Investigation

A few factors (the gradient/height of ramp, the mass of the object, friction, gravity, the energy act on the object or the length of object) can affect the final speed of an object at the end of the ramp.

Planning

I am going to do my investigation on ' mass of the object' which I think it is one of the factors that will affect the final speed of an object at the end of the ramp because when gravitational potential energy equals to mass times gravity times height, so if mass is increased, the gravitational potential energy will increase in proportionally. I will do the experiment by adding weights on top of a wooden cart to increase the mass, and then I will time how long it takes to fall down from the ramp and calculate the final speed by:

Diagram

My experiment results are:

Weight add to the cart (grams)	0	100	200	300	400
Time (sec)	6'78	6'07	7'21	6'86	6'93
Weight add to the cart (grams)	500	600	700	800	900
Time (sec)	7'19	7'03	6'61	6'77	6'57

According to the results, mass does not affect the final speed of an object at the end of the ramp. I think this is because when something is dropped, it will transfer from gravitational potential energy to kenetic energy

So I am going to change my investigation on the height of the ramp.

I think height of the ramp will affect the final speed of an object when height of the ramp is increased, the gravitational potential energy will increase proportionally due to:

G.P.E.= mass x gravity x height

<u>Method of doing the experiment</u>

I am going to do it by using a ramp that I can increase the height. Then I will release the cart at the top of the ramp and time how long it will take for the cart to come down. I will increase the height by 5cm each time (5cm, 10cm, 15cm, 20cm, 25cm and 30cm). I will take down the time thrice to get the average time of it because it is more reliable. Then I will work out the average speed. I will divide the length of the ramp by the time taken and work out the final speed by doubling the average speed. The length of the ramp is one metre and the weight of the cart is 900 grams.

I can make this a fair test by not pushing the cart, doing average on the time, and keeping the mass the same.

Apparatus

I will need:
A clamp to hold the ramp,
A ramp,
A wooden cart as the object and
A stopwatch for timing
for the experiment.

Safety features

I will make sure it is safe by putting books at the end to stop the cart from bumping into others' feet and I will make sure no one is standing near it. I will do the whole experiment on the ground because this can stop things from falling down the table and hit people's feet.

Diagram

Evidence/results

I have my experiment results after all of this and they are:

Height(cm)	5	10	15	20	25	30
Average Time(sec)	4'09	2'31	1'80	1'54	1'37	1'10

According to the results, there seems to be a trend. So, I think I will calculate the final speed.

Height(cm)	5	10	15	20	25	30
Final speed(cm/s)	0.489	0.865	1.111	1.299	1.46	1.818

The trend is obvious now. It shows that whenever the height is increased, the time taken will decrease and the final speed of the cart will increase.

From we calculate gravitational energy (mass x gravity/acceleration x height), height seems to be one of the main factors that can affect the G.P.E. because as height increases, the G.P.E. will be affected by it. Example: if an object with constant gravity (x), constant mass (y) but falls from changing heights (5 and 10), the outcome will be 5xy and 10xy and this also proved that when the height is increased, the G.P.E. will increase.

The forces of gravity pulls down on all objects have on Earth. If objects are allowed to fall, they accelerate downwards. Therefore, if an object is allowed to fall from a higher place, the gravity will pulls down the object with a greater force and the object will accelerate faster as it comes down. If the object falls from a higher place, there will be more time for the object to accelerate, so the final speed of the object will be faster, and as the gravitational force is greater, the object is being pulled harder and quicker. Therefore, this explains why an object will have a faster final speed at the end of the ramp whenever the height of the ramp is increased.

At first, I did an experiment on 'mass of the object' that the experiment doesn't work. I have found out that mass doesn't affect the final speed of an object.

When an object is held at a certain point, gravitational potential energy is stored; when it is dropped, it will transfer gravitational potential energy to kenetic energy. So that means:

Gravitational potential energy = kenetic energy

Mass x gravity x height = 0.5 x mass x velocity

This shows that 'mass' exists on both sides of the equation, that means it can be cancel out to simplified the equation. So the equation will become:

Gravity x height = 0.5 x velocity

That means 'mass' does not affect the 'velocity' on the right side of the equation.

Graph

I have also plotted a graph of height against final speed, and after that, I have drawn a line of best fit. The graph shows a straight line of best fit. The graph shows a straight line of best fit and this shows height and final speed are in direct proportion. This proves when the height of the ramp is increased, the final speed is increased and this means the object accelerates faster.

Evaluations

My results are quite accurate because on the graph, all of the results go very near the best-fit line. My results are quite reliable, as I do every height for three times and take the average of it. I can make the results more accurate by using a light sensor with the computer. This will be more accurate then using a stop watch because human need a time to react before their brain do what it is told to do which is the reaction time. I think my method of doing the experiment is quite good because I can get accurate results from it. I can improve it by putting the ramp more stable and firmer because the ramp keeps on sliding down the slide. I think the method of doing the experiment is quite good because it gives me a quite accurate result and it takes less than half an hour to finish the experiment.

At first, I did an experiment on ‘mass of the object’ that takes about 45 minutes but I got results that are not appropriate for my experiment. So I quickly change the investigation on another topic. Although it wastes lots of time, I learn that mass of an object will not affect the final speed of a falling object.