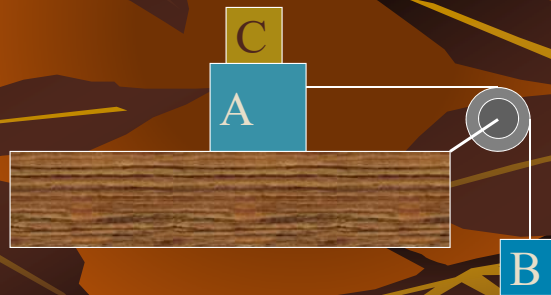


PHYS 210 - General Physics I

- Newton's Laws of Motion
- Rotation and forces

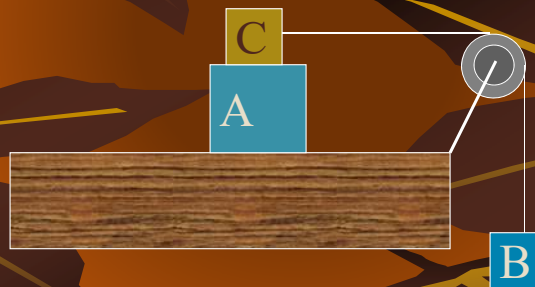
EX:

- Blocks A and B have weights of 44 N and 22 N, respectively. Determine the minimum weight of block C to keep A from sliding if μ_s between block A and the table is 0.20.



EX:

- Blocks A and B have weights of 44 N and 22 N, respectively. Determine the minimum weight of block C and the value of μ'_s between block C and A to keep A from sliding if μ_s between block A and the table is 0.20.



ROPE ON BLOCK C:

$\mu_s = ?$

μ_s

* FIND W_C & μ'_s S.T. BLOCKS DON'T MOVE.

$F_{sac} = F_{sca}$ (1)

$N_{ac} = N_{ca}$ (3)

$T_B = T_C$ (2)

$F_{sca} = \mu'_s N_{ca}$ (10)
(= F_{sa})

$\sum F_x = 0 = F_{sac} - F_{sa}$

$\sum F_y = 0 = N_a - N_{ac} - W_a$

$\therefore \begin{cases} F_{sac} = F_{sa} \\ N_a = N_{ac} + W_a \end{cases}$ (4) (5)

$\sum F_y = 0 = T_B - W_B$

$T_B = W_B$ (6)

$\sum F_x = 0 = T_C - F_{sca}$

$\sum F_y = 0 = N_{ca} - W_c$

$\therefore \begin{cases} T_C = F_{sca} \\ N_{ca} = W_c \end{cases}$ (7) (8)

* LOOK A BOXED EQUATIONS 310!

NOTES: $F_{sca} = \mu'_s N_{ca}$ (9)

$W_A = 44 \text{ N}$
 $W_B = 22 \text{ N}$
 $\mu_s = 0.20$
 $W_C = ?$

* LOOK AT BOXED EQUATIONS! $\exists 10!$

USE $F_{S,MAX}$ VALUES! (MIN VALUES FOR w_c)

NOTES: $F_{S,MAX} = \mu_s' N_{CA}$ (9)
(= F_{SA}) (2)

* $w_c = N_{CA} = N_A - w_A = \frac{F_{BA}}{\mu_s} - w_A = \frac{F_{BAC}}{\mu_s} - w_A = \frac{T_C}{\mu_s} - w_A = \frac{T_B}{\mu_s} - w_A$

$w_c = \frac{w_B}{\mu_s} - w_A = \frac{22N}{0.2} - 44N = 66N$

* $\mu_s' = \frac{F_{S,MAX}}{N_{CA}} = \frac{F_{S,MAX}}{w_c} = \frac{F_{SA}}{w_c} = \frac{\mu_s N_A}{w_c} = \mu_s \frac{(N_{AC} + w_A)}{w_c}$

$\mu_s' = \frac{\mu_s (N_{AC} + w_A)}{w_c} = \frac{\mu_s (w_c + w_A)}{w_c} = \frac{0.2(66N + 44N)}{66N} = 0.333$

Newton's Laws of Motion

These also work for rotational motion!

1. If $\vec{F}_{NET} = 0$, then $\vec{v} = \text{constant}$

❖ Mass is a measure of inertia

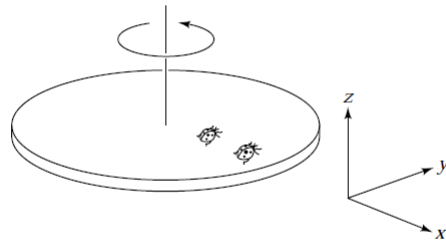
2. $\vec{F}_{NET} = m \vec{a}$

❖ SI unit of force is the Newton [N]

❖ The net force is parallel to the acceleration!

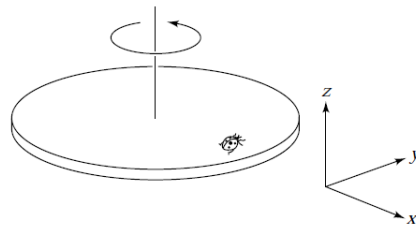
3. $\vec{F}_{12} = -\vec{F}_{21}$

A ladybug sits at the outer edge of a merry-go-round, and a gentleman bug sits halfway between her and the axis of rotation. The merry-go-round makes a complete revolution once each second. The gentleman bug's angular speed is



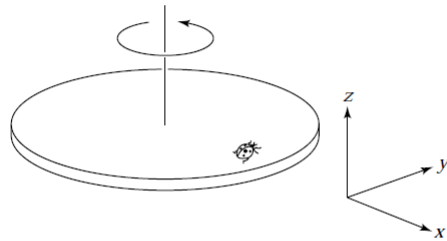
1. half the ladybug's.
2. the same as the ladybug's.
3. twice the ladybug's.
4. impossible to determine

A ladybug sits at the outer edge of a merry-go-round, that is turning and slowing down. At the instant shown in the figure, the radial component of the ladybug's (Cartesian) acceleration is



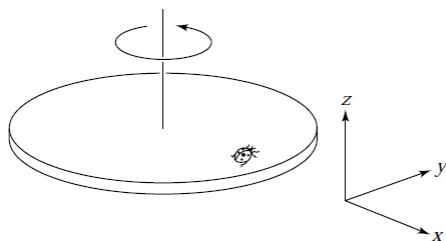
1. in the $+x$ direction.
2. in the $-x$ direction.
3. in the $+y$ direction.
4. in the $-y$ direction.
5. in the $+z$ direction.
6. in the $-z$ direction.
7. zero.

A ladybug sits at the outer edge of a merry-go-round that is turning and slowing down. The tangential component of the ladybug's (Cartesian) acceleration is



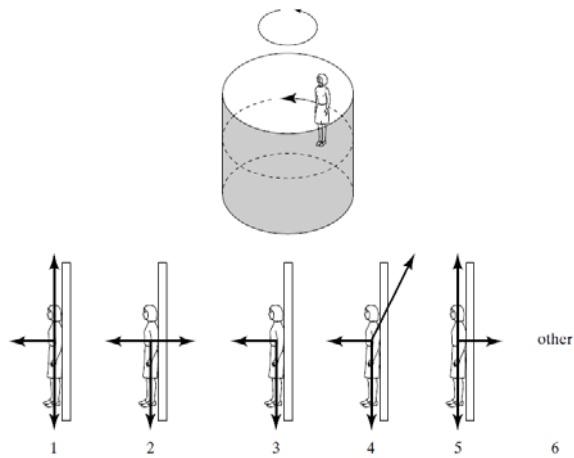
1. in the $+x$ direction.
2. in the $-x$ direction.
3. in the $+y$ direction.
4. in the $-y$ direction.
5. in the $+z$ direction.
6. in the $-z$ direction.
7. zero.

A ladybug sits at the outer edge of a merry-go-round that is turning and is slowing down. The vector expressing her angular velocity is



1. in the $+x$ direction.
2. in the $-x$ direction.
3. in the $+y$ direction.
4. in the $-y$ direction.
5. in the $+z$ direction.
6. in the $-z$ direction.
7. zero.

A rider in a “barrel of fun” finds herself stuck with her back to the wall. Which diagram correctly shows the forces acting on her?



Have a great weekend!