

# Mouse Trap Racer Scientific Investigations (Student)

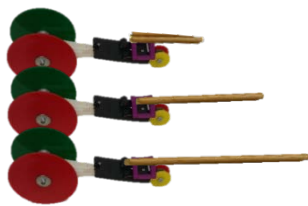
Online Resources at [www.steminabox.com.au/projects](http://www.steminabox.com.au/projects)

This Mouse Trap Racer Classroom STEM educational kit is appropriate for Upper Primary and Secondary School.

The Curriculum relevance is primarily Mechanics (study of Forces) and Working Scientifically. These student investigations are also relevant to the Technology and Mathematics Curricula. Full exemplars, worksheets and online support materials are provided for the following investigations:



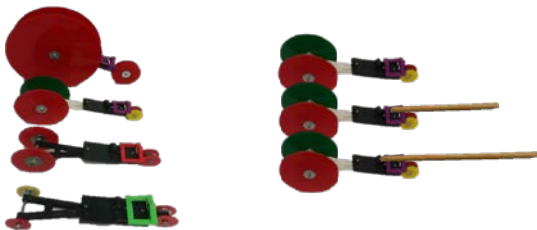
Effect of Spring Arm Length on Displacement



Effect of Wheel Diameter on Displacement



Optimal Vehicle Mechanical Advantage (Pooled Data)



Effect of Wheel Friction on Displacement



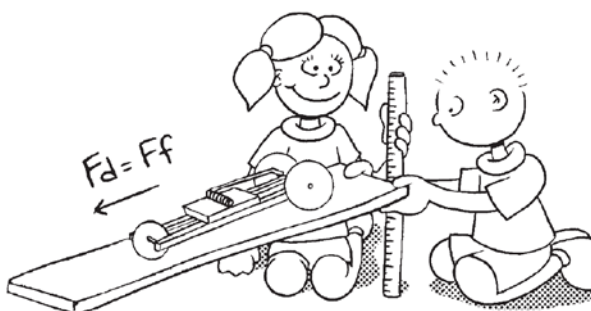
Influence of Vehicle Mass on Displacement



Influence of Chassis Design on Displacement



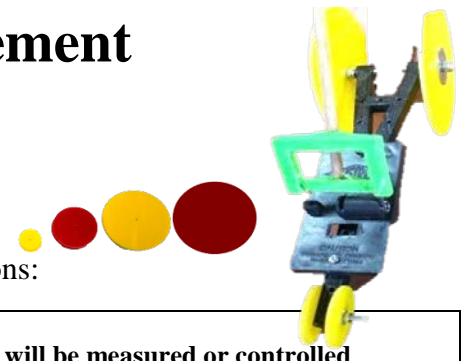
Determine Vehicle Kinetic Friction and Energy Efficiency



# Effect of Wheel Diameter on Displacement

**Aim:**

**Hypothesis:**



**Method:** A “fair test” method with the following variables and conditions:

The mousetrap racer will be started in similar conditions with the only difference being the size of the wheel diameter (40mm, 80mm, 120mm, and 160mm) with the resulting horizontal distance being recorded.

Type of Variable	Description	How it will be measured or controlled
Independent		
Dependant		
Controlled		
Controlled		
Controlled		
Controlled		
Controlled		

**Results:**

**Discussion:**

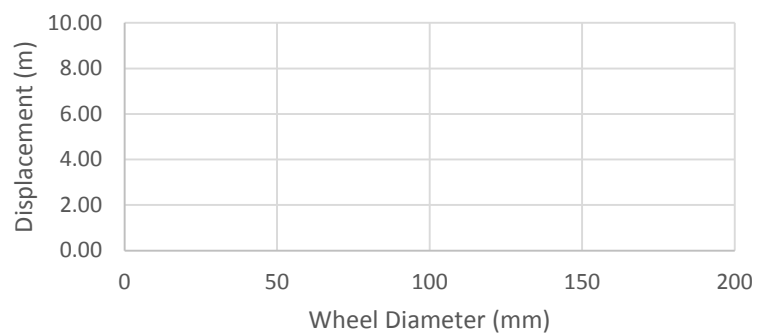
**Table 1. Effect of Wheel Diameter on Displacement**

Wheel Diameter (mm)	Displacement (m)				Further Observations
	Trial 1	Trial 2	Trial 3	Av	
40					
80					
120					
160					

*Controlled Variables: Spring Arm Length), Wheel Friction, mass*

**Conclusion:**

**Fig 1. Wheel Diameter Vs Displacement**



# Effect of Spring Arm Length on Displacement



**Aim:**

**Hypothesis:**

**Method:** A “fair test” method with the following variables and conditions:

Type of Variable	Description	How it will be measured or controlled
Independent		
Dependant		
Controlled		
Controlled		
Controlled		
Controlled		
Controlled		

The mousetrap racer will be tested in similar conditions with the only difference being the size of the spring arm (50mm, 100mm, 200mm, 480mm, 750mm) with the resulting horizontal distance being recorded.

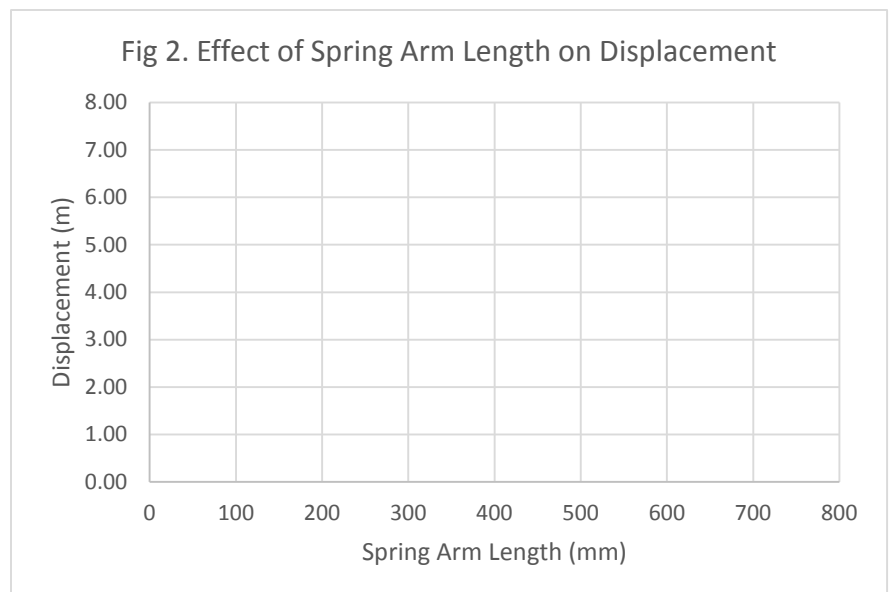
**Results:**

**Discussion:**

Spring Arm Length (mm)	Displacement (m)				Further Observations
	Trial 1	Trial 2	Trial 3	Av	
50					
100					
200					
480					
750					

*Controlled Variables: Wheel Diameter, Wheel Fiction, mass*

**Conclusion:**



# Effect of Wheel Friction on Displacement



**Aim:**

**Hypothesis:**

**Method:** A “fair test” method (mousetrap racers the same except for wheel surface)

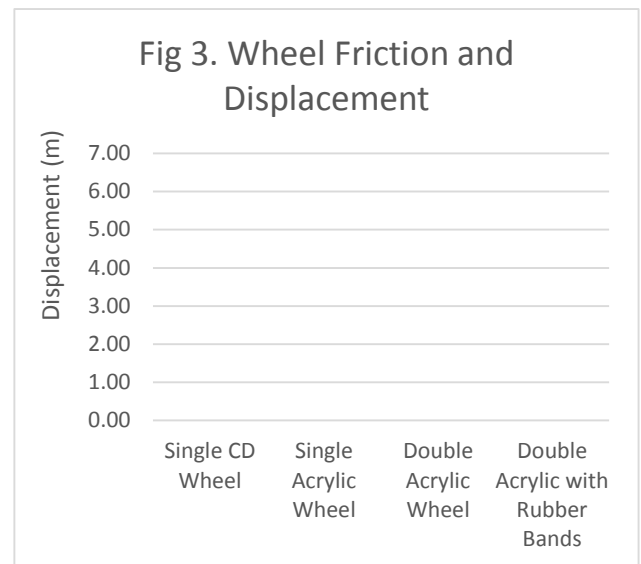
with the following variables and conditions:

Type of Variable	Description	How it will be measured or controlled
Independent		
Dependant		
Controlled		
Controlled		
Controlled		
Controlled		
Controlled		

Wheel Friction	Total Horizontal Distance (m)				Further Observations
	Trial 1	Trial 2	Trial 3	Average	
Single CD Wheel					
Single Acrylic Wheel					
Double Acrylic Wheel					
Double Acrylic with Rubber Bands					
<i>Controlled Variables: Wheel Diameter, Spring Arm Length</i>					

**Results:**

**Discussion:**



**Conclusion:**

# Effect of Vehicle Mass on Displacement

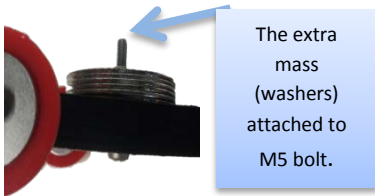


**Aim:**

**Hypothesis:**

**Method:** A “fair test” method with the following variables and conditions:

Type of Variable	Description	How it will be measured or controlled
Independent		
Dependant		
Controlled		
Controlled		
Controlled		
Controlled		
Controlled		



The extra mass (washers) attached to M5 bolt.

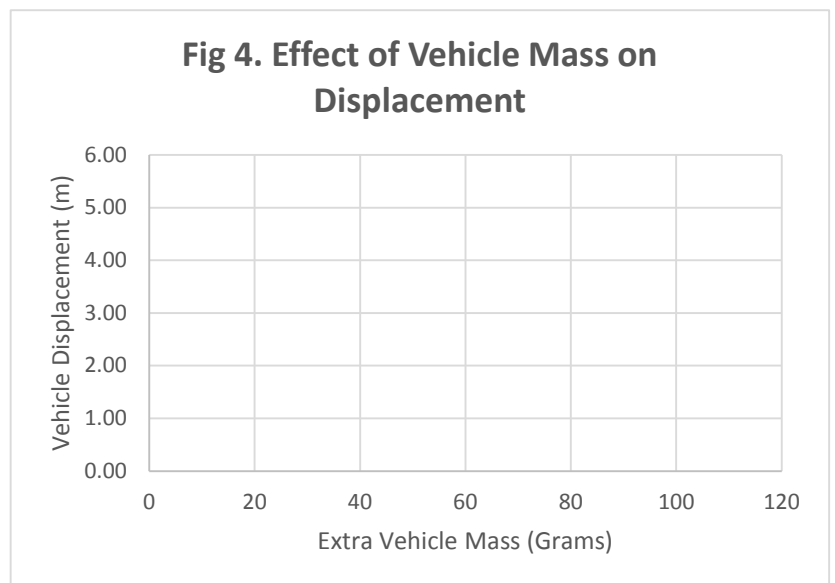
Extra Vehicle Mass (g)	Total Horizontal Distance (m)				Further Observations
	Trial 1	Trial 2	Trial 3	Average	
0					
24					
49					
72					
99					

*Controlled Variables: Wheel Diameter (120mm), Spring Arm Length (200mm)*

**Results:**

**Discussion:**

**Conclusion:**



# Influence of Chassis Design on Displacement



**Aim:**

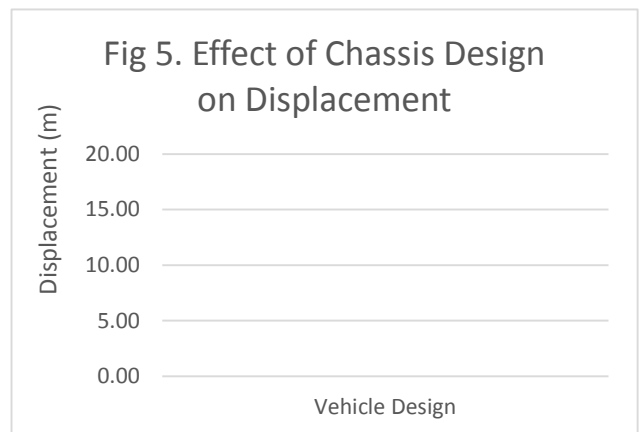
**Hypothesis:**

**Method:** Record displacement data for the best double axle mouse trap racer (accessed from previous experiments) and the single axle racer with vinyl record album wheels. Variables that should be controlled but are not include vehicle mass and overall mechanical advantage. A complete “fair test” method cannot be done with the resources at hand however the following variables and conditions are noted for the test conditions:

Type of Variable	Description	How it will be measured or controlled
Independent		
Dependant		
Controlled		
Controlled		
Controlled		
Controlled		

**Results:**

Vehicle Design	Total Horizontal Distance (m)				Further Observations
	Trial 1	Trial 2	Trial 3	Av	
Double Axle (CD wheels)					
Single Axle (Record Album Wheels)					



Design Feature	Engineering Issue	Significance
Single/Double Axles		
Vehicle mass		
Vehicle mass		

**Conclusion:**