

Water Rocket Spreadsheet Analysis Practice

1. Modify the input cells (yellow) of your spreadsheet, so that they represent the rocket launch described below. Make sure that you enter all of the data.

*A water rocket is launched directly upward. Its **dry mass is 0.19kg**, and its **cross-sectional area is 0.01m²**. All thrust (water and air) ends 0.08s after the rocket begins to move, so **0.08s is the starting time for this spreadsheet**. At this time ($t=0.08s$), the **rocket's velocity is 62m/s**, and its **height (above the ground) is 3.6m**. Weather data show that the **density of the air around the rocket was 1.23kg/m³**.*

2. Video analysis shows that this rocket **reaches its apogee at a time of 3.3s**. Use this information to find the rocket's drag coefficient by "guessing and checking." Plug in different values for the drag coefficient until the time to apogee (orange cell) is 3.3s.
3. Once you have adjusted the drag coefficient so that the time to apogee matches the rocket's real time to apogee, use the spreadsheet to find/enter the following data:

Things you can find in the top section of the spreadsheet:

- A. The rocket's drag coefficient: _____
- B. The rocket's height at apogee: _____
- C. The rocket's terminal velocity: _____

To find these, you will need to scroll through the rows of calculations and do a little more thinking:

- D. The rocket's actual velocity when it hits the ground: _____
- E. The rocket's fastest acceleration while it is in the air: _____
(either positive or negative)
- F. The rocket's slowest acceleration while it is in the air: _____
(either positive or negative) while it is in the air.

4. How high would a baseball go if it were thrown directly upward from ground level, at a speed of 80mph, on an average Earth day at sea level?

- A. Look up the data that you need in order to answer this with your spreadsheet. Feel free to use a search engine or AI to find it all. Enter your data in the spreadsheet and find the height at apogee.

Realistic 80mph baseball apogee height, according to your spreadsheet:

- B. Adjust your spreadsheet so it gives you the height that the baseball would reach if there were no drag.

80mph baseball apogee height without drag: _____

- C. Now choose your favorite AI and ask it how high a baseball would go if thrown directly upward from ground level at 80mph – and how high it would go if there were no air resistance.

AI Model used: _____

AI Answers:

Realistic 80mph baseball apogee height: _____

Realistic 80mph baseball apogee height: _____

- D. If the spreadsheet and AI answer disagreed, do you have any idea why?