

Name: \_\_\_\_\_

**RECITATION HANDOUT #4: Review for Test #1**

**Problem #1: Description of Motion**

At the beginning, the object is located to the left of the origin and has an initial velocity to the right.

The object then slows down with a constant acceleration.

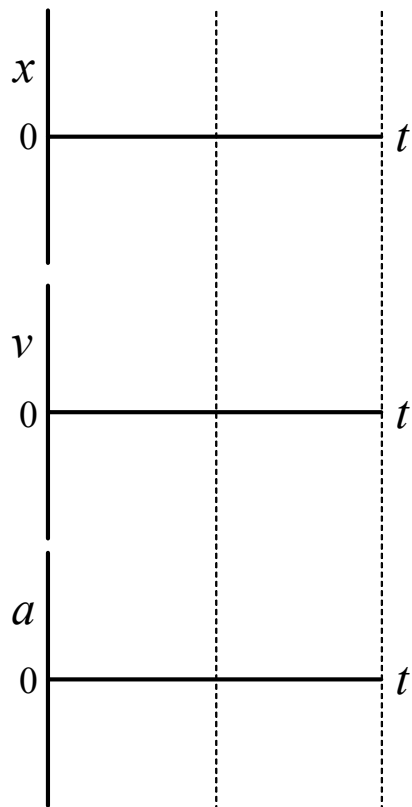
At the end, the object is stopped at the origin.

**Motion Diagram**

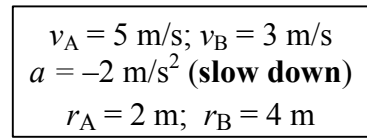
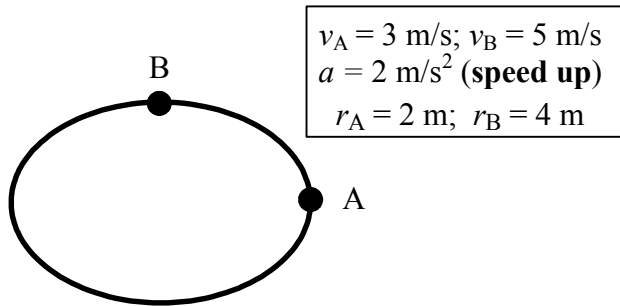
Draw & label (4)  $x$ -points, (3)  $\vec{v}_{\text{ave}}$  vectors & the  $\vec{a}$  vector.

Indicate the origin with a vertical line.

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2. An object moves counterclockwise with **increasing (or decreasing) speed** around an oval track as shown. Draw the **velocity** and **acceleration** vectors at points A and B on the provided grids (to nearest integer). **Explicitly** draw and label the **parallel** and **perpendicular acceleration** vector components and then vectorially add them to find the total acceleration. Show any necessary calculations at the bottom of the page.



$v_A$     1 div = 1 m/s                       $v_B$

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$v_A$     1 div = 1 m/s                       $v_B$

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$a_A$     1 div = 1 m/s<sup>2</sup>                       $a_B$     1 div = 1 m/s<sup>2</sup>

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$a_A$     1 div = 2 m/s<sup>2</sup>                       $a_B$     1 div = 1 m/s<sup>2</sup>

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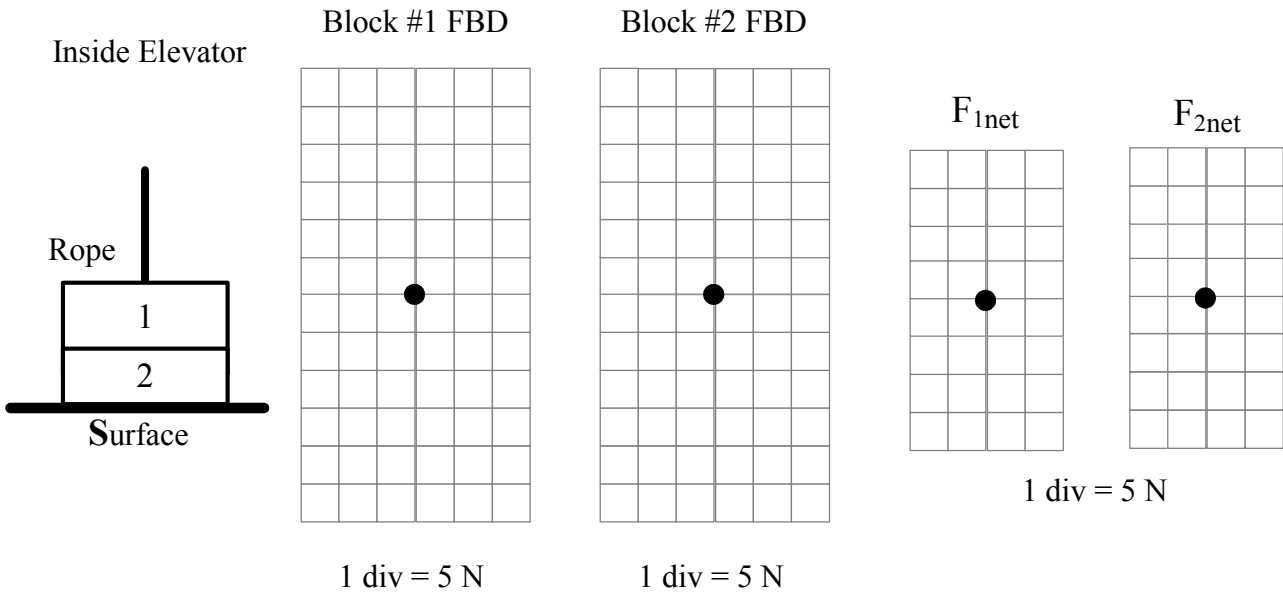
**Calculations:**

When the object **speeds up**, the **angle** between the  $v$  and  $a$  vectors is \_\_\_\_\_ ( $<90^\circ$ ,  $=90^\circ$ ,  $>90^\circ$ ).

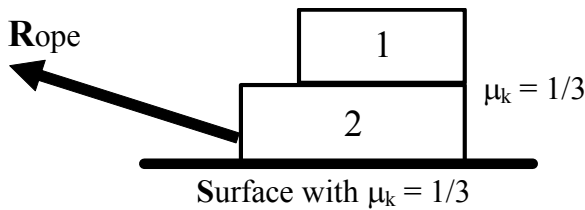
When the object **slows down**, the **angle** between the  $v$  and  $a$  vectors is \_\_\_\_\_ ( $<90^\circ$ ,  $=90^\circ$ ,  $>90^\circ$ ).

On the picture, **label** where **point C** ( $t = 2s$ ) should be located if the object is “**slowing down**”.

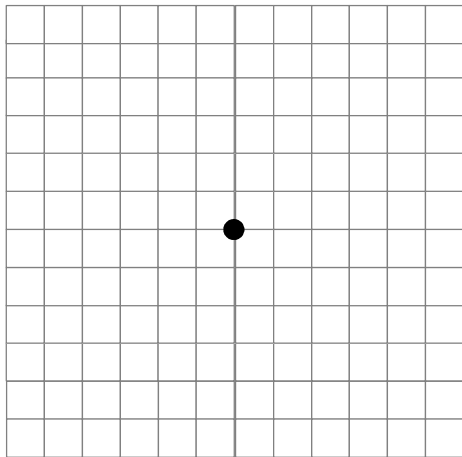
3. Block #1 (2 kg) and block #2 (2 kg) are inside an elevator in the configuration shown below. A rope is pulling up with a tension of 10 N on block #1. The elevator moves **downward** with **increasing** speed and both blocks have an acceleration of  $2.5 \text{ m/s}^2$ . Draw the **free body diagrams** for both blocks using the two subscript notation, and draw the **net force** on each block. (Assume  $g = 10 \text{ m/s}^2$ .)



4. Block #1 (1.5 kg) and block #2 (2 kg) are accelerating left with different acceleration values. A rope pulls block #2 with a **tension** of  $-30 \text{ N } \hat{i} + 5 \text{ N } \hat{j}$ . The coefficient of **KINETIC** friction between the blocks is  $\mu_k = 1/3$  and the coefficient of **KINETIC** friction between block #2 and the surface is  $\mu_k = 1/3$ . Draw the **free body diagrams** for both blocks using the two subscript notation, as well as the **net force** on each. Assume that the tension is sufficiently large to cause block #2 to slide beneath block #1 and to slide along the surface, i.e., kinetic friction is present at both interfaces. (Assume  $g = 10 \text{ m/s}^2$ .)

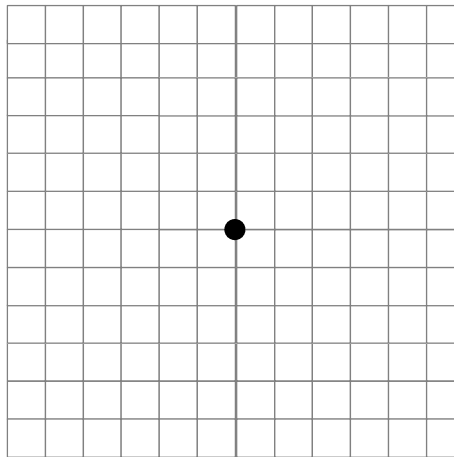


Block #1 FBD



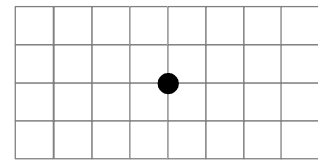
1 div = 5 N

Block #2 FBD

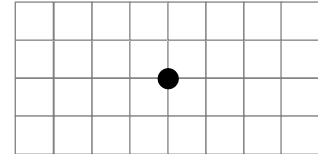


1 div = 5 N

$F_{1net}$



$F_{2net}$

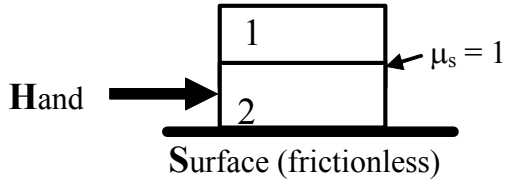


1 div = 5 N

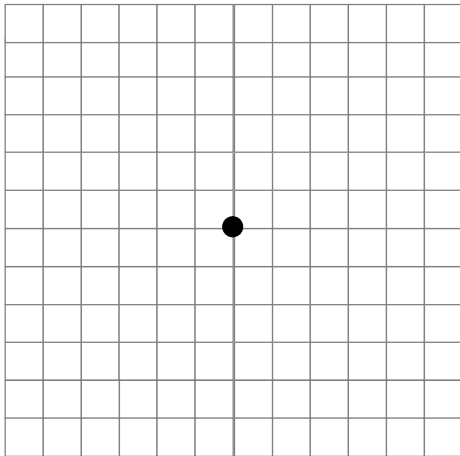
Acceleration of Block #1 = \_\_\_\_\_

Acceleration of Block #2 = \_\_\_\_\_

5. Block #1 (1 kg) and block #2 (2 kg) are sitting on a **frictionless** surface. A hand pushes block #2 and the coefficient of **STATIC** friction between the blocks is given by  $\mu_s = 1$ . Draw the **free body diagrams** for both blocks using the two subscript notation, as well as the **net force** on each. Both blocks have the **SAME** acceleration of  $5 \text{ m/s}^2$ . (Assume  $g = 10 \text{ m/s}^2$ .)

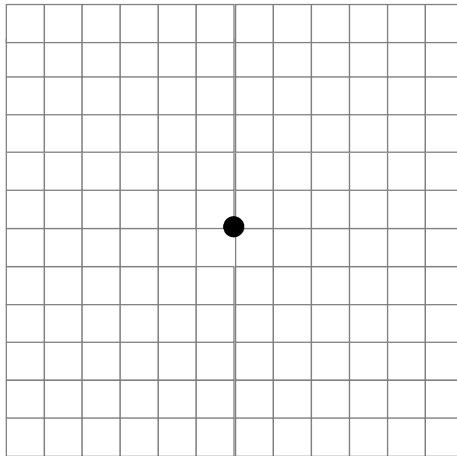


Block #1 FBD



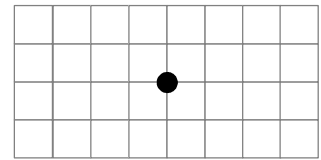
1 div = 5 N

Block #2 FBD

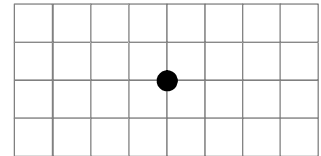


1 div = 5 N

$F_{1net}$

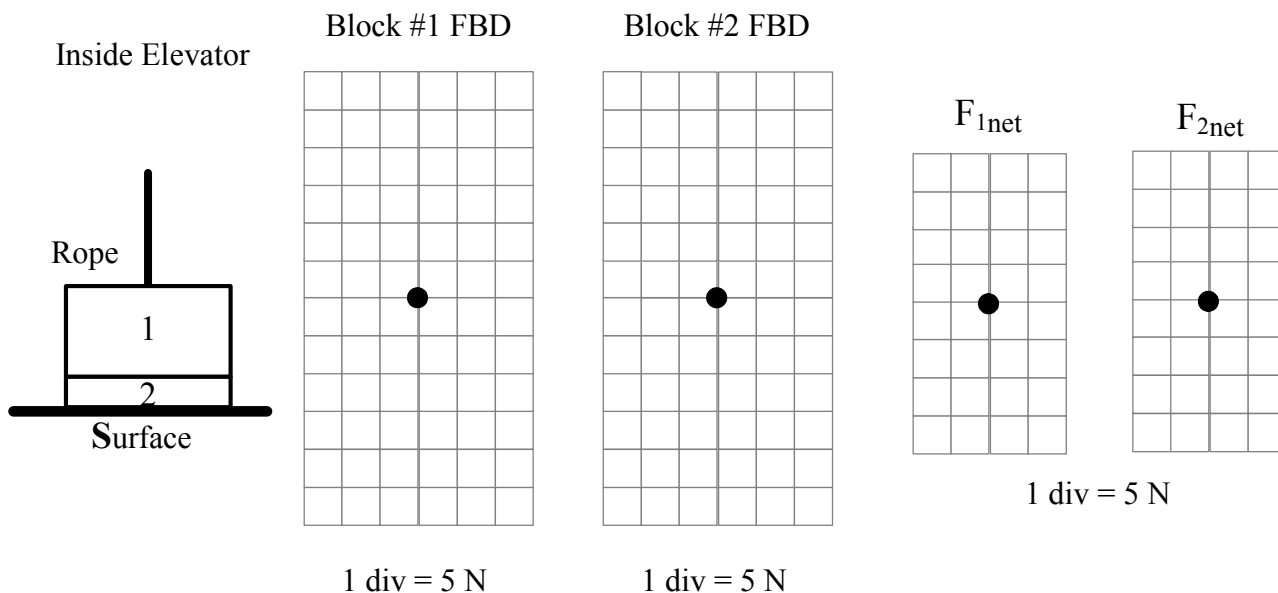


$F_{2net}$

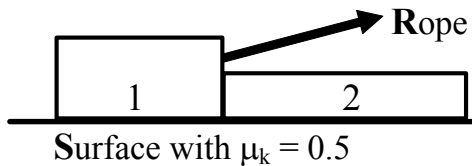


1 div = 5 N

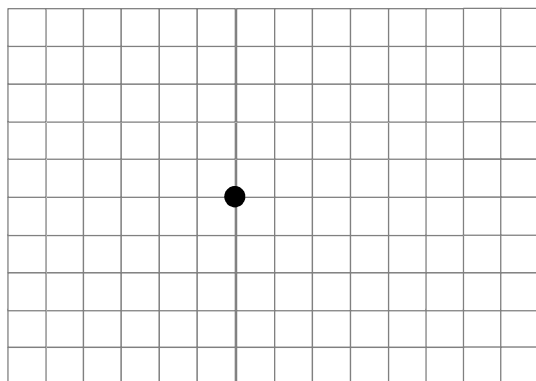
6. (CLASS) Block #1 (3 kg) and block #2 (1 kg) are inside an elevator in the configuration shown below. A rope is pulling up with a tension of 30 N on block #1. The elevator moves **downward** with **decreasing** speed and both blocks have an acceleration of  $5 \text{ m/s}^2$ . Draw the **free body diagrams** for both blocks using the two subscript notation, and draw the **net force** on each block. (Assume  $g = 10 \text{ m/s}^2$ .)



7. (CLASS) Block #1 (2 kg) and block #2 (2 kg) are moving on a surface with coefficient of kinetic friction  $\mu_k = 0.5$ . A rope pulls block #1 with a **tension** given by  $35 \text{ N } \hat{i} + 10 \text{ N } \hat{j}$ . Draw the **free body diagrams** for both blocks using the two subscript notation, as well as the **net force** on each. (Assume  $g = 10 \text{ m/s}^2$ .)

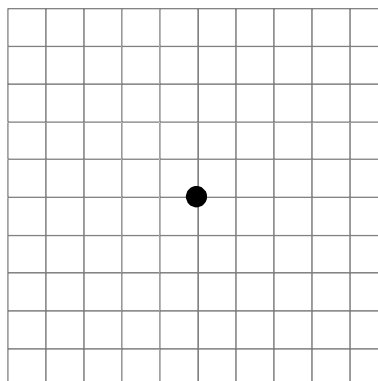


Block #1 FBD



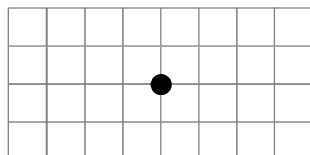
1 div = 5 N

Block #2 FBD



1 div = 5 N

$F_{1net}$



1 div = 5 N

$F_{2net}$

