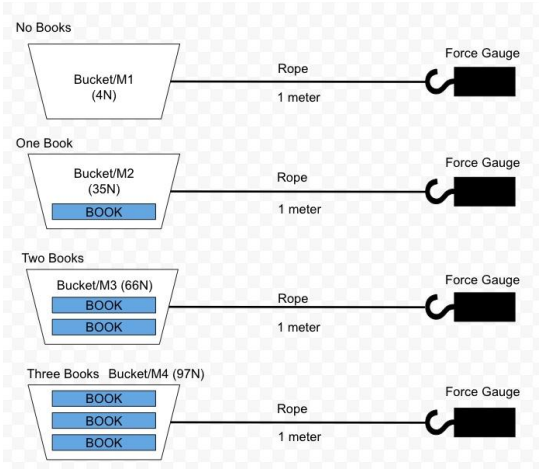
Investigation Question: How does adding weight to an object affect the coefficient of friction when it's being dragged?

Hypothesis: If the weight of the object increases, then the coefficient of fricition will also increase. The increase in the weight of the object will have a positive and linear correlation to the coefficient of friction.

Strategy:
Figure 1



- To start off, the variables we had to account for were the different weights that we were adding to the object, how far we were going to pull the object, and what the pulling force of the object would be.
- Since we completed our tests on the carpet, we needed something that would slide across the carpet smoothly, so in this case, we chose to use a plastic box.
- For our weights, we used three different textbooks that were the same size and added one each time.
- We measured the weight of the box alone, which is what we used for our initial weight with no added-on objects. After this, each time we added a book, the weight had a constant increase.
- We decided to keep the distance the same for all of the tests.
- We did three trials for each weight: the plastic box alone, the plastic box and one book, the plastic box and two books, and the plastic box and three books. We then took the average of the three trials as our final pulling force for each of the weights.
- In order to measure the pulling force, we used a force gauge that we hooked up to a computer.
- Finally, in order to measure our data, we dragged the plastic box across the floor with a string that was attached to a pencil that sat in the crook of the box. We placed the books inside the box when increasing weight.

Measured Data:
The last row is the average of the three trials so that we could get a singular force for each weight. The mass of the box without any additional weight was 4 newtons, and each book had a mass of 31 newtons which is why as each book was added on, it increased at a constant rate. We kept the distance, 1 meter, the same for all trials.

no books	weight (N)	pulling distance	pulling force (N)
trial 1	4	1 meter	0.56
trial 2	4	1 meter	0.747
trial 3	4	1 meter	0.93
Average	4	1 meter	0.7456666667
1 book	weight (N)	pulling distance	pulling force (N)
trial 1	35	1 meter	9.495
trial 2	35	1 meter	9.099
trial 3	35	1 meter	9.42
Average	35	1 meter	9.338
2 books	weight (N)	pulling distance	pulling force (N)
trial 1	66	1 meter	17.525
trial 2	66	1 meter	17.062
trial 3	66	1 meter	17.149
Average	66	1 meter	17.24533333
3 books	weight (N)	pulling distance	pulling force (N)
trial 1	97	1 meter	25.33
trial 2	97	1 meter	24.062
trial 3	97	1 meter	25.681
Average	97	1 meter	25.02433333

Analysis:

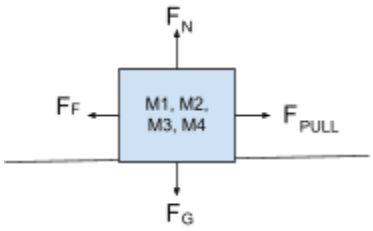


Figure 2
Through the free-body diagram in figure 2, we can see the various forces that are acting on the box. When looking at this diagram, there are two equations that we have to consider:

We can assume that the normal force is equal to the force of gravity, and therefore they will cancel out, allowing us to combine these equations. As a result, we are now able to find the kinetic coefficient of friction.

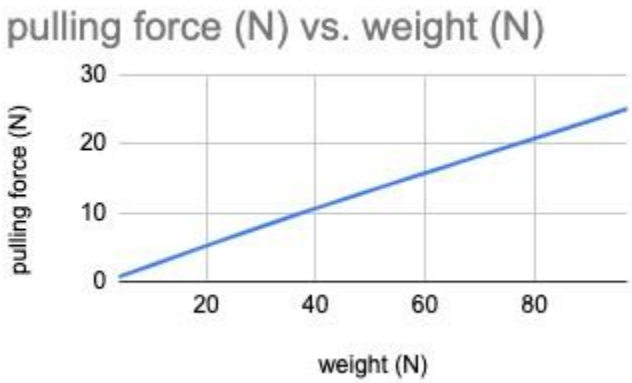


Figure 3
In Figure 3, the graph shows the comparison between