**Trebuchet Launch Activity –
How Far Does It Go? Worksheet**

**![C:\Users\yowell\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.IE5\BPT2SHK7\MC900090122[1].wmf]()Background**

In medieval times, the trebuchet was used as both a weapon and a supply engine because it could launch objects to those in need. The powerful trebuchet has a lever and a pouch attached to hold the objects that will be launched. The object that flies through the air is called a projectile, which travels in a parabolic motion. The formula for the velocity of a flying object is:

**Velocity =** (the rate of gravity)(the time it takes for a projectile to drop)

The rate of gravity = 32.2 feet/ second

**Hypotheses**

What object will travel the farthest? Why?

Paper ball because it is the lightest object and lighter objects travel farther than heavier object.

What if the two objects were the same in regards to the variable?

If there were two paper object of the same weight, then the object that was more compact would travel the farthest because of aerodynamics.

Which object would go farther base on shape? Why?

The paper ball will travel the farthest because it is the lightest object.

Predict how far you think each object will travel; label your units used (inches, feet, etc.)

|  |  |  |  |
| --- | --- | --- | --- |
| **Object** | **Robot 1** | **Robot 2(changed arm length)** | **Robot 3(changed arm angle)** |
| **Eraser** |  |  |  |
| **Ping pong ball** |  |  |  |
| **Chapstick** |  |  |  |
| **Gum Drop** |  |  |  |
| **Paper Ball** |  |  |  |
| **Tennis Ball** |  |  |  |

**Data Collection**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Object** | **Trial 1** | **Trial 2** | **Trial 3** | **Average** |
| **Eraser** | **23 cm** | **25 cm** | **28 cm** | **25.33333 cm** |
| **Ping pong ball** | **46 cm** | **52 cm** | **54 cm** | **50.66667 cm** |
| **Chapstick** | **35 cm** | **33 cm** | **39 cm** | **35.66667 cm** |
| **Gum Drop** | **40 cm** | **42 cm** | **45 cm** | **42.33333 cm** |
| **Paper Ball** | **100 cm** | **110 cm** | **115 cm** | **108.3333 cm** |
| **Tennis Ball** | **48 cm** | **50 cm** | **47 cm** | **48.33333 cm** |
|  |  |  |  |  |
|  |  |  |  |  |

**Results**

Analyze you data by making a bar graph of your results. Label your graph with the objects along the X axis and your distance along the Y axis.

**Data Collection 2**

Repeat the same experiments with changing the length of the arm.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Object** | **Trial 1** | **Trial 2** | **Trial 3** | **Average** |
| **Eraser** | **35 cm** | **40 cm** | **38 cm** | **37.66667 cm** |
| **Ping pong ball** | **59 cm** | **65 cm** | **67 cm** | **63.66667 cm** |
| **Chapstick** | **45 cm** | **43 cm** | **49 cm** | **45.66667 cm** |
| **Gum Drop** | **75 cm** | **70 cm** | **77 cm** | **74 cm** |
| **Paper Ball** | **150 cm** | **130 cm** | **164 cm** | **148 cm** |
| **Tennis Ball** | **71 cm** | **75 cm** | **79 cm** | **75 cm** |
|  |  |  |  |  |
|  |  |  |  |  |

**Results 2**

Analyze you data by making a bar graph of your results. Label your graph with the objects along the X axis and your distance along the Y axis.

**Eraser Ping Pong Chapstick Gum Paper Tennis
 Ball Drop Ball Ball**

**Data Collection 3**

Repeat the same experiments changing the angle of the arm.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Object** | **Trial 1** | **Trial 2** | **Trial 3** | **Average** |
| **Eraser** | **13 cm** | **12 cm** | **16 cm** | **13.66667 cm** |
| **Ping pong ball** | **25 cm** | **30 cm** | **32 cm** | **29 cm** |
| **Chapstick** | **20 cm** | **23 cm** | **25 cm** | **22.66667 cm** |
| **Gum Drop** | **41 cm** | **45 cm** | **47 cm** | **44.33333 cm** |
| **Paper Ball** | **85 cm** | **80 cm** | **82 cm** | **82.33333 cm** |
| **Tennis Ball** | **48 cm** | **50 cm** | **53 cm** | **50.33333cm** |
|  |  |  |  |  |
|  |  |  |  |  |

**Results 3**

Analyze you data by making a bar graph of your results. Label your graph with the objects along the X axis and your distance along the Y axis.

**Eraser Ping Pong Chapstick Gum Paper Tennis
 Ball Drop Ball Ball**

**Follow Up Questions / Conclusion**

Please explain your results?

What was your hypothesis?

Was your hypothesis correct? Please explain.

How could your experiment be better?

The results show how the weight of the object matters when assessing which object will go the farthest. More specifically, when changing one of the variables, like the length and angles, the resulting distance that the object traveled changes. We were correct in our hypothesis and the experiment may be better if we explored objects with the same weight, but different aerodynamics.