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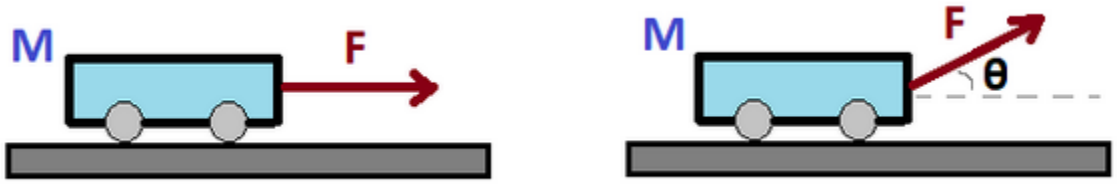
11.03 - Free Response (Qualitative/Quantitative Translation Worksheet)

A cart of mass M is placed on a horizontal, frictionless surface and pulled to the right with force F, as shown in the left image. The horizontal acceleration of the cart is recorded as A_1.

In trial 2, the same cart is pulled with an identical force magnitude, but directed at angle Θ above horizontal, as shown in the right image. The new horizontal acceleration is recorded as A_2.



Three students argue about the recorded accelerations. Their individual arguments are shown:

- Student A: Acceleration A_2 is greater than A_1 because the force is now directed in both the horizontal and vertical directions, instead of only the horizontal.
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- Student B: The accelerations are the same because the same overall mass and force are used. F=MA. If F and M are the same, so is A.

- Student C: A_1 is greater than A_2 because the amount of force in the horizontal direction has decreased, and we always consider only horizontal forces for acceleration.

1. List one correct part of Student A's argument

2. List one incorrect part of Student A's argument

3. List one correct part of Student B's argument

4. List one incorrect part of Student B's argument

5. List one correct part of Student C's argument

6. List one incorrect part of Student C's argument

7. Students pulled horizontally on a cart of unknown mass with several different force magnitudes, recording the horizontal acceleration each time. Their results are shown in the table below. Create a graph that will help you solve for the mass of the cart that was used. Show all steps.

Force (N)	Acceleration (m/s^2)
1	4
2	8
3	12
4	16

8. A new cart with different mass was issued to the students. They again varied the pulling force, but instead of pulling horizontally, they kept the pulling angle at a constant 30-degrees above horizontal. Their force vs. horizontal acceleration results are shown in the table below. Create a graph that will help you solve for the mass of the cart that was used. Show all steps.

Force (N)	Acceleration (m/s^2)
1	1.17
2	2.32
3	3.43
4	4.62