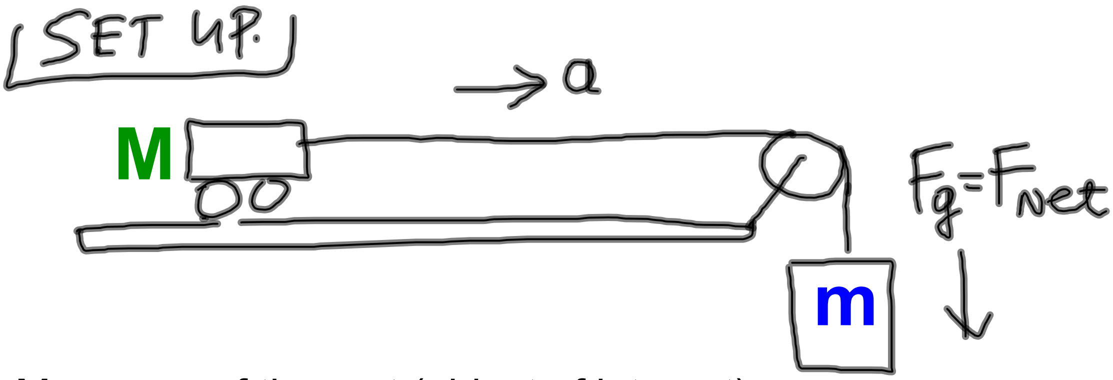
1. Does the acceleration of the cart depend on the net force exerted on the cart?

2. Does the acceleration of the cart depend on its mass?



M = mass of the cart (object of interest)
m = mass of the cylinder, which provides the net force pulling the cart via string.

Nov 11-9:36 AM

Part 1.
Find out the relationship between the acceleration of the cart and the net force acting on the cart (a vs. F_{net}).
- Keep the mass of the cart (M) constant and vary the net force causing the acceleration by varying the hanging mass (m).

$$F_g = F_{net} = mg$$

Nov 11-9:40 AM

Period 3 data.

Trial Number	Hanging mass m [g]	Hanging mass m [kg]	$F_{net} = Fg$ [N]	Acceleration a [m/s2]
1	10			**0.15486**
2	20			**0.33472**
3	30			**0.52280**
4	40			**0.68942**
5	50			**0.87656**
6	60			**1.02610**
7	70			**1.19080**
8	80			**1.34000**

Mass of the cart m = 500 g. It stays constant!

Nov 11-10:05 AM

Period 7 data.

Trial Number	Hanging mass m [g]	Hanging mass m [kg]	$F_{net} = Fg$ [N]	Acceleration a [m/s2]
1	10		0.09800	**0.1754**
2	20		0.19600	**0.3631**
3	30		0.29400	**0.53527**
4	40		0.39200	**0.71164**
5	50		0.49000	**0.87674**
6	60		0.58800	**1.0170**
7	70		0.68600	**1.12010**
8	80		0.78400	**1.30840**

Mass of the cart m = 500 g. It stays constant!

Nov 11-10:05 AM

Part 2.
Find out the relationship between the acceleration of the cart and its mass (a vs. m).
- Keep the hanging mass constant (50g) and vary mass of the cart.

Nov 11-9:40 AM

TRIAL	MASS OF THE CART	ACCELERATION m/s^2
1	500 g	0.90640
2	1,000 g	0.46809
3	1,500 g	0.31786
4	1,600 g	0.30375
5	1,700 g	0.28147
6	1,800 g	0.25478
7	1,900 g	0.24485
8	2,000 g	0.22280

HANGING MASS:
m = 50 g
CONSTANT!!!

Period 3 data

Nov 12-9:34 AM

TRIAL	MASS OF THE CART	ACCELERATION m/s^2
1	500 g	0.86725
2	1,000 g	0.46937
3	1,500 g	0.30367
4	1,600 g	0.29224
5	1,700 g	0.27739
6	1,800 g	0.25900
7	1,900 g	0.24549
8	2,000 g	0.23660

HANGING MASS: m = 50 g CONSTANT!!!

Period 7 data

Nov 12-9:34 AM

Graphing principles.

Graph: Position vs. Time

Position → dependent → always on y-axis (vertical)

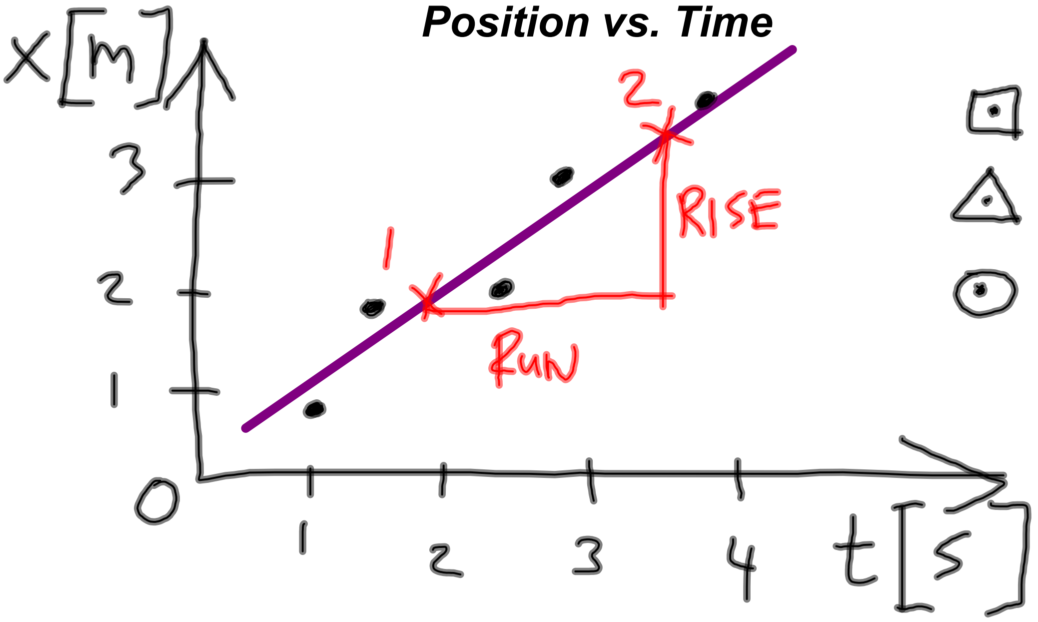
Time → independent → always on x-axis (horizontal)

- Use min. of 75% of the available area for the graph.

- Determine if it is proper to include data point (0,0).

Nov 12-9:54 AM

Position vs. Time



- best-fit line does not have to go through any data points.
- all points have to be as close as possible to the line.
- equal number of points above & below the best-fit line (+-1).

Nov 12-9:57 AM

- Calculate the slope of the best fit line by picking 2 points on the best-fit line.

$$\text{SLOPE} = \frac{\text{RISE}}{\text{RUN}}$$

$$S = \frac{x_2 - x_1}{t_2 - t_1}$$

- Do dimensional analysis of the slope to find out if the slope has a physical meaning.

$$S = \left[\frac{m}{s}\right]$$

Slope of x-t graph represents **velocity**

Nov 12-1:44 PM

Period 3 data.

Trial Number	Hanging mass m [g]	Hanging mass m [kg]	$F_{net} = Fg$ [N]	Acceleration a [m/s2]
1	10	0.0100	0.09800	**0.15486**
2	20	0.0200	0.19600	**0.33472**
3	30	0.0300	0.29400	**0.52280**
4	40	0.0400	0.39200	**0.68942**
5	50	0.0500	0.49000	**0.87656**
6	60	0.0600	0.58800	**1.02610**
7	70	0.0700	0.68600	**1.19080**
8	80	0.0800	0.7840	**1.34000**

see next page for details...

Nov 11-10:05 AM

Period 7 data.

Trial Number	Hanging mass m [g]	Hanging mass m [kg]	$F_{net} = Fg$ [N]	Acceleration a [m/s2]
1	10	0.0100	0.09800	**0.1754**
2	20	0.0200	0.19600	**0.3631**
3	30	0.0300	0.29400	**0.53527**
4	40	0.0400	0.39200	**0.71164**
5	50	0.0500	0.49000	**0.87674**
6	60	0.0600	0.58800	**1.0170**
7	70	0.0700	0.68600	**1.12010**
8	80	0.0800	0.78400	**1.30840**

- Convert the data numbers into a number with 1 place after decimal (do proper rounding) in a manageable magnitude for graphing i.e. tens.
- Add the conversion factor onto graph axis label; in this case: (x 10^{-2}).
- Important to remember when you calculate the slope!

Show numbers as: **78.4 x 10^{-2}** **130.8 x 10^{-2}**

Nov 13-9:44 AM