r^2}$$

- What is the force of attraction between the **5.97×10^{24}kg Earth** and the **7.24×10^{22}kg moon** that is **3.84×10^{8}m** away?
- **1.955×10^{20} N**
- What is the result of this force?

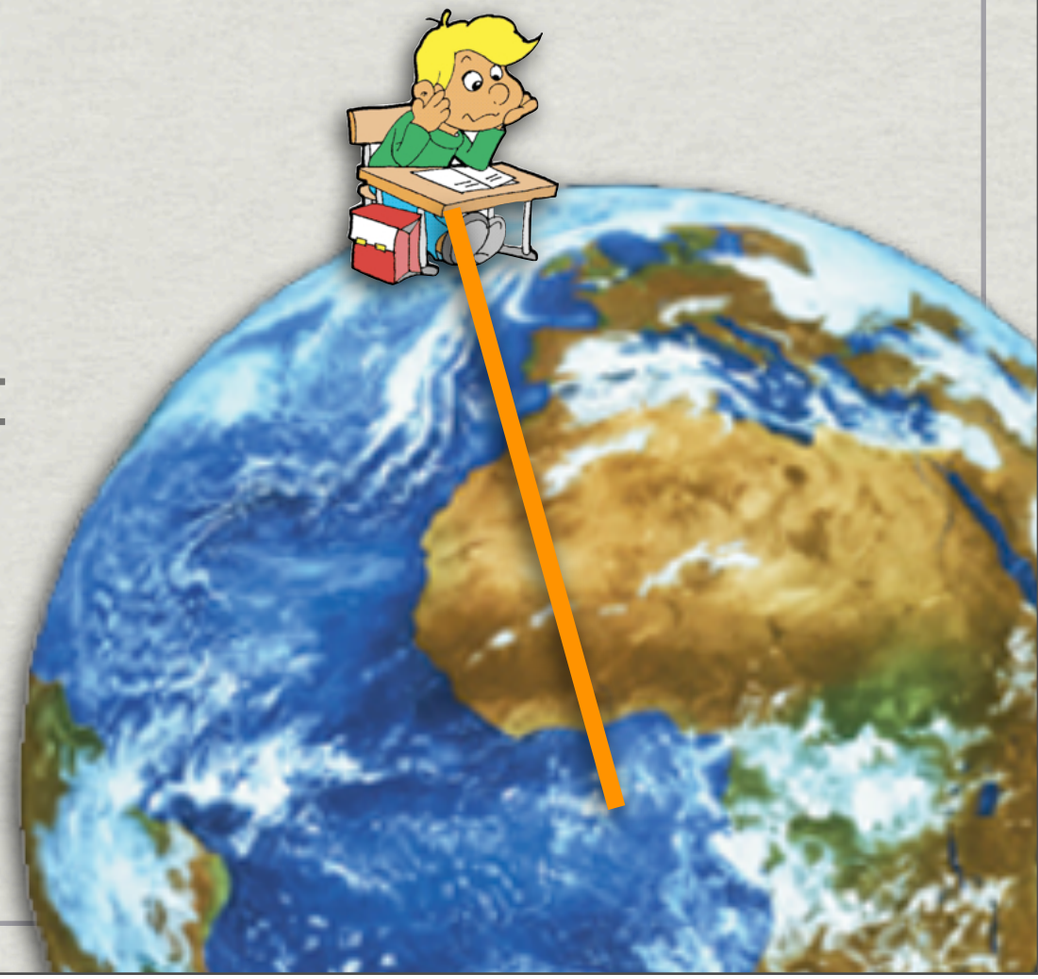
Weight

- What is the force of attraction between the **5.97x10^{24}kg Earth** and the **50kg boy** that is **6.371x10^{6}m** away?

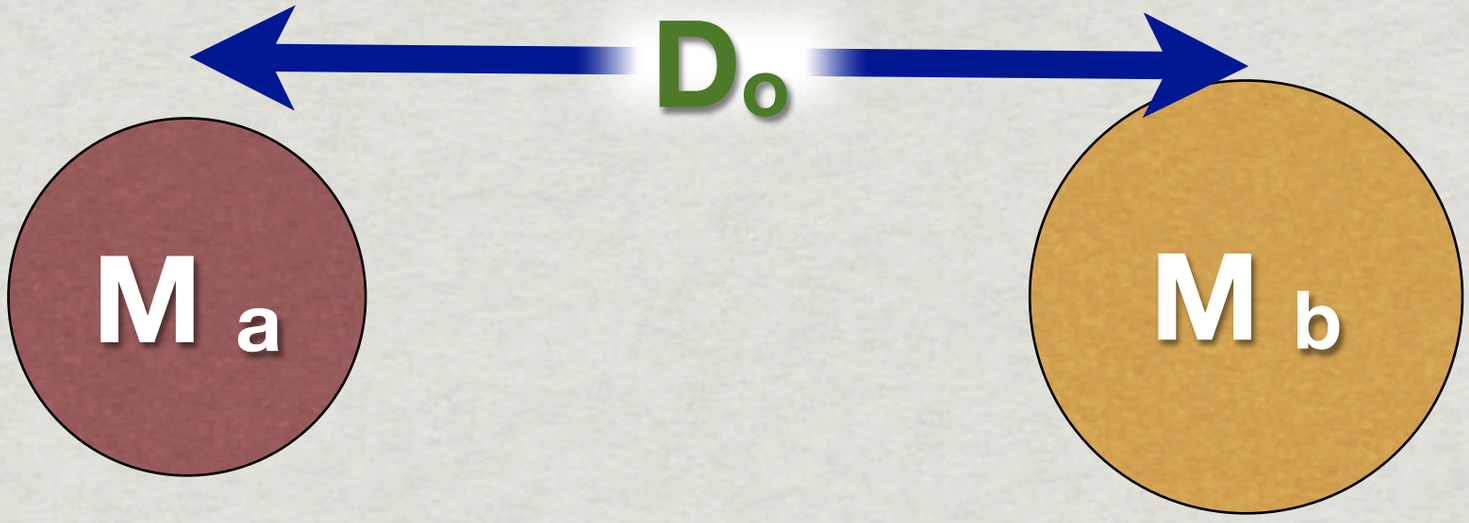
$$F_g = \frac{GMm}{r^2}$$

- **490.5 N**

- What do you get if you divide that by his mass?

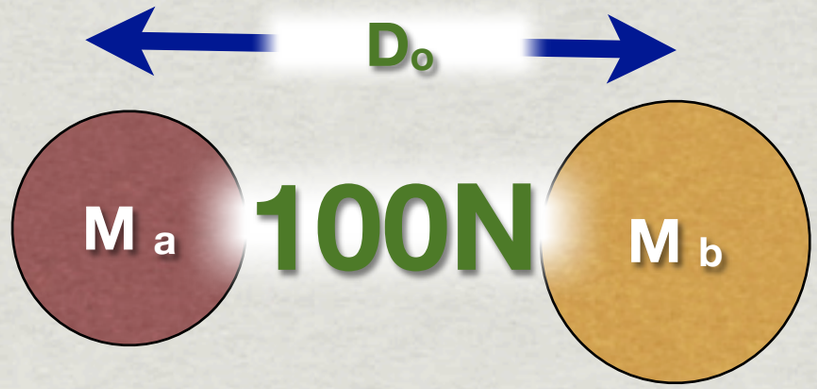


Relative Changes

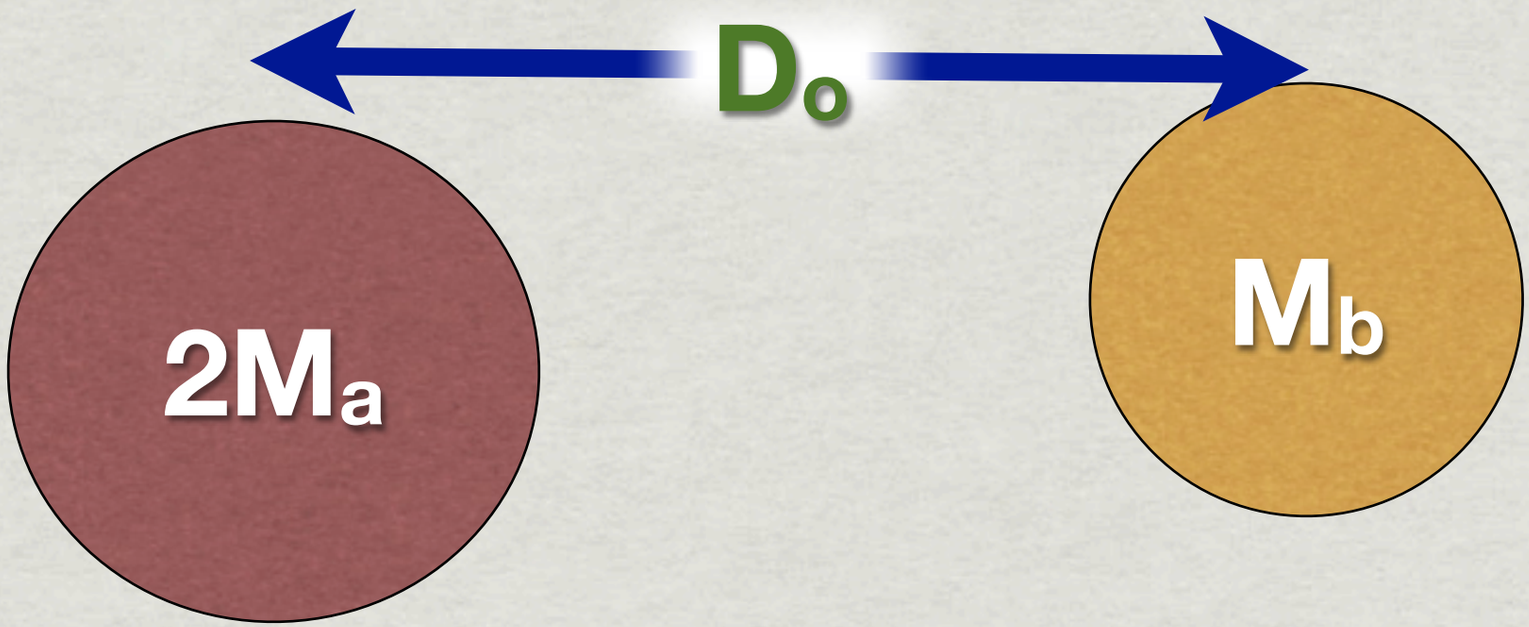


- These two masses have a force between them of 100N

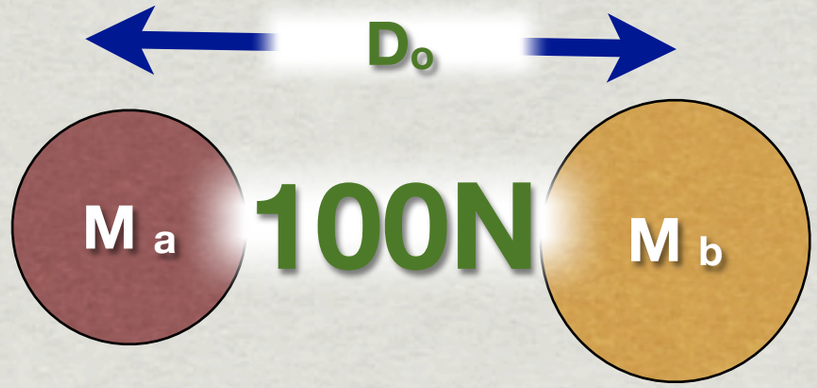
Relative Changes



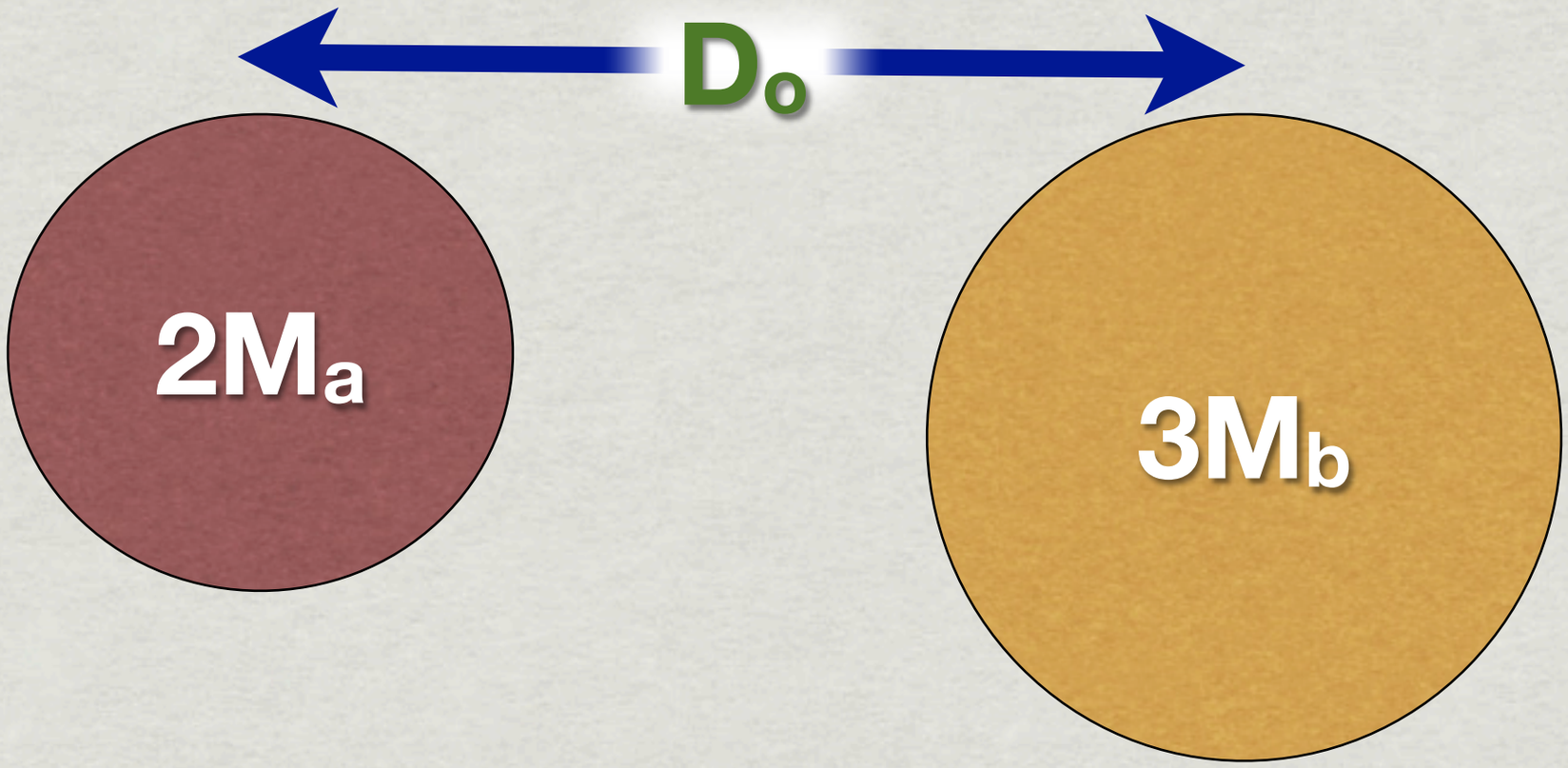
- What is the force between the masses below?



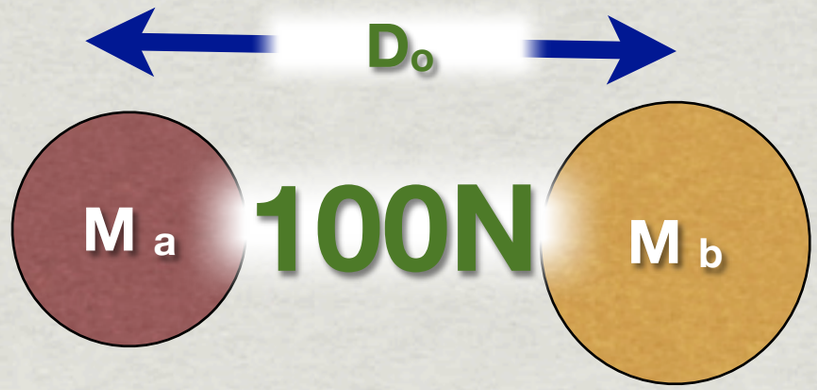
Relative Changes



- What is the force between the masses below?



Relative Changes



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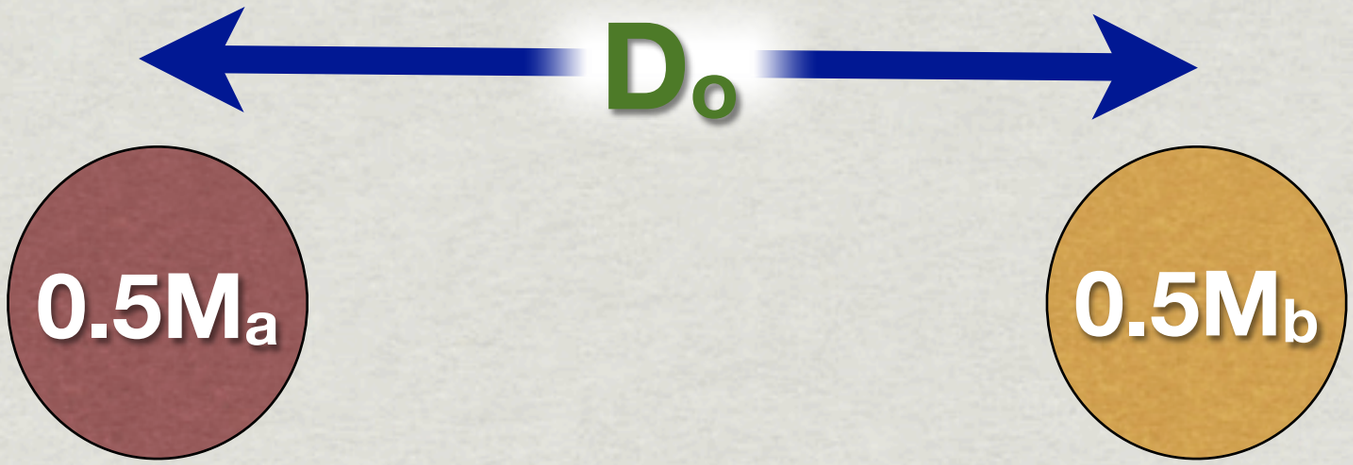

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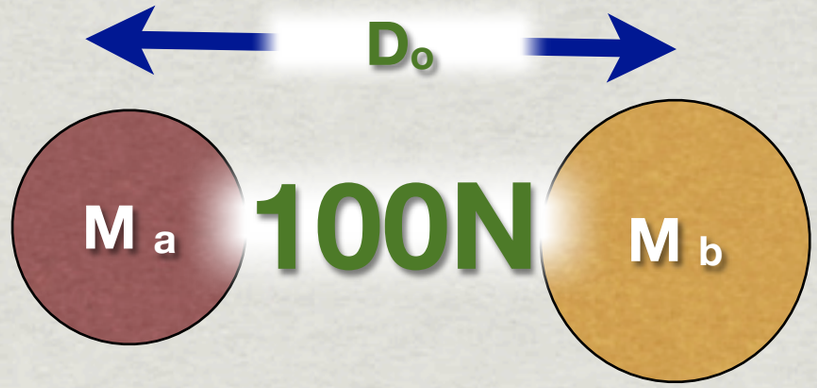

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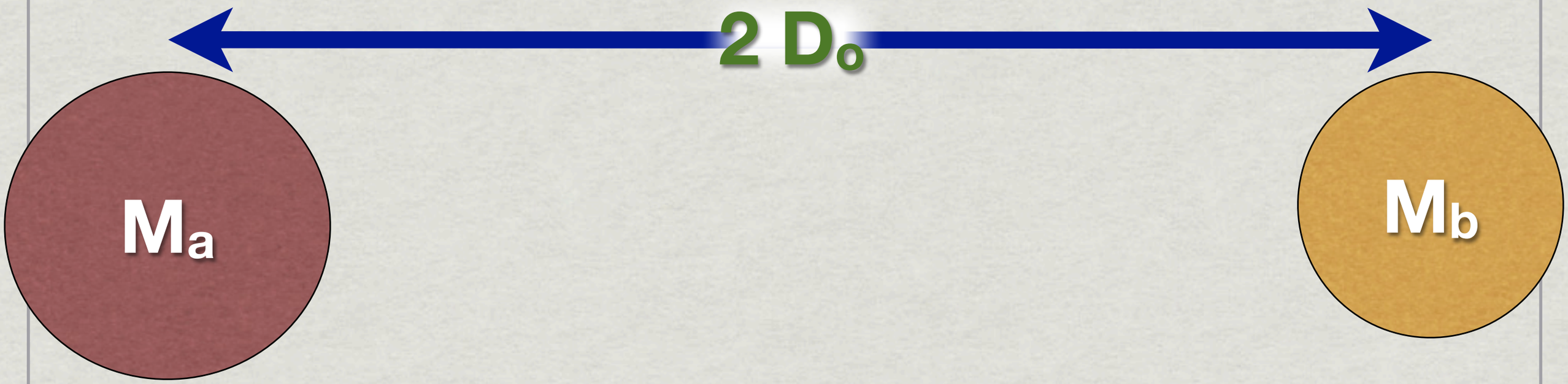
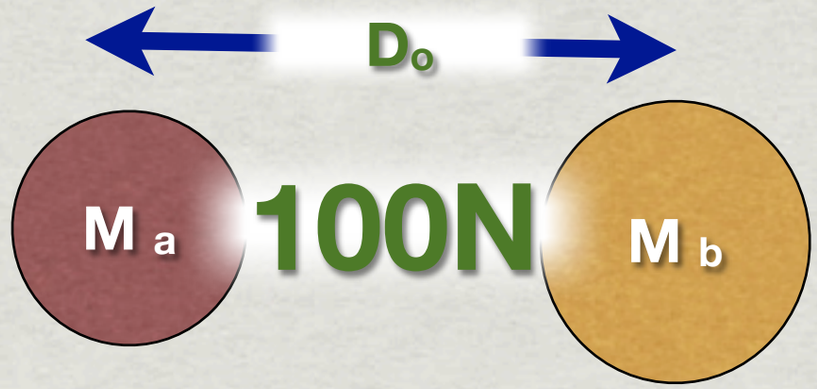


Relative Changes



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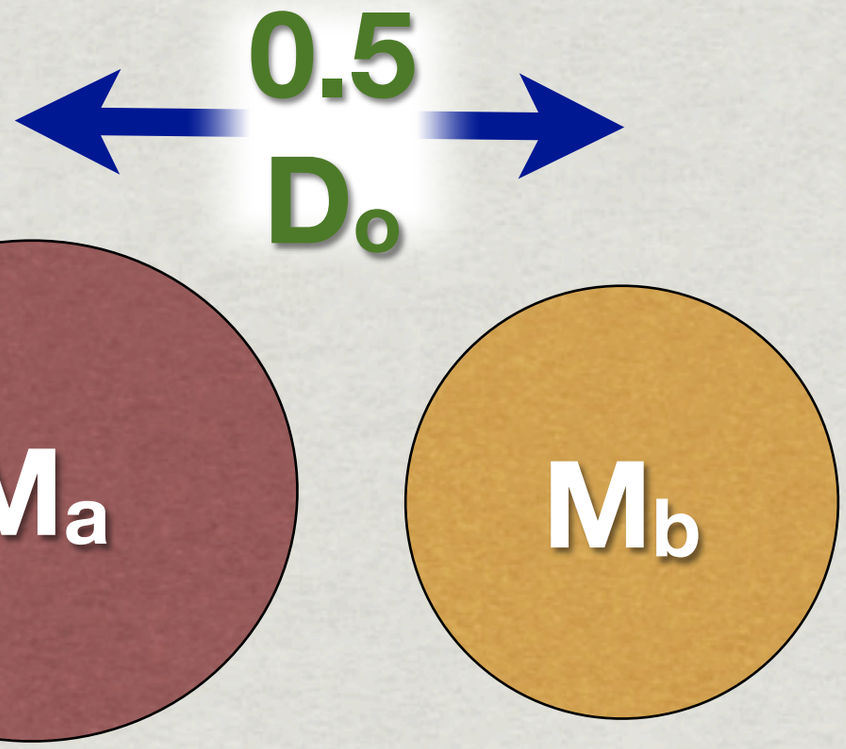
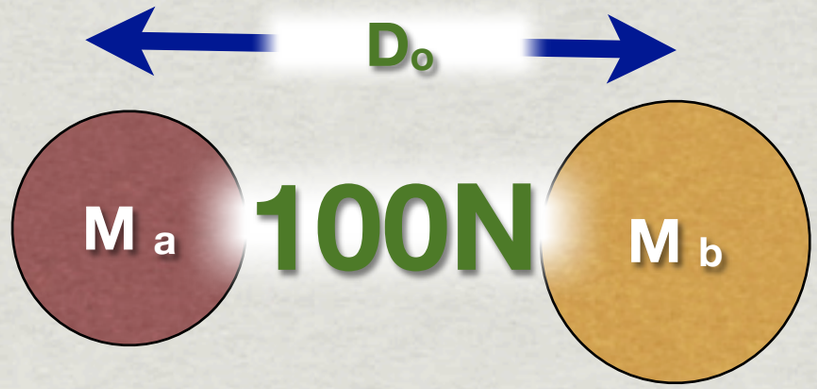


Relative Changes



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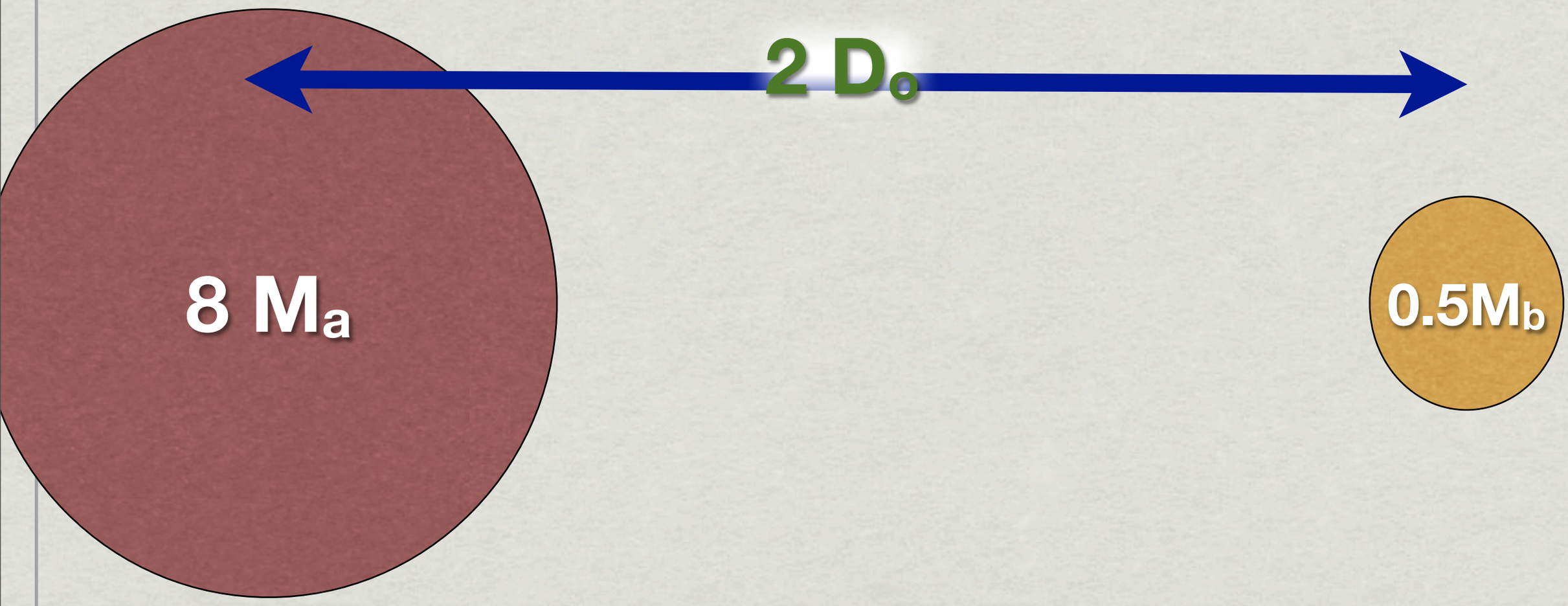


Cavendish Torsion Balance

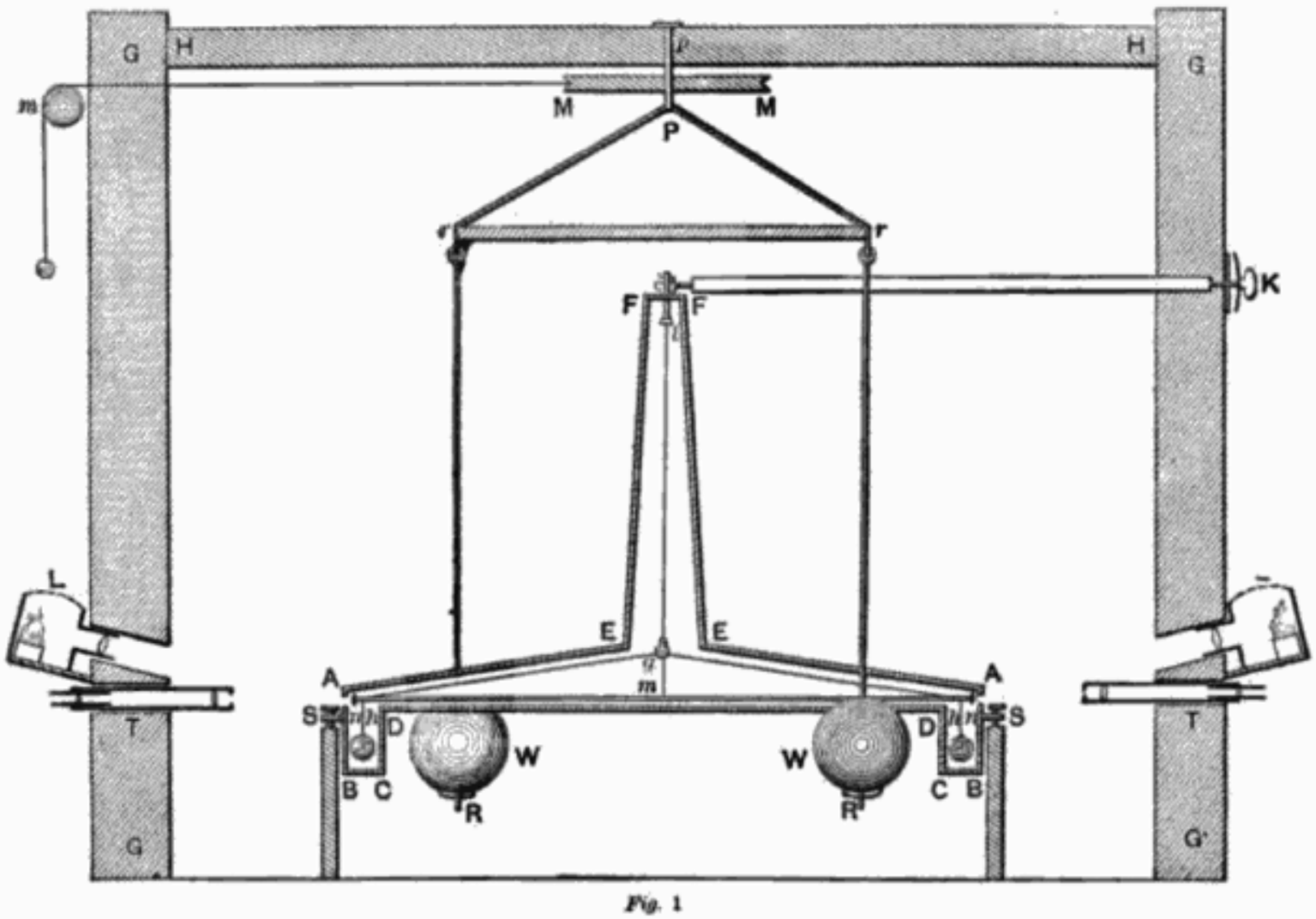
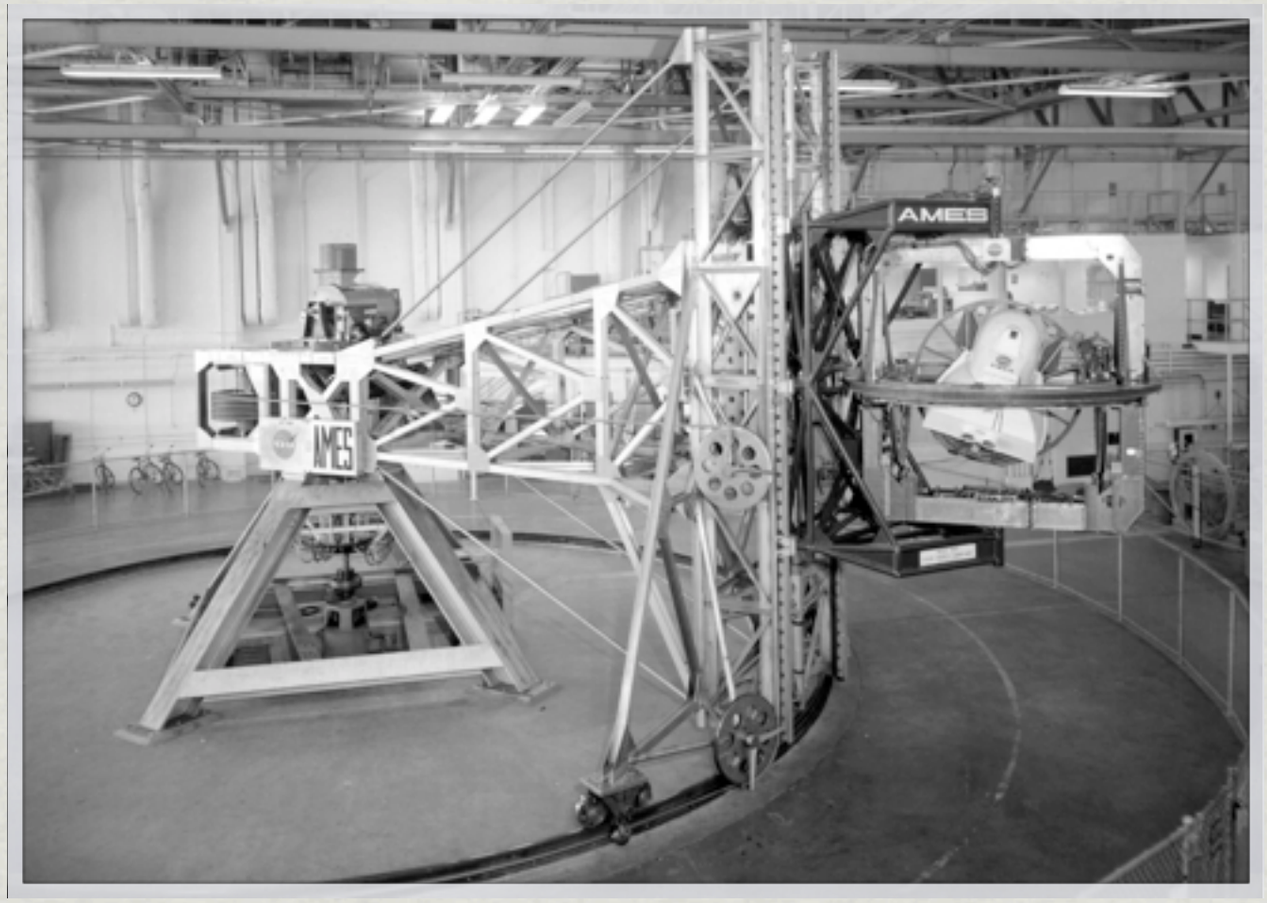


Fig. 1

H. Cavendish

Angular Velocity ω

- Find the velocity and centripetal acceleration of a test pilot
- r= 3.4 m
- ω = 90 rpm

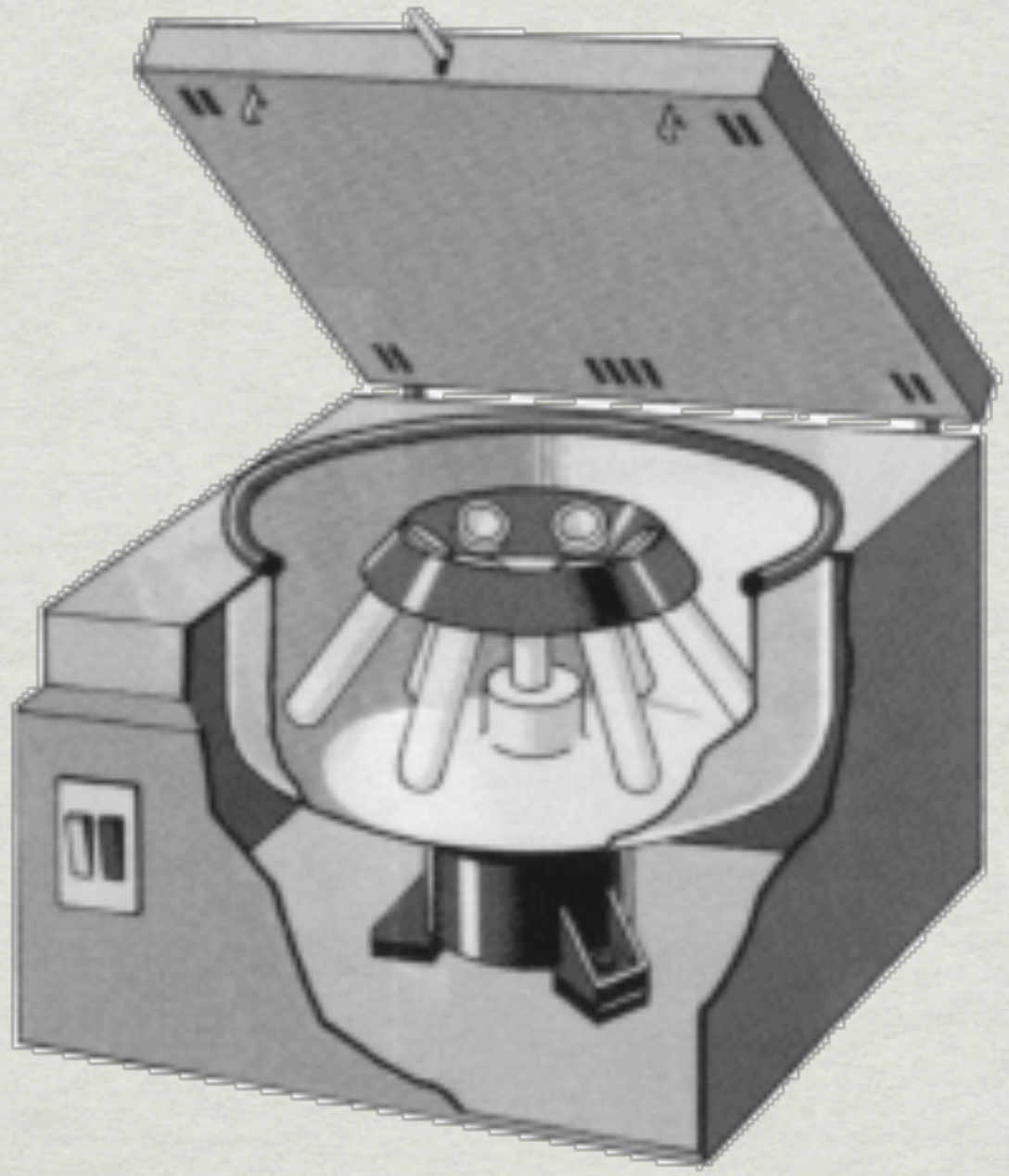


Angular Velocity ω

- Find the velocity of a car on the London Eye:
- r= 42m
- ω = 18°/min

Angular Velocity ω

- Find the velocity of a test tube in a centrifuge:
- r= 6 cm
- ω = 2826 rad/s



Angular Velocity ω

- Find the velocity of a rubber stopper:
- r = 70cm
- ω = 20rev/12s