

Squashketball 2019: Results

Bharti School of Engineering
Laurentian University
Sudbury, Ontario, Canada

Winter 2019

Prototype results

Group	Performance					Cost		Total Score
	2 ft ($\times 1$)	4 ft ($\times 2$)	7 ft ($\times 3.5$)	Total	Score	\$	Score	
1-01 [†]	5 3 3	0 5 1	1 0 2	33.5	75.4%	\$14.22	74.9%	75.2%
1-03	0 0 0	0 0 0	0 0 0	0	50%	\$11.94	91.6%	62.5%
1-04 [†]	1 1 5	3 3 3	5 1 1	49.5	87.5%	\$66.63	35%	71.8%
1-05	5 0 1	0 5 5	5 0 1	47	85.6%	\$9.97	93.1%	87.9%
1-06	0 0 0	0 0 0	0 0 0	0	50%	\$14.85	89.4%	61.8%
1-07 [†]	5 5 5	5 5 5	1 2 3	66	100%	\$22.93	68.2%	90.5%
1-08 [†]	1 1 3	0 5 5	1 1 1	35.5	76.9%	\$34.20	59.7%	71.7%
1-09 [†]	0 1 5	0 0 1	0 1 0	11.5	58.7%	\$5.72	81.3%	65.5%
1-10 [†]	0 0 0	0 0 0	0 0 0	0	50%	\$4.23	82.5%	59.7%
1-11*	2 3 2	1 3 2	0 0 0	19	64.4%	\$20.45	75.1%	67.6%
2-01 [†]	3 0 3	1 1 5	1 1 1	30.5	73.1%	\$8.19	79.5%	75%
2-02	3 2 5	1 0 0	0 0 1	15.5	61.7%	\$11.72	91.8%	70.8%
2-03	0 0 0	0 0 0	0 0 0	0	50%	\$14.82	89.4%	61.8%
2-04 [†]	1 3 3	1 1 5	0 5 1	42	81.8%	\$7.59	79.9%	81.2%
2-05 [†]	0 0 3	0 0 0	0 3 1	17	62.9%	\$14.70	74.5%	66.4%
2-06	0 0 0	0 0 0	0 0 0	0	50%	\$0.90	100%	65%
2-07	0 0 0	0 0 0	1 1 0	7	55.3%	\$14.46	89.7%	65.6%
2-08*	0 3 1	0 0 3	3 2 1	31	73.5%	\$27.34	69.9%	72.4%

*Penalty for late cost analysis sheet (-10% cost).

[†]Penalty for having to resubmit the cost analysis (-15% cost).

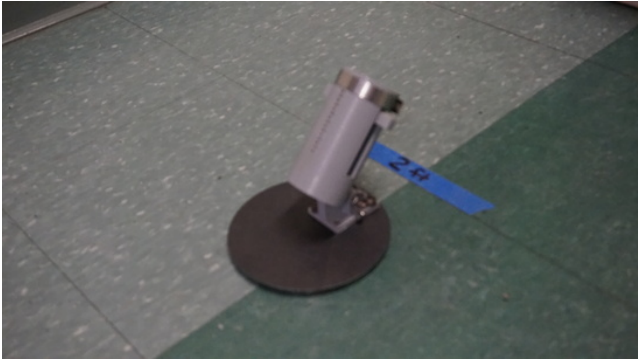
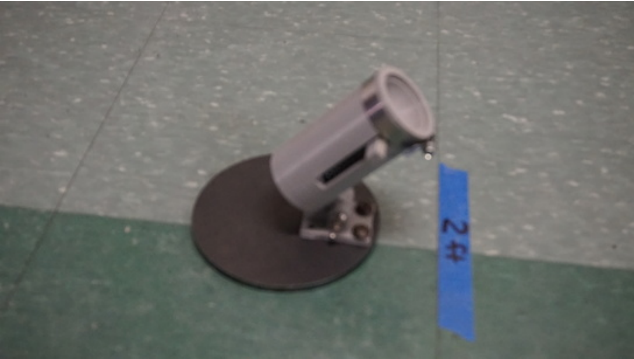
Final testing results

Group	Performance					Cost		Total Score
	2 ft (×1)	4 ft (×2)	7 ft (×3.5)	Total	Score	\$	Score	
1-01	1 2 0	1 1 5	0 0 1	20.5	50.6%	\$12.13	90.5%	62.5%
1-03	1 1 5	0 1 0	0 0 0	9	37.1%	\$24.40	23.2%	32.9%
1-04	0 0 0	0 0 0	0 0 0	0	25.4%	\$20.70	45.4%	31.4%
1-05	5 1 5	3 3 5	0 1 5	54	80.8%	\$9.97	95.3%	85.2%
1-06	2 3 0	1 0 0	0 0 0	7	34.6%	\$11.72	91.6%	51.7%
1-07	5 5 5	5 5 5	5 5 5	97.5	100%	\$8.12	97.6%	99.3%
1-08	3 2 3	1 1 5	0 1 5	43	72.4%	\$24.22	24.1%	57.9%
1-09	5 1 0	1 5 5	1 3 1	45.5	74.4%	\$5.72	99.1%	81.8%
1-10	0 0 0	0 0 0	0 0 0	0	25.4%	\$19.23	55.1%	34.3%
1-11	1 1 5	0 1 2	0 1 0	16.5	46.1%	\$8.70	97%	61.3%
2-01*	0 3 3	2 0 3	1 0 1	23	53.3%	\$8.19	87.5%	63.6%
2-02						\$11.72	91.6%	27.5%
2-03	0 1 1	1 1 0	5 5 5	58.5	83.9%	\$16.53	71.8%	80.3%
2-04*	5 1 5	1 5 1	5 5 3	70.5	90.8%	\$7.47	88.2%	90%
2-05	5 5 5	2 3 3	5 1 5	69.5	90.3%	\$16.82	70.2%	84.2%
2-06	1 5 5	1 5 5	5 5 3	78.5	94.4%	\$9.06	96.6%	95.1%
2-07	3 0 1	0 0 0	0 0 0	4	30.7%	\$15.62	76.7%	44.5%
2-08	5 5 5	5 3 5	1 0 1	48	76.4%	\$11.89	91.2%	80.8%

*Penalty for late cost analysis sheet (-10% cost).

Group 1-01

Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=23s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Paulin 1/4X4X1 ft. Steel Plate	\$12.70	We can make make 16 of our plates from one sheet	50%	\$6.35
ESUN3D ESUN PLA+ Filament -Silver	\$29.99	weight of the plastic parts(3d printed) 160g out of 1KG	16%	\$4.80
Hose Clamp - 1 5/16"-2 1/4" - Stainless Steel	\$1.29	We used 1 of them	100%	\$1.29
The Hillman Group 5/16-in-18 Zinc-Plated Hex-Head Standard (SAE) Bolt, 3/4-in	\$0.29	we used 3 of them	300%	\$0.87
Paulin6-32 Steel Wingnut	\$0.31	We used 1 of them	100%	\$0.31
The Hillman Group 1/4-in-20 Zinc-Plated Hex-Head Standard (SAE) Bolts, 1 1/4-in	\$0.29	We used 1 of them	100%	\$0.29
Paulin#6 Reg Lockwasher	\$0.07	we used 4 of them	400%	\$0.28
Chenille Kraft Glue Sticks, Bonus Bag, 200/Pack (CK-3358)	\$53.29	we used 1/8 of a glue stick	0.06%	\$0.03
			TOTAL	\$14.22

Final design



Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=23s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
ESUN3D ESUN PLA+ Filament -Silver	\$29.99	weight of the plastic parts(3d printed) 160g out of 1KG	16%	\$4.80
2 Pack 10mm x 070mm Compression Springs	\$1.99	used both springs	100%	\$1.99
Great Value 4L Natural Spring Water	\$1.47	We used 1 of them	100%	\$1.47
Hose Clamp - 1 5/16"-2 1/4" - Stainless Steel	\$1.29	We used 1 of them	100%	\$1.29
Subfloor Panel - 5,2mm x 4' x 4'	\$15.47	we can make 12 base plates out of the hole sheet	8.33%	\$1.29
1 lb 3/32 in. Aluminum TIG Filler Rods	\$15.99	The weight in grams is 454.54 for the bundle and our pin is 10g	2.2%	\$0.35
Paulin6-32 Steel Wingnut	\$0.31	We used 1 of them	100%	\$0.31
The Hillman Group 1/4-in-20 Zinc-Plated Hex-Head Standard (SAE) Bolts, 1 1/4-in	\$0.29	We used 1 of them	100%	\$0.29
Paulin#6 Reg Lockwasher	\$0.07	we used 2 of them	200%	\$0.14
Hillman Stainless Steel Pan Head Square Drive Sheet Metal Screws, Assorted	\$3.49	we used 4 out of 100 cannon attached to the base	4%	\$0.14
Chenille Kraft Glue Sticks, Bonus Bag, 200/Pack (CK-3358)	\$53.29	we used 1/8 of a glue stick	0.06%	\$0.03
EverbiltMEDIUM x 420 Feet COTTON TWINE	\$4.97	we used 2 feet out of the 420 feet	0.48%	\$0.02
Commercial Electric1/2-inch x 20 ft. Vinyl Electrical Tape, Multi Coloured (6-Pack)	\$1.99	we used 1 inch out of 120 ft	0.3%	\$0.01
			TOTAL	\$12.13

Group 1-03

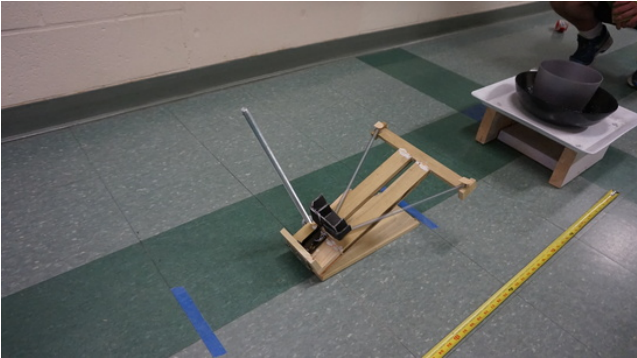
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=34s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
1/2-in Kiln-Dried Poplar Board	\$16.49	1 full board is enough to make two devices	50%	\$8.24
National Hardware N830-247-512RC Door Hinges in Satin Nickel	\$2.79	The entire thing was used	100%	\$2.79
Staples Economy Rubber Bands, Size #64 (17785-CA)	\$5.79	13 devices can be made with one pack	7.69%	\$0.45
Mastercraft Heavy-Duty Glue Sticks, 4-in	\$8.99	The entire package can be used to make 25 devices	4%	\$0.36
Staples #1 Size Vinyl-Coated Paper Clips, Tiger-Striped, 100/Pack	\$3.69	1 pack can make 50 devices	2%	\$0.07
Staples Push Pins, Assorted, 100/Pack	\$2.69	1 pack can make a 100 devices	1%	\$0.03
Horizon Group Usa Jumbo Wood Craft Sticks	\$4.97	The entire package can be used to make 37 devices	0.03%	\$0.00
			TOTAL	\$11.94

Final design

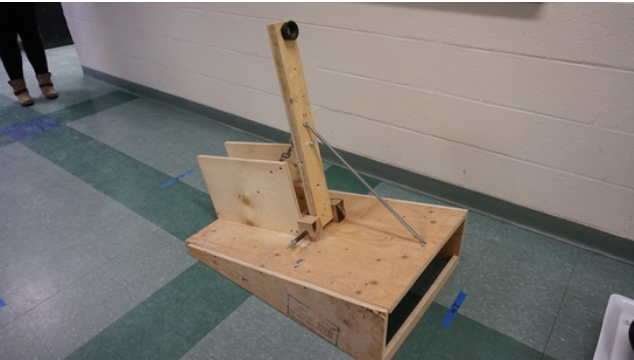


Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=30s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Onward 301 Gate Latch	\$6.39	latch and six screws were used but not the bar	100%	\$6.39
1/2-in Kiln-Dried Poplar Board	\$16.49	1/4 of the board was useds	25%	\$4.12
National Hardware N830-247-512RC Door Hinges in Satin Nickel	\$2.79	The entire thing was used including the 6 inclued screws	100%	\$2.79
Hillman 543005 Utility Extension Spring #209	\$4.99	1 out of 2 springs were used	50%	\$2.50
The Hillman Group 1/2-in-13 Hot-Dipped Galvanized Round-Head Standard (SAE) Carriage Bolt	\$1.99	1 was used	100%	\$1.99
Hillman 1/2-in-13 Galvanized Standard (SAE) Hex Nut	\$0.99	2 were used	200%	\$1.98
Kreg 1-in Pan-Head Square Standard (SAE) Pocket Hole Screw (100-Count)	\$7.49	18 out of 100 were used	18%	\$1.35
The Hillman Group Stainless Steel Standard (SAE) Flat Washer (5-Count), #10	\$1.99	3 out of 5 were used	60%	\$1.19
1 x 4 Knotty Pine Board, 4-ft	\$2.99	2/3 of the board was useds	25%	\$0.75
Tree Island 2 1/2-in 12-Gauge Hot-Dipped Galvanized Common Nail (80-Count)	\$9.49	4 ou of 80 were used	5%	\$0.47
The Hillman Group 1/2-in-13 Zinc-Plated Steel Standard (SAE) Fully Coarse Threaded Rod	\$3.49	1 rod was used	12.5%	\$0.44
Mastercraft Heavy-Duty Glue Sticks, 4-in	\$8.99	1 out of 25 glue stics were used	4%	\$0.36
Staples Foam Board, 20" x 30", Black, 3/Pack	\$15.89	1/20 of one board was used	1.6%	\$0.25
Staples #1 Size Vinyl-Coated Paper Clips, Tiger-Striped, 100/Pack	\$3.69	one paper clip out of a 100 was used	1%	\$0.04
Horizon Group Usa Jumbo Wood Craft Sticks	\$4.97	2/300 craft stics were used	0.67%	\$0.03
			TOTAL	\$24.40

Group 1-04

Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=41s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
3/4 inches 4 ftx8 ft Standard Spruce Plywood	\$42.98	used 5/8 of the sheet	62.5%	\$26.86
Scepter Gas Can Accessories Kit	\$5.99		100%	\$5.99
Ideal Security Inc. Adjustable Door Spring	\$5.49		100%	\$5.49
1/4 in. Grade 30 Slip Hook with Latch	\$4.99		100%	\$4.99
National Hardware 3/8-in-16 Zinc-Plated Standard (SAE) Eye Bolt	\$1.99	used 2 pieces	200%	\$3.98
5/8 in. Swivel Eye Snap Hook	\$3.79		100%	\$3.79
Stanley-National Hardware 1/4-in x 2 1/2-in Steel Standard (SAE) U-Bolt	\$1.79	used 2 pieces	200%	\$3.58
USP 1/2-in-14 Galvanized Round-Head Standard (SAE) Anchor Bolt	\$3.49		100%	\$3.49
The Hillman Group 3/8-in x 1/2-in Seamless Steel Spacer	\$2.29		100%	\$2.29
Chain Grade 30 Zinc With Quick Link, 1/4-in x 10-ft	\$17.99	used 1/10 of the chain	10%	\$1.79
Hillman Nylon Flat Washers, Assorted	\$0.79	used 2 washers	200%	\$1.58
Reliable Fasteners #8 x 1 1/2-in Brown Stainless Steel Bugle-Head Square Standard (SAE) Deck Screw (600-Count)	\$34.99	used 26/600 screws	4.33%	\$1.51
2-inch x 4-inch x 8 ft. SPF Dimensional Lumber	\$3.45	used 3/8 of the peice	37.5%	\$1.29
			TOTAL	\$66.63

Final design

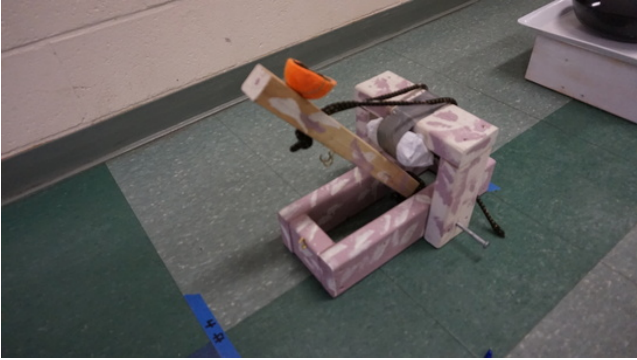
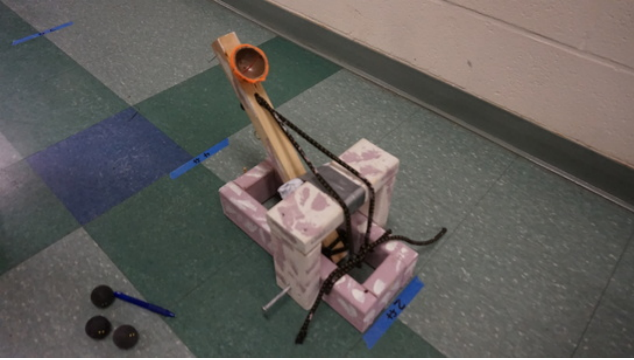


Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=39s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
RPS Products ABS CELLCORE 02IN X 12FT	\$17.98	3 feet used	25%	\$4.50
Secure Tite 36-in Coated Hook Bungee (2-Pack)	\$6.99	one bunjee used	50%	\$3.50
The Hillman Group 3/8-in-16 Zinc-Plated Steel Standard (SAE) Fully Coarse Threaded Rod, 24-in	\$3.49		100%	\$3.49
National Hardware 3/8-in-16 Zinc-Plated Standard (SAE) Eye Bolt - 221.267, 4-in	\$1.99		100%	\$1.99
Hillman 3/8-in-16 Galvanized Standard (SAE) Hex Nut	\$0.29	6 nuts used	600%	\$1.74
Twisted Polypropylene Rope	\$0.99	1.5 feet used	150%	\$1.50
Tree Island #6 Black Phosphate Bugle-Head Phillips Standard (SAE) Drywall Screws	\$24.99	6 used out of 100	6%	\$1.50
The Hillman Group Galvanized Steel Standard (SAE) Flat Washer, 1 3/8-in	\$0.99	1 washer used	100%	\$0.99
Select 2 x 4 x 8-ft Kiln-Dried Select SPF Stud	\$3.55	1 foot out of 8	12.5%	\$0.44
The Hillman Group Galvanized Steel Standard (SAE) Flat Washer, 3/4-in	\$0.19	2 washers used	200%	\$0.38
Duck Duck 1042017 1.88inch x 135feet Gray Professional Duct Tape	\$11.99	4 feet used	2.96%	\$0.35
Taiga Building Products 3/8 x 4-ft x 8-ft Standard Spruce Plywood	\$21.25	90 square inches out of 4608 square inches	1.56%	\$0.33
			TOTAL	\$20.70

Group 1-05

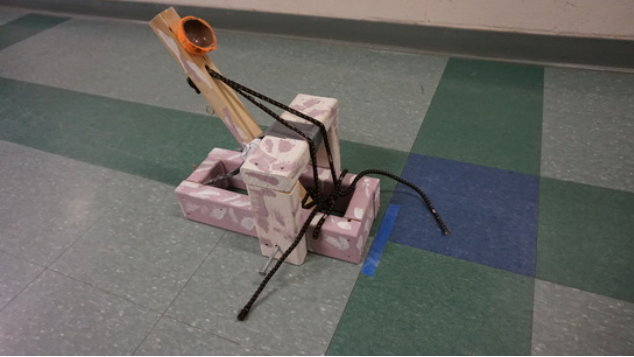
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=53s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
2-inch x 4-inch x 8 ft. SPF Dimensional Lumber	\$3.45	used 5.5ft	68.75%	\$2.37
8mm x 50' Bungee Cord on Plastic Spool	\$17.99	used 6 ft of it	12%	\$2.16
Hillman Galvanized Common Framing Nails, 12-in	\$1.49	used one	100%	\$1.49
Brass Plated Picture Hanger 10 Pieces	\$3.48	used 2	40%	\$1.39
Paulin 8x3 Construction Screws in Gold (1000-Pieces)	\$54.28	used 16	1.6%	\$0.87
THD 2x2x8 Framing Lumber	\$3.24	1.5ft	18.75%	\$0.61
14 Pack Brass Regular Screw Eyes	\$2.79	used two	14.29%	\$0.40
Matrix Balls, Yellow, 3-pk	\$1.99	Used half a ball to hold squash ball in launch	16.67%	\$0.33
H. Paulin 8x1-1/2 Cedar Deck Screws - 500pcs	\$30.98	used 2	0.4%	\$0.12
Hilroy Hilory Refill Paper Ruled, 200 Sheets	\$2.47	10 pages used	5%	\$0.12
TAPE-DUCT SCOTCH BASIC 48MMX50.2M SILVER	\$4.95	1 m used	1.99%	\$0.10
			TOTAL	\$9.97

Final design



Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=46s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
2-inch x 4-inch x 8 ft. SPF Dimensional Lumber	\$3.45	used 5.5ft	68.75%	\$2.37
8mm x 50' Bungee Cord on Plastic Spool	\$17.99	used 6 ft of it	12%	\$2.16
Hillman Galvanized Common Framing Nails, 12-in	\$1.49	used one	100%	\$1.49
Brass Plated Picture Hanger 10 Pieces	\$3.48	used 2	40%	\$1.39
Paulin 8x3 Construction Screws in Gold (1000-Pieces)	\$54.28	used 16	1.6%	\$0.87
THD 2x2x8 Framing Lumber	\$3.24	1.5ft	18.75%	\$0.61
14 Pack Brass Regular Screw Eyes	\$2.79	used two	14.29%	\$0.40
Matrix Balls, Yellow, 3-pk	\$1.99	Used half a ball to hold squash ball in launch	16.67%	\$0.33
H. Paulin 8x1-1/2 Cedar Deck Screws - 500pcs	\$30.98	used 2	0.4%	\$0.12
Hilroy Hilory Refill Paper Ruled, 200 Sheets	\$2.47	10 pages used	5%	\$0.12
TAPE-DUCT SCOTCH BASIC 48MMX50.2M SILVER	\$4.95	1 m used	1.99%	\$0.10
			TOTAL	\$9.97

Group 1-06

Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=1m02s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
RPS Products ABS CELLCORE 02IN X 12FT	\$17.98	We can make 3 cannons with one 12 foot pipe	33.33%	\$5.99
RPS Products 2-in Dia 45-Degree PVC Sch 40 Elbow	\$3.29		100%	\$3.29
Standard Bungee Cord Kit, 26-pk	\$24.99	We use 2 per device	7.69%	\$1.92
Waxman 24-Pack Oatmeal Round Felt Pads	\$9.37	We use 4 per device	16.67%	\$1.56
National Hardware 1/4-in-20 Stainless Steel Plain Eye Bolt with Hex Nut	\$0.99	We use 1 per device	100%	\$0.99
Paulin1/4-28 Fin Hex Nuts GR5 UNF	\$0.13	We use 4 per device (including the hex nut with the plain eye bolt)	300%	\$0.39
Tree Island #8 x 2-in Black Phosphate Square-Head Square Standard (SAE) Flooring Screw (1,800-Count)	\$64.99	We use 10 per device	0.56%	\$0.36
Tree Island #8 x 3-in Zinc-Plated Flat-Head Square Standard (SAE) Wood Screw (1,300-Count)	\$87.99	We use 5 per device	0.38%	\$0.34
			TOTAL	\$14.85

Final design



Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=52s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
RPS Products ABS CELLCORE 02IN X 12FT	\$17.98	We can make 4 cannons with one 12 foot pipe	25%	\$4.50
2" Central Vacuum System 45 Degree Short Elbow	\$2.19		100%	\$2.19
Standard Bungee Cord Kit, 26-pk	\$24.99	We use 2 per be device	7.69%	\$1.92
National Hardware 1/4-in-20 Stainless Steel Plain Eye Bolt with Hex Nut	\$0.99	We use 1 per device	100%	\$0.99
Everbilt1/2 inch Self-Adhesive Felt Pads (24 per Pack)	\$4.05	We use 4 per be device	16.67%	\$0.68
Paulin1/4-28 Fin Hex Nuts GR5 UNF	\$0.13	We use 4 per device (minus the one with the plain eye bolt	300%	\$0.39
Tree Island #8 x 2-in Black Phosphate Square-Head Square Standard (SAE) Flooring Screw (1,800-Count)	\$64.99	We use 10 per device	0.56%	\$0.36
Tree Island #8 x 3-in Zinc-Plated Flat-Head Square Standard (SAE) Wood Screw (1,300-Count)	\$87.99	We use 5 per device	0.38%	\$0.34
ipgIntertape Polymer Group HVAC Premium 14 MIL Duct Tape 1.88 inch x 60 Yards - 4 Pack	\$65.91	We use approximately 1 yards	0.42%	\$0.27
Commercial Electric4-inch Natural Cable Ties (1000-Pack)	\$21.95	We use 4 per device	0.4%	\$0.09
			TOTAL	\$11.72

Group 1-07

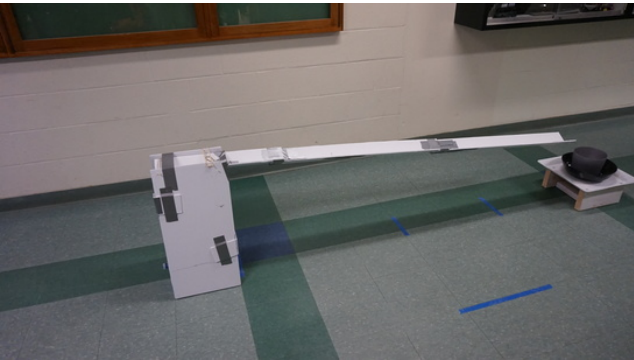
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=1m10s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Elmer's White Foam Display Board	\$10.27	Could make 1 per board	100%	\$10.27
Rubbermaid Easy Find Lids Containers	\$9.97	Could make 1 per container	100%	\$9.97
Great Value 24pk Spring Water	\$1.97	Used 9.5L of water	75.83%	\$1.49
All Purpose Strength Duck Tape, 48 mm. x 18.2 m.	\$4.97	Used 3.5m of 18.2m. Can make 5 devices	19.23%	\$0.96
Mainstays 12" 100 Piece Bamboo Skewers	\$2.50	Used 7 of 100 skewers. Can make 14 Devices	7%	\$0.17
Hemp Cord 48lb 400'-Natural	\$13.57	Used 2ft of 400ft. Can make 200 Devices	0.5%	\$0.07
			TOTAL	\$22.93

Final design

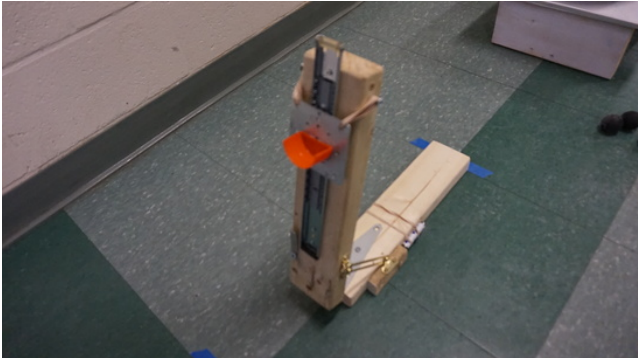
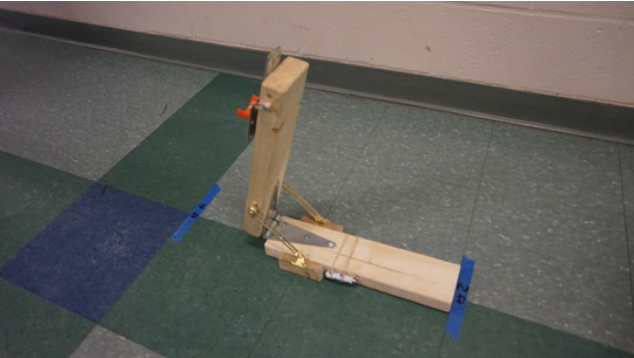


Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=1m>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Foam Core Board - 48 x 96", White, 3/16" thick	\$1675.00	Used, 3/8 of one board out of 100. Can make 266 devices	0.38%	\$6.28
All Purpose Strength Duck Tape, 48 mm. x 18.2 m.	\$4.97	Used 4m of 18.2m. Can make 5 devices	21.97%	\$1.09
Great Value 24pk Spring Water	\$1.97	6 bottles of 24. Can make 4 devices	25%	\$0.49
Mainstays 12" 100 Piece Bamboo Skewers	\$2.50	Used 7 of 100 skewers	7%	\$0.17
Hemp Cord 48lb 400'-Natural	\$14.48	Used 2ft of 400ft. Can make 200 Devices	0.5%	\$0.07
#64 Rubber Bands - 3 1/2 x 1/4", Tan	\$64.90	Use 1 of 3200. Can make 3200 devices	0%	\$0.01
			TOTAL	\$8.12

Group 1-08

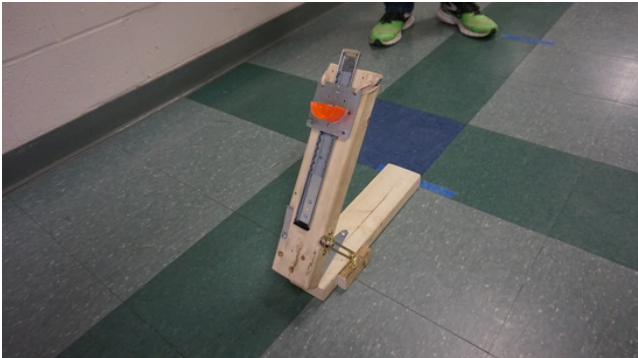
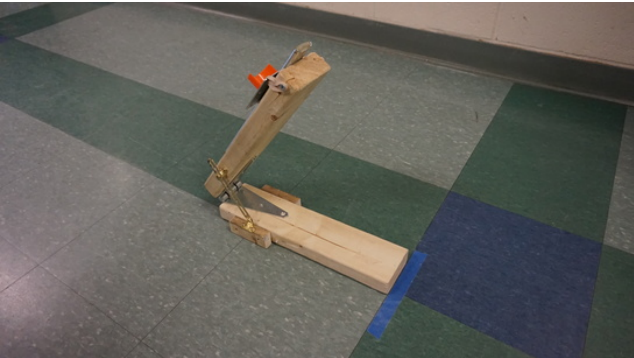
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=1m28s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Brass Universal Friction Lid Support	\$6.99		200%	\$13.98
11-3/4 in. Drawer Slide	\$4.99		100%	\$4.99
10" Zinc Heavy Duty Strap Hinge	\$4.79		100%	\$4.79
The Hillman Group #6 Zinc-Plated Flat-Head Slotted Standard (SAE) Wood Screws	\$2.99		100%	\$2.99
Laser Pet Toy	\$2.99		100%	\$2.99
Select 2 x 4 x 8-ft Kiln-Dried Select SPF Stud	\$3.55	only used half	50%	\$1.75
The Hillman Group #12 Zinc-Plated Flat-Head Square Standard (SAE) Wood Screws - 126092	\$2.99	8/15 used	53.33%	\$1.59
Canplas 10TC3 ABS Cap Fitting	\$1.99	only used half	50%	\$1.00
taples Economy Rubber Bands, Size #33	\$5.79	4/200 used	2%	\$0.12
			TOTAL	\$34.20

Final design

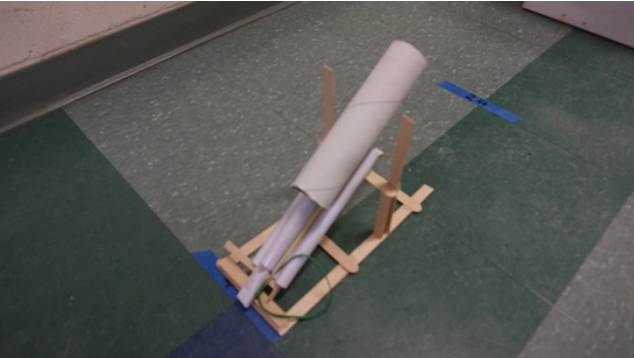


Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=1m17s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Brass Universal Friction Lid Support	\$6.99		100%	\$6.99
11-3/4 in. Drawer Slide	\$4.99		100%	\$4.99
10" Zinc Heavy Duty Strap Hinge	\$4.79		100%	\$4.79
The Hillman Group #6 Zinc-Plated Flat-Head Slotted Standard (SAE) Wood Screws	\$2.99		100%	\$2.99
Select 2 x 4 x 8-ft Kiln-Dried Select SPF Stud	\$3.55	only used half	50%	\$1.75
The Hillman Group #12 Zinc-Plated Flat-Head Square Standard (SAE) Wood Screws - 126092	\$2.99	8/15 used	53.33%	\$1.59
Canplas 10TC3 ABS Cap Fitting	\$1.99	only used half	50%	\$1.00
Staples Economy Rubber Bands, Size #33	\$5.79	4/200 used	2%	\$0.12
			TOTAL	\$24.22

Group 1-09

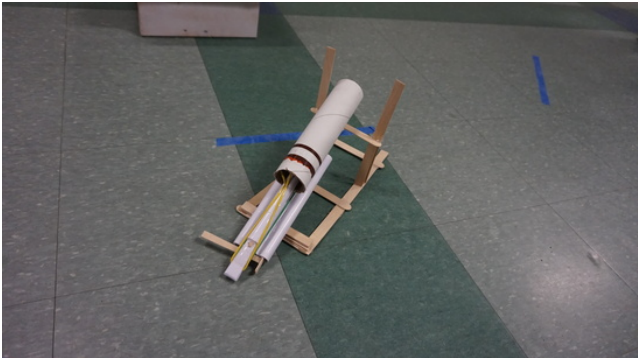
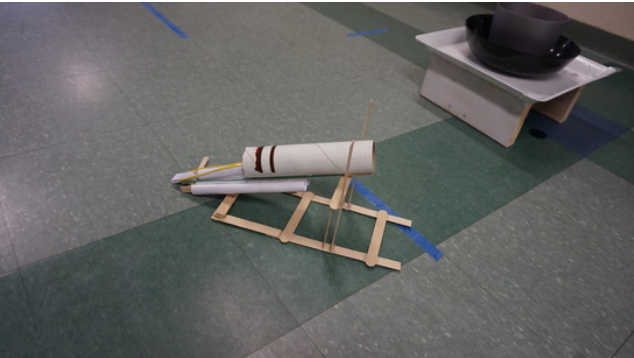
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=1m44s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
LePage Super Glue, 4 mL	\$8.59	used 30%	30%	\$2.58
Westcott All-Purpose Mini Hot Glue Sticks (30/Pack)	\$3.99	used 9 of 30	30%	\$1.20
Horizon Group USA Wood Skill Sticks(150 Pack)	\$6.59	used 20 of 150	13.33%	\$0.88
Plug-Seal Mailing Tubes, 2" x 36", 0.07 mil., Kraft (Open Box)	\$1.49	used 12 inch	33.33%	\$0.50
Staples Economy Big Rubber Bands, Size #117B	\$3.99	used 2 of 24	8.3%	\$0.33
HP Office Copy Paper, 20 lb., 8-1/2" x 11", Ream	\$6.99	used 14 of 500	2.8%	\$0.20
Hot-Melt Rubber Adhesive, 2" x 55 Yds. (48 mm x 50 m), 1.7-mil, Clear	\$1.99	used 2%	2%	\$0.04
			TOTAL	\$5.72

Final design

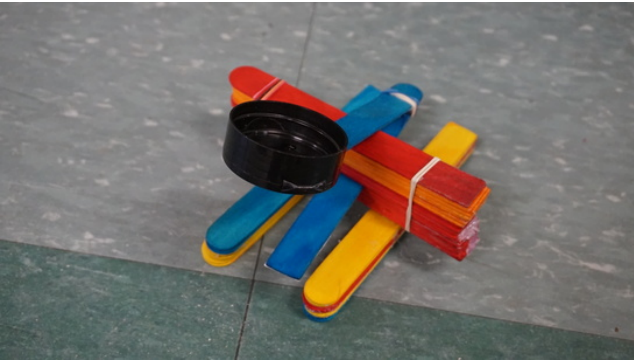


Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=1m27s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
LePage Super Glue, 4 mL	\$8.59	used 30%	30%	\$2.58
Westcott All-Purpose Mini Hot Glue Sticks (30/Pack)	\$3.99	used 9 of 30	30%	\$1.20
Horizon Group USA Wood Skill Sticks(150 Pack)	\$6.59	used 20 of 150	13.33%	\$0.88
Plug-Seal Mailing Tubes, 2" x 36", 0.07 mil., Kraft	\$1.49	used 12 inch	33.33%	\$0.50
Staples Economy Big Rubber Bands, Size #117B	\$3.99	used 2 of 24	8.3%	\$0.33
HP Office Copy Paper, 20 lb., 8-1/2" x 11", Ream	\$6.99	used 14 of 500	2.8%	\$0.20
Hot-Melt Rubber Adhesive, 2" x 55 Yds. (48 mm x 50 m), 1.7-mil, Clear	\$1.99	used 2%	2%	\$0.04
			TOTAL	\$5.72

Group 1-10

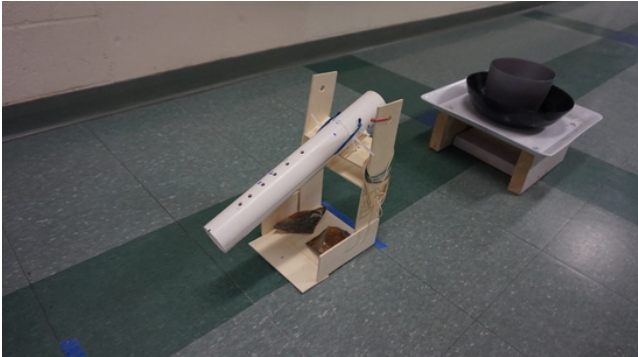
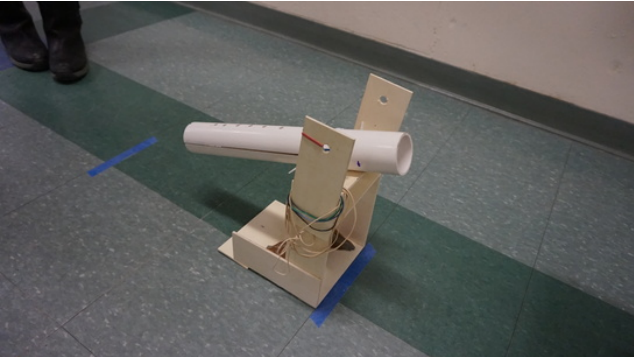
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=1m54s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
20g Gorilla Super Glue	\$8.48	required 30% to glue the craft sticks together	30%	\$2.54
Horizon Group Usa Colored Wood Craft Sticks	\$8.14	contains 150 pieces. Only 20 were enough for the device.	13.33%	\$1.09
Moustache Rubber Bands, 100g/Bag, Brown	\$2.99	required only 20% to hold the craft sticks in place	20%	\$0.60
			TOTAL	\$4.23

Final design

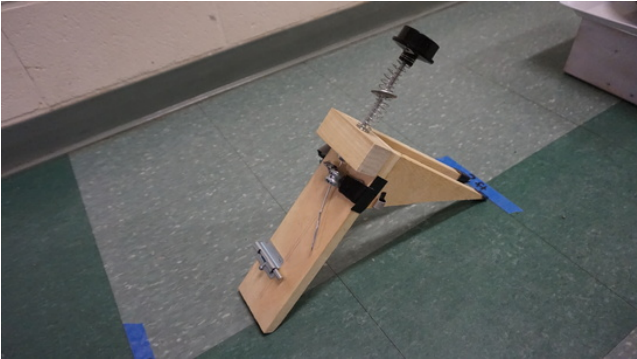
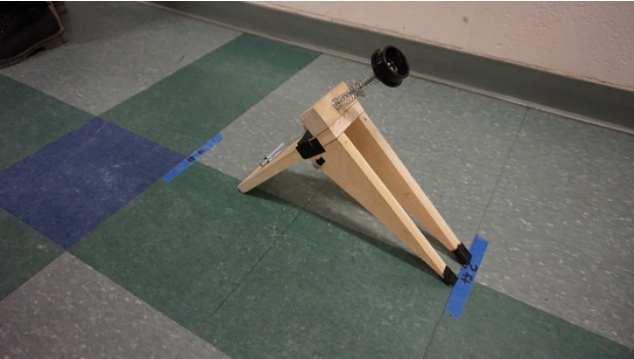


Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=1m34s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Crafter's Companion Craft Material Pack 15/Pkg-Wood Veneer Sheets-Adhesive Back	\$23.32	Made about 2.5 pieces from each plank	30%	\$7.00
IPEX HomeRite ProductsPVC 2 inches x 10 ft FLUE GAS VENT PIPE - System 636	\$28.78	Can make 5 pieces of required size from the tube	20%	\$5.76
Gorilla 20 g Super Glue Gel	\$8.48	Used to form the wooden base	50%	\$4.24
Garden Club Beach Pebbles,18-kg	\$8.99	Used to stabilize the base	11%	\$0.99
Moustache Rubber Bands, 100g/Bag, Brown	\$2.99	Required 20% of the total pack for the launch mechanism	20%	\$0.60
Commercial Electric8-inch Natural Cable Ties (100-Pack)	\$5.98	Required 5 ties in total to hold the PVC pipe in place and to mount the elastics on sides	5%	\$0.30
Nestle Pure Life Spring Water, 500ml Bottles, 24-Pack	\$4.99	The mouth of one water bottle was inserted into the PVC pipe to hold the ball and shoot it, when triggered	4.17%	\$0.21
Papermate Canadiana Wood Pencils, #2 HB, 24/Pack	\$3.49	1 pencil was used as the trigger to shoot the ball	4.2%	\$0.15
			TOTAL	\$19.23

Group 1-11

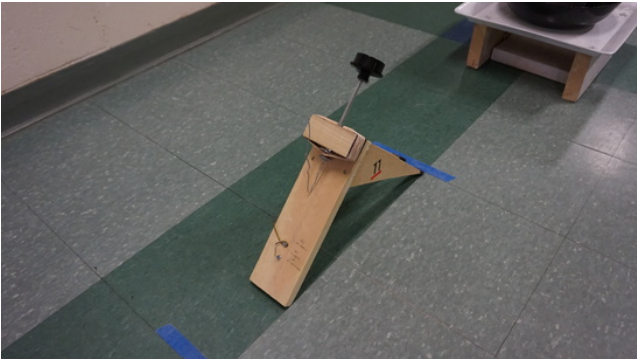
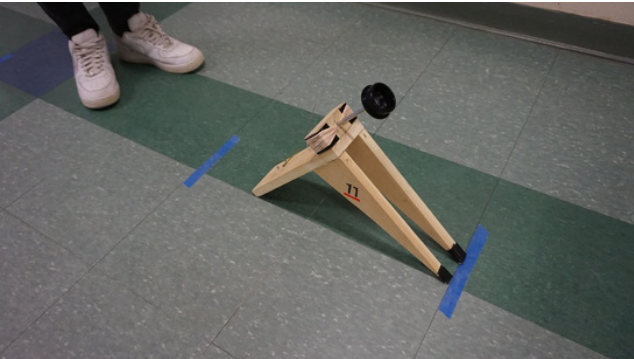
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=1m58s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Hillman Utility #47 Compression Springs	\$6.49	used both from 2-pack	100%	\$6.49
2-1/2" Zinc Barrel Bolt	\$3.99	used everything except 2 screws	100%	\$3.99
1 x 4 Knotty Pine Board, 8-ft	\$8.49	used 2 ft of 8 ft total	25%	\$2.12
American Valve AV30 Galvanized 2-Hole Pipe Strap	\$1.99	used whole thing	100%	\$1.99
OS&B Plastic 1-1/2" Dishwasher Bushing	\$1.98	used 1 of 1	100%	\$1.98
The Hillman Group 1/4-in-20 Zinc-Plated Hex-Head Standard (SAE) Bolts, 6-in	\$1.49	used 1 of 1	100%	\$1.49
Paulin 1/4 Fender Washer	\$0.32	used 2	200%	\$0.64
Paulin 1/4-20 Mach Screw Nut	\$0.31	used 2	200%	\$0.62
Arrow 5/16-in General Purpose Glue Sticks (24-Pack)	\$8.99	used 1 glue stick	4.17%	\$0.37
Gorilla Glue 35yd Black Gorilla Tape	\$10.97	used 0.82 yards out of 35 total	2.34%	\$0.26
The Hillman Group #8 Zinc-Plated Flat-Head Square Standard (SAE) Wood Screws - 47970	\$59.99	used 4 of 1000 total	0.4%	\$0.24
Hillman 9-Gauge Galvanized Utility Wire	\$11.99	used 0.66ft out of 50ft total	1.32%	\$0.16
Freeman 16G. Straight Finish Nail 1 Inch 1K Blister Pack	\$12.77	used 8 of 1000 total	0.8%	\$0.10
			TOTAL	\$20.45

Final design



Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=1m40s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
1 x 4 Knotty Pine Board, 8-ft	\$8.49	used 2 ft of 8 ft total	25%	\$2.12
OS&B Plastic 1-1/2" Dishwasher Bushing	\$1.98	used 1 of 1	100%	\$1.98
The Hillman Group 1/4-in-20 Zinc-Plated Hex-Head Standard (SAE) Bolts, 6-in	\$1.49	used 1 of 1	100%	\$1.49
Paulin 1/4 Fender Washer	\$0.32	used 2	200%	\$0.64
Paulin 1/4-20 Mach Screw Nut	\$0.31	used 2	200%	\$0.62
Arrow 5/16-in General Purpose Glue Sticks (24-Pack)	\$8.99	used 1.5 glue sticks	6.25%	\$0.56
The Hillman Group #8 Zinc-Plated Flat-Head Square Standard (SAE) Wood Screws - 47970	\$59.99	used 6 of 1000 total	0.6%	\$0.36
Gorilla Glue 35yd Black Gorilla Tape	\$11.97	used 0.82 yards out of 35 total	2.34%	\$0.28
Top Choice 2 x 2 x 8-ft Pressure Treated Lumber	\$5.14	used 0.29 feet out of 8 total	3.63%	\$0.19
Staples Economy Rubber Bands, Size #33	\$5.79	used 23 of 820 total	2.8%	\$0.16
Hillman 9-Gauge Galvanized Utility Wire	\$11.99	used 0.66ft out of 50ft total	1.32%	\$0.16
Freeman 16G. Straight Finish Nail 1 Inch 1K Blister Pack	\$12.77	used 8 of 1000 total	0.8%	\$0.10
Home Collection Wire Hanger, Black, 8-pk	\$2.99	used 10.5 cm out of 110 cm in a hanger, used 1/8 hangers	1.19%	\$0.04
			TOTAL	\$8.70

Group 2-01

Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=2m06s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Storex Micro Crate/ Black (18 units)	\$62.97	only need one milk crate	5.55%	\$3.50
MicroPro Sienna6 x 6 x 8' Treated Wood	\$31.77	only used 10 in of the 8ft	10.41%	\$3.31
5/8 inches 4 ftx8 ft Standard Spruce Plywood	\$35.98	Can make 54 pieces out of a sheet	1.85%	\$0.66
2-inch x 4-inch x 8 ft. SPF Dimensional Lumber	\$3.45	only used 1 ft of the 8 ft	12.5%	\$0.43
Kreg Tool Company Wood Screw 1.5 Inch Coarse-100Ct	\$6.78	only used 2 of 100	2%	\$0.14
Paulin 6X1-1/4 Coarse Phillips Drywall Screw (4000-Count)	\$38.78	only used 6 of 4000	0.15%	\$0.06
Paulin 1 1/2" Spiral Hot Galvanised 420g	\$7.60	only used 1 of 210 asuuming 2g per nail	0.48%	\$0.04
Duck All Purpose Duct Tape, Silver, 1.88 inch x 45 yds	\$9.47	only used 6 inches of 1620	0.37%	\$0.04
OOK Steel Wire Black 19Gx165 ft.	\$5.81	only used 5 inches of 165 ft	0.25%	\$0.01
Staples Economy Rubber Bands, Size #16	\$1.59	only used 2 of 590	0.33%	\$0.01
			TOTAL	\$8.19

Final design

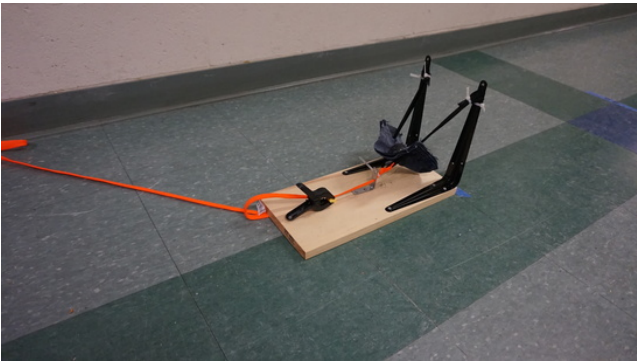


Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=1m49s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Storex Micro Crate/ Black (18 units)	\$62.97	only need one milk crate	5.55%	\$3.50
MicroPro Sienna6 x 6 x 8' Treated Wood	\$31.77	only used 10 in of the 8ft	10.41%	\$3.31
5/8 inches 4 ftx8 ft Standard Spruce Plywood	\$35.98	Can make 54 pieces out of a sheet	1.85%	\$0.66
2-inch x 4-inch x 8 ft. SPF Dimensional Lumber	\$3.45	only used 1 ft of the 8 ft	12.5%	\$0.43
Kreg Tool Company Wood Screw 1.5 Inch Coarse-100Ct	\$6.78	only used 2 of 100	2%	\$0.14
Paulin 6X1-1/4 Coarse Phillips Drywall Screw (4000-Count)	\$38.78	only used 6 of 4000	0.15%	\$0.06
Duck All Purpose Duct Tape, Silver, 1.88 inch x 45 yds	\$10.42	only used 6 inches of 1620	0.37%	\$0.04
Paulin 1 1/2" Spiral Hot Galvanised 420g	\$7.60	only used 1 of 210 asuuming 2g per nail	0.48%	\$0.04
OOK Steel Wire Black 19Gx165 ft.	\$6.27	only used 5 inches of 165 ft	0.25%	\$0.02
Staples Economy Rubber Bands, Size #16	\$1.59	only used 2 of 590	0.33%	\$0.01
			TOTAL	\$8.19

Group 2-02

Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=2m17s

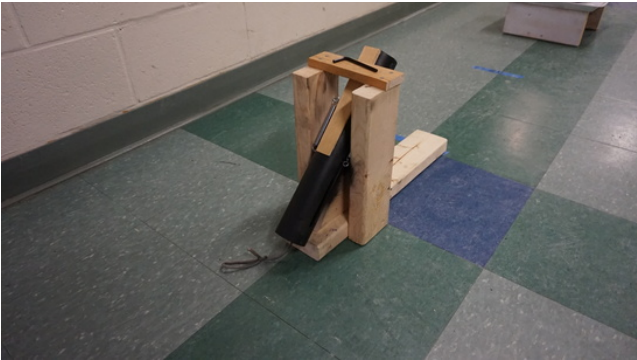
Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Everbilt 8 Inch X10 Inch Black Shelf Bracket	\$3.34	Used 2 for device	200%	\$6.68
Paulin 8X3/4 Oval Phil Tapping Screw	\$0.29	Used 5 screws	500%	\$1.45
VELCRO 2-in x 10-ft Industrial Strength Adhesive	\$25.99	used approx. 5% of total length	5%	\$1.30
1- inch x 6-inch x 8 ft. SPF KD	\$4.66	Used 1/8th of board	12.5%	\$0.58
Everbilt 1-1/2 Inch Zinc Corner Brace 4pk	\$1.78	Used 1 out of ther 4pk	25%	\$0.45
Commercial Electric 4-inch Natural Cable Ties (40-Pack)	\$3.48	Used 5 of 40 ties	12.5%	\$0.43
ANVIL Spring Clamp Set (14-pieces)	\$5.98	Used 1 of 14 clamps	7.14%	\$0.43
George Boys Slim Jeans	\$8.00	Used only one pocket of jean	5%	\$0.40
			TOTAL	\$11.72

Final design

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Everbilt 8 Inch X10 Inch Black Shelf Bracket	\$3.34	Used 2 for device	200%	\$6.68
Paulin 8X3/4 Oval Phil Tapping Screw	\$0.29	Used 5 screws	500%	\$1.45
VELCRO 2-in x 10-ft Industrial Strength Adhesive	\$25.99	used approx. 5% of total length	5%	\$1.30
1- inch x 6-inch x 8 ft. SPF KD	\$4.66	Used 1/8th of board	12.5%	\$0.58
Everbilt 1-1/2 Inch Zinc Corner Brace 4pk	\$1.78	Used 1 out of ther 4pk	25%	\$0.45
Commercial Electric 4-inch Natural Cable Ties (40-Pack)	\$3.48	Used 5 of 40 ties	12.5%	\$0.43
ANVIL Spring Clamp Set (14-pieces)	\$5.98	Used 1 of 14 clamps	7.14%	\$0.43
George Boys Slim Jeans	\$8.00	Used only one pocket of jean	5%	\$0.40
			TOTAL	\$11.72

Group 2-03

Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=2m31s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Hillman Expansion/Extension Spring, Steel	\$1.99	2x	200%	\$3.98
Hockey Puck, 6-oz	\$1.49	2x	200%	\$2.98
SCREW EYES 1-5/16"	\$1.99	1x	100%	\$1.99
IPEX HomeRite Products PVC 1/2 inches x 10 ft SCHEDULE 40 PLAIN END PIPE	\$8.98	1/5x	20%	\$1.80
2-inch x 4-inch x 8 ft. SPF Dimensional Lumber	\$3.45	1/2x	50%	\$1.73
Mastercraft SAE 13 Piece Long Arm Hex Key Set	\$15.99	1/13x	0.08%	\$1.23
Hillman Galvanized Deck Screws	\$6.69	1/7X	14.3%	\$0.96
Cotton Rope	\$3.99	1/25x	0.04%	\$0.16
			TOTAL	\$14.82

Final design



Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=1m54s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Hillman Utility Extension Spring	\$6.99	1x	100%	\$6.99
2-inch x 4-inch x 8 ft. SPF Dimensional Lumber	\$3.45	1x	100%	\$3.45
SCREW EYES 1-5/16"	\$1.99	1x	100%	\$1.99
IPEX HomeRite Products PVC 1/2 inches x 10 ft SCHEDULE 40 PLAIN END PIPE	\$8.98	1/5x	20%	\$1.80
Mastercraft SAE 13 Piece Long Arm Hex Key Set	\$15.99	1/13x	7.69%	\$1.23
Hillman Galvanized Deck Screws	\$6.69	2/7X	14.3%	\$0.96
0.25-in x 100-ft 3-Strand Twisted Polypropylene Rope (By-The-Roll)	\$11.99	1/100x	1%	\$0.12
			TOTAL	\$16.53

Group 2-04

Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=2m41s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Heavy Duty Strap Hinge, Zinc-Plated	\$3.19	we used the entire thing	100%	\$3.19
Taiga Building Products 1/2 x 4-ft x 8-ft Standard Spruce Plywood	\$27.98	we used this as the base of the catapult, about a tenth of it, meaning we could make 10 more devices from the leftovers	10%	\$2.88
16-in x 48-in Stain Grade Kiln-Dried Pine Panel	\$22.99	we cut this up and used the peices as supports for the main launcher, we didn't use very much of it, as we only needed small peices for supports, we could probably make about 25 more devices used what was left	4%	\$0.92
Reliable Fasteners #8 x 1 1/2-in Brown Stainless Steel Bugle-Head Square Standard (SAE) Deck Screw (600-Count)	\$34.99	we used only 6, as the bag is weighed instead of an exact number, and judging on the size of the bag, we estimate	1%	\$0.35
250' Cabled Nylon Twine	\$2.99	we used only a few feet for the string	0.4%	\$0.10
Goodtimes Foam Cups, 12 oz., 42/Pack	\$3.99	we used 1 of these to act as the basket for the catapult	2.38%	\$0.09
1 1/2 Inch Brad Nails (1000 Pack)	\$5.24	we only had 8 nails in our design	0.8%	\$0.04
Economy Rubber Bands, Size #16	\$5.79	the bag was a 10 lbs bag with 3000 rubber bands, a specific number was not given on bag, we used 10 meaning	0.3%	\$0.02
			TOTAL	\$7.59

Final design



Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=2m02s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Heavy Duty Strap Hinge, Zinc-Plated	\$3.19	we used the entire thing	100%	\$3.19
Taiga Building Products 1/2 x 4-ft x 8-ft Standard Spruce Plywood	\$27.98	we used this as the base of the catapult, about a tenth of it, meaning we could make 10 more devices from the leftovers	10%	\$2.80
16-in x 48-in Stain Grade Kiln-Dried Pine Panel	\$22.99	we cut this up and used the peices as supports for the main launcher, we didn't use very much of it, as we only needed small peices for supports, we could probably make about 25 more devices used what was left	4%	\$0.92
Reliable Fasteners #8 x 1 1/2-in Brown Stainless Steel Bugle-Head Square Standard (SAE) Deck Screw (600-Count)	\$36.99	we used only 6, as the bag is weighed instead of an exact number, and judging on the size of the bag, we estimate	1%	\$0.37
Goodtimes Foam Cups, 12 oz., 42/Pack	\$3.99	we used 1 of these to act as the basket for the catapult	2.38%	\$0.10
1 1/2 Inch Brad Nails (1000 Pack)	\$5.97	we only had 8 nails in our design	0.8%	\$0.05
250' Cabled Nylon Twine	\$2.99	we used only a few feet for the string	1.2%	\$0.04
Economy Rubber Bands, Size #16	\$5.59	the bag was a 10 lbs bag with 3000 rubber bands, a specific number was not given on bag, we used 10 meaning	0.3%	\$0.02
			TOTAL	\$7.47

Group 2-05

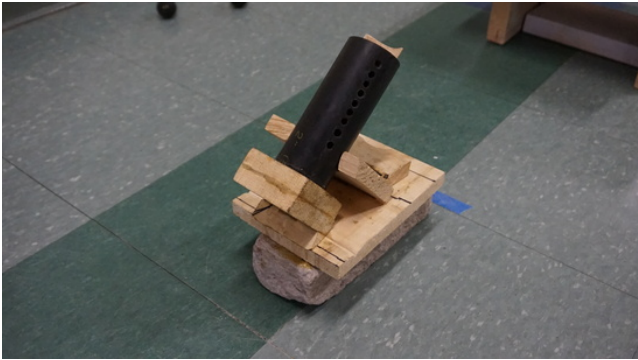
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=2m51s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Century Spring C-604 .21x1.38in. Compression Spring-4 pack	\$26.93	Could make 1 device "cannon" type part from this size piece	25%	\$6.73
Gorilla Glue Exposy Adhesive	\$9.99	Used to secure device to base	25%	\$2.50
Permacon Mini "Beltis" Garden Wall Brick	\$2.19	Could secure 1 device in place	100%	\$2.19
Irving 1x8x8 Knotty Pine	\$14.38	Could make 8 device bases from this size piece	12.5%	\$1.80
3"x12' ABS/DWV Pipe	\$31.99	Could make 24 "cannon shell" type parts from this size piece	4.16%	\$1.33
2-1/2-Inch Coarse Zinc-Plated Steel Square-Head Pocket Screw (50 Pack)	\$7.37	Could make 50 mechanical triggers for device	2%	\$0.15
			TOTAL	\$14.70

Final design

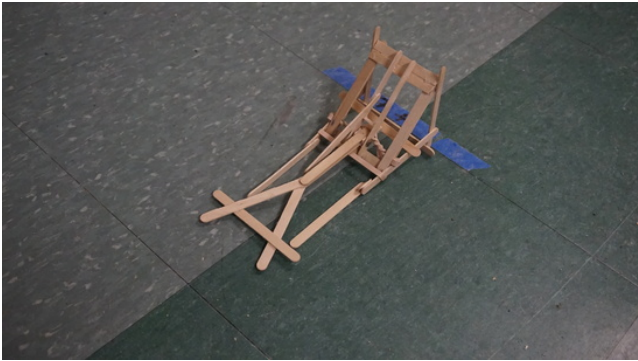
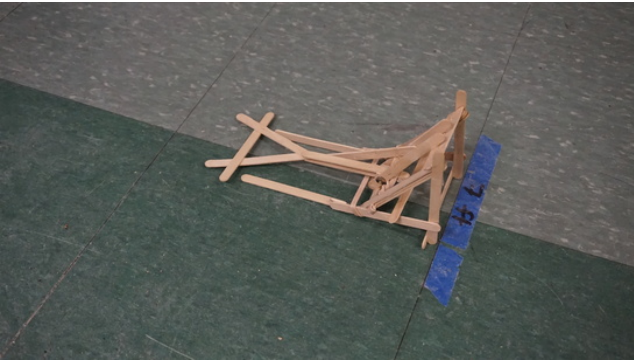


Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=2m09s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Century Spring C-604 .21x1.38in. Compression Spring-4 pack	\$26.93	Could make 1 device "cannon" type part from this size piece	25%	\$6.73
Gorilla Glue Exposy Adhesive	\$9.99	Used to secure device to base	45%	\$4.50
Permacon Mini "Beltis" Garden Wall Brick	\$2.19	Could secure 1 device in place	100%	\$2.19
Irving 1x8x8 Knotty Pine	\$14.38	Could make 8 device bases from this size piece	12.5%	\$1.80
3"x12' ABS/DWV Pipe	\$34.99	Could make 24 "cannon shell" type parts from this size piece	4.16%	\$1.46
2-1/2-Inch Coarse Zinc-Plated Steel Square-Head Pocket Screw (50 Pack)	\$7.37	Could make 50 mechanical triggers for device	2%	\$0.15
			TOTAL	\$16.82

Group 2-06

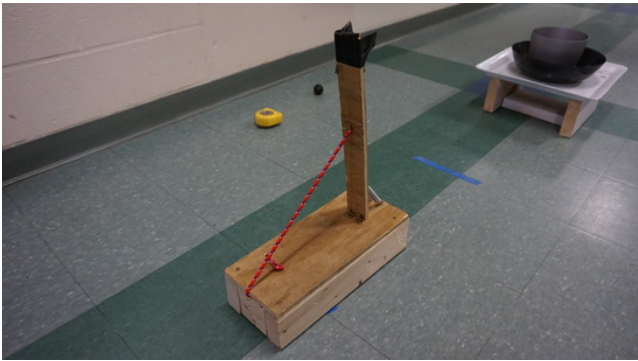
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=3m04s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Horizon Group USA Wood Craft Sticks, 1000/Pack (63547-NP)	\$19.99	Used 26 sticks	2.6%	\$0.52
Gorilla Glue Hot Sticks, 4-in - Full Size 30pk	\$9.99	Only needed one glue stick	3.3%	\$0.33
Staples Thumbtacks, Nickel, 200/Pack	\$2.79	3 thumbtacks	1.5%	\$0.04
Staples Economy Rubber Bands, Size #64 (17785-CA) 1lb bag	\$5.79	Only needed two rubber bands. (each band weighs 0.50g, 453g per bag (906 bands total)	0.22%	\$0.01
			TOTAL	\$0.90

Final design

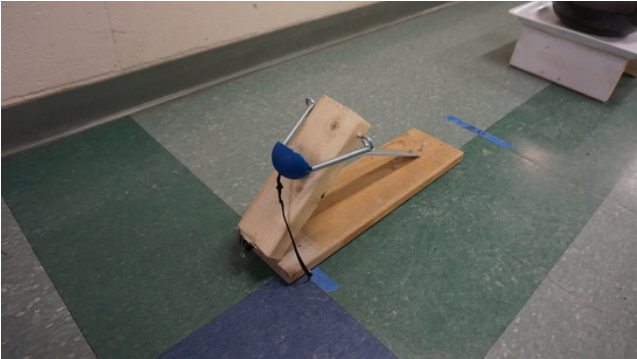
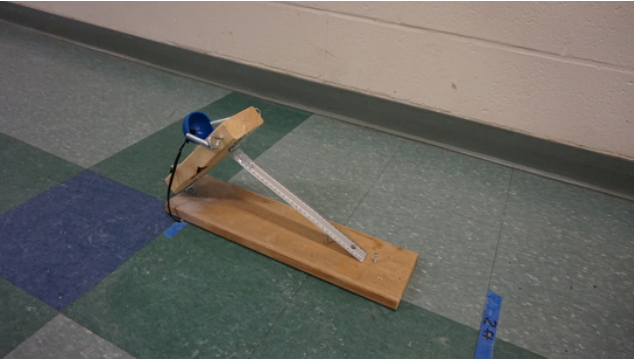


Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=2m16s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Hillman Expansion/Extension Spring, Steel	\$1.69	2 Springs	200%	\$3.38
Broad Cupboard Hinge, Solid Brass 4 pk	\$4.69	needed 2	50%	\$2.35
2-inch x 4-inch x 8 ft. SPF Dimensional Lumber	\$3.45	2 pcs x 15" & 1 pc x 3"	34.38%	\$1.19
1/2-inch x 4 ft. x 8 ft. Standard Spruce Plywood Board	\$27.98	Total Volume 2304" 1 pcs: 1/2'x6'x15' (37.5") 1 pcs: 1/2'x2'x16' (16")	2.32%	\$0.65
Paulin 8 X 3 Construction Screws Gold 250 pcs	\$25.78	6 used	2.4%	\$0.62
Everbilt 13/16 Inch Zinc Md Screw Eye 14pk	\$2.04	4 used	28.57%	\$0.58
Scotch 3M Scotch Cloth 220 Black Duct Tape	\$6.47	used about 3' of tape	2.5%	\$0.16
Everbilt 3/8Inch x 50Feet Diamond Braid Polypropylene Rope	\$3.47	2' of paracord was used	4%	\$0.14
			TOTAL	\$9.06

Group 2-07

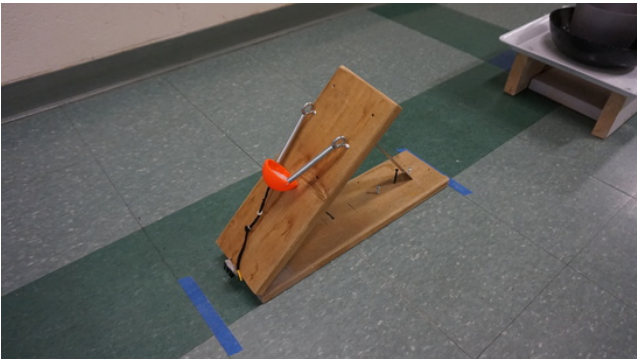
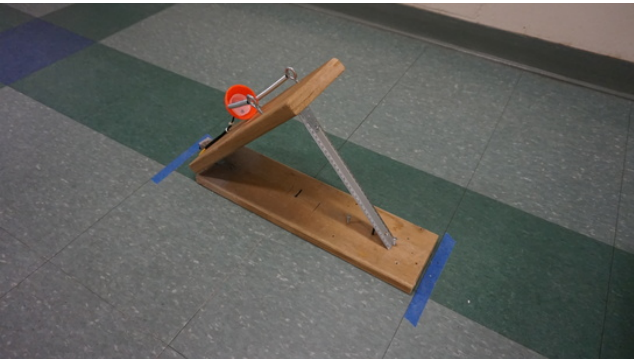
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=3m10s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Hillman Group Utility Extension Spring #207	\$4.99	entire package used (both springs)	100%	\$4.99
2 Pack 2" Zinc Light Strap Hinges	\$4.39	used everything in pack including screws	100%	\$4.39
Staples Acrylic Metric Ruler, 30cm, Metric	\$1.49	full ruler used	100%	\$1.49
1-in x 6-in x 5-Ft SPF Fence Board	\$2.79	approximately 2 ft of 5 ft used	40%	\$1.12
3/16" x 1-1/2" Zinc Eye Bolt, with Nut	\$0.49	2 eyebolts used	200%	\$0.98
MicroPro Sienna2-inch x 4-inch x 8 ft. Brown Pressure Treated Board	\$7.26	approximately 1 ft of 8 ft used	12.5%	\$0.91
Kiwi 1 Pair Skate White Sport Laces	\$4.97	20 cm used of 2 x 244 cm total laces	4.1%	\$0.20
Play Day Play Balls	\$14.96	1 of 100 balls used	1%	\$0.15
Staples Binder Clips, Assorted Sizes, Black, 60/Pack	\$5.99	1 binder clip from pack of 60	1.67%	\$0.10
25 Pack 1/8" Steel Back-Up Plates	\$2.19	1 of 25 used	4%	\$0.09
TAPE-BOX SEALING TARTAN 48MMX50M CLEAR	\$2.29	approximately 1 m of 50 m used	2%	\$0.05
			TOTAL	\$14.46

Final design

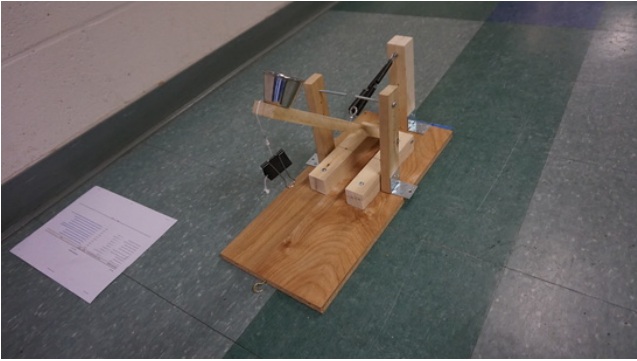
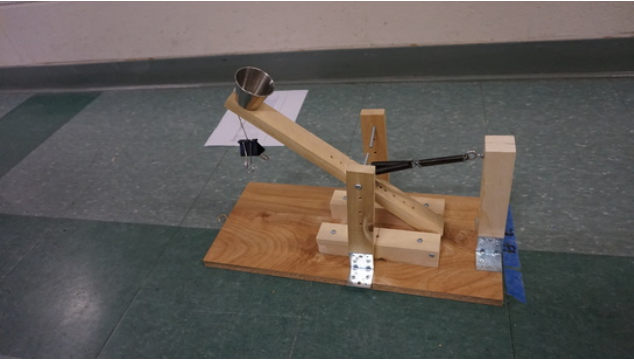


Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=2m22s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Hillman Group Utility Extension Spring #207	\$4.99	entire package used (both springs)	100%	\$4.99
2 Pack 2" Zinc Light Strap Hinges	\$4.39	used everything in pack including screws	100%	\$4.39
1-in x 6-in x 5-Ft SPF Fence Board	\$2.79	approximately 3.5 ft of 5 ft used	70%	\$1.95
Staples Acrylic Metric Ruler, 30cm, Metric	\$1.49	full ruler used	100%	\$1.49
3/16" x 1-1/2" Zinc Eye Bolt, with Nut	\$0.49	2 eyebolts used	200%	\$0.98
Gatorade Perform Clubpack	\$15.97	1 cap from 1 bottle of 24 used	4.16%	\$0.66
Paulin8-32 Mach Screw Nut	\$0.19	Used 2	200%	\$0.38
Kiwi 1 Pair Skate White Sport Laces	\$4.97	20 cm used of 2 x 244 cm total laces	4.1%	\$0.20
Duragrip8 x 3-Inch Deck Screws in Brown (1000 pieces)	\$45.98	4 screws of a box of 1000	0.4%	\$0.18
Play Day Play Balls	\$14.96	1 of 100 balls used	1%	\$0.15
Staples Binder Clips, Assorted Sizes, Black, 60/Pack	\$5.99	1 binder clip from pack of 60	1.67%	\$0.10
25 Pack 1/8" Steel Back-Up Plates	\$2.19	1 of 25 used	4%	\$0.09
TAPE-BOX SEALING TARTAN 48MMX50M CLEAR	\$2.29	approximately 1 m of 50 m used	2%	\$0.05
			TOTAL	\$15.62

Group 2-08

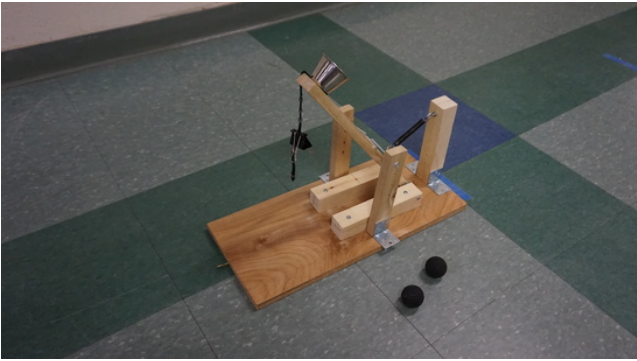
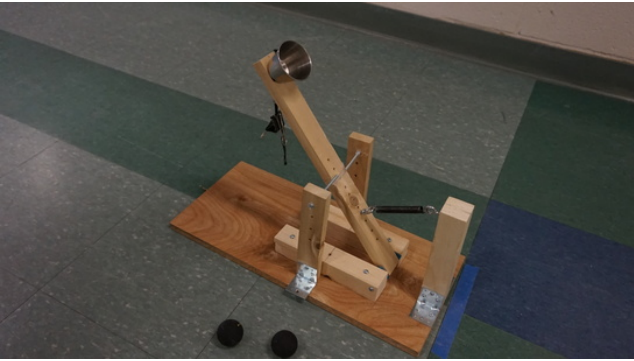
Prototype



Watch video of the device in action: https://youtu.be/ss8o-PTqW_w?t=3m21s

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Paulin 1/4 X 1 1/2C Utility Spring	\$2.21	4 bought	400%	\$8.84
Everbilt 1-1/2 Inch Zinc Double Wide Corner Brace 2pk	\$4.02	2 bought	200%	\$8.04
Porcupine 1-inch x 8-inch (Nominal) x 8 ft. #2 Cedar Board	\$14.32	2 of 8 feet used	25%	\$3.58
Paulin 10-32x2 Rd Soc Mach 9Pc Screw	\$2.97	6 of 9 used	100%	\$2.97
Paulin 10-24x3 Rd Soc Mach Screw 6Pc	\$2.97	2 of 6 used	33.33%	\$0.99
Staples Mesh Cup Doodad Small, Silver	\$0.97	1 bought	100%	\$0.97
THD 2x2x8 Framing Lumber	\$3.24	2 of 8 feet used	25%	\$0.81
THD 1x2x8 Framing Lumber	\$1.45	3 of 8 feet used can make two	50%	\$0.72
Everbilt 1/2 Inch Brass Cup Hook 6pk	\$1.21	3 of 9 used	33.33%	\$0.40
Everbilt MEDIUM x 420 Feet COTTON TWINE	\$4.97	1 of 420 feet used	0.24%	\$0.01
TOTAL				\$27.34

Final design



Watch video of the device in action: <https://youtu.be/o2-7KvSCpXs?t=2m30s>

Product Description	Full Cost	Justification for cost	Proportion of Total	Proportional Cost
Paulin 10-32x2 Rd Soc Mach 9Pc Screw	\$2.97	6 of 9 used	100%	\$2.97
Paulin 1/4 X 1 1/2C Utility Spring	\$2.21	4 bought	100%	\$2.21
Everbilt 3/4 Inch Zinc Corner Brace 4pk	\$1.75	1 bought	100%	\$1.75
Okaply Unfinished Square Edge Medium Density Fibreboard Shelving 5/8 Inch x 12 Inch x 96 Inch	\$6.98	19 inch od 96 inch used	20%	\$1.40
Paulin 10-24x3 Rd Soc Mach Screw 6Pc	\$2.97	2 of 6 used	33.33%	\$0.99
THD 2x2x8 Framing Lumber	\$3.24	2 of 8 feet used	25%	\$0.81
THD 1x2x8 Framing Lumber	\$1.45	3 of 8 feet used can make two	50%	\$0.72
Staples Mesh Pencil Cup	\$1.47	1 of 3 used	33%	\$0.49
Everbilt 1/2 Inch Brass Cup Hook 6pk	\$1.21	3 of 9 used	33.33%	\$0.40
Staples Binder Clips, Assorted Sizes, Black, 60/Tub	\$7.99	1 of 60 used	1.66%	\$0.13
Everbilt MEDIUM x 420 Feet COTTON TWINE	\$4.97	1 of 420 feet used	0.3%	\$0.01
TOTAL				\$11.89