Rules of Firefighting

NAME _____

Fire-fighters don't rely completely on the computer-generated indices to control fires. There are some general rules that they incorporate into their tools when predicting how a fire will behave.

Rule #1: Fuel Moisture

When fuel moisture is below 5 percent, fires in both fine fuels and large fuels tend to spread equally quickly. When moisture levels are between 5 and 10 percent, fine-fuels fires spread more rapidly than large-fuel fires. At levels above 10 percent, the rates of spread are about the same again. When fuel moisture is above 15 percent, the fine-fuel fires will tend to extinguish themselves, whereas large-fuel fires will continue to spread.

1. On a single set of axes, draw possible graphs for the rate of spread of fine-fuel and large-fuel fires. Share your graph with another student. Discuss any differences.

Rule #2: Wind Speed

A general rule states that *rate of spread*, a dimensionless index that measures how quickly a fire will grow, will double for each increase of 4 meters per second (mps) in wind speed.

2. What is the nature of the relationship between rate of spread and wind speed? Draw a possible graph that relates rate of spread to wind speed.

3. Assume that the rate of spread is 6 when wind speed is 0 meters per second. Complete the table of values for rate of spread. Plot the graph of spread vs. wind speed.

RATE OF SPREAD	WIND SPEED
6	0 mps
	28 mps

4. How many miles per hour is 4 meters per second? What do you think is the reasonable part of the graph that you just drew?

Rule #3: Slope of Terrain

Several rules concern spread rate and the slope of the terrain on which the fire is spreading. One suggests that the rate of spread will double for every increase of 10º in slope. Discrepancies occur because other factors affect the rate of spread, including how packed the fuel bed is.

5. What is the nature of the relationship in this rule?

6. Use the data in the following chart to create scatterplots for each of the different kinds of fuel. Superimpose on the scatterplots the graphs of the functions previously obtained. How closely do these equations model the given rules?

Relative Rates of Spread

Slope in Degrees	Grass	Loose Litter	Tightly Packed Litter
0	1.0	1.0	1.0
10	2.3	1.7	1.3
20	6.6	3.8	2.4
30	15.0	8.0	4.5
40	30.1	15.8	8.4
50	60.5	30.8	15.9
60	126.7	64.0	32.6