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AP Physics C: Mechanics

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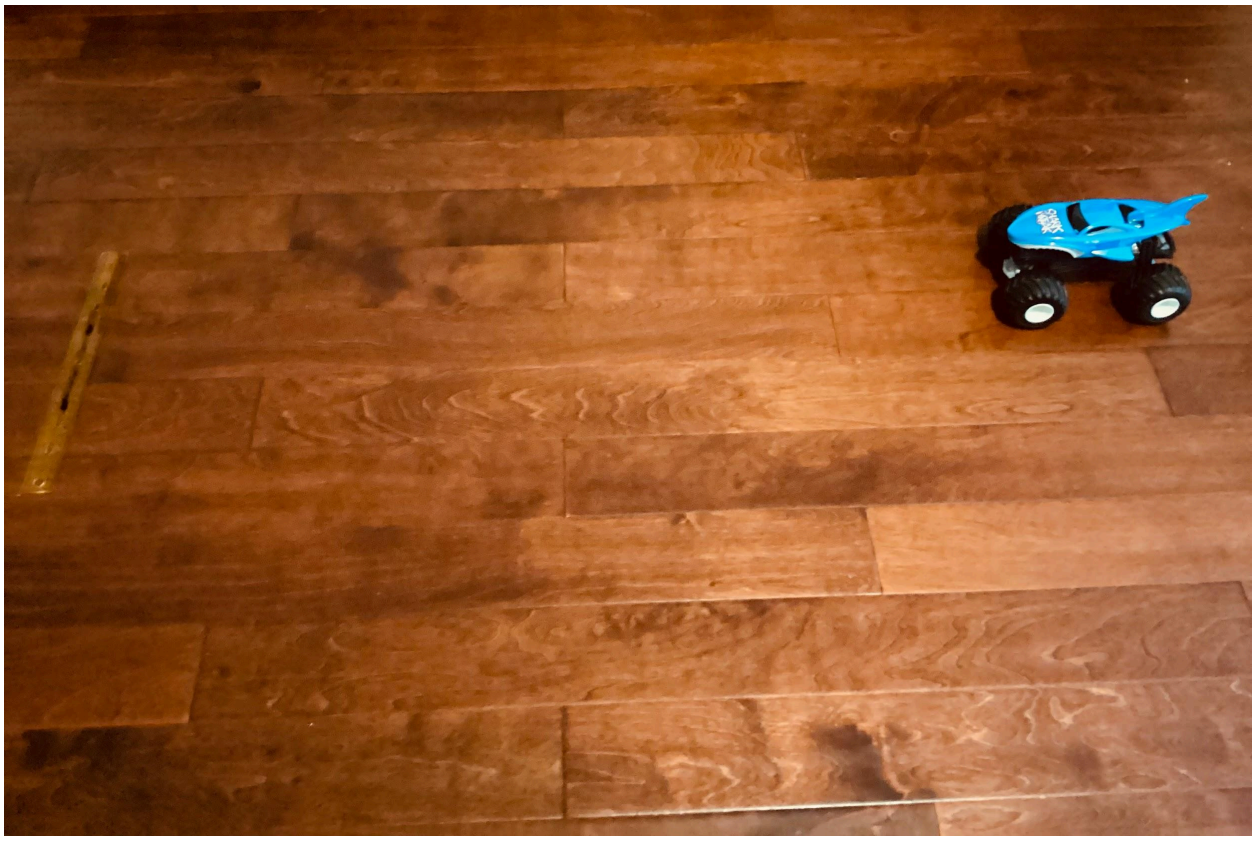
# Toy Buggy Experiment

**Purpose**:
To determine the graphical and mathematical relationship between position & clock reading for a toy buggy.

**Apparatus**:



**Question:** How does the change in starting position of the buggy affect the clock reading?

**Hypothesis:** If the starting position of the buggy is put closer to a set end position, then the clock reading will decrease because the change in clock reading is directly proportional to the change in position.

**Materials**:

- Buggy/Toy Car
- Tape Measure
- Rulers
- Digital Stopwatch

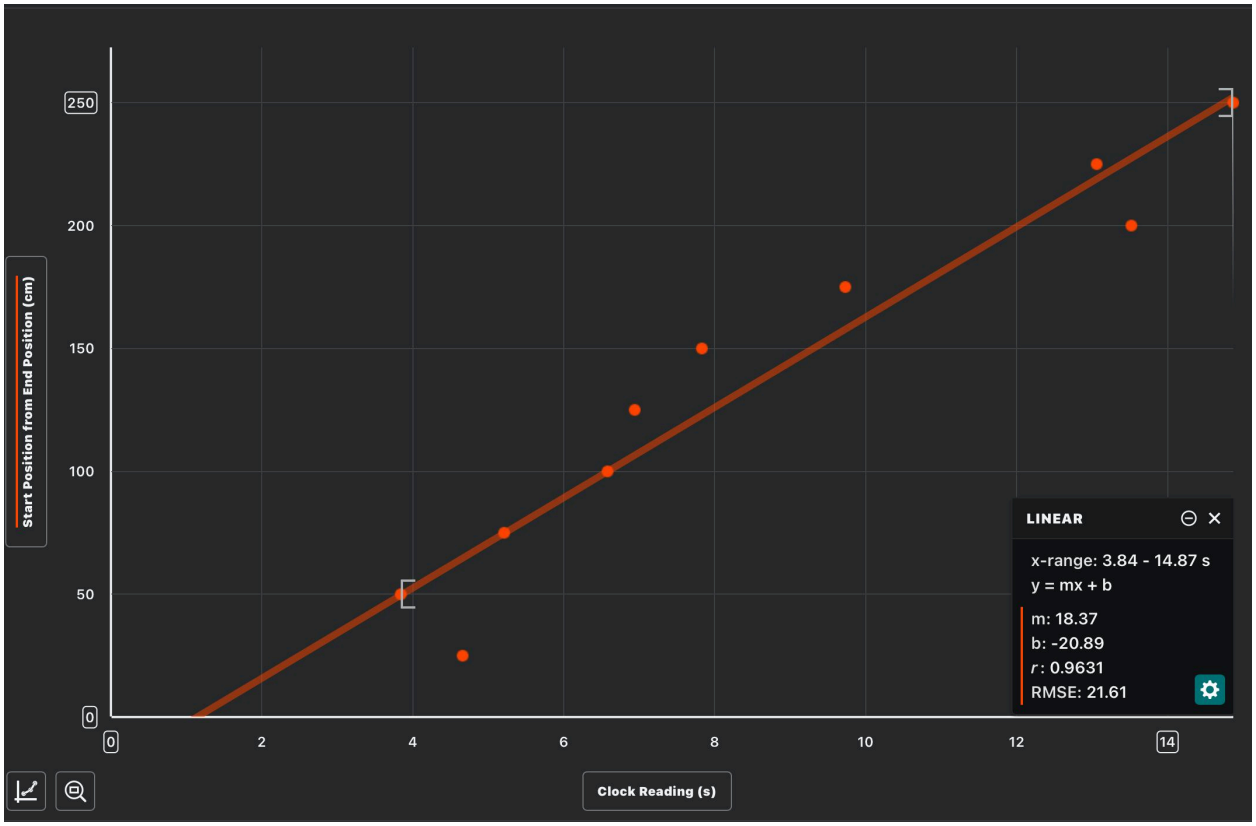
**Procedure:**

1. A ruler was set down as the permanent ‘end point’.
2. A ruler was set down as the first trial ‘start point’.
3. The distance between the start point and end point was measured as 25cm and recorded as the first trial distance.
4. The buggy was turned on a little behind the ‘start point’ and moved.
5. When the buggy got to the ‘start point’ the stopwatch timer began.
6. When the buggy got to the ‘end point’ the stopwatch was stopped.
7. The time was recorded as the first trial time.
8. The ‘start point’ distance to ‘end point’ distance increased by 25cm for the next trial.
9. Steps 2-8 were repeated to create 10 trials.
10. The data was gathered into a table for further analysis.

**Data Table:**

| | Position vs Clock Reading | |
|---|---|---|
| | Start Posi... (cm) | Clock Rea... (sec) |
| 1 | 25 | 4.66 |
| 2 | 50 | 3.84 |
| 3 | 75 | 5.21 |
| 4 | 100 | 6.58 |
| 5 | 125 | 6.94 |
| 6 | 150 | 7.83 |
| 7 | 175 | 9.73 |
| 8 | 200 | 13.52 |
| 9 | 225 | 13.06 |
| 10 | 250 | 14.87 |

**Graph:**




**Conclusion:**

The graph of our toy buggy's motion showed a linear relationship between position and time. The specific mathematical relationship we found was x = (18.37 cm/s)t - 20.89s. To get this equation, we plotted the buggy's position versus time, then used the slope-intercept form of a line to calculate the slope and y-intercept. The slope of 18.37 cm/s represents the velocity of the buggy, and the negative intercept of -20.89 s represents the head start the buggy had before the stopwatch began. The general equation of motion can be written as x = vt + b, where x is position, v is velocity, t is time, and b is the intercept. One source of error was the timing system used to find clock reading. Due to human error, the stopwatch could have been started and stopped differently. To fix this, a camera app could be used to see exactly when the buggy started and stopped. The buggy's battery also created inconsistencies. The buggy sped up when the

battery was warm and slowed down when the battery was drained. To fix this error, we can warm up the battery before testing and ensure that it is fully charged the whole time.