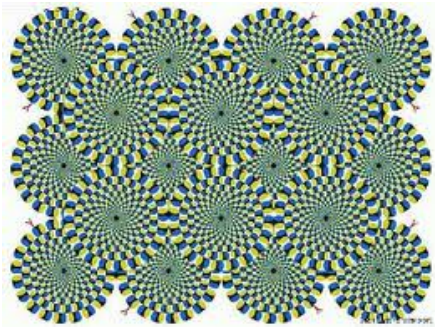
get your clicker

Lecture: Strings, Ramps and Circular Motion



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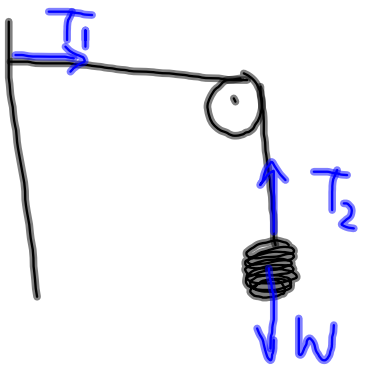
STRINGS

PULLEYS ONLY CHANGE THE DIRECTION OF THE FORCE OF THE STRING (TENSION), NOT THE MAGNITUDE.



$T_1 = T_2$

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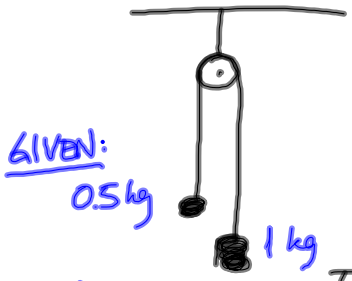
EX. PROBLEM: "ATWOOD MACHINE"

- ONE PULLEY W/ 2 WEIGHTS ATTACHED
- PULLEYS ARE FRICTION LESS
- STRINGS DON'T STRETCH

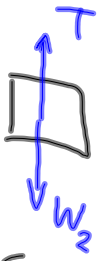


THINGS TO MEASURE / CALC: MASSES, TENSION, ACCEL

GIVEN:

FIND
$a = ?$
$T = ?$

FBD



$\Sigma F_y = ma_y$

$T - W_1 = m_1 a_y$

$T - 5 = 0.5 a_y$

$\Sigma F_y = ma_y$

$W_2 - T = m_2 a_y$

$10 - T = 1 a_y$

(PLUGGED IN GIVENS $g \approx 10 m/s^2$)

- TWO EQ'NS IN TWO UNKNOWNS
- "SOLVE" FOR 1 UNKNOWN FIRST
- THEN SUB INTO OTHER EQ'N AND SOLVE FOR 2ND UNKNOWN

$T = 5 + 1.5 a_y$

$10 - (5 + 0.5 a_y) = a_y$

$5 - 0.5 a_y = a_y$

$1.5 a_y = 5$

$a_y = \frac{5}{1.5} = 3.3 \, m/s^2$

$T = 5 + 0.5 a_y$

$= 5 + 0.5(3.3)$

$= 5 + 1.7$

$T = 6.7 \, N$

$a_y = \frac{F_{NET}}{m} = \frac{3.3}{1} - \frac{1.7}{0.5}$

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CIRCULAR MOTION

CIRCULAR MOTION IS ACCELERATED MOTION. { 1 T, 2 F }

T, ~~THEREFORE THERE~~ MUST BE A UNBALANCED FORCE

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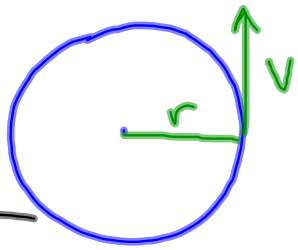
FORMULA FOR CIRCULAR ACCEL.

$$a_c = \frac{V^2}{r}$$



a_c	CIRC. ACCEL	m/s^2
V	TANGENTIAL VELOCITY	m/s
r	RADIUS	m

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(EX) CRUISE SET @ 15 m/s

RADIUS = 40 m

CAN THE CAR ACTUALLY DO THIS? ($a \leq 0.9g$)

$$a_c = \frac{V^2}{r} = \frac{15^2}{40} = 5.6 \text{ m/s}^2$$

$$\frac{a_c}{g} = \frac{5.6}{9.8} = 0.57 \checkmark \quad \text{YES}$$

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