Centripetal Force

1

Mr Gobbles

2

Centripetal Force

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

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

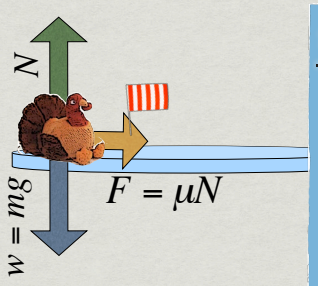
3

PROJECT
MERRY-GO-ROUND
CAROUSELS HAVE HORSES!

DATE 5/26/2010 | CLIENT WHS

4

Forces on the Turkey



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

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

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

5

PROJECT **BIG SWING**

WHAT KEEPS YOU FROM FALLING?

DATE 5/26/2010 | CLIENT WHS

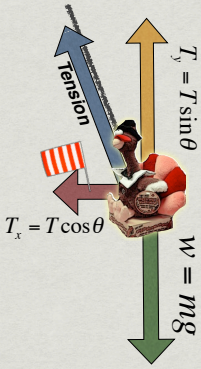
6

At an Angle

$$mg = T\sin\theta$$

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

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



7

PROJECT **THE ROTOR**

WHAT KEEPS YOU FROM FALLING?

DATE 5/26/2010 | CLIENT WHS

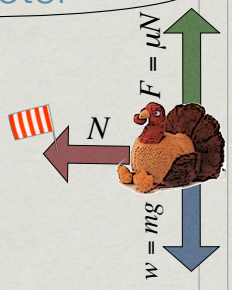
8

The Rotor

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

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

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



9

PROJECT **LOOPS**

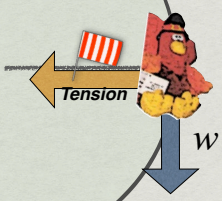
WHAT KEEPS YOU FROM FALLING?

DATE 5/26/2010 CLIENT WHS

10

Vertical Circles -Side

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

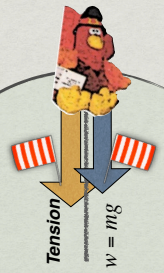


$$w = mg$$

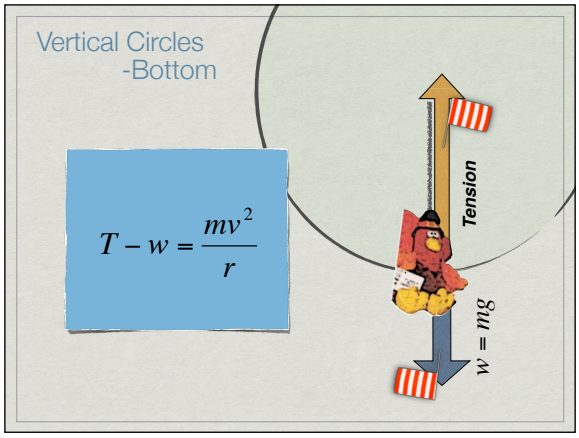
11

Vertical Circles -Top

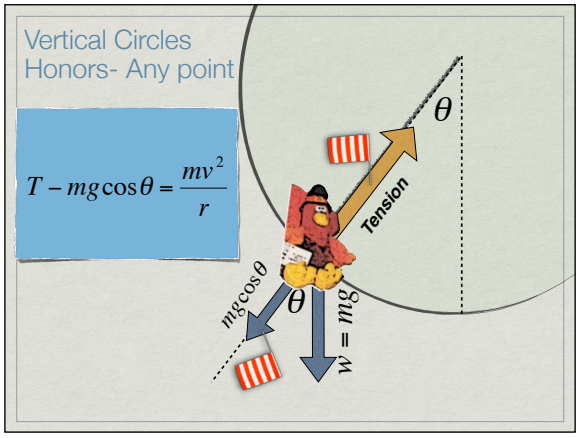
$$T + w = \frac{mv^2}{r}$$



12


Vertical Circles
-Bottom
$T - w = \frac{mv^2}{r}$
Tension
$w = mg$

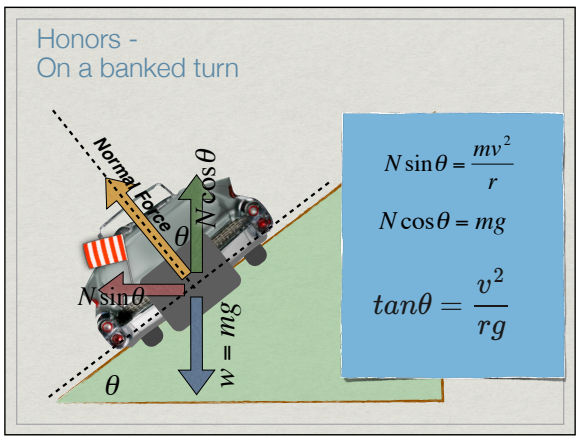
13


Vertical Circles
Honors- Any point
$T - mg\cos\theta = \frac{mv^2}{r}$
θ
Tension
$mg\cos\theta$
θ
$w = mg$

14


VELODROME DU MONT
PROJECT
BANKED TURNS
A NORMAL THING TO DO
DATE
5/26/2010
CLIENT
WHS

15


Honors -
On a banked turn
Normal Force
θ
$N\cos\theta$
$N\sin\theta$
$w = mg$
θ
$N\sin\theta = \frac{mv^2}{r}$
$N\cos\theta = mg$
$tan\theta = \frac{v^2}{rg}$

16

Universal Gravitation

17

Newton's Law of Universal Gravitation

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

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

$$G = 6.67x10^{-11}\ Nm^2/kg^2$$

18

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?

19

Between Planets

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

- What is the force of attraction between the **5.97x10^{24}kg Earth** and the **7.24x10^{22}kg moon** that is **3.84x10^{8}m** away?
- **1.955×10^{20} N**
- What is the result of this force?

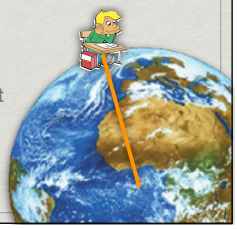
20

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?



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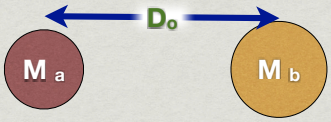
Relative Changes

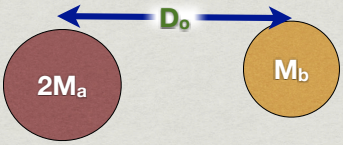


- These two masses have a force between them of 100N

22

Relative Changes

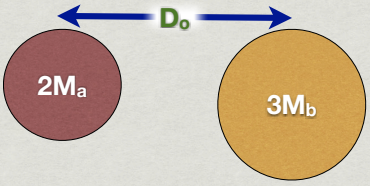
- What is the force between the masses below?



23

Relative Changes

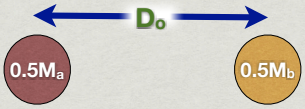
- What is the force between the masses below?



24

Relative Changes

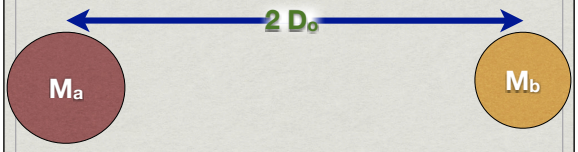
- What is the force between the masses below?



25

Relative Changes

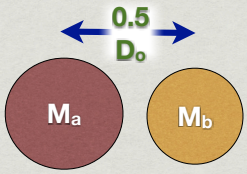
- What is the force between the masses below?



26

Relative Changes

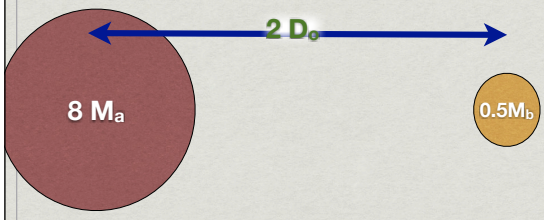
- What is the force between the masses below?



27

Relative Changes

- What is the force between the masses below?



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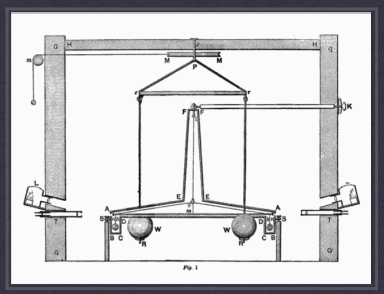
Cavendish Torsion Balance



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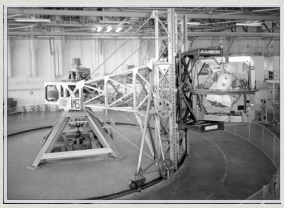
Angular Velocity ω

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



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Angular Velocity ω

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

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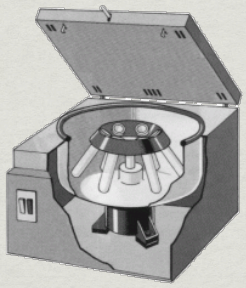
Angular Velocity ω

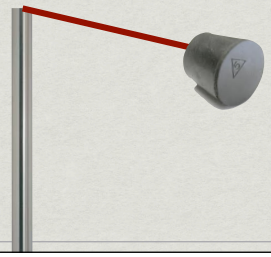
- Find the velocity of a test tube in a centrifuge:
- r= 6 cm
- ω = 2826 rad/s



32

Angular Velocity ω

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



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