

**Kinematics**

Equipment	Quantity required for 20 students working:		Unit cost	Supplier and catalog number	Comments	First use
	together as a class	semi-self paced				
Timing device. Use one of the following: A. Stopwatch, split-interval, 24 hours, 1/100 second, time-out/time-in.  B. Stopwatch, 1/100 second	10  10	5  5	\$19.95  \$8.95/pk 2	NASCO SB23809M  Frey 15576952	Battery required.	1.1
Meter sticks or Half-meter sticks	12 12	12 12	\$1.88 \$1.47	NASCO S00938M NASCO SB12163M	Price is for 12 or more Price is for 12 or more	1.1
Steel balls Use one of the following: (A) 7/8" diameter (B) 5/8" diameter	15 15	10 10	\$1.60 ea \$1.00 ea	Frey 15583800 Frey 15583812	Ball diameter not critical; choose to fit width of aluminum track.	1.1
Aluminum U-channel track (16 foot sections cut as follows) 8 ft sections 4 ft sections 2 ft sections	2 16 16	2 16 16		Local stores	Width should be such that balls are stable when rolling in grooves in channel. All sections should be of the same width.	1.1
Aluminum U-channel track of different width from the sections above 8 ft section 4 ft section	1 1	1 1		Local stores	This track and one from above will be needed for a demonstration in which two channel widths are required.	10.2
Washers	100	100		Local stores/stock	These are used as shims for raising and leveling the U-channel tracks.	1.1
Clear plastic ruler (1 ft. length) subdivided into 1/10" and centimeter scales	1/student	1/student		Local stores/supplies	Students should supply.	1.2
Launching ramps (cut from wood blocks roughly 1" x 1.5" x 5")	12	8		Local hardware/lumber stores	Small wooden wedges to place on U-channel tracks to launch balls. Used so that students can start ball repeatedly with same velocity by placing ball at fixed location on ramp. See Section 1 of Instructor's Guide for details.	1.2
Wooden blocks or bricks, various heights: 1", 2", 2.5", and 3" in height	assortment	assortment		Local shop scrap pieces/hardware stores	Used to support aluminum tracks.	1.5
Fan cart (battery operated)	5	3	\$44.95	Frey 15589749	Furnished with rigid sail, but sail not required.	3.2
Batteries, AA NiCad 1.25 V, 0.650 A h	5 pks 2	3 pks 2	\$6.95	Radio Shack 23-191	For use with fan carts. Standard cells may be used.	3.2

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Ticker (Acceleration) Timer (DC) includes motorized striker, carbon disks, ticker tape, and instructions; operates on 1.5 V D cells (not included)	10	5	\$22.35	NASCO SB19009M		3.2
Timer tape 0.5" paper tape, 500 ft. rolls, 1 pk 5 roll	2 pk	1 pk	\$6.25	Frey 15576417		3.2
Carbon paper disks for use with ticker timers (1 pk 100)	1 pk	1 pk	\$6.25	Frey 15576429		3.2
Batteries, D-cell NiCad, 1.25 V	10 pks 2	5 pks 2	6.99/pk 2	Radio Shack 23-123	For use with ticker timers (2/timer). Standard cells may be used.	3.2
Ring stands (24" L)	12	5			See also H&T.	4.3
Clamp holders adjustable for rods up to 5/8" diameter swivels and locks to any angle	12	5	\$11.10	Frey 15585174		4.3
White string	4-5	2-3		Local supply	Make belt from a loop of about 4.0 meters of string. Mark every tenth centimeter of string with a marker so that marks are clearly visible when the belt is moving.	4.3
Motor, variable speed	4-5	2-3	approx. \$10 - \$15	Local hobby store Exs.: Mabuchi motors RS540 (common), or RS555SH	Motor used to drive the belt in Experiment 4.3. It should be mounted above and to the side of the track by a buret clamp attached to a ring stand	4.3
Pulley, set of 2 (1" diameter)	4-5 pairs	2-3 pairs	approx. \$5.00/pair	Local hobby store Ex: Tamiya 70121 set	Place pulley on motor drive shaft. A brass rod and coupler may be needed. The latter may be purchased at hobby stores. Mount a second pulley on a brass rod held by a ring stand using buret clamp.	4.3
Modeler's saw for cutting metal	1	1	approx. \$3.50	Local hobby store	Optional: Used to cut brass rod in Experiment 4.3.	OPT 4.3
Set of small screwdrivers (jewelry size)	1	1		Local supply/hardware store	Used to mount pulleys in Experiment 4.3.	4.3

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Power supply for variable speed motor	4-5	2-3	approx. \$45.00	Local hobby store Ex: TECH II tm Railpower 1400; 14 VDC or 18VAC output; Model Rectifier Corp.; 80 Newfield Ave., Edison, NJ 08817; (732) 225-6360	Used to control motor speed in Experiment 4.3.	4.3
Dynamics (skate) carts: pair of wheeled blocks used in velocity and acceleration studies	10	5	\$33.80/set	Frey 15570128 (without plunger)		6.2
Boards, 4' x 9"	10 boards	4 boards		Local hardware/lumber stores		6.2
Objects with mass of 100g to 300 g that can be dropped from about 70 cm high. Options include: (A) Slotted weights, 100 g (B) Blocks of wood	10 assorted	6 assorted	\$7.70	NASC0 SB16598M		10.5