Name

Period

Date

Acceleration using Hot Wheels

Purpose:

You will use three books, a photogate, a stopwatch, a Hot Wheel car, a marble, and a track to determine the acceleration of your car.

Procedure:

1. Set up the Hot Wheel track with one book under the starting point of the ramp.

2. Place the photogate at the end of your track. Make sure it still is hovering over the track.

3. Turn the photogate on by pressing the start button. Make sure your units blink “km/hr”!!! Keep pressing “start” until it flashes km/hr.

4. Clear your stopwatch and get ready to take time.

5. Have one person release the car while the other person starts the stop watch **at the same time**.

6. Have the timer person stop the stopwatch as the car goes through the photogate. Record this time in “time”.

7. Convert your photogate (km/hr) to (m/s)

8. Record your “final velocity” from the photogate in the table(s) below.

9. Calculate the acceleration for each trial.

10. Do three trials for each “# of books”.

11. Repeat steps 1-9 using two books.

12. Repeat steps 1-9 using three books.

13. Now repeat the trials using a marble in place of the Hot Wheels’ car.

Trials using the Hot Wheels car-

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| # of books | Trial # | Vi  (m/s) | Vf (m/s) | t (s) | v/ t= (m/s) | a (in m/s2) |
| 1 | 1 | 0 |  |  |  |  |
|  | 2 | 0 |  |  |  |  |
|  | 3 | 0 |  |  |  |  |
| 2 | 1 | 0 |  |  |  |  |
|  | 2 | 0 |  |  |  |  |
|  | 3 | 0 |  |  |  |  |
| 3 | 1 | 0 |  |  |  |  |
|  | 2 | 0 |  |  |  |  |
|  | 3 | 0 |  |  |  |  |

Trials using the marble-

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| # of books | Trial # | Vi (m/s) | Vf (m/s) | t (s) | v/ t= (m/s) | a (in m/s2) |
| 1 | 1 | 0 |  |  |  |  |
|  | 2 | 0 |  |  |  |  |
|  | 3 | 0 |  |  |  |  |
| 2 | 1 | 0 |  |  |  |  |
|  | 2 | 0 |  |  |  |  |
|  | 3 | 0 |  |  |  |  |
| 3 | 1 | 0 |  |  |  |  |
|  | 2 | 0 |  |  |  |  |
|  | 3 | 0 |  |  |  |  |

Extended Questions

13. What is acceleration?

14. Does the car or the marble accelerate down the ramp faster?

15. Why does this one (answer to #14) accelerate faster than the other one?

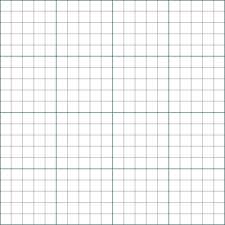
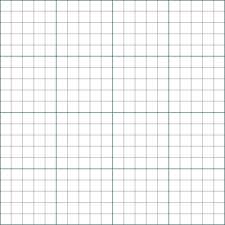
16. What happens to acceleration as you add more books (increase the ramp’s height)?

17. In general, as the car travels further and further down the ramp what happens to its velocity?

18. After you have completed the graphs, what relationship do you see? (aka- none, direct, inverse, square root)

Graphing Section

Construct a graph for acceleration of the car using a velocity-time graph. Use different colored pencils for each of the lines (plot the data for 1 book, 2 books, and 3 books).  Place the time magnitudes for the car on the horizontal or x-axis and the velocity magnitudes on the y-axis.  Remember that all blocks (squares) on each axis must have an equal value when you plot the data for accuracy in slope. Repeat on a separate graph for the marble. Include title, labels, and units.

[](http://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&docid=cadDyluRiF7goM&tbnid=NgluwVy4pCOhUM:&ved=0CAcQjRw&url=http://commons.wikimedia.org/wiki/File:Graph-paper.svg&ei=Rp8fVIuzC6OziwKRt4CQCw&bvm=bv.75775273,d.cGE&psig=AFQjCNEmoh38IXSJ4gcvNU8ui66K_7hpWw&ust=1411444819064758) [](http://www.google.com/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&docid=cadDyluRiF7goM&tbnid=NgluwVy4pCOhUM:&ved=0CAcQjRw&url=http://commons.wikimedia.org/wiki/File:Graph-paper.svg&ei=Rp8fVIuzC6OziwKRt4CQCw&bvm=bv.75775273,d.cGE&psig=AFQjCNEmoh38IXSJ4gcvNU8ui66K_7hpWw&ust=1411444819064758)