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Get the Materials Down the Hill! Worksheet

A. Brainstorm

Problem scenario: *You are trying to move a large amount of material down a hill. You have limited tools and resources for your use. Your task is to move the largest amount of material in 5 minutes and determine its acceleration down the hill. Brainstorm how you can use the given materials provided by your teacher for the task.*

Notes of brainstorming ideas:

B. Plan for a solution

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C. Sketch the planned prototype on the hill

D. Sketch a free body diagram
2-dimensional FBD for mass going downhill

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1-dimensional FBD for mass going downhill
2-dimensional FBD for counterweight going uphill
1-dimensional FBD for counterweight going uphill

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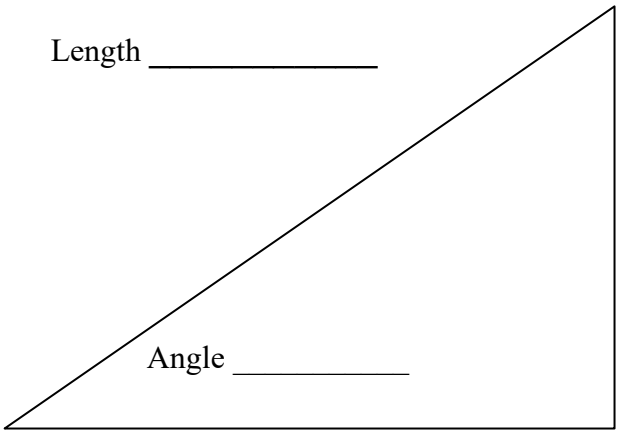
E. Calculations

1. Determine the angle of the hill.



2. Based on your arrangement, determine the maximum amount of time it takes to move the maximum amount of mass.

Run	Mass	Time
1		
2		
3		
Average mass (kg)		

3. Determine the acceleration of the load transported by your prototype. Show all calculations that support your analysis based on Newton's second law of motion.

4. Based on your prototype, determine the equivalent of the mass (in kilograms) as a load (in Newtons).

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F. Report and feedback

1. Report to the group your prototype solution and data regarding the maximum mass able to transport.

2. Annotate feedback from your peers on your solution.

G. Redesign your solution

1. Rework your solution based on the feedback provided by your peers.

2. Sketch your redesign.

3. Based on your redesign, determine which was the maximum amount of mass in the given period.

Run	Mass	Time
1		
2		
3		
Average mass (kg)		

H. Reflect on your solution

Reflect on how other countries work to solve a common problem regarding transporting materials necessary for construction. How do they use their resources to solve that specific problem? What are your takeaways regarding solving their specific problem?