# POWERMILLS

## Teaching Guidelines

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| **Subject:** Mathematics<br>**Topics:** Algebra, Expressions and Equations, Patterns and Functions<br>**Grades:** 8 - 12 |
| **Concepts**:<br>• Function |
| **Knowledge and Skills**:<br>• Can solve an equation involving powers by taking roots |

Procedure: This activity is best done by students working individually or in teams of two.

Distribute the handout and discuss it.

Ensure that students understand why the amount of power produced by a wind generator would increase as the wind speed increases.

Discuss the fact that this is a functional relationship, and identify the independent variable (wind speed) and dependent variable (power). Then assign the task to individuals or teams.

Students should determine values of $k$ by plugging in the given values for wind speed and power. This will yield four slightly different values for each blade; it is up to the students to decide how to find one value of $k$ that best represents the relationship, for each blade. They would then use that value to find the power supplied at a wind speed of 25 mph.

# PowerMills

Janet,

We've just completed the first run of tests on the new blade design. The data is below, along with the data on our standard blades. (Both blades are the same size.) Can you give me a quick analysis?

1. Plot the data for both blades.
2. As you know, the relationship between the power produced and the speed of the wind should follow this equation:

   $$P = kw^3$$

   Please find the equation for each blade and the corresponding value of *k.*
3. For the new blade, what would you predict as the amount of power that would be produced in a 25 mile per hour wind?

| wind speed | Power: Old blade | Power: new blade |
|---|---|---|
| 5 mph | 98 watts | 113 watts |
| 10 mph | 743 watts | 855 watts |
| 15 mph | 2570 watts | 3010 watts |
| 20 mph | 6130 watts | 7080 watts |

Please have this on my desk by the end of the day.

*Charlie*
CFB