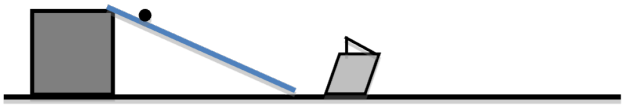
Push the Plow

A group of physics students are doing a lab on the topic of energy. They create an incline using a stack of Dominoes and a 30-cm ruler. A glass marble is released from rest along the ruler at various locations. The marble rolls down a groove in the middle of the ruler, strikes a folded note card (the *plow*) and pushes it across the table. See **Figure 1**.

Figure 1



In **Part 1** of the lab, students measure the release location along the ruler and the distance that the plow is pushed before stopping. The 0.0-cm location is the lowest point and the 30.0 cm is the highest point along the ruler. Their data is shown in **Table 1**.

Table 1

Trial	Release Location (cm)	Distance the Plow is Pushed (cm)
1	5.0	12.4
2	10.0	23.9
3	15.0	36.4
4	20.0	48.2
5	25.0	59.9
6	30.0	72.0

In **Part 2** of the lab, students construct a hill using two stacks of Dominoes and the same 30-cm ruler. Their goal is to determine the release location along the ruler from which the marble will push the *plow* the same approximate distance as it did in Part 1 of the lab. After much testing, they collect the data shown in **Table 2**.

Table 2

Trial	Release Location (cm)	Distance the Plow is Pushed (cm)
7	2.4	12.4
8	5.3	24.0
9	7.7	36.2
10	10.1	47.9
11	12.5	60.1
12	15.2	72.4

In **Part 3** of the lab, students construct a hill using a single stack of Dominos and the same 30-cm ruler. But in the Part 3 trials, students release a metal marble having nearly twice the mass as the glass marble used in **Part 1**. The students release the metal marble from the same release locations used in Part 1 and measure the corresponding distances that the plow is pushed. Their data is shown in **Table 3**.

Table 3

Trial	Release Location (cm)	Distance the Plow is Pushed (cm)
13	5.0	25.0
14	10.0	48.5
15	15.0	72.6
16	20.0	95.8
17	25.0	--*
18	30.0	--*

*Distance was too far and not measureable.