

## Project RADAR: Math Lesson Plan

This math lesson plan is an opportunity for students to take the tools they are learning in current Math classes and apply it to a fun, interactive lesson plan of monitoring speeds of cars in busy intersections around their High School.

### ***Math elements:***

- Formula analysis
- Graph Analysis
- Critical thinking

Instructions for lesson plan recommendations to help make this a successful event:

- 15-18 students to be broken up into 3 teams (student team =5-6 students)
- Planning involvement of math or physics teachers
- Target students who can apply \_\_\_\_\_? (Sophomores, Juniors & Seniors may be best fit)
- **Observation:** How many cars are exceeding the speed limit, how speeding fines would apply.
- The project will need a minimum of **3 class dates** set for those involved & student teams, each to be 30 min-45 min each:
  - 1) **1st Class Date:** Pre-event presentation/overview of project to set-up event
  - 2) **2nd Class Date:** Event with radar velocity radar guns (student teams with supervisor)
  - 3) **3rd Class Date:** Post-event wrap-up & debrief, career based questions & awareness to community and school on findings.

Materials needed:

- Project RADAR kit
- Lesson Plan sheet (1 per student team, 20 vehicles recording per sheet)
- Parent/Guardian permission letter
- Project RADAR PowerPoint (on flash drive) for school staff/project coordinator to present for pre-event & post-event activities

## Speed Record Sheet (1 sheet per student team)

Group A

TIME	VELOCITY

Group B

TIME	VELOCITY

Group C

TIME	VELOCITY

Group D

TIME	VELOCITY

Group E

TIME	VELOCITY

## Project RADAR: Math Speeding Ticket Debrief (1 sheet per student team)

**Question:** How does the speed of vehicles in your school area compare to the speed limit and what speeding fines would be applied based on those speed?

**Materials:** 3 Radar guns, recording sheet

**Procedure:**

1. Set up three stations with radar guns in 3 different intersections in the school area. One person should operate the gun, another should act as the timer, and a third should act as the recorder.
2. As each car approaches, the person at station should measure its speed with the radar gun. Record data.

**(Practice exercise only, does not depict any factual information related to parties or entities)**

The state wants to change its system for assigning speeding fines to drivers. The current system allows a judge to assign a fine that is within the ranges shown in Table 1.

**Table 1. State Speeding Fines**

Miles per Hour over Speed Limit	Minimum Fine	Maximum Fine
1 – 5	\$55	\$125
6 – 10	\$75	\$150
11 – 15	\$95	\$175
16 – 20	\$125	\$225
21 – 30	\$180	\$600

Some people have complained that the State speed fine system is not fair. The New Drivers Association (NDA) is recommending a new speeding fine system. The NDA is studying another state system because of the claims that it is fairer.

**Table 2. Other State Speeding Fines**

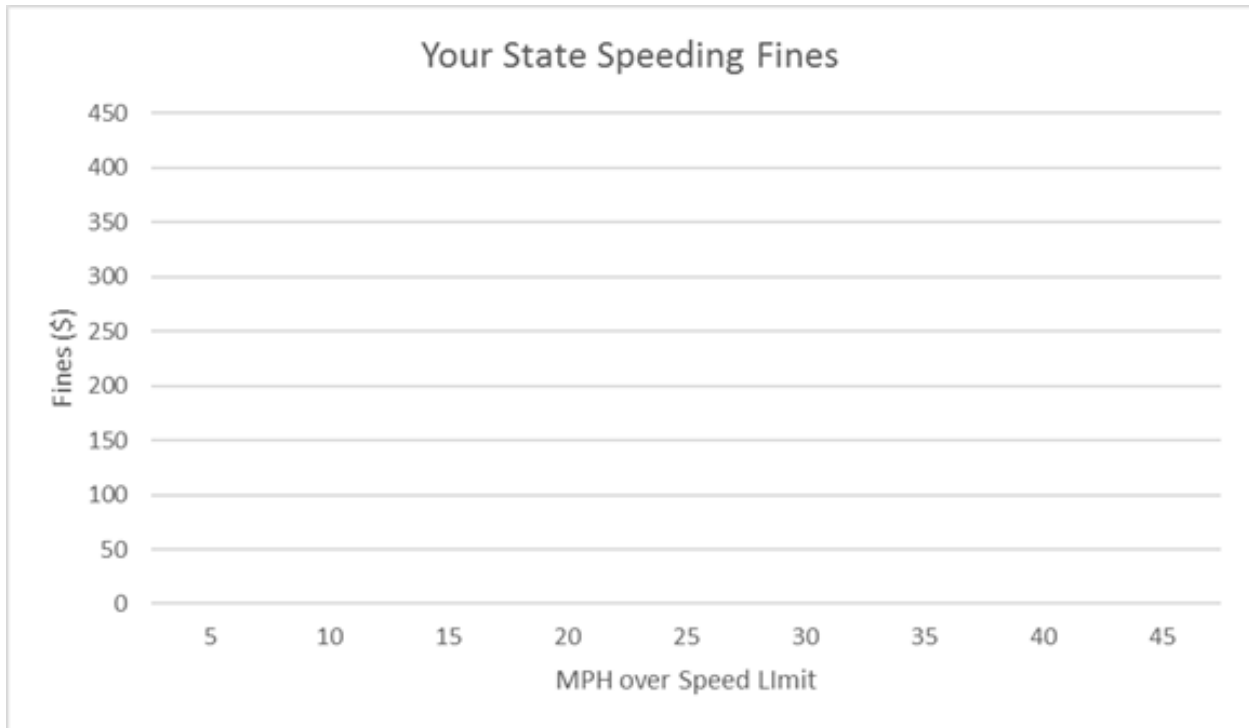
Miles per Hour over Speed Limit	Fine
1 – 10	\$100 flat charge
11 or more	\$100 flat charge plus \$10 for each additional mph above the first 10 mph

In this exercise, you will:

- Analyze the speeding fine systems for both States
- Use data to propose a fairer speeding fine system for your current state.
- Calculate out the fines for the car you measured with the radar gun for both state fine systems

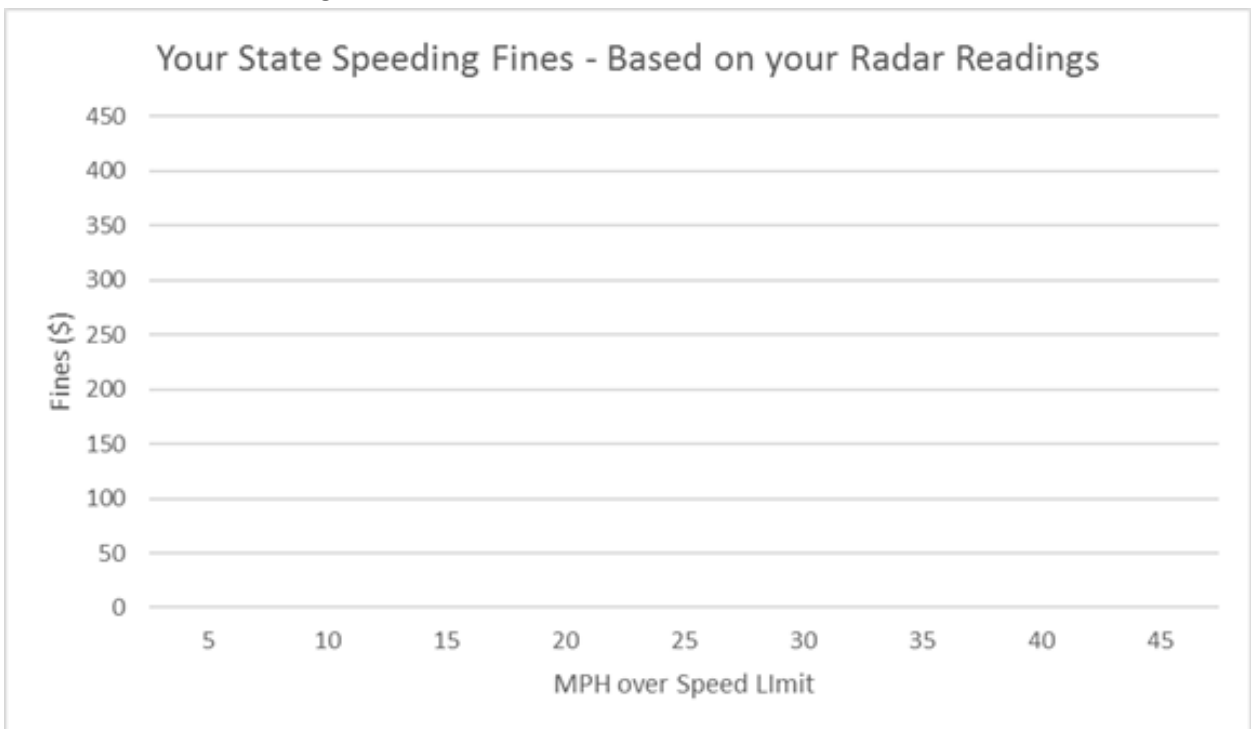
1. Part A – Use the information in Table 2 to plot data points for your state speeding fines.

- Plot a point to represent the fine for driving 5 mph over the speed limit.
- Plot additional points for each increment of 5 mpg over the speed limit up to 45 mph over the speed limit.



2. Part B – Create an equation to calculate your state’s speeding fine,  $f$ , based on the number of miles per hour,  $m$ , over the speed limit when  $1 \leq m \leq 10$ .

- a. Plot a point to represent the fine for each car that exceeded the speed limit in your radar recordings.



- b. What was the average miles per hour the cars speed over the speed limit?

c. What % of cars were exceeding the speed limit?

d. What's the average fine that would be issued based on the plots in your graph?

3. Part C - Based on your findings, what are your recommendations on the speeding fines – explain why.